



MIDDLE-SOUTH BRANCH FOREST RIVER DAM NO. 1 (MATEJCEK DAM)

FEASIBILITY REPORT AND PLAN OF WORK

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September 3, 2019

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REQUEST FOR ASSISTANCE

The Walsh County Water Resource District (WCWRD) applied to the Natural Resources Conservation Service (NRCS) for the Watershed Rehabilitation Program for the Middle-South Branch Forest River Watershed Dam No. 1 (Matejcek Dam). Matejcek Dam was constructed in 1966 through funding and technical assistance provided by the NRCS Watershed Program and is currently owned and operated by the WCWRD. In 2018, the NRCS awarded the WCWRD \$500,000 of technical assistance funding through the Watershed Rehabilitation Program. The NRCS and the WCWRD entered into a Cooperative Agreement to complete a Watershed Plan-Environmental Assessment for the review of rehabilitation of Matejcek Dam.



1 APPLICABLE AGENCY AUTHORITY

The original work plan was prepared, and works of improvement have been installed, under the authority of the Watershed Protection and Flood Prevention Act of 1954 (Public Law 83-566) as amended. The rehabilitation of Middle-South Branch Forest River Watershed Dam No. 1 (Matejcek Dam) is authorized under Public Law 83-566 (16 U.S.C. 1012), which authorizes financial assistance to local organizations to cover a portion of costs incurred for the rehabilitation of structural measures originally constructed as part of a project carried out under Public Law 83-566

1.1 PLANNING TEAM STRUCTURE

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1.2 COMPLIANCE WITH OTHER FEDERAL LAWS, REGULATIONS, EXECUTIVE ORDERS, OTHER AUTHORITIES

In addition to Public Law 83-566, several other Federal laws, regulations, Executive Orders, and NRCS policies are directly related to the Watershed Planning effort and its anticipated outcomes. A comprehensive list is provided in the NRCS National Watershed Planning Manual, Part 500.32 (US Department of Agriculture-National Resource Conservation Service, 2014). All work undertaken in this planning effort, or to implement outcomes from this planning effort, will be in conformance with all applicable Federal laws, regulations, Executive Orders, and NRCS policies. Other authorities will also include compliance with applicable state and local laws, policies, and regulations.

2 PURPOSE AND NEED FOR ACTION

The purpose of the project is to bring Middle Branch Forest River Dam No. 1 (Matejcek Dam) into compliance with current NRCS and ND State Water Commission (SWC) dam performance, design, and safety standards while maintaining the current flood protection and recreational opportunities.

The need for the project is based on the following concerns:

- **Dam performance, design, and public safety:** Reducing the risk to public safety is necessary because Matejcek Dam does not meet current performance and safety standards for a high hazard dam for either NRCS or the ND SWC. Matejcek Dam was constructed in 1966 by a group of local Sponsors, with technical and financial assistance from the Natural Resources Conservation Service (NRCS), formerly the Soil Conservation Service (SCS), and has exceeded its design life of 50 years (in 2016). The dam was assessed against current dam safety requirements for a High Hazard classification as part of the Dam Assessment Report (Gannett Fleming, Inc., 2010). The Dam Assessment Report indicated that approximately 28 potentially inhabitable structures would be impacted in the event of a dam breach. Of these structures, approximately six potentially inhabitable structures, including residences, would experience flooding within 1.5 mile downstream of the dam. (Gannett Fleming, Inc., 2010).
- **Flood protection:** Flood protection along the Forest River downstream of Matejcek Dam is needed because damages due to flooding occur to land, crops, buildings and facilities, and infrastructure. Flooding caused by spring snowmelt and heavy summer rainfall can lead to delayed planting or damage to crops. The Watershed Work Plan shows installation of Matejcek Dam, along with two other flood retarding structures, reduces flood damages by 30% (US Department of Agriculture-Soil Conservation Service, 1961).
- **Recreation:** Matejcek Dam was constructed to provide habitat for fish and wildlife and associated recreational opportunities for area residents. Recreation is needed to enhance local opportunities for area residents to enjoy outdoor activities. Currently, the normal pool and adjacent land provides outdoor recreation opportunities for area residents including a public beach, fishing, boat access, hiking, and camping. The normal pool upstream of Matejcek Dam is only one of four available public fisheries in Walsh County, ND (North Dakota Game and Fish Department, 2016d). Recreation sites like this are relatively uncommon in the region.

3 MATEJCEK DAM BACKGROUND INFORMATION

3.1 AS-BUILT DESIGN DATA

Table 1: Matejcek Dam as-built design data

General Data		
Year Design	1964	
Year Constructed	1966	
Purpose(s)	Flood Control, Wildlife, and Recreation	
Original Hazard Classification	Significant	
Current Hazard Classification	High	
Design Life	50 years	
Original Design Drainage Area	45.9 sq. mi.	
Revised Drainage Area (Direct) ^[1]	121.2 sq. mi.	
Revised Drainage Area (Indirect) ^{[1][4]}	171.9 sq. mi.	
Dam Height	60 feet	
Maximum Dam Height	86.6 feet	
Embankment Length	1,150 feet	
Embankment Top Width ^[2]	32 feet	
Embankment Upstream Slope	3.5 H:1 V	
Embankment Downstream Slope	2.5 H:1 V	
Critical Elevations		Elevation (MSL) ^[3]
Top of Dam	1366.0	
Auxiliary Spillway Crest	1360.8	
Principal Spillway Riser Tower Crest	1354.2	
Principal Spillway Orifice Inverts	1334.8	
Principal Spillway Outfall Invert	1295.8	
Principal Spillway Stilling Basin Invert	1278.6	
Reference Point	Storage	Surface Area
Top of Dam	9,144 acre- feet	--
Auxiliary Spillway Crest	7,725 acre - feet	252.8 acres
Principal Spillway Riser Tower Crest	6,162 acre - feet	221.7 acres
Principal Spillway Orifice Inverts	2,745 acre - feet	134.8 acres

[1] Revised using available LiDAR information.

[2] Includes roadway width of Walsh County Road 14.

[3] Add 1.20 feet to convert MSL vertical datum to NAVD 1988 vertical datum (approximate).

[4] Indirect drainage area is the Michigan Spillway Project drainage area, which has a regulated discharge of 50 CFS.

3.2 MICHIGAN SPILLWAY DRAINAGE

Matejcek Dam is located downstream of the Michigan Spillway Project (constructed by the Nelson County Water Resource District). The Michigan Spillway Project discharges runoff volume from an approximately 172 square mile watershed into the Forest River upstream of Matejcek Dam. The Michigan Spillway Project consists of a pumping system capable of discharging 50 cubic feet per second, controlled via an agreement for maximum allowable stage in the reservoir. The spillway was constructed after Matejcek Dam was completed.

3.3 CURRENT DAM SAFETY INFORMATION

Matejcek Dam was assessed against current Dam Safety requirements for a High Hazard classification as part of the previously completed Dam Assessment Report (Gannett Fleming, Inc., 2010). Based on this assessment, the following deficiencies were identified:

- The Auxiliary Spillway Crest is 8.7 feet lower than required for a NRCS High Hazard Structure. NRCS requires that a High Hazard structure be capable of passing the 100-year flood through the Principal Spillway without utilizing the Auxiliary Spillway.
- The Top of Dam is 16.4 feet lower than what is required for a NRCS High Hazard Structure to pass the freeboard hydrograph, assuming that the auxiliary spillway is raised 8.7 feet.
- The Principal Spillway is not capable of meeting NRCS drawdown requirements, which specify that 85% or more of the maximum retarding volume be drawn down in 10-days or less.
- An auxiliary spillway integrity analysis indicated that a potential complete breach during the passage of the 24-hour duration freeboard hydrograph.
- The existing riser structure is non-standard for NRCS structures.
- The low-level drawdown gate is inoperable.
- Apparent irregular downstream slope.
- Anti-seep collars were built along the principal spillway outlet conduit, and no filter diaphragm was used.
- Slough observed on downstream slope.

4 RESOURCE INFORMATION

Matejcek Dam is located within the Forest River Watershed, which is in northeast North Dakota and is a tributary to the Red River Basin. The contributing watershed area to the Forest River is 896 square miles. The initial Watershed Work Plan (discussed in Section 4.1) included the Middle Branch and South Branch of the Forest River Watershed. This Feasibility Report describes the area local to Matejcek Dam and its context on the landscape. This context is organized in this report as three layers of land area assessment as follows:

- Forest River Watershed Drainage Area: The largest area is the Forest River Watershed_Drainage Area. This extent describes the wider region surrounding Matejcek Dam and is mentioned where a larger context is appropriate for this report. **Exhibit 01.1** provides a map of the area.
- Area of Interest (AOI): The second layer of assessment is referred to as the AOI. This includes three sub-watersheds or parts of watersheds within or adjacent to the Forest River Drainage Area (Areas 1A, 1B, 2). The characteristics of these areas are described in detail in this Feasibility Report, grouped together and also each separately. This information describes the environmental context of Matejcek Dam and extent of the Forest River downstream of the dam. **Exhibit 01.2** shows the location of these watersheds within the AOI. More details are shown in Section 5.3.1.
- Area of Potential Effect (APE): The third layer of assessment (Area 3) consists of two zones: the Dam Zone includes the dam site, the flood pool upstream, a stretch of river immediately downstream; the River Zone includes the length of the river downstream to Lake Ardoch. This assessment layer is referred to as the APE and it is the land which may be directly affected by project activities. This specific area location is shown on **Exhibit 01.2** and more details are shown in Section 5.3.1.

4.1 SUMMARY OF WATERSHED WORK PLAN

The initial Watershed Work Plan for the Middle-South Branch of the Forest River (US Department of Agriculture-Soil Conservation Service, 1961) was sponsored by Nelson County Soil Conservation District, Three Rivers Soil Conservation District, Walsh County Soil Conservation District, Eastern Grand Forks Soil Conservation District, and Walsh County Water Conservation and Flood Control District. The planning extents covered approximately 343 square miles of the Forest River Watershed.

The principal problem identified in the Watershed Work Plan is floodwater damage to land, crops, buildings and facilities, roads, bridges, and rural and urban property. Spring snowmelt and excessive rainfall events were cited as the primary cause of flooding in the Forest River Watershed. Spring snowmelt leads to delayed planting, and heavy summer rainfall events can damage to seeded and/or growing crops. The average annual floodwater damages were estimated to be \$120,272, with \$84,997 related to crop damages. Average annual erosion damage was estimated at \$2,039 in relation to floodplain scour, and indirect average annual damages were estimated at \$12,231. This brought the annual damage total average to \$134,542 for the Forest River Watershed included in the planning extents. All monetary values discussed are in reference to the US dollar value in 1961.

The original Watershed Work Plan's preferred alternative included installation of land treatment measures, two floodwater retarding structures (Dam 4, Fordville Dam; Dam 6, Whitman Dam), one multipurpose structure (Dam 1, Matejcek Dam), and a floodway channel. Dams 1 and 6 were located on the Middle Branch of the Forest River, and Dam 4 was located on the South Branch of the Forest River. All three dams

combined provide 13,408 acre-feet of floodwater detention and control a drainage area of 179.2 square miles of the upper Forest River Watershed. The floodway channel was proposed to be constructed just south of the Grand Forks/Walsh County line and would divert flows from the Forest River east into a natural coulee to bypass floodwaters from damage areas near the community of Forest River, ND.

After completion of the original Watershed Work Plan, several subsequent modifications were issued. Dam 6 (Whitman Dam) was modified converted to provide a fish and wildlife pool (US Department of Agriculture-Soil Conservation Service, 1962), Dam 1 (Matejcek Dam) was modified to increase the volume of the fish and wildlife pool (US Department of Agriculture-Soil Conservation Service, 1964), and Dam 4 (Fordville Dam) was later relocated and also converted to provide a fish and wildlife pool (US Department of Agriculture-Soil Conservation Service, 1969). An additional channel conveyance project referred to as the Fairdale Drain was added to the Watershed Work Plan in 1970 (US Department of Agriculture-Soil Conservation Service, 1970). This added component included 25.8 linear miles of channelization upstream of Dam 6. The final modification to the Watershed Work Plan removed this floodway channel due primarily to local opposition to the project alignment (US Department of Agriculture-Soil Conservation Service, 1988b).

4.2 EXISTING DATA

Previous studies and investigations that are applicable to the Watershed Planning Effort were inventoried and reviewed. These publications are listed below and are also cited in the References section of this document:

- Middle-South Branch Forest River Watershed Work Plan (US Department of Agriculture-Soil Conservation Service, 1961)
- Supplemental Watershed Work Plan Agreement No. 1 (US Department of Agriculture-Soil Conservation Service, 1962)
- Supplemental Watershed Work Plan Agreement No. 2 (US Department of Agriculture-Soil Conservation Service, 1964)
- Flood Retarding Fish and Wildlife Dam No. 1 As-Built Drawings (US Department of Agriculture-Soil Conservation Service, 1966)
- Supplemental Watershed Work Plan Agreement No. 3 (US Department of Agriculture-Soil Conservation Service, 1969)
- Supplemental Watershed Work Plan Agreement No. 4 (US Department of Agriculture-Soil Conservation Service, 1970)
- Supplemental Watershed Work Plan Agreement No. 5 (US Department of Agriculture-Soil Conservation Service, 1971)
- Supplemental Watershed Work Plan Agreement No. 6 (US Department of Agriculture-Soil Conservation Service, 1977)
- Reconnaissance Report: Red River of the North Basin, Forest River Subbasin (US Army Corps of Engineers, 1980)
- ND State Water Commission 1983 Inspection Summary Letter (Sprynczynatyk, David A, 1985)
- Forest River Diversion Study (US Department of Agriculture-Soil Conservation Service, 1988a)
- ND State Water Commission 1987 Inspection Summary Letter (Sprynczynatyk, 1988)

- Supplemental Watershed Work Plan Agreement No. 7 (US Department of Agriculture-Soil Conservation Service, 1988b)
- Phase I Inspection Report National Dam Safety Program (US Army Corps of Engineers, 1978)
- ND State Water Commission 1991 Inspection Summary Letter (Frink, 1993)
- Forest River Flood Plain Management Study (US Department of Agriculture-National Resource Conservation Service, 1996)
- NRCS Dam Inspection Summary Letter (Benson & Thompson, 2008)
- Matejcek Dam Emergency Action Plan (Walsh County Water Resource District, 2008)
- Dam Assessment Report (Gannett Fleming, Inc., 2010)
- Red River of the North Hydrologic Modeling – Phase 2 (US Army Corps of Engineers, 2013)
- Forest River Watershed Comprehensive Detention Plan (Red River Joint Water Resource District, 2013)
- North Dakota 2016 Integrated Section 305(b) Water Quality Assessment Report and Section 303(d) List of Waters Needing Total Maximum Daily Loads (North Dakota Department of Health, 2017a).

4.3 GATHERED DATA

Information that has been gathered through review of publications cited in the previous section, in addition to available geospatial (GIS) data and field investigations, was used to provide background information for the Watershed Planning Effort. This information is summarized in the following sections.

4.3.1 AREA OF INTEREST

A specific Area of Interest (AOI) has been defined, consisting of three smaller watershed areas within the Forest River Drainage Area (See the beginning of Section 5 for more details). The three watershed areas are defined based on anticipated impacts and planning requirements. Each of these, Area 1A, Area 1B, and Area 2, are briefly described below and shown in **Exhibit 01.2**. The location of the project (Matejcek Dam) where there will be direct effects upon the environment (the Area of Potential Effect, APE), is identified below as Area 3.

4.3.1.1 AREA 1A: UPSTREAM OF MATEJCEK DAM (DIRECT)

Area 1A is approximately 120 square miles and contains portions of Cavalier, Nelson, and Walsh Counties. This is the directly-contributing watershed upstream of Matejcek Dam (Area 1A). Environmental concerns may include sediment and nutrient delivery, impacts to riparian corridors and forest resources, and land treatment.

4.3.1.2 AREA 1B: UPSTREAM OF MATEJCEK DAM (INDIRECT)

Area 1B, approximately 172 square miles, is located in Nelson, Walsh, and Ramsey Counties. Historically, this watershed was considered hydrologically closed, meaning runoff would accumulate in basins that provided no natural outlet. Successive years of high runoff resulted in several of these closed basins experienced flood damages and increased risk of an uncontrolled overflow. In response to this, the Nelson County Water Resource District constructed the Michigan Spillway Project to provide a controlled release of high water trapped in several closed basins. This project enables regulated discharge into a tributary of the Middle Branch of the Forest River upstream of Matejcek Dam. Resource assessments will consider the effects of this additional discharge in the Forest River.

4.3.1.3 AREA 2: DOWNSTREAM OF MATEJCEK DAM

Matejcek Dam provides streamflow regulation downstream to the Forest River. Area 2 is extended downstream far enough to include flood-prone stretches between the communities of Forest River and Minto, ND. Area 2 is approximately 179 square miles, and contains portions of Grand Forks, Nelson, and Walsh Counties.

4.3.1.4 AREA 3: MATEJCEK DAM AND ASSOCIATED FLOOD POOLS

Area 3 is the Area of Potential Effect (APE) for this project and includes two zones: The Dam Zone (the dam, the flood pool, and a stretch of river immediately downstream of the dam) and the River Zone (the stretch of river from the dam downstream to Lake Ardoch). All alternatives are likely to have an impact on these zones, with more acute impacts on the dam zone and less acute impacts on the river zone. The dam zone includes non-tilled regions of the Forest River Valley and is approximately 1089 acres, entirely within Walsh County. The River Zone includes 46 miles of river (Middle Branch Forest River, North Branch Forest River, Forest River) and the adjacent floodplain. Area 3 overlaps with and is included in assessments of Area 1A and Area 2.

4.3.2 LANDFORMS AND TOPOGRAPHY

The eastern portion of the AOI is located within the Lake Agassiz Plain, which includes the Glacial Lake Agassiz Basin, Sand Deltas and Beach Ridges, and Saline Area. The western portion of the AOI is located within the Northern Glaciated Plains, most specifically the Drift Plains of that region (Bryce, et al., 1998). Most of the region is covered by silt and clay deposits consistent with a lake bottom. Beach ridges scattered throughout the valley mark the former shoreline of the giant Lake Agassiz, at various periods of time. The valley rises 500 feet over a bedrock escarpment to mark the natural boundary of the Red River Valley (North Dakota Game and Fish Department, 2016a). Prairie potholes located within the AOI provide natural water management because of their ability to absorb rainfall and snow melt runoff. The watershed is generally characterized by moderate slopes in the west (Nelson and western Walsh Counties), with slopes flattening in the east (Grand Forks and eastern Walsh Counties).

The watershed upstream of Matejcek Dam, Area 1A, is generally characterized by moderate slopes. The elevation change over the watershed is a maximum elevation of 1686 feet (NAVD1988) in the north western portion of the watershed, and an elevation of 1366 feet at Matejcek Dam. The area downstream of the dam, along the Forest River (Area 2), consists moderate slopes along the escarpment of the Red River Basin until approximately ND State Highway 18. From there, slopes gradually flatten to the east. Portions of the Forest River floodplain between the communities of Forest River and Minto, ND are “perched”, meaning the adjacent floodplain slopes away from the river channel. Elevations in the APE downstream of Matejcek Dam range from 1366 feet at Matejcek Dam to 802 feet at the outlet of Lake Ardoch. **Exhibits 02.1 and 02.2** provide a visual depiction of elevation and **Exhibits 02.3 and 02.4** show landscape slope.

4.3.3 LAND USE

Land use is predominantly agricultural over the Forest River Watershed, but natural land, including open water, is also abundant in the area. Land use data are presented in **Exhibit 03.1** and in **Figure 1** below (National Agricultural Statistics Service, 2017). Human development in the watershed is low, ranging between 4.3 % and 11.5 % in the AOI. Agriculture, as crops and hayland/pasture, covers 69 % of the area (208,000 acres) while natural land (wetlands, open water, and deciduous forests) covers 25 % (76,000 acres). The predominant crops in the watershed are spring wheat (17 %) and soybeans (17 %). Area 2 has the highest proportion of crop production (84 %, 96,000 acres) dominated by soybeans and spring wheat; followed by Area 1A (75 %, 58,000 acres) dominated by spring wheat, grass/pasture, soybeans, and canola; and Area 1B (50 %, 54,000 acres) dominated by spring wheat, grass/pasture, and soybeans. Herbaceous wetland is the dominant natural area habitat. Area 1B leads with the largest proportion of natural land (44 %, 49,000 acres), followed by Area 1A (21 %, 16,000 acres) and Area 2 (10 %, 11,000 acres). Area 3 Dam Zone, as observed during a field vegetation survey (Houston Engineering, Inc., 2019) includes 33 % agricultural land (tilled land and pasture/hayland) and 77 % natural land including open water (**Exhibit 03.2, Table 2**).

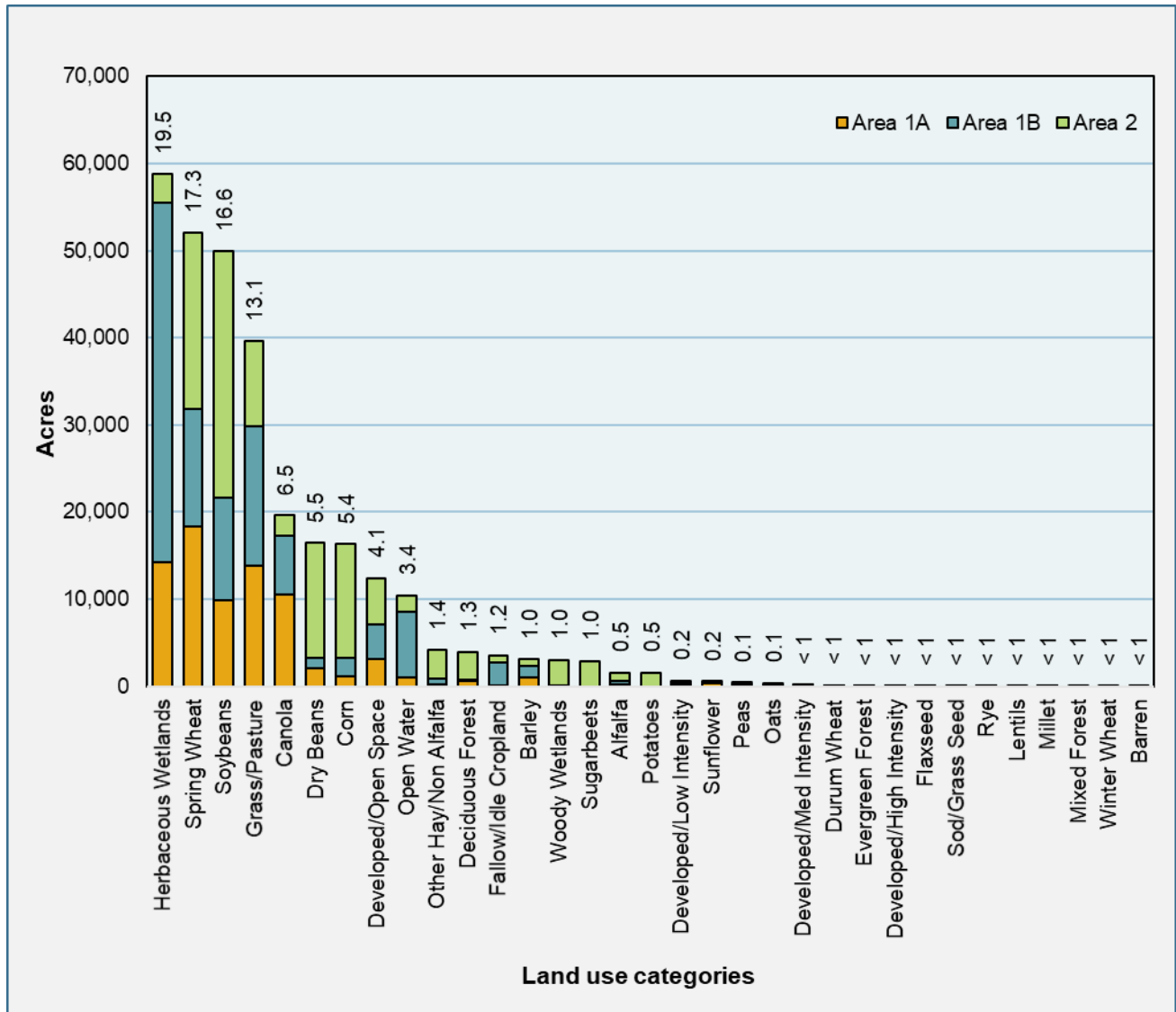


Figure 1: Land use in the Area of Interest (values above bars indicate combined percent).

Table 2: Land use observed in Area of Potential Effect (Area 3 – Dam Zone).

Plant community	Acres	% of total acres
Riparian forest	448	41.1
Pasture/hayland	195	17.9
Agricultural land	164	15.0
Open water	134	12.3
Mixed grass prairie	110	10.1
Riverine wetland (herbaceous wetlands)	25	2.3
Palustrine emergent wetland (herbaceous wetlands)	13	1.2
Total survey area	1089	100.0

4.3.4 STATE AND FEDERAL LANDS

Natural areas are sites in which land and water are maintained to provide some ecosystem services as natural conditions. These areas may be under private ownership or easement agreements and may be under the jurisdiction of the Federal government, state governments, or private land. North Dakota also has a system for managing trust assets related to land and mineral acres.

The AOI has a variety of sites set aside or managed for supporting animal populations and plant communities, including Waterfowl Production Areas, Wildlife Refuges, and Wildlife Management Areas (**Exhibit 04.1, Table 3**, (North Dakota Information Technology Department, 2019). Area 1A has the least with 308 acres, followed by Area 1B with 1259 acres, and Area 2 with 2394 acres. Lake Ardoch National Wildlife Refuge is directly associated with the Forest River and there are several mineral trust lands adjacent to the APE River Zone. There are no wildlife areas nor State Trust Lands in Area 3 Dam Zone.

Table 3: Federal and state lands in the Area of Interest

	Area 1A	Area 1B	Area 2	Area 3
Land designation	Name, acres			
National Waterfowl Production Area	Fairdale (260) Trenda (46) Old Aalalen (2)	Pelto (127) Dahl (79) Erickson (160) McHugh (396) Toutges (188) Walsh (70) Hove (239)	-	-
National Wildlife Refuge	-		Ardoch, part (2,235)	-
State Wildlife Management Areas	-	-	159	-
Total wildlife conservation areas	308	1,259	2,394	0
State Trust Land Minerals	3,780	11,822	1,986	-
State Trust Land Surface	159	556	-	-
Total federal and state land	4,247	13,637	4,380	

4.3.5 GEOLOGY AND SOILS

4.3.5.1 SURFACE GEOLOGY

Surficial geology of the region is characterized by sedimentary deposits resulting from glaciation. Nelson County and western Walsh County are located in the Drift Prairie ecoregion where landforms are associated with glaciers and include moraines (Bryce, et al., 1998) (**Exhibit 05.1**). The eastern two-thirds of Walsh County are located in the Red River Valley, below the Pembina Escarpment, and the landforms here are associated with glacial Lake Agassiz. Several formations are present in the AOI and these consist of glacial till, silt, clay, cross-bedded sand, and shale sediments (North Dakota Geologic Survey, 2018); **Exhibit 05.2**). The Coleharbor formation, the most abundant in the watershed, is composed of lenses and beds of till, gravel, sand, silt, clay, and boulders and cobbles (Bluemle, 1973). This formation has poorly-integrated drainage, gentle slopes, potholes, and glacial outwash and lake plain areas. This formation makes up 82 % of the AOI (247,000 acres) (**Figure 2**). The Oahe and Pierre formations are formed from river sediments. The Oahe formation is comprised of clays and the Pierre formation is marine offshore shale. These two formations are less common over the AOI. Area 1A (95 %, 73,000 acres) and Area 1B (100 %, 110,000 acres) are dominated by Coleharbor glacial till, while Area 2 has a mix of Coleharbor till (45 %, 52, 000 acres), Coleharbor silt (22 %, 25, 000 acres), Oahe clay (21 %, 24, 000 acres), and Coleharbor cross-bedded sand (river sediments) (10 %, 12, 000 acres). Area 3 is dominated by Pierre shale (86 %, 950 acres), with lesser amounts of Oahe clay (8 %) and Coleharbor glacial till (6 %) (**Figure 2**).

The surface geology in the area, being fine glacial sedimentary deposits, is highly erodible. This, in addition to the low-relief landscape, makes the area subject to highly-meandering watercourses and substantial sediment movement to the Red River of the North.

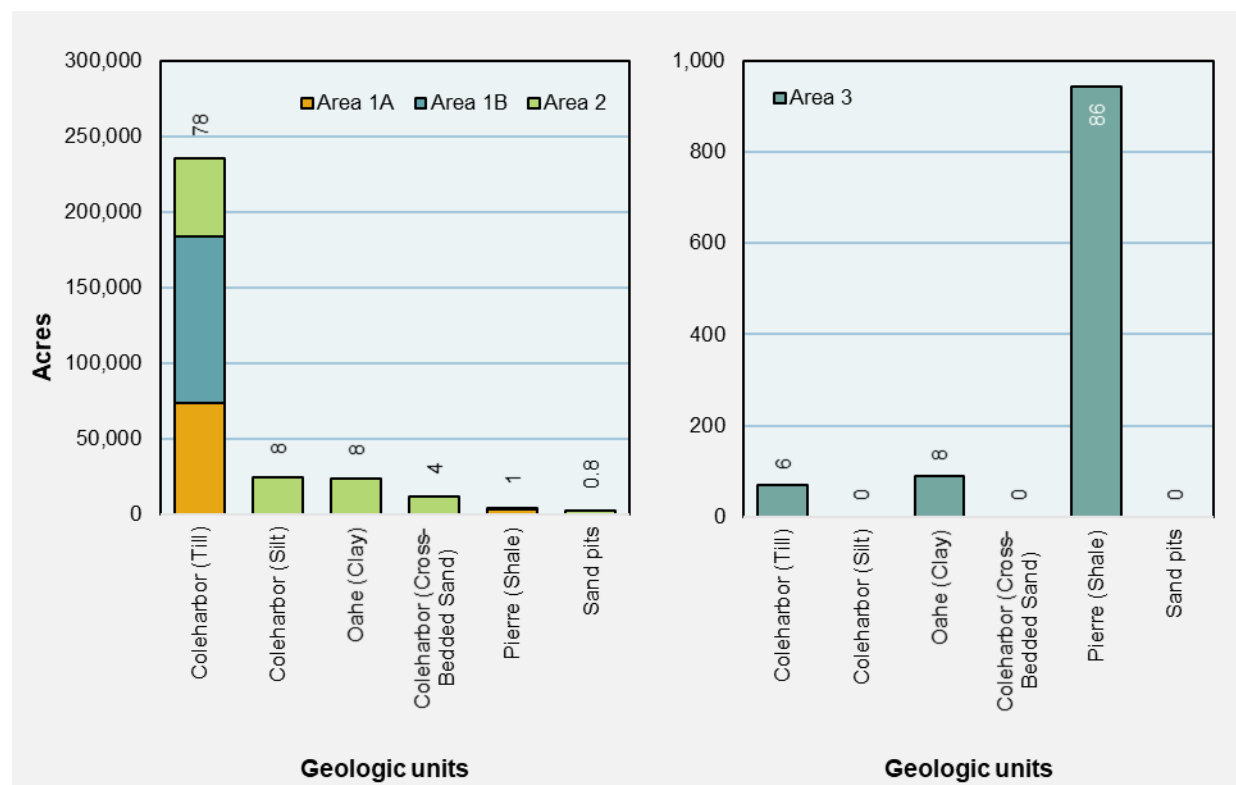


Figure 2: Surficial geology in the Area of Interest (values above bars indicate combined percent).

4.3.5.2 SOILS

Soil units and textures: Over the AOI there are 294 different mapped units (Soil Survey Staff, USDA-NRCS, 2017). **Table 4** lists the dominant soil units in the AOI (top 75 % land cover). They are predominantly loamy textured (loam: 97 %, 233,000 acres; silty clay loam: 12 %, 27,000 acres) (**Figure 3, Exhibit 05.3**, (Soil Survey Staff, USDA-NRCS, 2018). Area 2 includes some other soil types including sandy loam, silty loam, silty clays, and silty clay loam (sum 29 %, 67,000 acres). This reflects the underlying geologic units of glacial till interspersed with river sediments. The most common soil unit is Barnes-Buse loams (3 to 6 percent slopes), which covers 17 % of the land area (51,000 acres). These are deep, well-drained soils formed in loamy till on till plains and moraines (Soil Survey Staff, USDA-NRCS, 2019). Area 1 has a total of 62 different soil units (**Table 5**), the most common of which are Barnes-Buse loams, 3 to 6 percent slopes (21 %, 16,000 acres); Hamerly-Wyard loams, 0 to 3 percent slopes (14 %, 10,500 acres); Balaton-Wyard loams, 0 to 6 percent slopes (13 %, 10,000 acres); and Vallery, saline-Parnell complex, 0 to 1 percent slopes (11 %, 8,000 acres). These soils are deep to very deep and poorly- to well-drained. Area 1B has a total of 60 different soil units and is similar to area 1A (**Table 5**). Area 2 has a total of 174 different soil units, with many units covering smaller areas. The most dominant soil here is Barnes-Buse loams, 3 to 6 percent slopes at 12 % of the land area (14,000 acres). Area 3 is dominated by loamy soils (99 %, 900 acres) (**Figure 3**). This area contains a total of 23 different soil units and these two units cover at least 50 % of the land area (**Table 5**). These are Kloten-Walsh-Edgeley loams, wooded, 6 to 35 percent slopes (37 %, 400 acres) and Kloten-Walsh-Edgeley loams, 6 to 35 percent slopes (13 %, 150 acres). The Kloten series is shallow, well-drained and moderately permeable soils on gently sloping to steep valley sides.

Table 4: Predominant soil units within the Area of Interest (top 75 % land cover).

Soil unit name	Acres	Percent acres
Barnes-Buse loams, 3 to 6 percent slopes	51036	17
Vallery, saline-Parnell complex, 0 to 1 percent slopes	26080	9
Balaton-Wyard loams, 0 to 6 percent slopes	26003	9
Hamerly-Wyard loams, 0 to 3 percent slopes	19179	6
Barnes-Svea loams, 3 to 6 percent slopes	13354	4
Hamerly-Tonka complex, 0 to 3 percent slopes	11650	4
Barnes-Buse-Langhei loams, 6 to 9 percent slopes	10390	3
Barnes-Svea loams, 0 to 3 percent slopes	8831	3
Vallery-Hamerly loams, saline, 0 to 3 percent slopes	7407	2
Parnell silty clay loam, 0 to 1 percent slopes	6765	2
Svea-Cresbard loams, 0 to 3 percent slopes	6750	2
Glyndon silt loam, 0 to 2 percent slopes	5882	2
Vallery loam, saline, 0 to 1 percent slopes	5377	2
Southam silty clay loam, 0 to 1 percent slopes	5151	2
Arvilla sandy loam, 0 to 6 percent slopes	4036	1
LaDelle silt loam, 0 to 2 percent slopes, occasionally flooded	3843	1
Fargo silty clay, 0 to 1 percent slopes	3296	1
Barnes-Cresbard loams, 3 to 6 percent slopes	3257	1
Hegne-Fargo silty clays, 0 to 2 percent slopes	3081	1
Fairdale silt loam, 0 to 2 percent slopes, occasionally flooded	3066	1
Inkster sandy loam, 0 to 2 percent slopes	2890	1

Table 5: Predominant soils in watersheds within the Area of Interest and Area of Potential Effect (top 50 % cover)

Area and soil unit name		Acres	Percent acres
Area 1A	Barnes-Buse loams, 3 to 6 percent slopes	16039	21
	Hamerly-Wyard loams, 0 to 3 percent slopes	10472	14
	Balaton-Wyard loams, 0 to 6 percent slopes	9921	13
	Vallers, saline-Parnell complex, 0 to 1 percent slopes	8232	11
Area 1B	Barnes-Buse loams, 3 to 6 percent slopes	20887	19
	Vallers, saline-Parnell complex, 0 to 1 percent slopes	16167	15
	Balaton-Wyard loams, 0 to 6 percent slopes	15283	14
	Hamerly-Tonka complex, 0 to 3 percent slopes	8206	7
	Hamerly-Wyard loams, 0 to 3 percent slopes	7305	7
Area 2	Barnes-Buse loams, 3 - 6 % slopes	14109	12
	Glyndon silt loam, 0 - 2 % slopes	5882	5
	Arvilla sandy loam, 0 - 6 % slopes	4036	4
	LaDelle silt loam, 0 - 2 % slopes, occasionally flooded	3843	3
	Fargo silty clay, 0 - 1 % slopes	3296	3
	Hegne-Fargo silty clays, 0 - 2 % slopes	3081	3
	Fairdale silt loam, 0 - 2 % slopes, occasionally flooded	3066	3
	Inkster sandy loam, 0 - 2 % slopes	2890	3
	Overly silty clay loam, 0 - 2 % slopes	2711	2
	Barnes-Svea loams, 0 - 3 % slopes	2671	2
	Barnes-Cresbard loams, 3 - 6 % slopes	2594	2
	Barnes-Svea loams, 3 - 6 % slopes	2586	2
	Barnes-Buse-Langhei loams, 6 - 9 % slopes	2506	2
	Svea-Cresbard loams, 0 - 3 % slopes	2278	2
	Bearden silty clay loam, 0 - 1 % slopes	2150	2
	Renshaw loam, 0 - 2 % slopes	2021	2
	Bearden silty clay loam, 0 - 2 % slopes	2018	2
	Overly silty clay loam, 0 - 1 % slopes, fans	1892	2
	Wyndmere fine sandy loam, 0 - 2 % slopes	1721	2
Area 3 (APE Dam Zone)	Kloten-Walsh-Edgeley loams, wooded, 6 - 35 % slopes	406	37
	Kloten-Walsh-Edgeley loams, 6 - 35 % slopes	146	13
	Vang-Brantford loams, 0 - 2 % slopes	68	6
	Barnes-Svea loams, 3 - 6 % slopes	64	6
	Barnes-Svea loams, 0 - 3 % slopes	59	5
	Barnes-Buse loams, 3 - 6 % slopes	37	3
	Brantford-Vang loams, 2 - 6 % slopes	29	3
	La Prairie, wooded-Fluvaquents, channeled complex, 0 - 2 % slopes, frequently flooded	25	2
	Buse-Barnes-Darnen loams, 3 - 9 % slopes	18	2
	La Prairie-Fluvaquents, channeled complex, 0 - 2 % slopes, frequently flooded	17	2

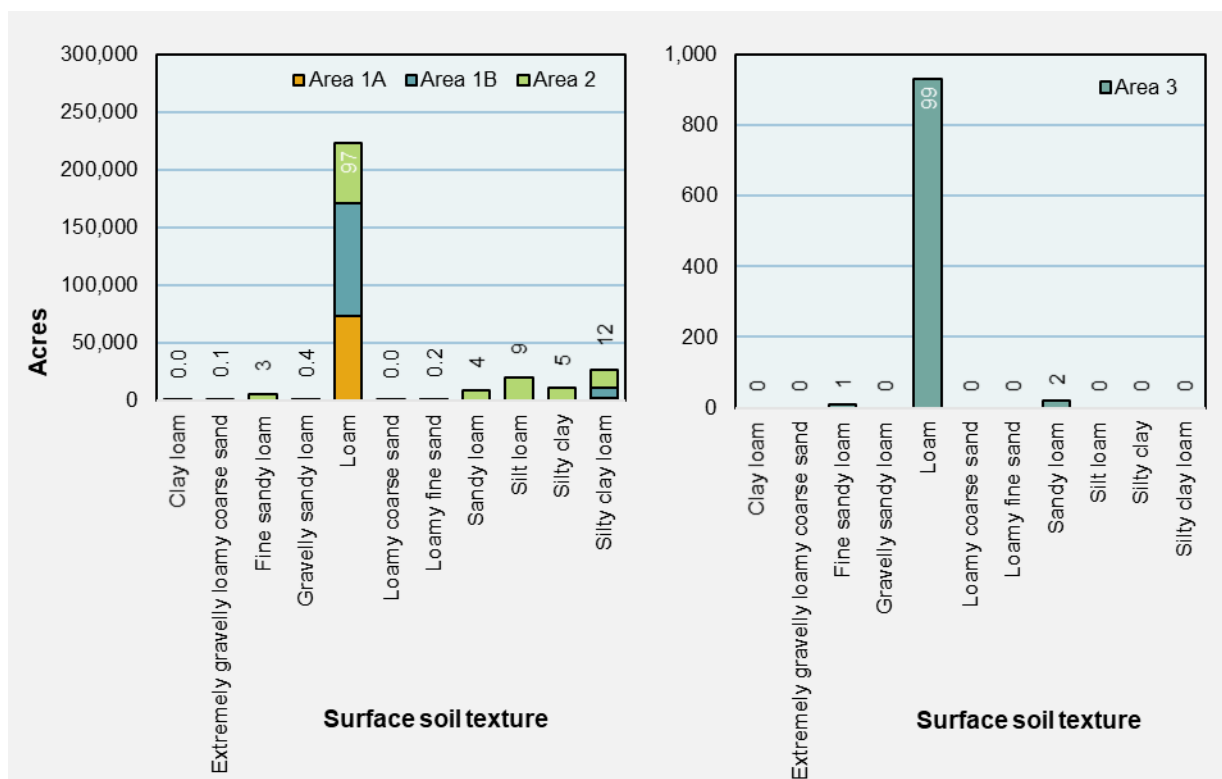


Figure 3: Surface soil texture in the Area of Interest (values above bars indicate combined percent).

Hydric Soil Ratings: In their natural, undrained condition, hydric soils are saturated, flooded, or ponded long enough during a growing season to develop an anaerobic condition that supports the growth and regeneration of hydrophytic vegetation (Environmental Laboratory, 1987). Approximately 86% (218,000 acres) of the AOI, not including open water, is comprised of soils with zero or low hydric ratings (1-32%) (Soil Survey Staff, USDA-NRCS, 2018), **Exhibit 05.4, Figure 4**. Of the remaining soils, 13% of the soils are moderate-to highly hydric (32,000 acres); and 1% of the soils are classified as 100 % hydric (4,300 acres). The soils in Area 1 are predominantly not hydric to slightly hydric with 95 % of the soils having a hydric rating between 0-32 % (58,000 acres). Area 1B also has dominant soils with low hydric ratings with 82 % of the land being 0-32 % hydric (67,000 acres). Both of these areas have less than 0.1 % land in the higher hydric ratings of 66-100 %. Area 2 is dominated by land with low hydric ratings (0-32 % hydric rating, 83 %, 94,000 acres), but this area does have proportionally more highly hydric soils than the other two areas. Area 2 has 13 % of the land in the highly hydric rating (66-100 %), which is equivalent to 14,000 acres. These results correspond to the prevalence of wetlands in Area 2 and the lower proportion of wetlands in Area 1B.

Most of the land in the APE (Area 3) (94 %, 906 acres), not including open water, has soils with a hydric rating of zero, with 30 % with a rating of 1-32 % (285 acres), 5 % with a rating of 33-65 (52 acres), and 0.3 % with a rating of 66-99 % (3 acres) (**Figure 4**). The soils with a hydric rating range of 33-65 are listed as Fluvaquents, channeled-Fairdale complex, 0 to 2 percent slopes, frequently flooded; La Prairie, wooded-Fluvaquents, channeled complex, 0 to 2 percent slopes, frequently flooded; and La Prairie-Fluvaquents, channeled complex, 0 to 2 percent slopes, frequently flooded; and are located in the woodlands where the tributaries enter the flood pool and also downstream of the dam. The soil unit with a hydric rating of 93 %, Lowe-Fluvaquents (channeled complex, 0-2 % slopes, frequently flooded) is located north of the boat landing and spillway at the location of an old floodplain.

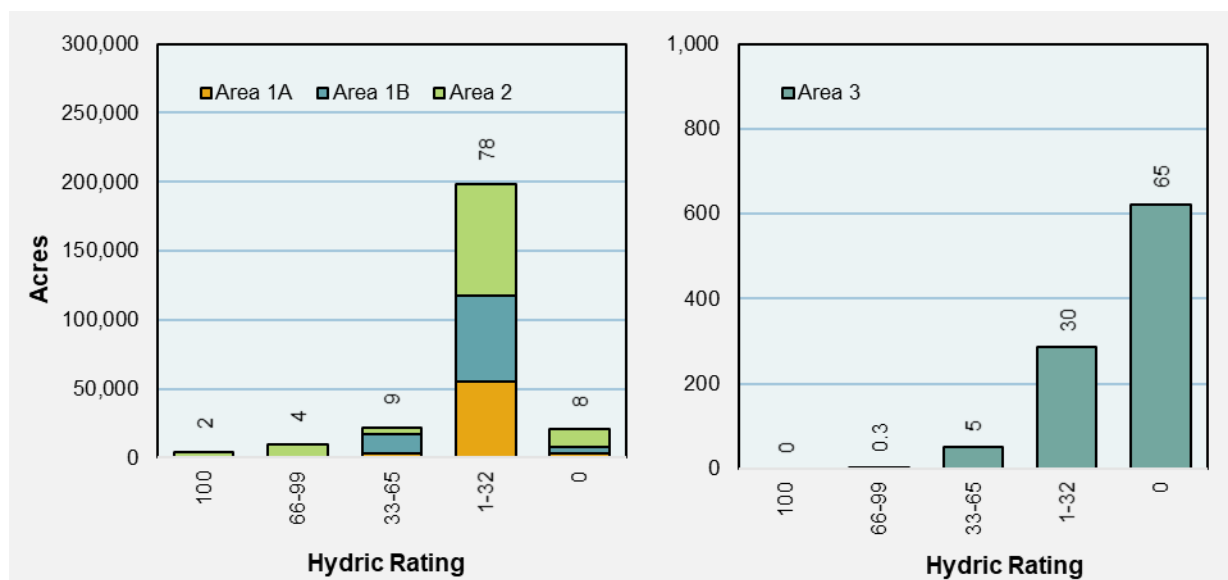


Figure 4: Soil hydric rating in the Area of Interest (values above bars indicate combined percent).

K Factor (erosion): The K factor of a soil is an index of relative susceptibility to erosion (US Department of Agriculture RUSLE Development Team, 2001). The index values range between 0.02 to 0.64, with higher erosion potential at the higher values. High-clay soils and sandy soils tend to have low K values, find sandy loams typically have moderate values, and high-silt soils are the most erodible. The K values for the AOI range from 0.1 to 0.49 (**Figure 5, Exhibit 05.5**) (Soil Survey Staff, USDA-NRCS, 2018)). Areas 1A and 1B are dominated by soils with K values between 0.1 and 0.3 (Area 1A: 99.7 %, 76,000 acres; area 1B: 99.5 %, 107,000 acres). Area 2 is also dominated by soils with K values between 0.1 and 0.3 (81 %, 92,000 acres), but 17 % of the land consists of soils with K values between 0.3 and 0.4 (19,600 acres). These patterns reflect the soil textures where the silty soils in Area 2 are more susceptible to erosion. Area 3 is dominated by soils that are low to moderately erodible, with 95 % of the soils having K values of 0.2-0.3 (501 acres).

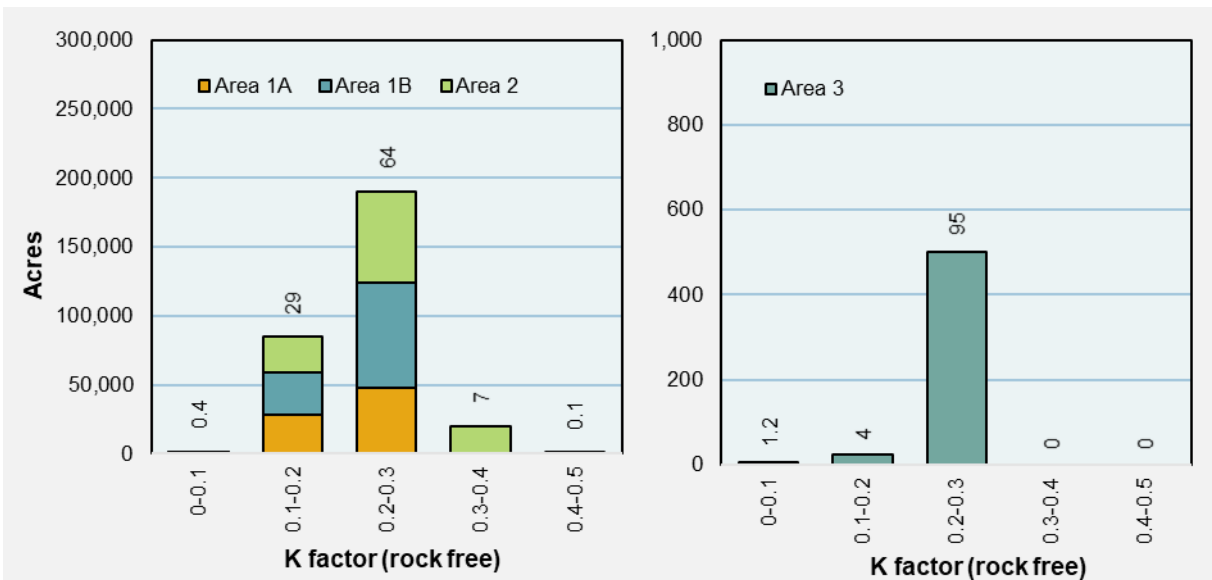


Figure 5: Soil K factor (rock free) in the Area of Interest (values above bars indicate combined percent).

4.3.6 AGRICULTURAL PRODUCTIVITY

4.3.6.1 PRIME FARMLAND

Protection for important farmland, rangeland, and forest land is established in the Farmland Protection Policy Act (FPPA), US Department of Agriculture regulations implementing the FPPA (7 CFR Part 658), and USDA DR No. 9500-3, Land Use Policy. Section 658.5 of the FPPA defines criteria for federal agencies to consider when identifying the potential adverse effects of federal programs on farmland. Federal agencies are to consider actions that could reduce adverse effects on farmland and assure that federal programs, to the extent practicable, are compatible with state, local government, and private programs.

The AOI is classified predominately “prime farmland” (27 %, 161,000 acres), but approximately 16 % of the area classified as “not prime farmland” (97,000 acres) (**Figure 6, Exhibit 06.1**) (Soil Survey Staff, USDA-NRCS, 2018). Only 3 % is noted as “farmland of statewide importance” (19,000 acres) and 4 % is designated as “prime farmland if drained” (24,000 acres). The latter indicates most of the wetlands with farming potential have already been drained or otherwise altered. Areas 1A, 1B, and 2 show similar proportions of the different categories, but of the three, Area 1A has a higher percentage of “prime farmland” compared with the other land types (61 %), Area 1B has slightly higher percentage of “not prime farmland” (40 %), and Area 2 has the highest proportion of “prime farmland if drained” (10 %). This reflects the characteristic of Area 2 having the greatest proportion of wetlands. The rating “of statewide importance” is relatively low, ranging between 5-8 %. Area 3 has a large proportion of land area rated as “not prime farmland” (76 %, 833 acres). This reflects the presence of open water areas and extensive woodland. None of the land is rated as “prime farmland if drained”, while 16 % is “prime farmland” (178 acres) and 8 % is “of statewide importance” (87 acres).

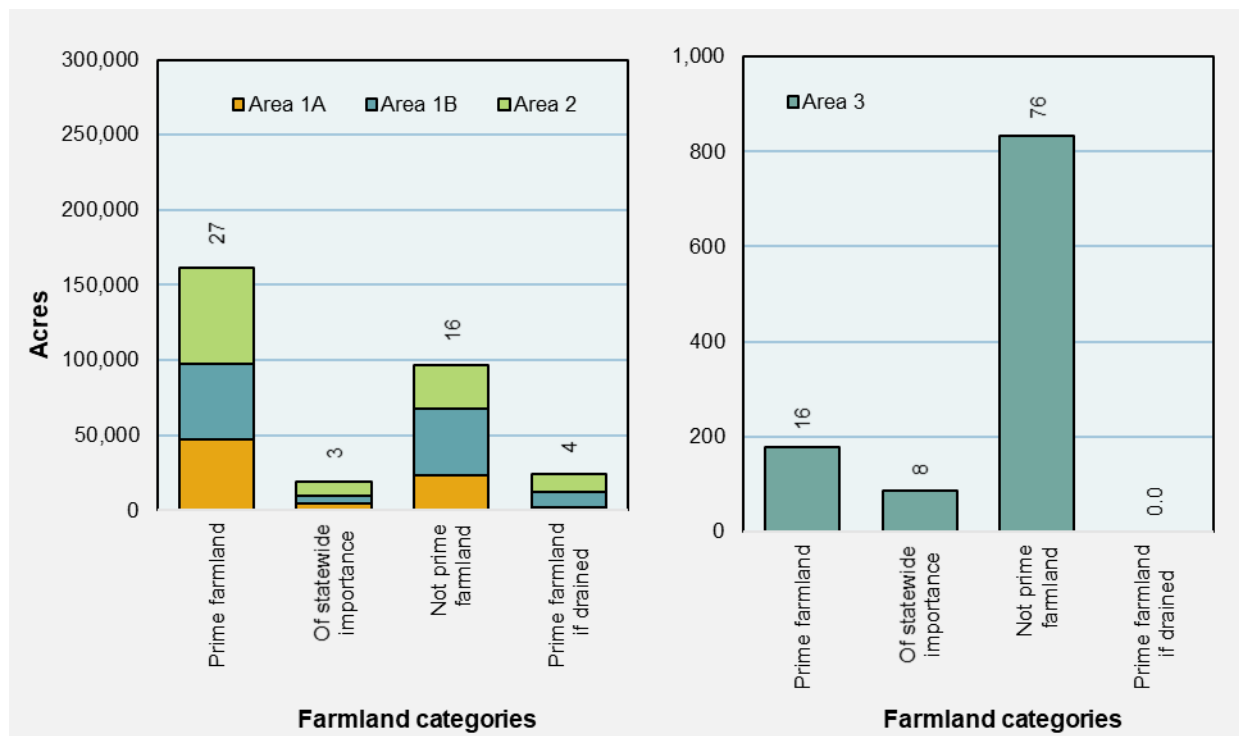


Figure 6: Farmland classification in the Area of Interest (values above bars indicate combined percent).

4.3.6.2 CROP PRODUCTIVITY

The Natural Resources Conservation Service Crop Productivity Index (CPI) is a relative ranking of soil units based on their crop production potential. These rankings were developed to enable comparison of the potential yield of various soils over time. The ranking was developed based on physical and chemical properties of the soils (water capacity, pH, slope, soil moisture status, cation-exchange capacity, organic matter content, salinity, and surface fragments) in addition to flooding or ponding potential. The data include several assumptions including implementation of artificial drainage where needed, natural weather conditions but not climactic conditions, and the index was designed for the production of corn.

The Crop Productivity Index data for the AOI show 49 % of the total acres with an index value of 61-80 (146,000 acres) (**Figure 7, Exhibit 06.2**) (Soil Survey Staff, USDA-NRCS, 2018). The index brackets of 21-40, 41-60, and 81-100 each cover 16 % of the acres, while the lower bracket, 0-20, covers only 3 % of the total acres. Area 1A (63 %, 48,000 acres) and 1B (56 %, 61,000 acres) show the highest proportions of the land in the 61-80 index bracket, but Area 1B also has some land which falls in the 0-20 index bracket (6 %, 6300 acres). Area 2 has the highest proportion of acres in the 81-100 bracket (38 %, 43,000 acres) followed closely by the bracket 61-80 (32 %, 37,000 acres). This indicates Area 2 has better potential crop productivity compared with the other areas, likely due to fewer wetlands, less varied topography, and a higher proportion of better-draining soil types (sandy loam and silty loams). Area 3 (APE) shows lower potential productivity compared with the other areas. Area 3 has 61 % of the land area (590 acres) in bracket 21-40, while the land with better productivity covers only 38 % of the area (370 acres).

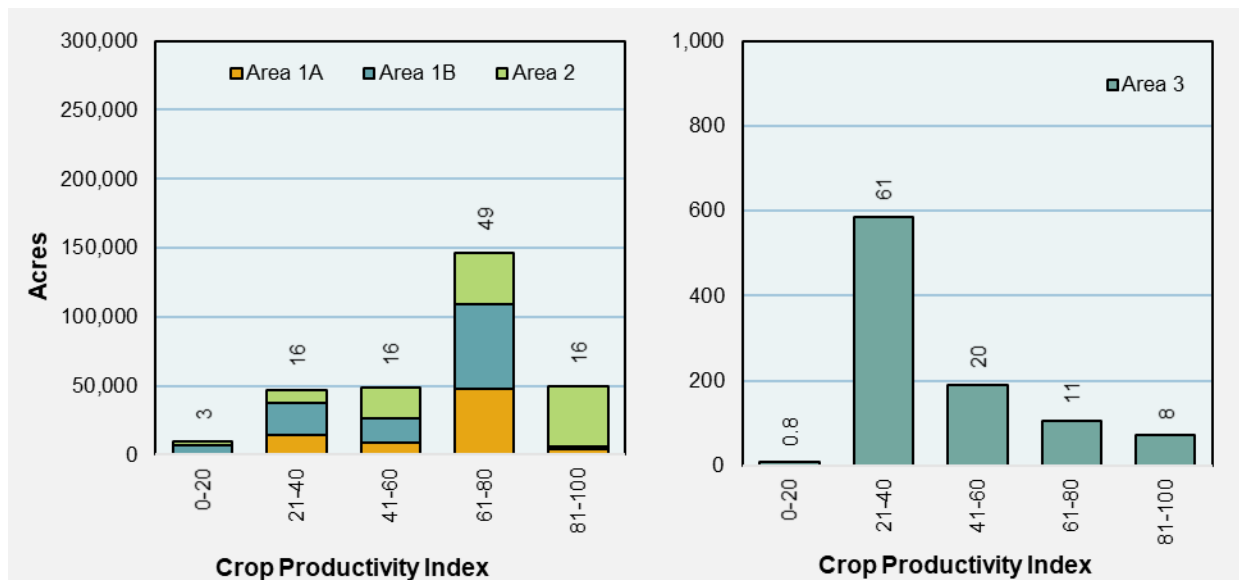


Figure 7: Crop Productivity Index in the Area of Interest (values above bars indicate combined percent).

4.3.6.3 NORMAL YEAR RANGE PRODUCTION

Normal year range production is a measure of the amount of vegetation expected annually in an area that is well managed and supports or potentially supports the natural plant community. When normalized against topography and climate, this metric can describe the type and amount of vegetation on rangeland and is based on the soil type, regardless of the current vegetation (i.e. does not describe only current grazing land). This measure enables landowners to estimate the number of grazing animals the land can support.

Over the AOI, 94 % of the total acres can support between 2001-5000 lbs./acre/year (282,000 acres), with the greatest proportion of this growing 2001-3000 lbs./acre/year (**Figure 8, Exhibit 06.3**) (Soil Survey Staff, USDA-NRCS, 2018). The total acreage of low production is smaller, as is the highest production bracket. This pattern is very similar for Areas 1A, 1B, and 2. The land here shows better than average potential crop productivity. Area 3 (APE) shows 90 % of the land can support 2001-3000 lbs./acre/year (855 acres), with the remaining 10 % distributed among the other production brackets.

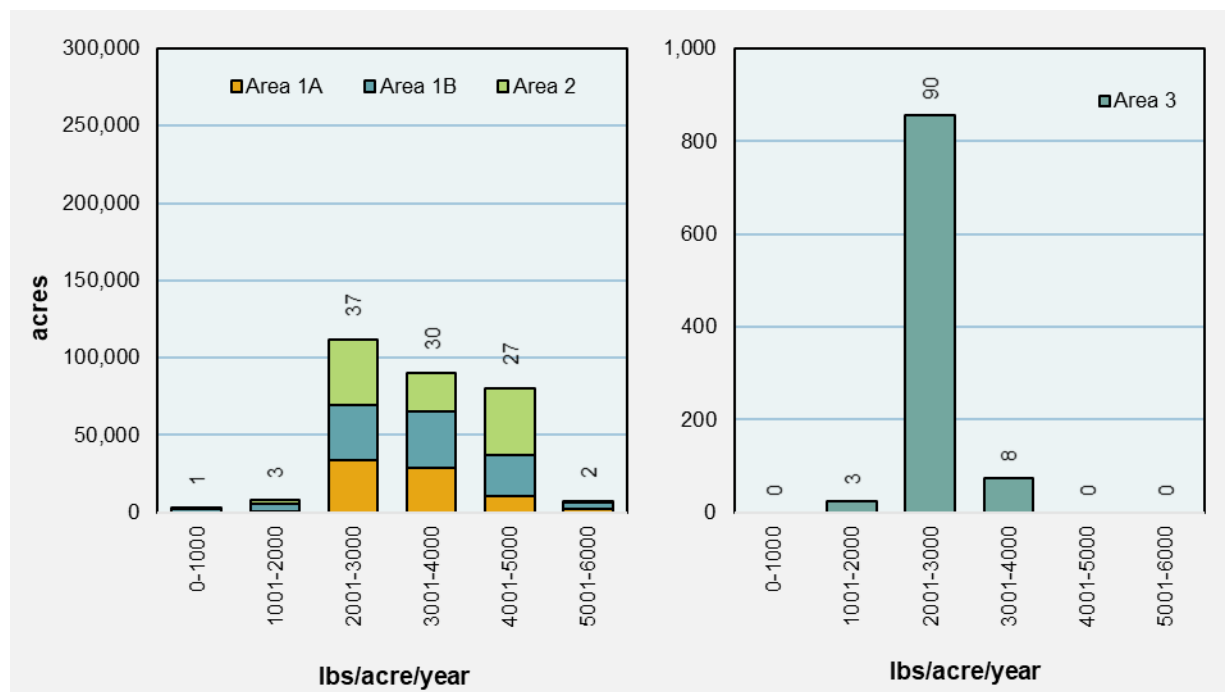


Figure 8: Normal year range production in the Area of Interest (values above bars indicate combined percent).

4.3.7 WATERS

Waters in the area consist of wetlands, open water (lakes), and a network of rivers. All of these are protected to varying degrees under the Clean Water Act and other legislation. When federal funding is used for construction and improvement projects, Executive Order 11990 requires federal agencies to preserve, enhance, or minimize degradation and losses to wetlands. NRCS policy for implementing the executive order can be found at 190-GM, Part 410, Subpart B, Section 410.26. The Clean Water Act Section 404 requires permitting from the US Army Corps of Engineers for activities that impact wetlands and Other Waters of the US. The NRCS floodplain management policy reviews activities in wetlands that occur within the 50-year floodplain (190-GM Section 510.25). Rivers, in addition to regulation under the US Army Corps of Engineers, may fall under the National Wild and Scenic Rivers Act of 1968 (Public Law 90-542).

4.3.7.1 RIVERS AND STREAMS

The Red River of the North is a navigable river and by definition the Forest River and tributaries would be considered Waters of the US and under the jurisdiction of the US Army Corps of Engineers. Neither the Forest River nor its tributaries are included in the list of rivers designated as Wild and Scenic Rivers (US Fish and Wildlife Service, 2019b).

The region is covered by a network of streams and rivers all flowing from the higher elevations of the Drift Plains eventually to the Red River of the North (US Fish and Wildlife Service 2018, North Dakota Information Technology Department 2019, US Department of Interior 2019). At the northern end of Area 1A there are several unnamed tributaries which flow into the Middle Branch Forest River (**Exhibit 07.1**). At the southwestern part of Area 1A there are more unnamed tributaries which feed into the Middle Branch Forest River just before it enters the pool of Matejcek Dam (Area 3). To the north of Area 3, there are more unnamed tributaries flowing into the Matejcek Dam pool. In Area 1A there are a total of 29 miles of the Middle Branch Forest River and approximately 64 miles of tributary. Once in Area 2, the Middle Branch Forest River (6.8 miles) flows into the North Branch Forest River (6.4 miles), which meets with the South Branch Forest River (40 miles within the area). These waters then flow into Lake Ardoch with the Forest River (33 miles). The Michigan Spillway, bringing water from the closed basin of Area 1B, feeds into the Middle Branch Forest River upstream of Matejcek Dam. Within Area 3, there are 4.5 miles of the Middle Branch Forest River and 1.6 miles of unnamed tributary, both meeting at the Matejcek Dam pool.

4.3.7.2 WETLANDS AND OPEN WATER

The US Fish and Wildlife Service's National Wetland Inventory (NWI) maps all wetlands within AOI (US Fish and Wildlife Service, 2018)(**Exhibit 07.2**). The area includes wetlands classified in riverine, lacustrine (lakes), and palustrine systems (freshwater wetlands). Classifications further break down into several additional categories. Out of the total acres in the AOI, 12 % are wetlands (35,000 acres). Of these, the most frequent wetland type is freshwater emergent wetlands (87 %, 30,000 acres) (**Figure 9**). The other wetland types are less frequent and include lakes (8 %), freshwater wetlands (4 %), and riverine wetlands (2 %). Areas 1A and 1B have more freshwater emergent wetlands than any other type (over 90 %, A1 has 7,300 acres and 1B has 20,000 acres). Area 2 has 60 % (3,300 acres) freshwater wetlands in addition to 920 acres of lakes (17 %) and 640 acres of riverine wetlands (12 %).

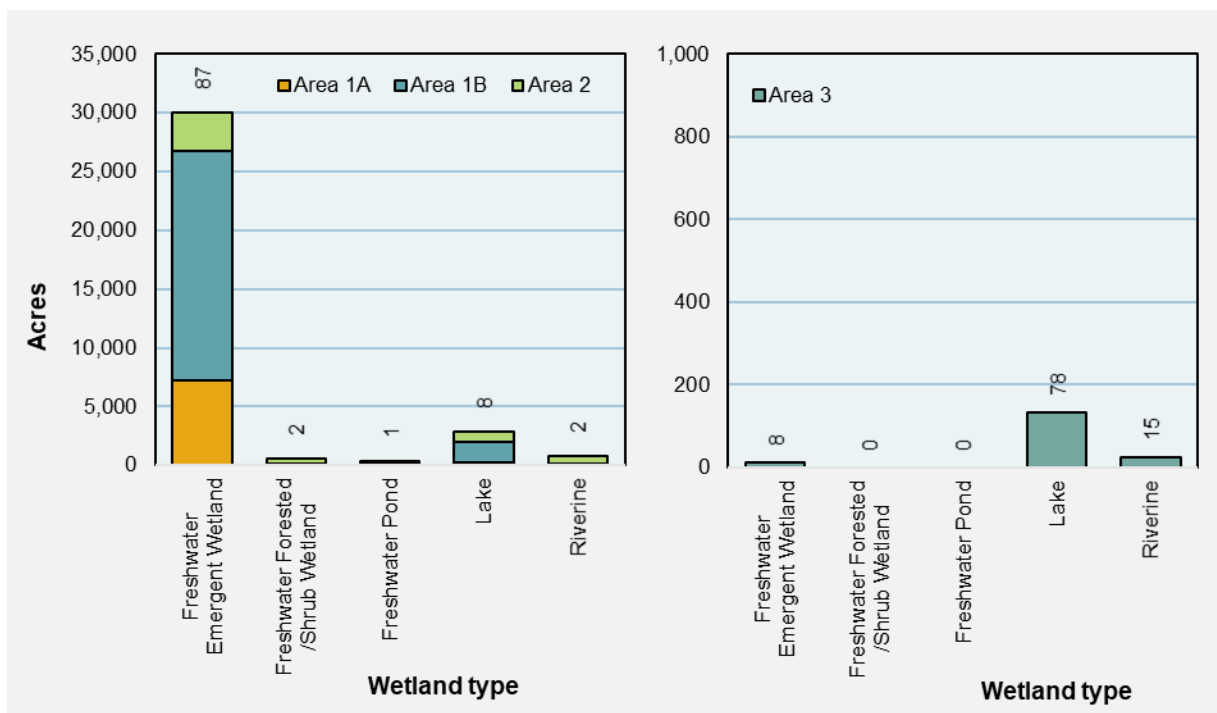


Figure 9: Wetlands and open water in the Area of Interest, left shows US Fish and Wildlife Service National Wetlands Inventory (2018, right shows result of vegetation survey (2018), number above column indicates proportional wetland type.

For Area 3 the NWI data show 164 acres of wetlands and open water within Area 3 (15 % land area), but results of a field vegetation survey (Houston Engineering, Inc., 2019) show 172 acres of wetlands and open water, equivalent to 16 % of the area (**Exhibit 03.2, Figure 9**). These are 4 % riverine (4 %, 25 acres) and freshwater emergent wetlands (2 %, 13 acres) and the open water is the flood pool. (open water habitat, 22 %, 134 acres).

4.3.8 HYDROLOGY AND WATER MANAGEMENT

The Forest River Watershed is an 896-square mile watershed contributing to the Red River Basin. The upper portion of the Forest River Watershed consists of three branches; the North Branch (154 square mile watershed), Middle Branch (147 square mile watershed), and South Branch (50 square mile watershed). The North Branch and Middle Branch join near the community of Fordville, ND. The South Branch confluence with the Forest River is further downstream approximately 8.9 river miles. In addition to the three branches, a recently constructed flood control project (Michigan Spillway) now provides a regulated outlet for a watershed area of approximately 172 square miles. Flows are regulated through a pumping station with a maximum discharge of approximately 50 cubic feet per second. These discharges are pumped into a tributary that contributes to the Middle Branch Forest River between Whitman Dam and Matejcek Dam (**Exhibit 07.1**).

Further downstream lower reaches of the Forest River flow through the Glacial Lake Plain, which is characterized by flat streambed and landscape slopes. This results in a more attenuated flood hydrograph and expansive flooding. The Forest River between the communities of Forest River and Minto, ND is a “perched” channel, meaning that the adjacent floodplain slopes away from Forest River bank. During high flows, this can result in flows breaking out to the north and to the east away from the Forest River. These breakouts, when combined with localized hydrology, have resulted in flooding west and south of Minto.

4.3.8.1 SOLE SOURCE AQUIFERS AND GROUNDWATER RESOURCES

A sole source aquifer, as defined by the U.S. Environmental Protection Agency, is an aquifer which supplies at least 50% of the drinking water for the service area where there are no reasonably available alternative drinking water sources (US Environmental Protection Agency, 2018). According to the EPA there are no sole source aquifers within the study area. Sources of groundwater within the AOI include the Fordville, Medford, Elk Valley, and Inskter aquifers (**Exhibit 08.1**) (North Dakota Information Technology Department, 2019), which are considered “shallow”, major glacial-drift aquifers. These aquifers are located in Area 2.

4.3.8.2 FLOOD CONTROL

Flows in the AOI are regulated by several small flood control dams scattered throughout the upper watershed over the North Branch, Middle Branch, and South Branch sub-watersheds (**Exhibit 07.1, Table 6**). Additionally, drainage improvements have been constructed both privately and publicly throughout the watershed to enhance agricultural production. Further downstream, a mainstem dam provides a fish and wildlife pool at Lake Ardoch National Wildlife Refuge. This structure submerges during severe flooding, resulting in little flood attenuation at this location.

The AOI contains several flood-retarding dams, some of which were constructed by the NRCS through Public Law 83-566. These dams are located primarily in the upper portions of the north, middle, and south branches of the watershed (**Table 6, Exhibit 07.1**) (North Dakota State Water Commission, 2019). Included within the APE, Matejcek Dam is in the Dam Zone, but the Fordville Dam is located on the South Branch of the Forest River before it merges with the River Zone.

Table 6: Dams in the region of Matejcek Dam

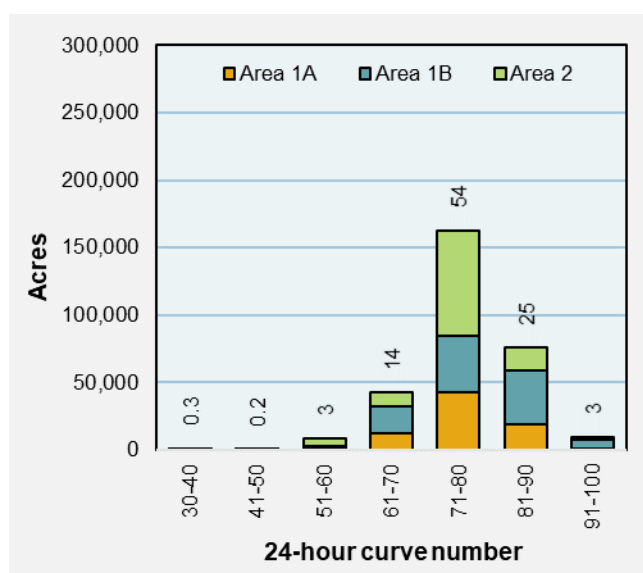
Area name	Dam name	Primary Purpose	Year Built	Drainage Area (Sq. Mi.)	Maximum Volume (acre-feet)	Normal Pool surface area (acres)	Linear distance from Matejcek Dam (miles)
North Branch Forest River Drainage Area	Dougherty	Recreation	1935	55	no data	no data	11
	Bylin (NB FR Dam 1)	Flood Control	1964	22.1	5,850	60	11
	Kratochvil (NB FR Dam 3)	Flood Control	1962	12.6	2,837	32	8
	Soukup (NB FR Dam 5)	Flood Control	1962	3.3	1,116	33	5
	Chyle (NB FR Dam 6)	Flood Control	1966	5.9	1,470	12	11
Area 1A	Whitman Dam (MSB FR Dam 6)	Flood Control	1965	84.7	9,364	143	7
	Sarnia Dam	Flood Control	1936	26.6	1,610	no data	9
Area 2	Fordville (MSB FR Dam 4)	Flood Control	1978	41.5	10,703	197	8
	Lake Ardoch	Fish and Wildlife	1934	793	13,630	996	28
Area 3	Matejcek Dam	Flood Control			9,144	134	--
Other significant dams in region outside Forest River Drainage Area	Homme Reservoir (Park River)	Flood Control	1951	229	6,700	194	14
	Niagara 1	Water Supply	1905	2.9	170	17	15
	Niagara 2	Recreation	1935	2.9	243	16	15
	Kolding	Flood Control	1972	11.2	1,983	9.8	20

4.3.8.3 RUNOFF POTENTIAL

Land use data were combined with hydrologic soils data to estimate the runoff potential throughout the area of interest by estimating the NRCS 24-hour Curve Number (US Department of Agriculture-National Resource Conservation Service, 2004). The metric depends on properties of water infiltration for bare soils after prolonged wetting (of a maximum 24-hour during rainfall) and includes land cover characteristics. Curve Number values provide a relative likelihood of runoff on a scale of 0-100. A high Curve Number value of 100 would indicate an impervious condition, which means all rainfall becomes runoff. Therefore, the higher the Curve Number value, the higher the runoff potential. The NRCS Runoff Curve Number values were estimated and generated in GIS through a previous hydrologic modeling effort (US Army Corps of Engineers, 2013).

Review of these Curve Number values indicates for the AOI the majority of soils are within the range of higher than median runoff (99.5 % of the total land area) and the bracket with the highest proportion of land is numbers between 71-80 % (Area 1A: 55 %, 42,000 acres, Area 1B: 38 %, 42,000 acres, and Area 2: 69 %, 78,000 acres) (**Figure 10**) (Soil Survey Staff, USDA-NRCS, 2018). This indicates a high proportion of rainfall is converted to surface runoff (**Exhibit 08.2**). Area 3 (APE) reflects a similar pattern, with the exception of a greater percentage of soils showing high runoff potential (91-100 % runoff, 14 % of the land area, 156 acres)

Figure 10: NRCS 24-hour runoff curve number (%) in the Area of Interest (values above bars indicate combined percent).



A number of modeling efforts have been completed or are currently underway for other projects in the Forest River Watershed. In 2011, the United States Army Corps of Engineers (USACE) along with local sponsors began work on the development of hydrologic models from Halstad, MN, to the international border (including the Forest River Watershed) using HEC-HMS (V.3.5) as part of the *Red River of the North Hydrologic Modeling – Phase 2* report (USACE, 2013). Methods developed as part of the Phase 2 study were aimed at developing a consistent method to analyze hydrology within the Red River Basin while still accounting for unique characteristics within each subwatershed.

Further development of the hydrologic model was done through the *Forest River Watershed Comprehensive Detention Plan* (Red River Joint Water Resource District, 2013). This effort focused on the development of potential storage sites in the watershed. Through the study, detail was added to the hydrologic model and input parameters were refined through calibration efforts beyond the Phase 2 report.

Additionally, ongoing efforts towards a Watershed Plan through the Regional Cooperation Partnership Program (RCPP) have enabled further refinement of the hydrologic model for the Forest River Watershed. The development of a detailed hydraulic model using the HEC-RAS software was also included as part of the RCPP effort. The hydraulic model is used to generate water surface profiles by hydraulically routing runoff hydrographs by the hydrologic model. The HEC-RAS model extends from Matejcek Dam to the Forest River crossing with US Interstate 29 upstream of the confluence with the Red River of the North.

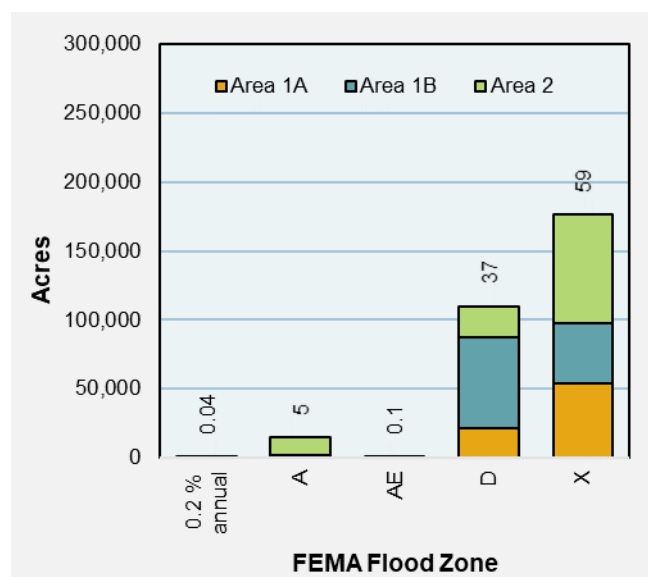
4.3.8.4 FLOODPLAIN MANAGEMENT

Floodplain maps and designations are developed by the Federal Emergency Management Agency (FEMA) and these inform the National Flood Insurance Program (NFIP). The current Digital Flood Insurance Rate Map identifies Special Flood Hazard Areas. These areas subject to inundations by the 1% annual chance flood are designated by zones A, AE, AH, AW, AR A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% chance flood. **Exhibit 08.3** shows the designated FEMA Flood Zones (US Department of Homeland Security, 2019). Areas within the AOI are designated as Zone A, AE, and as areas with 0.2 % Annual Chance of Flood Hazard

- Zone A: High risk: Areas subject to inundation by the 1 % annual-chance flood event generally determined using approximate methodologies. Because detailed hydraulic analyses have not been performed, no Base Flood Elevations (BFEs) or flood depths are shown. Mandatory flood insurance purchase requirements and floodplain management standards apply.
- Zone AE: High risk: Areas subject to inundation by the 1 % annual-chance flood event determined by detailed methods. BFEs are shown. Mandatory flood insurance purchase requirements and floodplain management standards apply.
- 0.2% Annual Chance of Flood Hazard: The 0.2 % annual-chance of flood hazard represent areas inundated by a 500-year flood.
- Zone D: Undetermined risk: Areas of possible flooding but flood hazard analysis has not been conducted.
- Zone X: Low risk: Areas outside the 500-year flood zone or protected by a levee for a 100-year flood

Over the AOI, most of the land is designated as low risk (Zone X, 59 %) and the next largest category is Zone D, undetermined (37 %)(**Figure 11**). Only 3 % of the land is under high risk (Zone s A and AE) with 2 % (14,800 acres). Area 1A has 2 % of land in Zone A (1800 acres), Area 1B has 0.04 % of land in Zone A, and Area 2 has 11 % of land in Zone A (12,600 acres). Most of the land in Area 3 is low risk (71 %) but 29 % is categorized as high risk (Zone A, 322 acres).

Figure 11: FEMA Flood Zone in the Area of Interest (values above bars indicate combined percent).



4.3.8.5 WATER QUALITY

The Clean Water Act (Section 303(d)) requires states to monitor and evaluate their waters to determine if they meet water quality standards. Waters that do not meet their designated uses due to water quality standard violations are listed as impaired. States are required to monitor total maximum daily load (TMDL) studies and to submit an updated list of impaired waters to the US Environmental Protection Agency every two years.

The North Dakota Department of Health (NDDH) last published water quality data in its 2016 Water Quality Assessment Report (North Dakota Department of Health, 2017a). Of the 295 public lakes and reservoirs in the state, only 200 are listed specifically in the state's water quality standards as "classified" lakes and therefore are noted as having beneficial uses. The remaining 95 lakes and reservoirs, while included in the state's estimate of total lake acres, are not considered classified waters and thus not assessed. The report lists waterbodies not meeting water quality standards and those requiring TMDL studies. Of the streams and lakes assessed within the AOI, portions of the Forest River, including its North Branch, Middle Branch, and South Branch are listed as impaired (**Table 7**).

Lack of dissolved oxygen in the water is a significant issue at Matejcek Dam. During the winter of 2017-2018 there was a fishkill at the dam, affecting the populations of pike, suckers, crappie, and yellow perch (Figure 12). North Dakota Game and Fish Department staff measured low oxygen again in the winter of 2018-2019 and thus a second year of fish population crash is expected (pers. comm. Hiltner, NDGF).

Figure 122: Matejcek Dam fishkill 2017-2018 (photograph by Randy Hiltner 2018)



Table 7: Impaired waters in the Area of Interest

Waterbody Name	Number	Size	Designated use	Supports designated use	Impairment
Forest River from its confluence with South Branch Forest River, downstream to its confluence with a tributary near Hwy 18	ND-09020308-015-S_00	13.0 miles	Fish & other aquatic biota	Fully supporting but threatened	Benthic-macroinvertebrate bioassessments, fishes bioassessments, selenium
South Branch Forest River from its confluence with Unnamed tributary watershed (ND-09020308-018-S) downstream to Fordville Dam	ND-09020308-017-S_00	8.0 miles	Recreation	Fully supporting but threatened	<i>Escherichia coli</i>
Middle Branch Forest River from Matejcek Dam, downstream to its confluence with North Branch Forest River	ND-09020308-023-S_00	8.7 miles	Fish & other aquatic biota	Not supporting	Benthic-macroinvertebrate bioassessments, fishes bioassessments
Whitman Dam	ND-09020308-002-L_00	150.0 acres	Recreation	Fully supporting but threatened	Nutrient/eutrophication biological indicators
Matejcek Dam	ND-09020308-003-L_00	130.0 acres	Fish & other aquatic biota	Fully supporting but threatened	Dissolved oxygen, nutrient/eutrophication biological Indicators

4.3.9 AIR QUALITY

The Environmental Protection Agency, as directed under the Clean Air Act, set National Ambient Air Quality Standards (AAQS) (40 CFR 50). These standards define six pollutants that contribute to degradation of regional visibility or are considered harmful to the environment and public health: carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO₂), ozone (O₃) particle pollution (PM), and sulfur dioxide (SO₂). Nitrous oxide and particulates are the primary pollutants related to agriculture. Specific locations, Class I areas, are given special protections for air clarity. These areas include locations where there is national or regional natural, scenic, recreational, or historic value.

The North Dakota Department of Health (NDDH) Division of Air Quality is responsible for ensuring air quality is maintained in accordance with the levels established by state and federal standards. NDDH operates a network of ambient air quality monitoring sites throughout the state. The stations closest to the AOI are in Grand Forks, Grand Forks County and Devils Lake, Ramsey County. No state or federal standards were exceeded according to the North Dakota Ambient Air Quality Monitoring Program 2017 Annual Report (North Dakota Department of Health, 2017b). The AOI is designated to be in attainment or unclassifiable (to be considered in attainment) for all air quality standards.

4.3.10 HABITAT AND PLANT COMMUNITIES

4.3.10.1 ECOREGIONS

The watershed areas are located in two Level III Ecoregions: Northern Glaciated Plains and Lake Agassiz Glacial Plain (Bryce, et al., 1998) (**Exhibit 05.1**).

The Northern Glaciated Plains ecoregion consists of transitional grasslands within a continental climate zone formed on recent glaciation. The landforms range from drift plains, glacial lake basins, shallow river valleys, and deposits of rocks to sands. The drainage system is immature and supports numerous wetlands ranging from seasonal to permanent. Most of the land has been converted primarily to farmland, but historic vegetation ranged from tallgrass prairie to short grass prairie and wetland ecosystems. The watershed areas are located in a sub-region (Level IV Ecoregion) known as the Drift Plains. This sub-ecoregion was formed by retreating glaciers and the resulting undulating topography of thick glacial till.

The Lake Agassiz Glacial Plain is characterized by an extremely flat lake plain and gently rolling hills, the beach ridge, on the west and east sides of the lake bed. Historic vegetation included tallgrass prairie with many wetlands and shrubland and forests. The continental climate and the predominance of rich loamy soils supported tallgrass prairie until agriculture began to dominate from the mid-19th century. Most of the AOI is within the Glacial Lake Agassiz Basin, but some acres cover two smaller Level IV Ecoregions: Sand Deltas and Beach Ridges, and the Saline Area. The Glacial Lake Agassiz Basin is characterized by the poorly-defined floodplain of the Red River of the North. This ecoregion is extremely productive for agriculture and thus most of the wetlands and natural areas have been cultivated. The Sand Deltas and Beach Ridges ecoregion has parallel ridges of sand gravel formed by Lake Agassiz. The Saline Area ecoregion is characterized by saline groundwater. This salinity negatively affects crop production and land in this ecoregion is more suitable for pasture or left natural. This area supports salt-tolerant species and many of the wetlands are brackish.

Areas 1A, 1B and 3 are entirely within the Northern Glaciated Plains, Drift Plains ecoregion (**Exhibit 05.1**). Area 2 falls within both the Drift Plains ecoregion (36 %, 41,400 acres) and the Lake Agassiz Glacial Plain (64 %, 72,200 acres). Area 2 is also divided between the three Level IV ecoregions with 47 % of the land

area in the Glacial Lake Agassiz Basin (53,700 acres), 10 % within the Beach Ridges and Sand Deltas ecoregion (11,800 acres), and 6 % within the Saline Area ecoregion (7,200 acres).

4.3.10.2 PLANT COMMUNITIES

Within the AOI there are several major plant communities as defined by the (North Dakota Game and Fish Department, 2016c). These consist of tallgrass prairie, eastern Drift Plains mixed grass prairie, tame grassland, upland forest, riparian forest, and several types of wetlands. Wetlands and rivers are discussed in detail in Section 5.3.7.

Tallgrass prairie: Tallgrass prairie once covered much of the central plains and supports a wide variety of plant and animal species. Most tallgrass prairie has been altered for agriculture and only remnants exist in the AOI. The plant species found historically in this community are shown in **Table 8**.

Table 8: Species characteristic of historic tallgrass prairie habitat

Group	Species
Grasses	<i>Andropogon gerardii</i> (big bluestem), <i>Elymus trachycaulus</i> (slender wheatgrass), <i>Hesperostipa spartea</i> (porcupine grass), <i>Muhlenbergia richardsonis</i> (mat muhly), <i>Panicum virgatum</i> (switchgrass), <i>Sorghastrum nutans</i> (Indian grass), and <i>Sporobolus heterolepis</i> (prairie dropseed)
Sedges	<i>Carex festucacea</i> (fescue sedge), <i>Carex praticola</i> (meadow sedge)
Forbs	<i>Anemone canadensis</i> (meadow anemone), <i>Artemisia ludoviciana</i> (white sage), <i>Drymocallis arguta</i> (prairie cinquefoil), <i>Glycyrrhiza lepidota</i> (wild licorice), <i>Liatris pycnostachya</i> (prairie blazing star), <i>Platanthera praeclara</i> (western prairie-fringed orchid), <i>Rudbeckia hirta</i> (black-eyed Susan), <i>Sisyrinchium montanum</i> (blue-eyed grass), and <i>Solidago altissima</i> (tall goldenrod)

Eastern Drift Plains mixed grass prairie: This community is the transition between tallgrass prairie (wetter) and shortgrass prairie (drier). The mixed grass prairie includes many grasses and other graminoids, in addition to a variety of trees and shrubs (**Table 9**) and contains many wetland basins. This community also has been reduced significantly by agriculture.

Table 9: Species characteristic of historic eastern (Drift-Prairie) mixed grass habitat (historic)

Group	Species
Grasses	Prairie junegrass, green needlegrass, needle-and-thread, blue grama, little bluestem, yellow sedge, Western wheatgrass, Canada wild rye, spike oats, big sandgrass, porcupine grass, mat muhly, side-oats grama, Leiberg's panicum,
Sedges	Needleleaf sedge, threadleaf sedge
Forbs	Pasque flower, western wall-flower, torch flower, prairie rose, Missouri milkvetch, purple loco, lead plant, Indian breadroot, purple prairie-clover, gaura, hairy puccoon, harebell, stiff goldenrod, smooth fleabane, purple coneflower, upland wormwood, fringed sage

Tame grassland: The community type of tame grassland includes land that had been tilled and has been returned to grassland. Alfalfa is the most common hay crop, but tame grassland also includes typically *Bromus inermis* (brome grass) (**Table 10**). Much of the land area had been enrolled in the Conservation Reserve Program (CRP), which entails seeding the land with grass species for hay production. Walsh county had 100,001-150,000 acres of CRP in 2005 and 50,001-100,000 in 2014.

Table 10: Species characteristic of tame grassland habitat

Group	Species
Grasses	Smooth brome, crested wheatgrass, intermediate wheatgrass, tall wheatgrass, big bluestem
forbs	Alfalfa, sweet clover

Upland forest: This community, which includes including deciduous and coniferous forests, wooded shrubland, riparian forests, and rural tree plantings, is scattered throughout the state and is relatively rare (4 % of total land). Of the forests in North Dakota, most are deciduous (98 %, **Table 11**) and larger tracts are found in the Pembina Gorge, Turtle Mountains, Devils Lake Hills, and the Killdeer Mountains. These forests are primarily under private ownership and are utilized for cattle grazing and harvest of wood products. Concerns for these areas are reduced forest regeneration and clearing for development. This habitat may be found in the AOI, but it is not present in Area 3.

Table 11: Species characteristic of upland deciduous forest habitat

Group	Species
Trees / shrubs	Bur oak, green ash, quaking aspen, balsam poplar, paper birch, American hazelnut, black currant, Missouri gooseberry, red raspberry, Saskatoon serviceberry, hawthorn, prickly rose, pin cherry, choke cherry
Forbs	False lily-of-the valley, early meadowrue, yellow avens, pink wood violet, wild sarsaparilla, dwarf cornel, pink wintergreen, arrowleaf aster

Riparian Forest: Riparian forest occurs at the interface between a river, stream, or tributary and drier land. The soils and vegetation here are strongly influenced by the presence of water and this results in a distinct plant community (**Table 12**). Although federal law does not specifically regulate riparian areas, it is the policy of NRCS to integrate management of riparian areas into all plans and alternatives (190-GM, Part 411).

As observed through aerial photography, limited riparian areas exist in the western reaches of the Middle Branch of the Forest River, upstream of Matejcek Dam in Area 1A. Along the South Branch Forest River, west of Fordville Dam there are moderately-sized stands of riparian woodland. East of Matejcek Dam, along the river in the APE River Zone, the abundance of tree cover is greater and forms a nearly continuous corridor downstream to the city of Minto. Between Minto and Lake Ardoch the riparian corridor is sparse due to the historic river channel movement and agricultural practices here. Within the boundary of Area 3, there are 448 acres of riparian forest (41 % of the land area) (see below for Area 3 vegetation) (Houston Engineering, Inc., 2019).

Table 12: Species characteristic of riparian forest habitat

Group	Species
Trees / shrubs	Cottonwood, American elm, green ash, box elder, bur oak, basswood, hackberry, peachleaf willow, hophornbeam, prickly ash, Missouri gooseberry, black currant, buckthorn, nannyberry green ash and elm trees
Grasses	Virginia wild rye, nodding muhly
Sedges / rushes	Charming sedge, Sprengel's sedge
Forbs	Jack-in-the-pulpit, wood leek, large bellwort, false Solomon's seal, Solomon's seal, nodding trillium, carrion flower, tall nettle, wood nettle, wild four-o'clock, baneberry, wild ginger, columbine, kidneyleaf buttercup, tall meadowrue, bloodroot, yellow wood violet, pink wood violet, white avens, sweet cicely, wild sarsaparilla, honeywort, waterleaf, yellow wood parsnip, fringed loostripe, tall coneflower

Wetlands and lakes: North Dakota has more than one million wetland basins and lakes and these support a wide variety of plant species. Because wetlands are dynamic and, in many cases, dependent upon precipitation, they can be susceptible to tilling during drier years and are threatened by drainage in wetter years. Lakes are susceptible to non-point source pollution, predominantly from agriculture. In spite of this, wetlands are critical for filtering and storing water, and for supporting habitat for animal populations and plant communities (**Table 13**).

Table 13: Species characteristic of wetland and lake habitats

Group	Species
Grasses	Fine-textured grasses, northern reedgrass, prairie cordgrass, phragmites, tall mannagrass, whitetop, sloughgrass
Sedges / rushes / cattails	Narrow-leaf cattail, hybrid cattail, slender sedge, slough sedge, common spikerush, hardstem bulrush, river bulrush, slender bulrush, Baltic rush, softstem bulrush, water sedge
Forbs	Marsh smartweed, narrow leaf dock, western dock, marsh cress, silverweed, rough cinquefoil, lance leaf loostripe, clasping leaf dogbane, germander, marsh hedge nettle, western water horehound, wild mint, giant bur reed, narrowleaf water plantain, western water plantain, water parsnip
Trees / shrubs	Sandbar willow
Aquatic	Sago pondweed, horned pondweed, grass-leaf pondweed, coontail, common watermilfoil, common bladderwort, musk grass, white water crowfoot, western wigeon grass

Areas 1A, 1B have been converted extensively to agricultural land. Area 1B still retains numerous wetlands, but many of these are intermittently farmed. This disturbance precludes the normal development of healthy natural plant communities. Area 2 has more extensive farming, but the Forest River corridor provides some habitat for riparian forests.

Results of a vegetation survey by Houston Engineering, Inc. (2019) identified several plant communities in Area 3 (**Table 14, Exhibit 03.2**). The communities associated with the dam and flood pools include wetlands (riverine, palustrine-emergent, riparian forest), pasture/hayland, and mixed grass prairie. Communities downstream from the dam include riverine and riparian forest wetlands and mixed grass prairie. The communities in Area 3 show overall a Biological Condition rating of “fair.” This metric describes the condition of the community relative to a natural plant community which would be supported by the characteristics of the site (e.g. tame grassland in a location which would originally have been mixed grass prairie). The condition of “fair” reflects moderate changes to community structure with disturbance forcing species abundance toward fewer native species.

Table 14: Plant communities and species in Area 3.

Community	Acres, percent of total area	Dominant species (number of natural species)	Floristic Quality Condition rating
Agricultural land	163.6, 15 %	domesticated plants or bare ground (0)	n/a
Riverine wetland	24.9, 2.3 %	<i>Phalaris arundinacea</i> (4)	poor
Palustrine-emergent wetland	12.9, 1.2 %	<i>Carex pellita</i> , <i>Leersia oryzoides</i> , <i>Phalaris arundinacea</i> , <i>Spartina pectinata</i> , <i>Typha X glauca</i> (28)	fair
Riparian forest	448.2, 41%	<i>Acer negundo</i> , <i>Bromus inermis</i> , <i>Carex pensylvanica</i> , <i>Celtis occidentalis</i> , <i>Ostrya virginiana</i> , <i>Phalaris arundinacea</i> , <i>Populus tremuloides</i> , <i>Quercus macrocarpa</i> , <i>Symphoricarpos albus</i> , <i>Ulmus americana</i> (24)	good
Tame grassland (pasture / hayland)	195.4, 18 %	<i>Artemisia ludoviciana</i> , <i>Bromus inermis</i> , <i>Medicago sativa</i> , <i>Melilotus officinalis</i> , <i>Poa pratensis</i> (17)	poor
Mixed grass prairie	110.1, 10 %	<i>Bromus inermis</i> , <i>Cirsium arvense</i> , <i>Poa pratensis</i> (6)	poor
Open water habitat	134.1, 12 %	n/a	n/a

4.3.11 FISH AND WILDLIFE

4.3.11.1 GENERAL FISH AND WILDLIFE

A large variety of animals potentially occupy the AOI and these include the taxonomic groups of birds, mammals, fish, reptiles, amphibians, and various invertebrates (**Tables 15-21**). Portions of Forest River have been designated for Fish and Other Aquatic Biota uses (North Dakota Department of Health, 2017a). Some of these stretches are currently impaired (see **Table 7**, Section 5.3.8.5). Fish species found in the Forest River Watershed include typical communities of warm water streams and many species found in the connected waters of the Red River of the North drainage area. There are 51 typical fish species present within the North Dakota portion of the Red River Basin, 27 fish species have been identified characteristic to Forest River (**Table 18**) (Goldstein, 1995). Even though there are many lakes in North Dakota, as of 2018 there have been no thorough fish population assessments done by fisheries biologists (North Dakota Game and Fish Department, 2018b). Area 3 has habitats that could support the species listed in **Tables 15-21**, and also has a variety of fish (**Tables 18-19**).

Table 15: Animals characteristic of tallgrass prairie habitat

Group	Species
Birds	Mallard, blue-winged teal, red-tailed hawk, American kestrel, ring-necked pheasant, killdeer, eastern kingbird, western kingbird, American crow, common yellowthroat, clay-colored sparrow, vesper sparrow, savannah sparrow, Henslow's sparrow, western meadowlark, brown-headed cowbird
Mammals	Northern short-tailed shrew, white-tailed jackrabbit, snowshoe hare, Franklin's ground squirrel, thirteen-lined ground squirrel, northern pocket gopher, plains pocket gopher, western harvest mouse, deer mouse, northern grasshopper mouse, prairie vole, meadow vole, meadow jumping mouse, western jumping mouse, coyote, red fox, raccoon, badger, striped skunk, white-tailed deer, moose
Reptiles / amphibians	American toad, Great Plains toad, northern leopard frog, chorus frog, tiger salamander, plains garter snake, common garter snake

Table 16: Animals characteristic of eastern mixed grass (Drift Prairie) and tame grassland habitat

Group	Species
Birds	American wigeon, green-winged teal, mallard, blue-winged teal, Northern shoveler, gadwall, lesser scaup, red-tailed hawk, American kestrel, gray partridge, ring-necked pheasant, spotted sandpiper, killdeer, mourning dove, common nighthawk, western kingbird, western kingbird, horned lark, American crow, eastern bluebird, common yellowthroat, clay-colored sparrow, vesper sparrow, savannah sparrow, western meadowlark, brown-headed cowbird
Mammals	Northern short-tailed shrew, white-tailed jackrabbit, snowshoe hare, Franklin's ground squirrel, thirteen-lined ground squirrel, northern pocket gopher, olive-backed pocket mouse, western harvest mouse, deer mouse, northern grasshopper mouse, prairie vole, meadow vole, meadow jumping mouse, western jumping mouse, coyote, red fox, raccoon, badger, striped skunk, white-tailed deer, moose
Reptiles / amphibians	American toad, Great Plains toad, Woodhouse's toad, Northern leopard frog, chorus frog, tiger salamander, plains garter snake, common garter snake

Table 17: Animals characteristic of upland deciduous forest habitat

Group	Species
Birds	Turkey vulture, sharp-shinned hawk, Cooper's hawk, broad-winged hawk (Turtle Mountains), red-tailed hawk, American kestrel, merlin, ruffed grouse, wild turkey, mourning dove, great horned owl, eastern screech owl, long-eared owl, common nighthawk, ruby-throated hummingbird, yellow-bellied sapsucker, downy woodpecker, hairy woodpecker, yellow-shafted flicker, western wood pewee, eastern wood-pewee, yellow-bellied flycatcher, willow flycatcher, least flycatcher, great crested flycatcher, purple martin, tree swallow, blue jay, black-billed magpie, common crow, black-capped chickadee, white-breasted nuthatch, brown creeper, house wren, golden-crowned kinglet, ruby-crowned kinglet, eastern bluebird, veery, wood thrush, American robin, gray catbird, brown thrasher, cedar waxwing, yellow-throated vireo, warbling vireo, Philadelphia vireo, red-eyed vireo, yellow warbler, chestnut-sided warbler, yellow-rumped warbler, American redstart, black-and-white warbler, ovenbird, northern waterthrush, mourning warbler, common yellowthroat, migratory warblers, scarlet tanager, rose-breasted grosbeak, black-headed grosbeak, lazuli bunting, indigo bunting, spotted towhee, eastern towhee, chipping sparrow, lark sparrow, clay-colored sparrow, song sparrow, common grackle, brown-headed cowbird, orchard oriole, Bullock's oriole, Baltimore oriole, pine siskin, American goldfinch, evening grosbeak
Mammals	Little brown bat, silver-haired bat, big brown bat, eastern red bat, hoary bat, eastern cottontail, woodchuck, eastern chipmunk, gray squirrel, fox squirrel, northern flying squirrel, beaver, white-footed mouse, southern red-backed vole, meadow vole, meadow jumping mouse, western jumping mouse, porcupine, coyote, red fox, gray fox, raccoon, American marten, ermine, long-tailed weasel, least weasel, bobcat, elk, mule deer, white-tailed deer
Reptiles / amphibians	American toad, gray tree frog, wood frog, common garter snake, plains garter snake

Table 18: Fish characteristic of the Forest River

Group	Species
Fish	<i>Ambloplites rupestris</i> (rock bass), <i>Ameiurus melas</i> (black bullhead), <i>A. nebulosus</i> (brown bullhead), <i>Aplodinotus grunniens</i> (freshwater drum), <i>Carpionides cyprinus</i> (quillback), <i>Catostomus commersonii</i> (white sucker), <i>Culaea inconstans</i> (brook stickleback), <i>Cyprinus carpio</i> (carp), <i>Esox lucius</i> (northern pike), <i>Etheostoma nigrum</i> (Johnny darter), <i>Ictalurus punctatus</i> (channel catfish), <i>Ictiobus cyprinellus</i> (bigmouth buffalo), <i>Luxilus cornutus</i> (common shiner), <i>Notropis blennioides</i> (river shiner), <i>Notropis stramineus</i> (sand shiner), <i>Noturus gyrinus</i> (adpole madtom), <i>Perca flavescens</i> (yellow perch), <i>Percina maculata</i> (blackside darter), <i>Percopsis omiscomaycus</i> (trout-perch), <i>Pimephales notatus</i> (bluntnose minnow), <i>Pimephales promelas</i> (fathead minnow), <i>Pomoxis nigromaculatus</i> (black crappie), <i>Rhinichthys atratulus</i> (blacknose dace), <i>R. cataractae</i> (longnose dace), <i>Sander canadensis</i> (sauger), <i>S. vitreus</i> (walleye), and <i>Semolilus atromaculatus</i> (creek chub)

Table 19: Fish characteristic of Matejcek Dam (deepwater habitat, lake), stocked and wild species

Group	Species
Fish	Walleye, yellow perch, northern pike, crappie, white sucker, tiger muskie

Table 20: Animals characteristic of riparian forests

Group	Species
Birds	Wood duck, mallard, hooded merganser, common merganser, turkey vulture, osprey, sharp-shinned hawk, Cooper's hawk, red-tailed hawk, American kestrel, ring-necked pheasant, wild turkey, American woodcock, mourning dove, yellow-billed cuckoo, great horned owl, eastern screech owl, barred owl, long-eared owl, common nighthawk, chimney swift, ruby-throated hummingbird, yellow-bellied sapsucker, downy woodpecker, hairy woodpecker, yellow-shafted flicker, pileated woodpecker, Western wood pewee, eastern wood-pewee, yellow-bellied flycatcher, willow flycatcher, least flycatcher, eastern flycatcher, great crested flycatcher, purple martin, tree swallow, northern rough-winged swallow, bank swallow, cliff swallow, blue jay, black-billed magpie, common crow, black-capped chickadee, white-breasted nuthatch, brown creeper, house wren, eastern bluebird, veery, wood thrush, American robin, gray catbird, brown thrasher, cedar waxwing, Bell's vireo, yellow-throated vireo, warbling vireo, Philadelphia vireo, red-eyed vireo, yellow warbler, yellow-rumped warbler, American redstart, ovenbird, northern waterthrush, common yellowthroat, migratory warblers, scarlet tanager, rose-breasted grosbeak, black-headed grosbeak, lazuli bunting, indigo bunting, spotted towhee, eastern towhee, chipping sparrow, lark sparrow, clay-colored sparrow, song sparrow, common grackle, brown-headed cowbird, orchard oriole, Bullock's oriole, Baltimore oriole, American goldfinch
Mammals	Little brown bat, silver-haired bat, big brown bat, eastern red bat, hoary bat, eastern cottontail, woodchuck, eastern chipmunk, gray squirrel, fox squirrel, northern flying squirrel, beaver, white-footed mouse, southern red-backed vole, meadow vole, meadow jumping mouse, western jumping mouse, porcupine, coyote, red fox, gray fox, raccoon, American marten, ermine, long-tailed weasel, least weasel, bobcat, elk, mule deer, white-tailed deer
Reptiles / amphibians	Woodhouse's toad, Great Plains toad, gray tree frog, northern leopard frog, tiger salamander, common mudpuppy, common garter snake, plains garter snake, painted turtle

Table 21: Animals (breeding) characteristic of wetlands and lakes

Group	Species
Birds	Common loon, pied-billed grebe, red-necked grebe, eared grebe, western grebe, double-crested cormorant, great blue heron, great egret, black-crowned night heron, white-faced ibis, Canada goose, wood duck, green-winged teal, mallard, blue-winged teal, northern shoveler, gadwall, American wigeon, ring-necked duck, lesser scaup, common goldeneye, hooded merganser, ruddy duck, Virginia rail, sora, American coot, killdeer, spotted sandpiper, Wilson's snipe, ring-billed gull, California gull, common tern, Forster's tern, belted kingfisher, willow flycatcher, tree swallow, northern rough-winged swallow, bank swallow, cliff swallow, marsh wren, yellow warbler, common yellowthroat, yellow-breasted chat, savannah sparrow, song sparrow, swamp sparrow, red-winged blackbird, yellow-headed blackbird, brown-headed cowbird
Mammals	Beaver, muskrat, otter
Reptiles / amphibians	American toad, Great Plains toad, Woodhouse's toad, gray treefrog, chorus frog, wood frog, northern leopard frog, tiger salamander, common mudpuppy, painted turtle, common garter snake, plains garter snake

4.3.11.2 MIGRATORY BIRDS

The Migratory Bird Treaty Act (MBTA) makes it unlawful to pursue, hunt, take, capture or kill; attempt to take, capture or kill; possess, offer to or sell, barter, purchase, deliver or cause to be shipped, exported, imported, transported, carried, or received any migratory bird, part, nest, egg, or product, manufactured or not. Provisions are in place for the protection of migratory bird, part, nest, egg, or product. Under the MBTA, “migratory birds” essentially include all birds native to the U.S.; and the law pertains to any time of the year, not just during migration.

North Dakota is located within the Central Flyway, one of the major migration paths in North America. Migratory birds may occur in the AOI during spring and fall migration, as well using the area as breeding and nesting grounds through the summer. Three-hundred seventy-five bird species can be seen in the state (North Dakota Game and Fish Department, 2016b). Because the AOI is located within the Prairie Pothole Region, the area has additional importance to waterfowl species. According to the Information for Planning and Consultation system of the USFWS (US Fish and Wildlife Service, 2019a), migratory bird species of concern (USFWS Birds of Conservation Concern list) that may be in the project vicinity and may be affected by activities in the AOI are listed in **Table 22**. Waterfowl that have been observed in Walsh County and may also be present in the planning area include snow goose, greater white-fronted goose, Canada goose, tundra swan, wood duck, blue-winged teal, northern shoveler, gadwall, American wigeon, mallard, northern pintail, canvasback, redhead, ring-necked duck, greater scaup, lesser scaup, bufflehead, and ruddy duck (eBird database, 2019). In Area 2, the Audubon Society notes the McHugh Slough/Lake Laretta area as an Important Bird Area (National Audubon Society, 2019). Lake Laretta historically had an island which was an important nesting site. Since flooding during the recent wet period, the birds have moved to the nearby McHugh Slough. This important nesting area is negatively impacted by agriculture and drainage.

Table 22: Migratory bird species of concern (not full list of all birds that may occur)

Species name	Breeding season	Species name	Breeding season
American bittern	Apr 1 to Aug 31	Long-eared owl	Mar 1 to Jul 15
American golden-plover	Breeds elsewhere	Marbled godwit	May 1 to Jul 31
Black tern	May 15 to Aug 20	Nelson's sparrow	May 15 to Sept 5
Black-billed cuckoo	May 15 to Oct 10	Red-headed woodpecker	May 10 to Sept 10
Bobolink	May 20 to Jul 31	Semipalmated sandpiper	Breeds elsewhere
Buff-breasted sandpiper	Breeds elsewhere	Short-billed dowitcher	Breeds elsewhere
Chestnut-collared longspur	May 1 to Aug 10	Smith's longspur	Breeds elsewhere
Dunlin	Breeds elsewhere	Sprague's pipit	May 10 to Aug 31
Hudsonian godwit	Breeds elsewhere	Yellow rail	May 15 to Sept 10
Lesser yellowlegs	Breeds elsewhere		

4.3.11.3 BALD AND GOLDEN EAGLES

The Bald and Golden Eagle Protection Act (16 USC § 668-668c) provides for the protection of bald and golden eagles by prohibiting the taking, possession, and commerce of such birds, except under certain specified conditions. USFWS issues permits to take, possess, and transport bald and golden eagles. There is potential for nests in the project vicinity. This information will be determined by the North Dakota Game and Fish Department.

4.3.12 THREATS TO ECOLOGICAL SYSTEMS

4.3.12.1 GENERAL THREATS

There are numerous threats to ecological systems in the region affecting plant communities and animal populations. Most of these threats are due, either directly or indirectly, to human activity and impact on land use. Threats to organisms and habitats have been listed in the North Dakota State Wildlife Action Plan (North Dakota Game and Fish Department, 2015) and the categories include residential and commercial development, agriculture, energy production and mining, transportation and service corridors, biological resource use, human intrusions and disturbance, natural system modification, invasives and other problematic species, pollution, geological events, climate change and severe weather, among others. Poor water quality also has resulted in negative impacts to fish populations at Matejcek Dam (see Section 5.3.8.5, **Figure 12**). NRCS policy (190-GM, Part 414) follows the requirements of the Executive Order 13112 (Invasive Species, February 3, 1999), which directs federal agencies to “prevent the introduction of invasive species, provide for their control, and to minimize the economic, ecological, and human health impacts that invasive species cause.” Projects that are associated with NRCS also require “No action be authorized, funded, or carried out that is believed to or is likely to cause or promote the introduction or spread of invasive species in the U.S. or elsewhere.”

4.3.12.2 NON-NATIVE / INVASIVE SPECIES

In addition to noxious weeds and invasive plant species, there are other organisms which are problematic, including invasive animal species and pathogens. There are eleven noxious weeds identified for North Dakota (Lym, R; Travnicek, A J, 2015). The counties of the watershed areas have additional designated noxious weeds within their jurisdictions (North Dakota Department of Agriculture, 2018))(Table 23). There are many other species of non-native plants in North Dakota, some of which are invasive and /or a nuisance to landowners (Table 24, (Lym, 2018). According to the North Dakota Department of Game and Fish, *Dreissena polymorpha* (zebra mussels) are present within the entire length of the Red River and tributaries (North Dakota State University, 2016). Zebra mussels may be present in the lower reaches of the Forest River but may not be present within the study area. *Ophiostoma ulmi* and *Ophiostoma novo-ulmi* (Dutch elm disease) has been confirmed within every county and is likely present within the AOI (LeBoldus, Bergdahl, Knodel, & Zeleznik, 2016).

Table 23: North Dakota state and county listed noxious weeds (as of February 2019)

Location	Species
Statewide	<i>Artemisia absinthium</i> (absinth wormwood), <i>Carduus nutans</i> (musk thistle), <i>Centaurea diffusa</i> (diffuse knapweed), <i>Centaurea maculosa</i> (spotted knapweed), <i>Centaurea repens</i> (Russian knapweed), <i>Cirsium arvense</i> (Canada thistle), <i>Euphorbia esula</i> (leafy spurge), <i>Linaria genistifolia</i> subsp. <i>dalmatica</i> ;(Dalmatian toadflax), <i>Linaria vulgaris</i> (yellow toadflax), <i>Lythrum salicaria</i> , <i>Lythrum virgatum</i> , and all cultivars (purple loosestrife), <i>Tamarisk</i> spp. (salt cedar)
Cavalier County	<i>Matricaria recutita</i> (false chamomile), <i>Asclepias syriaca</i> (milkweed), <i>Tanacetum vulgare</i> (common tansy)
Grand Forks County	<i>Bassia scoparia</i> (kochia)
Nelson County	<i>Sonchus arvensis</i> (perennial sow thistle)
Ramsey County	<i>Sonchus oleraceus</i> (annual sow thistle), <i>Matricaria recutita</i> (false chamomile)
Walsh County	<i>Matricaria recutita</i> (false chamomile)

Table 24: Troublesome non-native plant species in North Dakota (Lym 2018, * other species)

Species	Species
<i>Acroptilon repens</i> (Russian knapweed)	<i>Hyoscyamus niger</i> (black henbane)
<i>Amaranthus palmeri</i> (Palmer amaranth)	<i>Matricaria recutita</i> (false chamomile)
<i>Arctium minus</i> (common burdock)	<i>Onopordum acanthium</i> (Scotch thistle)
<i>Bromus tectorum</i> (downy brome)	<i>Sonchus arvensis</i> (perennial sow thistle)
<i>Cardaria draba</i> (hoary cress)	<i>Sonchus arvensis</i> ssp. <i>uliginosus</i> (marsh sow thistle)
<i>Carduus acanthoides</i> (plumeless thistle)	<i>Sonchus asper</i> (spiny sow thistle)
<i>Centaurea solstitialis</i> (yellow star thistle)	<i>Sonchus oleraceus</i> (annual sow thistle)
<i>Cirsium vulgare</i> (bull thistle)	<i>Tanacetum vulgare</i> (common tansy)
<i>Convolvulus arvensis</i> (field bindweed)	<i>Verbascum thapsus</i> (common mullein)
<i>Crepis tectorum</i> (narrowleaf hawksbeard)	<i>Melilotus officinalis</i> *
<i>Cynoglossum officinale</i> (houndstongue)	<i>Phalaris arundinacea</i> *
<i>Gypsophila paniculata</i> (baby's breath)	<i>Poa pratensis</i> *
<i>Halogeton glomeratus</i> (halogeton -sandy areas)	<i>Typha X glauca</i> *
<i>Hieracium aurantiacum</i> (orange hawkweed)	

4.3.13 THREATENED AND ENDANGERED SPECIES

The Endangered Species Act (ESA) directs Federal agencies to conserve endangered and threatened species. There are twelve species listed as threatened (likely to become an endangered species in the near future) or endangered (in danger of extinction now) which may occur in North Dakota. Because North Dakota does not have a state threatened or endangered (T & E) species list, those species listed by the ESA of 1973, as amended, are considered listed and the US Fish and Wildlife Service (USFWS) has primary oversight of these species. However, the ND Game and Fish Department has listed species of concern for the state's wildlife conservation strategy (Dyke, Johnson , & Isakson, 2015).

The USFWS online Information Planning and Conservation System (IPaC) program (US Fish and Wildlife Service, 2019a) shows no designated critical habitat in the AOI, but the following federally listed species may be present (**Table 25**). Descriptions of these listed species and their presence in relation to the project are provided below. These three species may be present temporarily in the APE, but the likelihood is low.

Table 25: Threatened and endangered species for Carrington, Grand Forks, Nelson, Ramsey, and Walsh Counties

Species	Habitat
<i>Canis lupus</i> (gray wolf), Endangered	There is final designated critical habitat for this species. The location is not available. Wolves tend to avoid human population and can roam widely.
<i>Myotis septentrionalis</i> (northern long-eared bat), Threatened	No critical habitat has been designated for this species in North Dakota. Bats use trees, particularly if they are part of a forest corridor, for roosting and breeding.
<i>Grus americana</i> (whooping crane), Endangered	There is final designated critical habitat for this species. These birds may migrate through North Dakota but avoid human populations.

4.3.13.1 SPECIES ASSOCIATED WITH CONSERVATION PRIORITY IN NORTH DAKOTA

In the State Wildlife Action Plan (North Dakota Game and Fish Department, 2015), the North Dakota Department of Game and Fish describes the strategies for fish and wildlife conservation. The plan lists animal species targeted for conservation priority. The species on that list that may occur in the watershed areas are shown for the following habitats: tallgrass prairie (**Table 26**), eastern Drift Plains mixed grass prairie (**Table 27**), tame grassland (**Table 28**), deciduous forest (**Table 29**), wetlands (**Table 30**), and rivers and riparian forests (**Table 31**).

Table 26: Species of state conservation priority in tallgrass prairie habitat

Group	Species
Birds	American bittern, northern pintail, northern harrier, Swainson's hawk, American kestrel, sharp-tailed grouse, greater prairie-chicken, yellow rail, willet, upland sandpiper, marbled godwit, Wilson's phalarope, short-eared owl, grasshopper sparrow, Le Conte's sparrow, Nelson's sparrow, dickcissel, bobolink, western meadowlark
Mammals	Pygmy shrew, arctic shrew, plains pocket mouse, Richardson' ground squirrel, eastern spotted skunk, gray fox
Reptiles / amphibians	Canadian toad, northern prairie skink, plains hog-nosed snake
Insects	Dakota skipper, poweshiek skipperling, monarch butterfly, regal fritillary

Table 27: Species of state conservation priority in eastern drift plains mixed grass habitat

Group	Species
Birds	Horned grebe, American bittern, northern pintail, lesser scaup, northern harrier, American kestrel, Swainson's hawk, ferruginous hawk, sharp-tailed grouse, yellow rail, willet, upland sandpiper, marbled godwit, Wilson's phalarope, franklin's gull, black tern, short-eared owl, loggerhead shrike, sedge wren, Sprague's pipit, lark bunting, grasshopper sparrow, Baird's sparrow, Le Conte's sparrow, Nelson's sparrow, chestnut-collared longspur, dickcissel, bobolink, western meadowlark
Mammals	Pygmy shrew, arctic shrew, plains pocket mouse, Richardson's ground squirrel, gray fox
Reptiles / amphibians	Plains spadefoot, Canadian toad, smooth green snake, plains hog-nosed snake
Insects	Dakota skipper, monarch butterfly, regal fritillary

Table 28: Species of state conservation priority in tame grassland habitat

Group	Species
Birds	American bittern, northern pintail, lesser scaup, northern harrier, Swainson's hawk, sharp-tailed grouse, greater prairie-chicken, willet, upland sandpiper, marbled godwit, long-billed curlew, Wilson's phalarope, short-eared owl, burrowing owl, loggerhead shrike, lark bunting, grasshopper sparrow, Baird's sparrow, Le Conte's sparrow, Nelson's sparrow, chestnut-collared longspur, dickcissel, bobolink, western meadowlark
Mammals	Arctic shrew, pygmy shrew, plains pocket mouse, hispid pocket mouse, Richardson's ground squirrel
Reptiles / amphibians	Plains spadefoot, Canadian toad, smooth green snake, plains hog-nosed snake
Insects	Monarch butterfly, regal fritillary

Table 29: Species of state conservation priority in deciduous forest habitat

Group	Species
Birds	Horned grebe, golden eagle, bald eagle, Swainson's hawk, black-billed cuckoo, red-headed woodpecker
Mammals	Arctic shrew, pygmy shrew, northern long-eared bat, western small-footed bat, long-eared bat, long-legged bat, little brown bat, big brown bat, Townsend's big-eared bat, American marten, gray fox

Table 30: Species of state conservation priority in wetland habitat

Group	Species
Birds	Horned grebe, American white pelican, American bittern, northern pintail lesser scaup, canvasback, bald eagle, northern harrier, yellow rail, whooping crane, piping plover, American avocet, willet, upland sandpiper, long-billed curlew, marbled godwit, red knot, Wilson's phalarope, Franklin's gull, black tern, short-eared owl, Le Conte's sparrow, Nelson's sparrow
Mammals	Arctic shrew, pygmy shrew, river otter
Reptiles / amphibians	Plains spadefoot, Canadian toad, snapping turtle
Insects	Monarch butterfly

Table 31: Species of state conservation priority in rivers and riparian forests

Group	Species
Birds	Bald eagle, red-headed woodpecker, blackbilled cuckoo
Mammals	River otter, northern long-eared bat, little brown bat, big brown bat, gray fox
Fish	Northern pearl dace, silver chub, northern redbelly dace, trout-perch, chestnut lamprey, silver lamprey, largescale stoneroller, hornyhead chub, pugnose shiner, blacknose shiner, carmine shiner, finsecale dace, yellow bullhead, logperch, river darter, burbot
Mussels	Threeridge, Wabash pigtoe, mapleleaf, black sandshell, creek heelsplitter, pink heelsplitter, creeper

4.3.14 SOCIOECONOMIC CHARACTERISTICS AND ENVIRONMENTAL JUSTICE

Environmental justice is the principle that all human populations have the opportunity to comment on proposed federal actions and all populations are allowed to share benefits, are not excluded, and are not adversely affected disproportionately by government programs affecting human health or the environment. Executive Order 12898 (February 11, 1994) requires federal agencies to make environmental justice part of the mission. To do this, the agencies must identify how their activities affect minority or low-income populations and Indian Tribes.

Analysis of the socioeconomic status within the AOI was reviewed for Walsh, Nelson, and Grand Forks counties. Cavalier and Ramsey county were not included because only a small area of the AOI is within these counties. Employment within this tri-county region from 1970 to 2000 is shown in **Table 32** (Headwater Economics, 2017). Service related jobs represented 57% of the workforce in the assessment area; this had increased from 1970 (42 %) to 2000 (57 %) by 13 %. Government jobs represented 25 % of the workforce followed non-services related jobs representing 18 % of the workforce. From 1970 to 2000, jobs in non-service related industries grew from 8,498 to 9,981, a 17 % increase.

The U.S. Department of Labor, Bureau of Labor Statistics (BLS), monitors labor market activity, working conditions, and price changes in the economy. The BLS quarterly census of employment and wages data was utilized to characterize the public and private employment characteristics of the AOI. The data are available on a county level. Because Walsh County contains most of the land of the AOI, the Walsh County statistical data were considered representative (**Table 33**) (US Department of Labor, Bureau of Labor Statistics, 2017). Private entities represent approximately 97 % of the commerce within Walsh County.

Table 32: Walsh, Nelson, and Grand Forks Counties employment by industry, 1970-2000 (percent of total)

Total Employment %	1970	1980	1990	2000	Change 1990-2000
Non-Services Related	22	18	14	18	29
Farm	13	9	6	5	-10
Agricultural services, forestry, fishing & other	0	1	1	1	56
Mining (including fossil fuels)	0	0	0	0	-77
Construction	4	5	4	6	70
Manufacturing (incl. forest products)	4	3	3	5	57
Services Related	42	50	54	57	13
Transportation & public utilities	4	5	4	4	6
Wholesale trade	3	4	4	4	3
Retail trade	15	18	18	19	10
Finance, insurance, & real estate	4	4	5	4	-2
Services	15	19	22	26	21
Government	37	31	32	25	-17

Table 33: Walsh County 2013-2016 annual average employment and wages

Summary Change Table	Annual Establish-ments	Annual Average Employment	Total Annual Wages (\$ US)	Annual Average Weekly Wage	Annual Wages per Employee (\$ US)
Walsh County 2013-2016 Annual Averages - Private					
2013 levels	474	4,120	\$148 million	\$690	\$35,880
2016 levels	480	3,918	\$148 million	\$726	\$37,775
Change from 2013 to 2016	6	-202	\$197,000	\$36	+\$1,895
Percent change from 2013 to 2016	1.3	-4.9	+0.1	+5.2	+5.3
Walsh County 2013-2016 Annual Averages - Federal Government					
2013 levels	16	61	\$2.6 million	\$816	\$42,448
2016 levels	14	55	\$2.7 million	\$927	\$48,210
Change from 2013 to 2016	-2	-6	+\$100,000	+\$111	+\$5,762
Percent change from 2013 to 2016	-12.5	-9.8	+3.9	+13.6	+13.6

4.3.15 CULTURAL AND HISTORIC CHARACTERISTICS

The National Historic Preservation Act (NHPA) of 1966 directed Federal agencies to develop a program of cultural preservation and consider effects of projects on historic properties. NRCS has established a policy and guidance for compliance with NHPA and other authorities, including the American Indian Religious Freedom Act (42 U.S.C. Section 1996); Native American Graves Protection and Repatriation Act (25 U.S.C. Sections 3001-3013); Executive Order (EO) 13175, Consultation and Coordination with Indian Tribal Governments (2000); EO 13007, Indian Sacred Sites (1996); and a range of Executive Orders.

A Class I Literature Search cultural resources report was completed for the Forest River Watershed Plan – Environmental Assessment (McFarlane, J; Cummings, J, 2019). The study area for this assessment was approximately 570 square miles and included Areas 1A and 2 with some additional area to the north of Area 2. Area 1B was not included in this report. The results noted three sites listed in the National Register of Historic Places, 24 historic structures, 29 historic cemeteries, and 415 archaeological sites. Several of the historic cemeteries and historic structures are located in Areas 1A and 2, and numerous archaeological sites are shown to be in all three, including in Area 1B. There is a large concentration of these sites in the River Zone APE between Fordville and Inkster, and there appears to be three archaeological sites downstream from the dam within approximately 2000 feet. There are no noted sites within Area 3 Dam zone.

4.3.16 RECREATION

There are several sites in the AOI area which provide for a variety of recreational activities including fishing, boating, swimming, camping, hunting, snowmobiling, birdwatching, and hiking. There are several locations for fishing and three with boating access sites located at local dams within the AOI (**Table 6**). Within 26 miles of Matejcek Dam there are six sites for boating and fishing (Whitman Dam, Fordville Dam, Bylin Dam, Homme Lake, Niagara Dam, and Kolding Dam) and two sites with fishing only (Laretta Lake and Dougherty Dam) (North Dakota Game and Fish Department, 2016d). There is one Wildlife Management Area and ten Waterfowl Protection Areas in the AOI (**Table 3**). Fordville dam provides opportunities for tent camping, RV sites, a picnic area with a playground, a swimming beach, boating, and fishing (Grand Forks County Information Services, 2014). Matejcek Dam (Area 3) has a variety of recreation opportunities. The 130-acre lake has five miles of shoreline and is an average depth of 19 feet (maximum depth 44 feet), and is suitable for boating, fishing and swimming. The lake is stocked with black crappie, northern pike, tiger muskie, walleye, yellow perch, and white suckers (North Dakota Game and Fish Department, 2018b). In 2017 approximately 20,000 walleye were stocked in the lake (North Dakota Game and Fish Department, 2018a). The eastern side of the lake has boat access and a public beach. The western side has boat access, day-use picnic area, campground, playground, and hiking paths.

4.3.17 AESTHETICS

The scenic beauty or aesthetic nature of a viewshed includes the existing natural and built features visible to a viewer. Some features which elicit viewers' positive perceived value can include historic properties; cultural resources, traditional cultural places, and cultural landscapes; areas of scenic beauty, scenic overlooks, and highways; wilderness areas, parks, and national forests; wild and scenic rivers, recreational, or nationwide inventory rivers; and pastoral landscapes. Changes to these viewsheds can be perceived as a negative impact to the landscape. Area 3 (APE), Matejcek Dam, is located within a rural, agricultural setting, but the view of the lake, the woodland, and the valley below the dam provide some relief to the flat landscape and a surprise as the viewer descends into the valley. The majority of the viewshed within the AOI includes fields, hayland, and rural residences. There are no designated scenic byways or scenic waterways within the study area.

5 PRELIMINARY RESULTS OF THE ENVIRONMENTAL EVALUATION

5.1 POTENTIAL ALTERNATIVES

Concept alternatives are discussed in this section. Details of specific alternatives will be refined and further evaluated for resource impacts during more detailed planning. The following alternative concepts will be evaluated as part of the Watershed Planning Effort. The alternatives of no action and decommissioning the dam are included here as requested by NRCS, but do not preclude other alternatives which meet the project purpose and need.

5.1.1 NO FEDERAL ACTION

The anticipated future condition of Matejcek Dam will be estimated assuming no federal action is taken. It is anticipated that one of the following three potential actions would be taken through a non-federally financed project. Options for Matejcek Dam will be discussed with the SLO, NRCS, NDSWC, and other affected non-federal entities to determine an anticipated future condition assuming no federal action is taken.

5.1.2 DECOMMISSION

Decommissioning of Matejcek Dam consists of sufficient removal of the existing embankment to eliminate attenuated flood storage for the 100-year, 24-hour rainfall event. The channel would also have to be stabilized and reconnected to the historic floodplain to restore proper geomorphic functions to the river. The top of the Matejcek Dam embankment also provides a road corridor for Walsh County Road 14. Removal of the embankment would require either sufficient embankment removal to meet vertical curve and slope requirements for road design, or rerouting Walsh County Road 14 through an alternative alignment. A new crossing for Walsh County Road 14 would be required over the Forest River.

5.1.3 NON-STRUCTURAL REHABILITATION

Removal of flood risk from the breach inundation zone to reduce Dam Hazard Classification may be an applicable alternative for Matejcek Dam. The previously completed Dam Assessment Report identifies 28 potentially inhabitable structures that would experience flooding in the event of a dam failure. Removal of flood risk during a dam failure may require property acquisition and structure demolition, structure relocation, well and septic capping and/or removal, and flood proofing. Additional flood risk that would be required to be removed include protection of critical access routes within the breach zone. A reduced Dam Hazard Classification may still require structural improvements to Matejcek Dam to meet NRCS and State Dam Safety criteria, however these improvements would likely be a reduced scope than structural rehabilitation to meet High Hazard Classification requirements.

5.1.4 STRUCTURAL REHABILITATION

Potential rehabilitation alternatives for Matejcek Dam were evaluated preliminarily in the previously completed Dam Assessment Report (Gannett Fleming, Inc., 2010). Alternatives were developed to meet High Hazard Classification requirements. The most cost-effective alternative identified consisted of the following structural improvements:

- Raise the Auxiliary Spillway crest elevation by 8.7 feet to pass the 100-year flow through the principal spillway without activating the auxiliary spillway.
- Raise the top of dam elevation by 16.4 feet to meet freeboard requirements.
- Utilize roller-compacted concrete to armor the Auxiliary Spillway ensure spillway integrity requirements are met.
- Upgrade the Principal Spillway riser structure to meet current NRCS design standards.
- Geotechnical improvements to address seepage control within the embankment and downstream toe area.

5.2 ESTIMATED COSTS

This preliminary investigation does not evaluate costs of alternatives; however, limited cost data is available through the previously completed Dam Assessment Report (Gannett Fleming, Inc., 2010). The cost data, using 2010-dollar estimates, are presented in **Table 34**.

Table 34: Dam assessment report alternative cost estimate (2010 dollars)

Alternative	Total Construction Costs	Construction Contingency (25 %)	Other Project Costs (40 %)	Total Costs
No Federal Action ^[1]	Unknown	Unknown	Unknown	Unknown
Decommission ^[1]	\$8,000,000	\$2,000,000	\$4,000,000	\$14,000,000
Non-Structural ^[2]	Unknown	Unknown	Unknown	Unknown
Structural Rehabilitation	\$15,900,000	\$3,975,000	\$7,950,000	\$27,825,000

[1] Costs assume removal of entire dam to original valley cross section. Cost savings could be achieved by limiting the scope of the dam removal to notch the embankment. The estimated construction cost of a partial removal is \$2,100,000.

[2] Not included in the Dam Assessment Report.

The costs presented in the table above are conceptual and will be subject to revision through the Watershed Rehabilitation Planning effort. Costs associated with identified reasonable alternatives will be evaluated to determine if they are feasible.

5.3 IDENTIFIED RESOURCE CONCERNS AND POTENTIAL EFFECTS

Alternatives have not been analyzed to sufficiently determine specific impacts to various resources. Complete site evaluations and more detailed watershed planning will use an interdisciplinary team consisting of technical expertise across a range of disciplines. The group will work to establish a workable solution with the local resources of concern. Depending on the scope of impacts for identified alternatives, the following potential impacts will be reviewed by the team (**Table 35**).

Consistent with the NRCS, National Watershed Program Manual (NWPM), Part 501.24(B), a list of potential resources concerns will be presented to the public during a public meeting. This meeting will enable the general public to rate the level of concern for several various considerations. After engaging the public in scoping, the interagency team will the concerns that are identified by the public

Table 35: Identified resource concerns and potential effects

Identified Resource Concern	Existing Condition	No Federal Action	Decommission	Potential Effects		
				Non-Structural Rehabilitation		Structural Rehabilitation
Description	MD is currently designated as a high hazard structure that doesn't meet current Dam Safety criteria. dam failure risk	Alternative not yet defined. Assumed to be consistent with one of the three potential federal actions.	Dam removal, channel stabilization, revised road design and river crossing, eliminates dam failure risk	Downstream at-risk property acquisition, eliminates dam failure risk only if reduced scope structural improvements are implemented		Structural improvements to Matejcek Dam to bring the dam into current NDSWC and NRCS High Hazard requirements. This may include increasing embankment heights, increasing spillway capacities, or a combination thereof. While the risk of dam failure may be reduced, a dam breach could be more catastrophic than the existing condition if embankment heights were increased.
Public Safety and Transportation	MD results in a reduced frequency of adverse impacts public safety and transportation. High flows can result in increased frequency of road overtopping, road damages, residential access, and community access. The increased dam failure potential associated with Dam Safety concerns poses an increased risk public safety and transportation downstream of the dam.	Alternative not yet defined.	Increased frequency of flooding downstream of MD would result in for frequent flood associated impacts to transportation and public safety. These potential impacts include an increased frequency of road overtopping, road damages, residential access, and community access. Adverse impacts would likely need to be addressed.	Removal of at-risk structures and critical access routes would reduce public safety and transportation concerns downstream of MD. Transportation routes for non-critical routes would likely remain relatively unchanged. Impacts associated with dam failure are expected to be reduced slightly due to a lesser hazard classification.		The reduced frequency of adverse impacts to public safety and transportation would still be provided. The adverse impacts associated with risk of dam failure would be reduced by addressing Dam Safety concerns.
Dam Safety (Section 3.2)	MD is currently designated as a high hazard structure that doesn't meet current Dam Safety criteria. This poses an increased risk of dam failure for downstream residents.	Alternative not yet defined.	Removal of MD would eliminate the associated risk with a dam failure.	Removal of at-risk structures would reduce the Dam Hazard classification. Some structural improvements would likely still be required due to identified dam safety deficiencies. Impacts associated with dam failure are expected to be reduced slightly due to a lesser hazard classification.		MD would meet all Dam Safety criteria for a High Hazard Classification, resulting in a reduced dam failure risk as compared to the existing condition. Impacts associated with dam failure are expected to be increased slightly due to the anticipated requirement for an increased dam height.
Land Use (Section 4.3.3)	MD facilitates increased agricultural production downstream due to reduced severity of summer floods. A dam failure resulting from Dam Safety concerns would have an immediate impact to agricultural land use downstream of the dam.	Alternative not yet defined.	Increased frequency of flooding may result in land use changes and/or crop type changes in the downstream floodplain.	Rehabilitation to a Significant Hazard classification may result in increased impacts to land use during low frequency flood events. Impacts associated with dam failure are expected to be reduced slightly due to a lesser hazard classification.		Land use impacts would remain largely unchanged from the existing condition. Impacts associated with dam failure are expected to be increased slightly due to the anticipated requirement for an increased dam height.
State and Federal Lands (Section 4.3.4)	There are currently no State and Federal Lands in Area 3. The normal pool of MD is a state managed fishery. Lake Ardoch National Wildlife Refuge is located downstream of MD.	Alternative not yet defined.	Decommissioning of MD may result in hydrologic impacts to Lake Ardoch NWR. The normal pool of MD would no longer be present as a state managed fishery.	Rehabilitation to a Significant Hazard classification may result in increased flows into Lake Ardoch NWR during low frequency flood events. Impacts associated with dam failure are expected to be reduced slightly due to a lesser hazard classification.		Rehabilitation to a High Hazard classification may result in increased flows into Lake Ardoch NWR during low frequency flood events. Impacts associated with dam failure are expected to be increased slightly due to the anticipated requirement for an increased dam height.
Soils (Section 4.3.5)	Potential for erosion in tilled areas of the downstream floodplain. A dam failure resulting from Dam Safety concerns would likely result in erosion and/or deposition of sediment in inundated areas.	Alternative not yet defined.	Increased potential for erosion in tilled areas due to more frequent out of bank flows downstream.	Rehabilitation to a Significant Hazard classification may result in increased impacts to soils during low frequency flood events. Impacts associated with dam failure are expected to be reduced slightly due to a lesser hazard classification.		MD would meet all Dam Safety criteria for a High Hazard Classification, resulting in a reduced dam failure risk as compared to the existing condition. Impacts associated with dam failure are expected to be increased slightly due to the anticipated requirement for an increased dam height.
Agricultural Productivity (Section 4.3.6)	MD increases agricultural production in the historic downstream floodplain along the Forest River by reducing peak flow rates on moderate to high frequency rainfall events. Dam failure would likely result in significant impacts to agriculture due to flooding, erosion, and/or deposition on cropland within the breach zone.	Alternative not yet defined.	Decommission of MD would increase the frequency of flooding downstream, resulting in reduced agricultural productivity in flood zones. Potential to increase flooding on prime farmlands downstream of MD.	While rehabilitation to a Significant Hazard classification may result in increased impacts to cropland during low frequency flood events, these impacts are anticipated to be negligible. Impacts associated with dam failure are expected to be reduced slightly due to a lesser hazard classification.		While rehabilitation to a High Hazard classification may result in reduced impacts to cropland during low frequency flood events, these impacts are anticipated to be negligible. Impacts associated with dam failure are expected to be increased slightly due to the anticipated requirement for an increased dam height.
Wetlands and Open Water (Section 4.3.7)	Wetlands and open water exist within the MD area. Wetlands are identified downstream of the dam. Peak flow attenuation caused by MD has likely affected riparian floodplain wetland connectivity in riparian zones. A dam failure resulting from Dam Safety concerns would likely result in significant impacts due to flooding, erosion, and/or deposition within wetland basins downstream of MD.	Alternative not yet defined.	Removal of the normal pool at Matejcek Dam could allow for re-establishment of riparian floodplain wetlands connected to historic riparian zones downstream of MD.	Rehabilitation to a Significant Hazard classification may result in increased impacts to riparian wetlands during low frequency flood events. Impacts associated with dam failure are expected to be reduced slightly due to a lesser hazard classification.		Depending on required dam heights and normal pool elevations, open water and wetlands within the flood pool may change. Downstream wetlands are expected to remain unchanged from the existing condition. Impacts associated with dam failure are expected to be increased slightly due to the anticipated requirement for an increased dam height.

Table 35: Identified resource concerns and potential effects

Rivers and Streams (Section 4.3.7)	MD interferes with the water flow of Middle-South branch of the Forest River. The MD normal pool and flood pool inundates a portion of the historic riparian corridor and associated floodplain. Attenuated flows from MD have altered downstream hydrology, and have likely impacted the riparian corridor and associated floodplain. A dam failure resulting from Dam Safety concerns would have an immediate impact to riparian zones downstream of the dam.	Alternative not yet defined.	Removal of MD would modify the hydrologic response to surface runoff downstream along the Forest River. While this may change/improve riparian functions, it may not restore them due to other alterations to hydrology within Forest River watershed.	Rehabilitation to a Significant Hazard classification may result in increased impacts to downstream rivers and streams during low frequency flood events. Impacts associated with dam failure are expected to be reduced slightly due to a lesser hazard classification.	Expected to remain unchanged from the existing condition. Impacts associated with dam failure are expected to be increased slightly due to the anticipated requirement for an increased dam height.
Floodplain Management (Section 4.3.8)	MD currently regulates flows to 13,000 acres of regulatory 100-year floodplain (designated Zone A and Zone AE flood areas).	Alternative not yet defined.	Decommissioning would result in more frequent flooding downstream and could lead to an increased 100-year regulatory Base Flood Elevation.	Reduced downstream flood risk due to removal of structures within the MD breach zone. Regulatory floodplain downstream of MD may be affected due to rehabilitation to a Significant Hazard Dam.	No changes expected to regulatory 100-year floodplain. Benefits to the 500-year floodplain may occur due to increased hydrologic capacity of the Principal Spillway before activation of the Auxiliary Spillway.
Water Quality (Section 4.3.8)	Various reaches of the Forest River downstream of MD are listed on the EPA's 303(d) list. The conservation pool at MD is also listed on the EPA's 303(d) list. MD has recently had low dissolved oxygen levels at various times of the year that has resulted in impacts to fish communities in the normal pool. Dam failure would likely result in immediate sediment and nutrient loading of downstream water bodies through erosion of the embankment and accumulated sediment.	Alternative not yet defined.	Normal river flows and functions would resume upstream after dam removal resulting in a rehabilitated dynamic landscape and habitat. The residence time provided by MD would be removed and may result in increased sediment and nutrient loading downstream.	Expected to remain unchanged from the existing condition. Impacts associated with dam failure are expected to be reduced slightly due to a lesser hazard classification.	Expected to remain unchanged from the existing condition. Impacts associated with dam failure are expected to be increased slightly due to the anticipated requirement for an increased dam height.
Air Quality (Section 4.3.9)	There are no issues in the area	Alternative not yet defined.	Expected to remain unchanged from the existing condition.	Expected to remain unchanged from the existing condition.	Expected to remain unchanged from the existing condition.
Plant Communities (Section 4.3.10)	MD and downstream watershed currently support a range of agricultural uses as well as natural communities of wetland, riparian/upland forest species. Dam failure would result in immediate impacts to plant communities downstream along the Forest River.	Alternative not yet defined.	Normal river flows would result in rehabilitation of floodplain riparian forests and spatial adjustments in palustrine and riverine wetlands	Expected to remain unchanged from the existing condition. Impacts associated with dam failure are expected to be reduced slightly due to a lesser hazard classification.	Expected to remain unchanged from the existing condition. Impacts associated with dam failure are expected to be increased slightly due to the anticipated requirement for an increased dam height.
Fish and Wildlife (Section 4.3.11)	MD currently provides habitat for animals associated with deep water habitat, wetlands, riparian forests. Dam failure would remove deep water habitat, and impact habitat downstream along the Forest River.	Alternative not yet defined.	Deep water habitat will be lost. Additional habitat gains would be made through restoration of channel and forested floodplain.	Minimal changes in fish and wildlife habitat expected. Rehabilitation to a significant hazard dam may result in slightly reduced flood pool impacts to habitat during low frequency events. These reduced impacts are expected to be negligible because of the low frequency of these events. Impacts associated with dam failure are expected to be reduced slightly due to a lesser hazard classification.	Minimal changes in fish and wildlife habitat expected. Minor temporary impacts to riparian forest and riverine wetlands due to increased dam height, however increased flood pool usage would be infrequent. Modifications to the principal spillway may provide an opportunity to enhance the current fishery. Impacts associated with dam failure are expected to be increased slightly due to the anticipated requirement for an increased dam height.
Ecological Systems (Section 4.3.12)	MD impacts ecological systems by altering hydrology and inundating historic riparian areas and associated flood plains. Dam owners currently work to spray noxious weeds as they are noted on the dam embankment. Dam failure would result in extremely high flow rates within he downstream channel. Through impacts to other resources, the overall ecology of the downstream channel would be reduced.	Alternative not yet defined.	Riparian ecology would be restored in the MD flood pool and downstream.	Minimal changes to ecological systems are expected. Rehabilitation to a significant hazard dam may result in slightly reduced flood pool impacts during low frequency events. These reduced impacts are expected to be negligible because of the low frequency of these events. Impacts associated with dam failure are expected to be reduced slightly due to a lesser hazard classification.	Minimal changes to ecological systems are expected. Impacts associated with dam failure are expected to be increased slightly due to the anticipated requirement for an increased dam height.

Table 35: Identified resource concerns and potential effects

Threatened and Endangered Species (Section 4.3.13)	There are two Federally-listed endangered species and one threatened species within the Area of Interest (MD), many species listed by state for conservation priority associated with open water habitat, riparian forests, wetlands	Alternative not yet defined.	Likely no change to Federally-listed species, potential for increased population of state-listed species in riparian forests, decreased populations for state listed species in open water habitat	No change to Federally-listed species, and minimal change for state-listed species	No change to Federally-listed species, and minimal change for state-listed species
Socioeconomics and Environmental Justice (Section 4.3.14)	MD currently provides flood damage reduction benefits to agriculture, private structures, public infrastructure, and communities on the Forest River downstream of MD. Dam failure would likely be a catastrophic event that would adversely affect area socioeconomics through impacts to public and private structures, infrastructure, and agricultural land.	Alternative not yet defined.	Decommissioning would result in increased downstream economic losses and/or additional costs associated with mitigating the increased risk.	Removal of residents from occupied structures could result in minor economic impacts to the region due to loss of residents and property values. Flood damage reduction benefits to agriculture provided from MD are anticipated to remain consistent with the existing conditions. Impacts associated with dam failure are expected to be reduced slightly due to a lesser hazard classification.	The reduction of flood damages MD currently provides would continue. Impacts associated with dam failure are expected to be increased slightly due to the anticipated requirement for an increased dam height.
Cultural and Historic (Section 4.3.15)	Preliminary (incomplete) assessment indicates numerous National Register of Historic Places, historic structures, cemeteries, and archaeological sites, downstream of MD, several archaeological sites directly downstream of the dam.	Alternative not yet defined.	These historic items existed prior to the construction of MD. Rehabilitation of dynamic river flow may expose these or additional sites.	These historic items existed prior to the construction of MD. Failure of a significant hazard dam may pose a risk to sites listed within the breach zone.	Expected to remain unchanged from the existing condition because these historic items existed prior to the construction of MD. Failure of a high hazard dam may pose a risk to sites listed within the breach zone.
Recreation (Section 4.3.16)	MD provides recreation opportunities to area residents, including boating, hiking, fishing, hunting, picnicking, camping, swimming, and bird-watching. Because current recreational opportunities are present because of MD, dam failure would remove these opportunities.	Alternative not yet defined.	Fishing and boating opportunities would be removed with elimination of the pool. Restored riparian areas may provide additional opportunities for hiking, hunting, and bird-watching.	Modifications to the principal spillway to enhance the current fishery could create additional fishing opportunities.	Modifications to the principal spillway to enhance the current fishery could create additional fishing opportunities.
Aesthetics (Section 4.3.17)	MD provides scenic beauty with the pool, forested banks, and valley downstream as contrast to the predominant viewscape of flat, tilled land.	Alternative not yet defined.	Controlled water release and dam removal would restore normal river flows and functions upstream and downstream. This would result in a picturesque forested river valley.	Minimal changes anticipated unless dam fails. In this case, after twenty years of vegetation regrowth the picturesque forested river valley would become reestablished.	Minimal changes anticipated.

5.4 REQUIRED CONSULTATION AND PERMITS

Required consultations have not yet been completed. These consultations will be completed as required by applicable laws and policies as part of the Watershed Rehabilitation Planning effort. Potential required consultations are listed in the **Table 36**.

Table 36: Potential Required Consultations

Resource Concern/Regulation	Consulting Entity
Air Quality	EPA Office of Air and Radiation
Water Quality	North Dakota Department of Health
Cultural Resources (Historic Properties)	State Historic Preservation Officer; Tribal Historic Preservation Officer
Endangered and Threatened Species	US Fish and Wildlife Service
Tribal Interests	Affected Tribal Government
Waters of the United States, Including Wetlands	US Army Corps of Engineers

Permit requirements will also be established through completion of the Watershed Rehabilitation Planning effort.

5.5 NEPA DOCUMENTATION REQUIRED

It is anticipated that selected alternatives will require an EA only. However, this is dependent on the scope of impacts for selected alternatives. If the impacts cannot be reasonably overcome, an Environmental Impact Statement (EIS) may be necessary. This will not be known until impacts are quantified through the Watershed Rehabilitation Planning process.

6 SCOPE OF PLANNING EFFORT

Watershed Planning will focus on reducing damages related to high flows and runoff volumes. The general public, watershed stakeholders, and various agencies with a vested interest in the watershed will be engaged to initially determine resources of concern within the study area. Outreach will continue throughout the planning effort to ensure that reasonable alternatives are developed. The following list of general tasks will be completed through this planning effort:

- Purpose and Need for Action
- Public Participation
- Data Collection & Resource Inventory
- Development of Alternatives
- Detailed Alternative Review
- Environmental Consequences
- Select Preferred Alternative
- Complete Watershed Plan-EA

A copy of the Plan of Work & Schedule is available in **Appendix A**. The corresponding Statement of Work that is included in the Cooperative Agreement between NRCS and the WCWRD is included in **Appendix B**. This plan of work provides more details on sub tasks that will be completed in each of the tasks outlined above.

7 COOPERATIVE AGENCIES IDENTIFIED

Letters of Invitation have been prepared for the following entities to participate in Planning. Each County Water Resource District will also be permitted to appoint an additional resident to the Project Team.

- United States Army Corps of Engineers
- United States Fish and Wildlife Service
- Federal Emergency Management Agency, Region 8
- North Dakota State Water Commission
- North Dakota Game and Fish Department
- North Dakota Department of Transportation
- North Dakota Department of Environmental Quality
- North Dakota State Historical Society
- Walsh County Commission
- Walsh County Water Resource District
- Walsh County Department of Emergency Management
- Walsh County Three Rivers Soil Conservation District
- Walsh County Highway Department
- Nelson County Commission
- Nelson County Water Resource District
- Nelson County Soil Conservation District
- Nelson County Department of Emergency Management
- Nelson County Highway Department
- Grand Forks County Commission
- Grand Forks County Water Resource District
- Grand Forks County Department of Emergency Management
- Grand Forks County Highway Department
- All required Tribal Entities

8 PUBLIC PARTICIPATION

Outreach for the planning effort will include engaging the general public a minimum of three times. The previously referenced Watershed Stakeholders Committee and Cooperating Agencies will meet on a regular basis to provide comment and participate in watershed planning. A copy of the Public Participation Plan is available in **Appendix C**.

The first public meeting was held at the Minto Community Center on July 29, 2019. Zach O. Herrmann presented an introduction to the project for an audience of 39 stakeholders (see presentation and meeting sign-in sheets, **Appendix C**). A comment sheet was provided and the comments resulting from the meeting have been collated after the closing of the comment period (seven responses, August 30, 2019)(**Appendix C**). In general, the comments fell into five general categories as follows:

- need for more flood protection (i.e. more water in reservoir, upper watershed area accounted for in dam capacity) (three responses);
- stakeholders want more details of need for project and plans;
- concern about water quality (e.g. fish kills);
- make sure public meeting notices get to all stakeholders; and
- status or previous flood control plans (drainage ditch in Section 5 & 6 in Johnstown Township).

9 FACILITATING & OBSTRUCTING FACTORS

Various factors that will affect the outcome of the planning effort will be identified during planning. To date, these factors are largely unknown because alternatives have not been studied to sufficiently understand impacts.

10 TIMING AND AVAILABILITY OF RESOURCES

Development of the Watershed Plan-EA is anticipated to be completed by September 30, 2020. **Appendix A** provides an estimated project timeline for the planning effort.

11 VIABILITY EVALUATION OF SPONSORS

The Sponsors meet all requirements to move forward with Rehabilitation of Matejcek Dam.

12 REFERENCES

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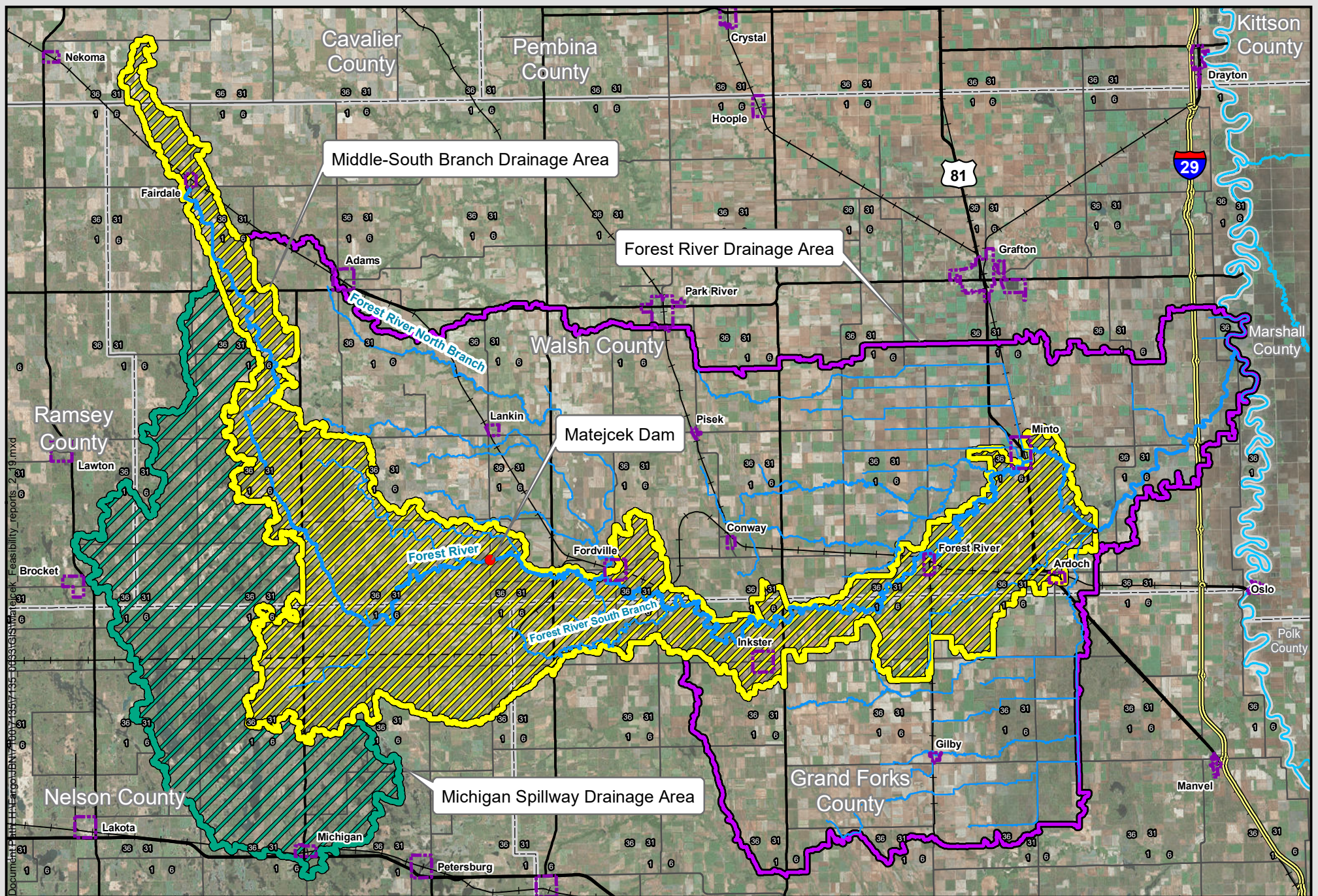
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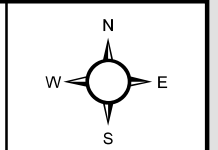
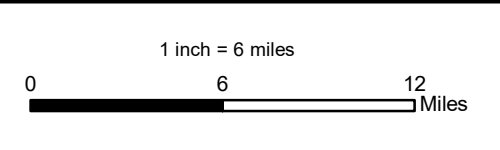
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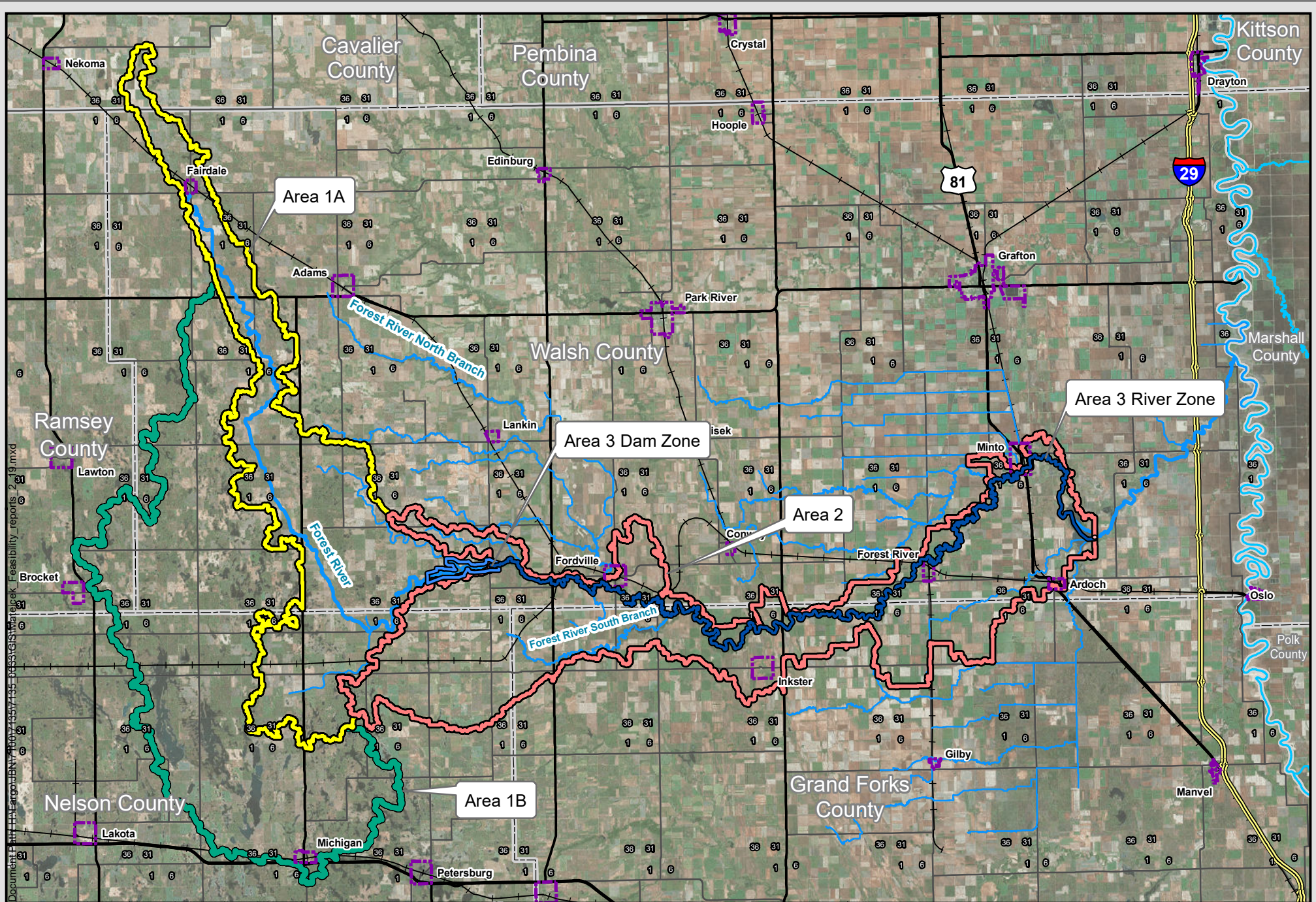
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Exhibit 01.1: Location Map: Middle-South Branch Forest River Watershed

Middle-South Branch Forest River Dam No. 1 (Matejcek Dam)
 Feasibility Study and Plan of Work
 Forest River Joint Water Resource District





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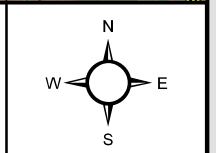
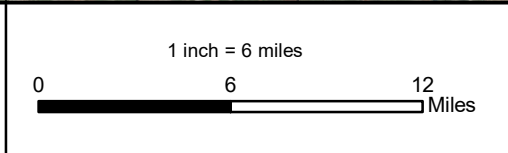
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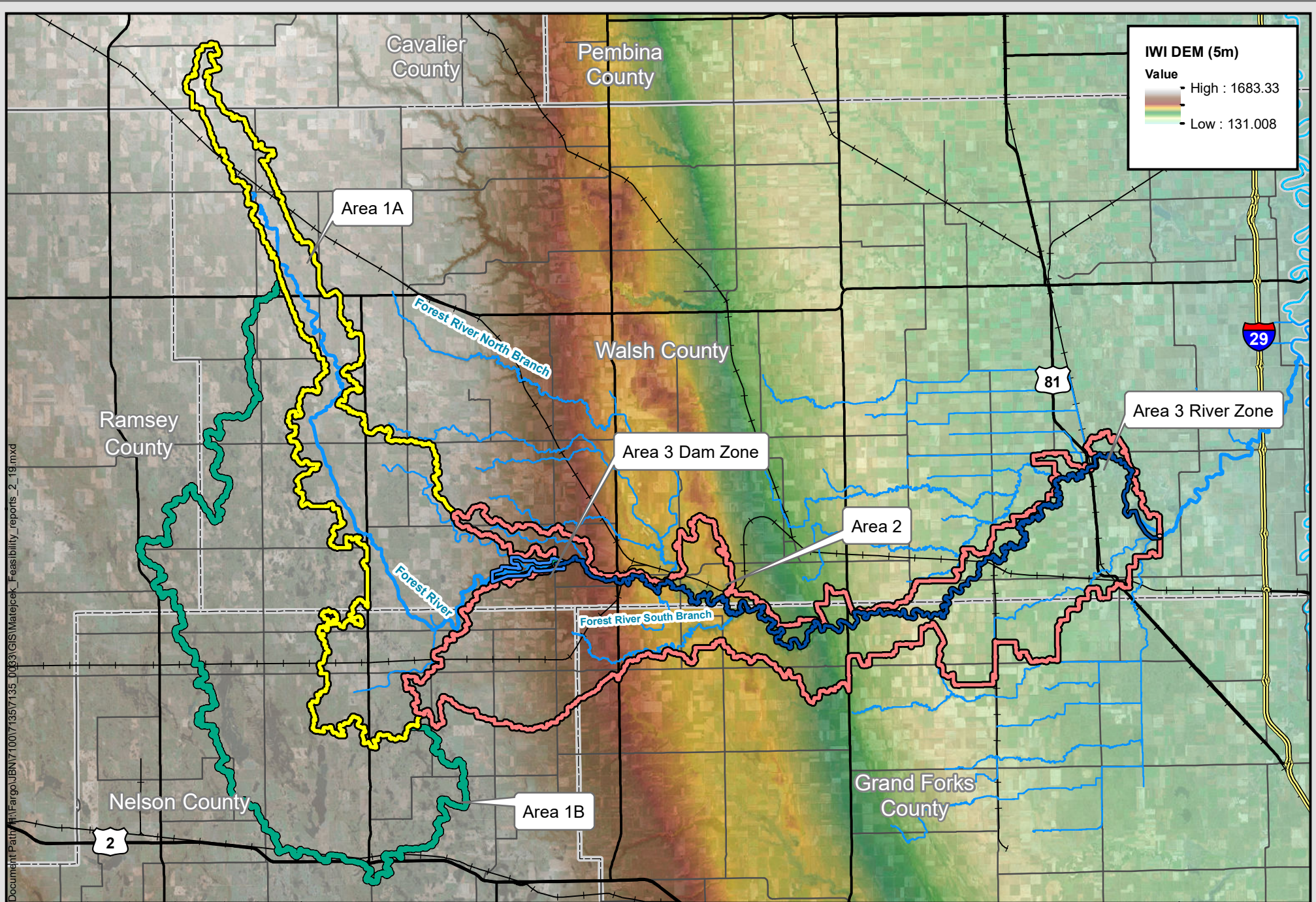
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Exhibit 01.2: Area of Interest (1A, 1B, 2, and 3)

Middle-South Branch Forest River Dam No. 1 (Matejcek Dam)
Feasibility Study and Plan of Work
Forest River Joint Water Resource District





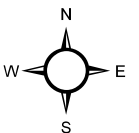
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Exhibit 02.1: LiDAR Map: Area of Interest (1A, 1B, 2 and 3)

Middle-South Branch Forest River Dam No. 1 (Matejcek Dam)
 Feasibility Study and Plan of Work
 Forest River Joint Water Resource District

1 inch = 6 miles

0 6 12 Miles



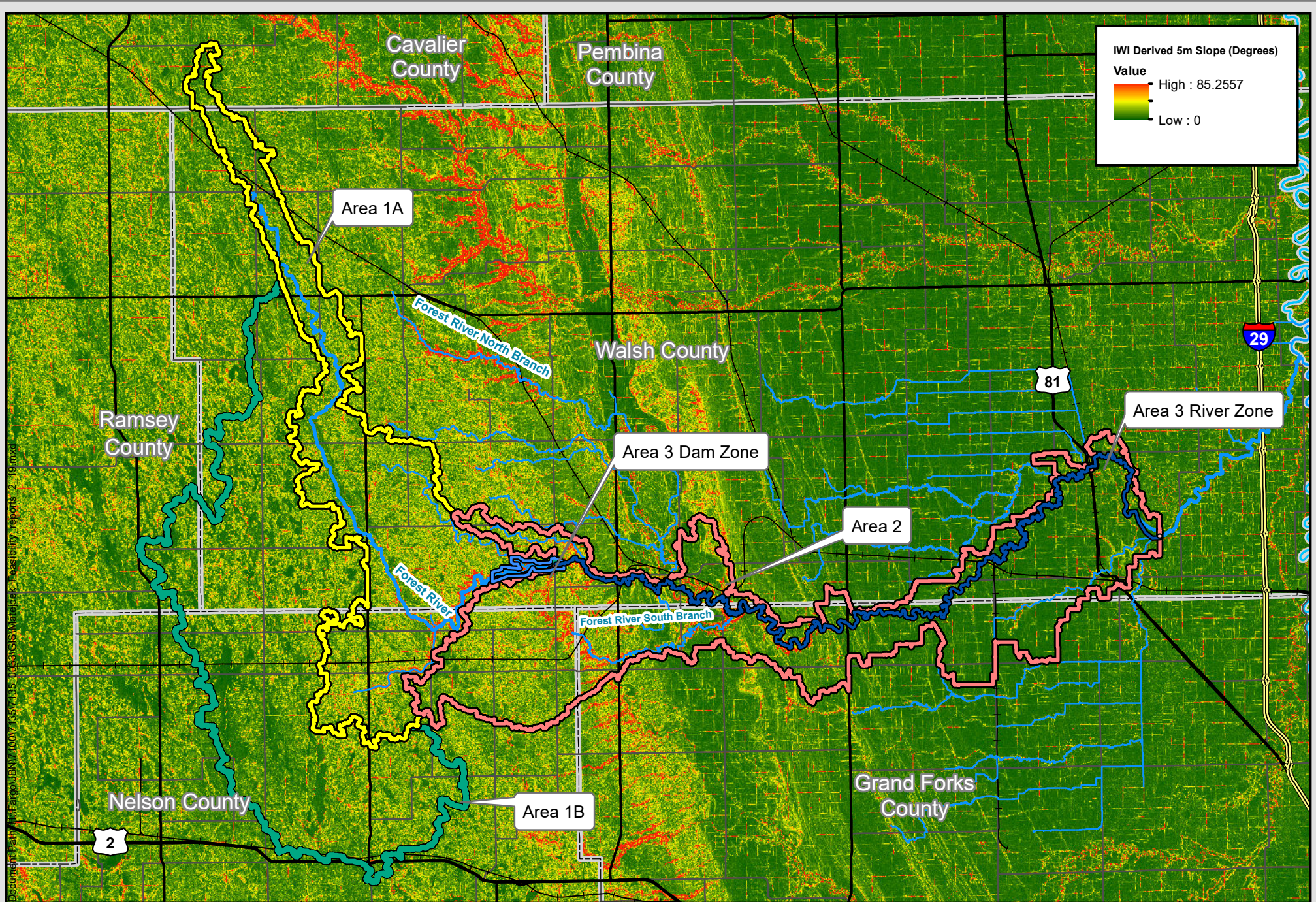
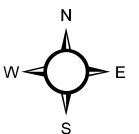
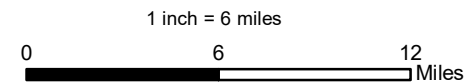
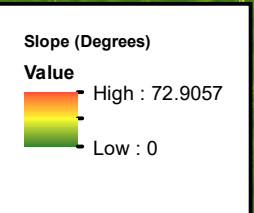


Exhibit 02.3: LiDAR Derived Slope of Area of Interest (1A, 1B, 2 and 3)

Middle-South Branch Forest River Dam No. 1 (Matejcek Dam)
 Feasibility Study and Plan of Work
 Forest River Joint Water Resource District





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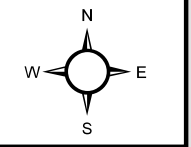
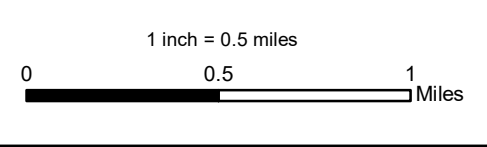
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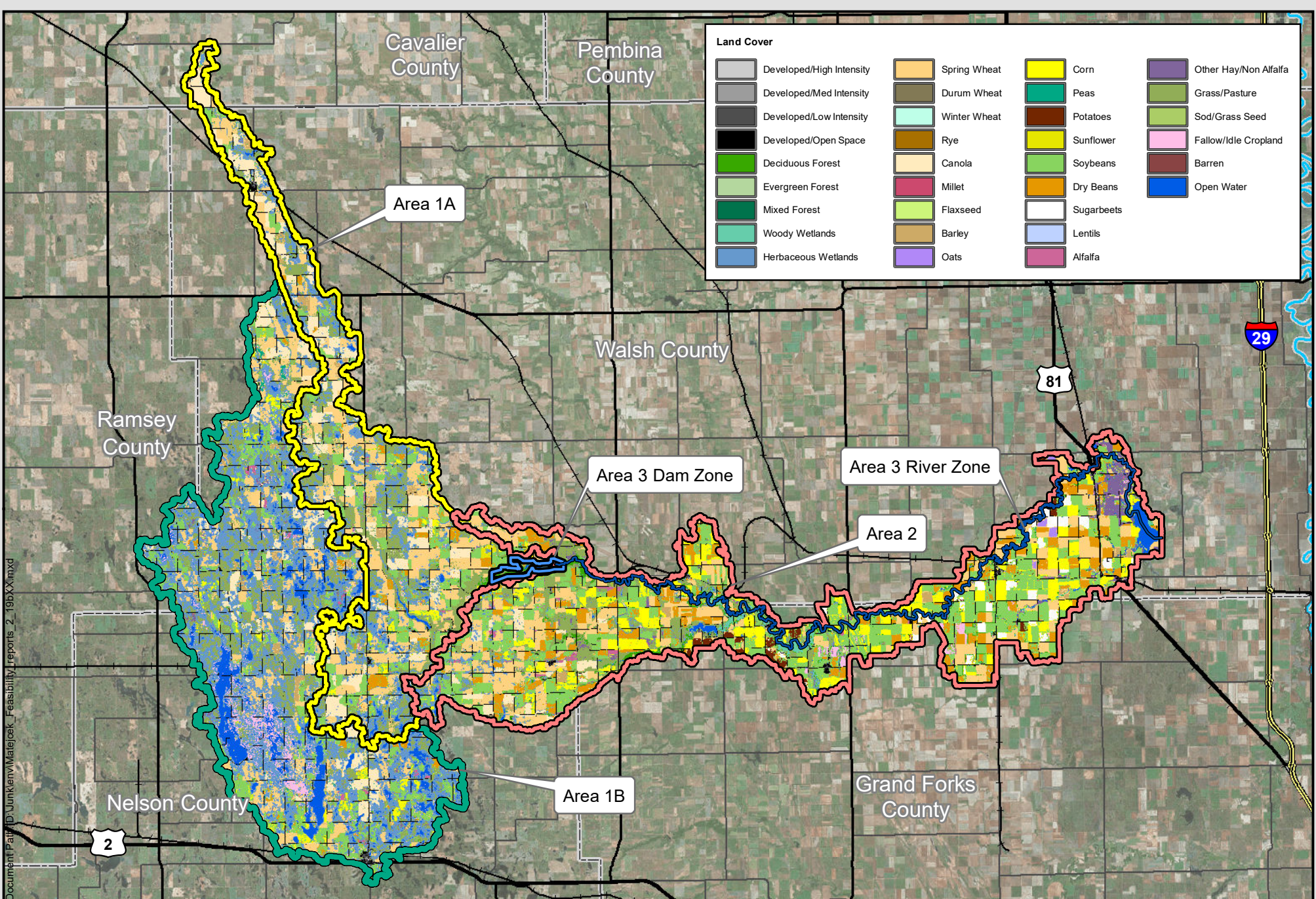
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Exhibit 02.4: LiDAR Derived Slope of Area of Potential Effect - Dam Zone

Middle-South Branch Forest River Dam No. 1 (Matejcek Dam)
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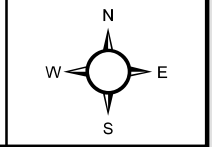
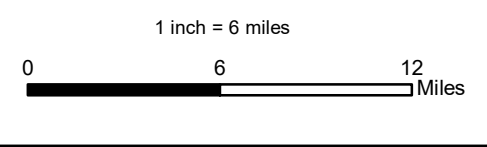
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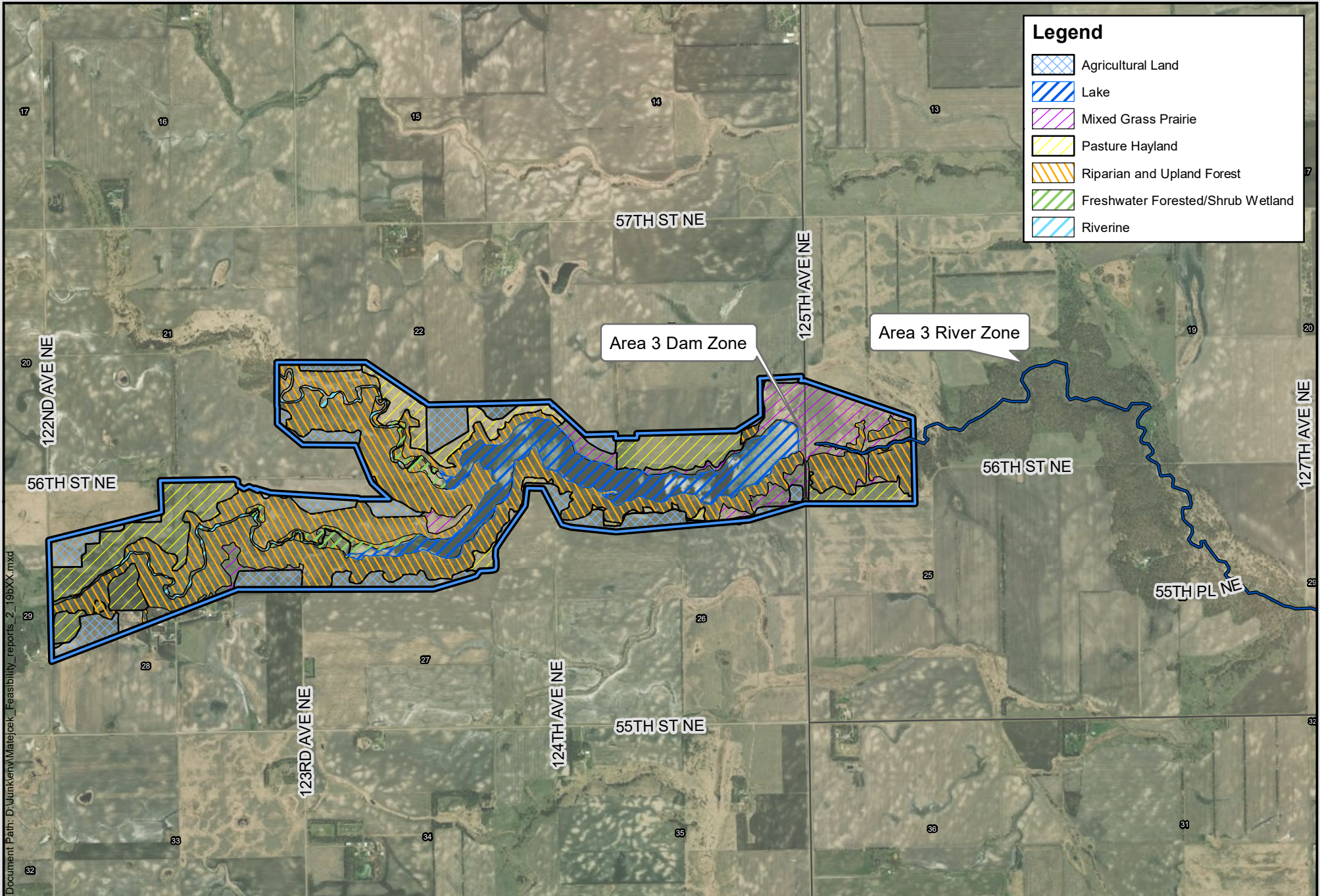
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Exhibit 03.1: NASS Cropland Data (2017): Area of Interest (1A, 1B, 2, and 3)

Middle-South Branch Forest River Dam No. 1 (Matejcek Dam)
Feasibility Study and Plan of Work
Forest River Joint Water Resource District





Legend

-  Agricultural Land
-  Lake
-  Mixed Grass Prairie
-  Pasture Hayland
-  Riparian and Upland Forest
-  Freshwater Forested/Shrub Wetland
-  Riverine

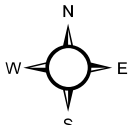
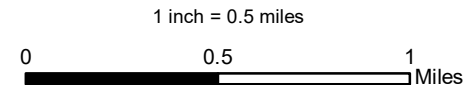
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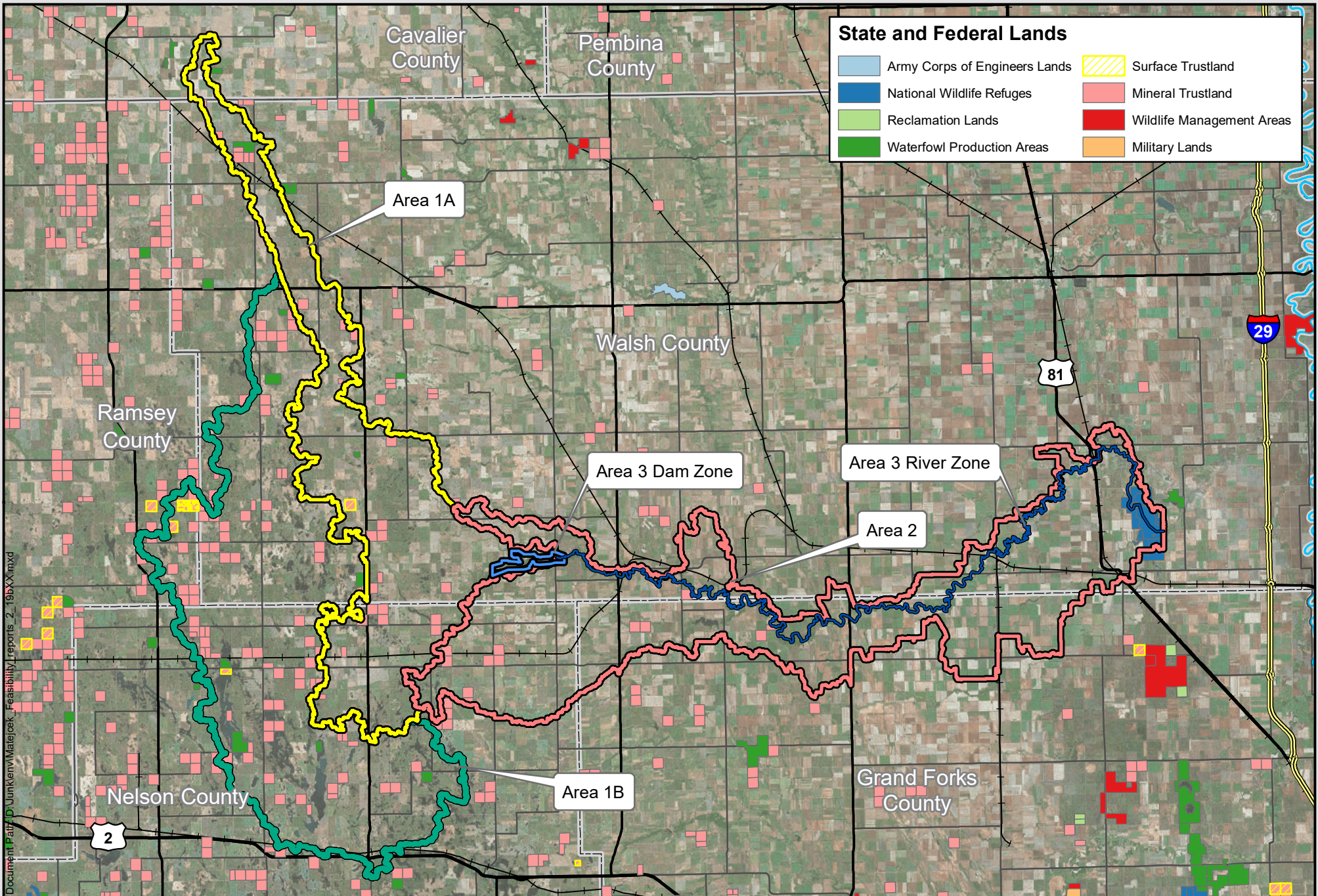
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Exhibit 03.2: HEI Vegetation Survey: Dam Zone Area of Potential Effect (Area 3)

Middle-South Branch Forest River Dam No. 1 (Matejcek Dam)
Feasibility Study and Plan of Work
Forest River Joint Water Resource District





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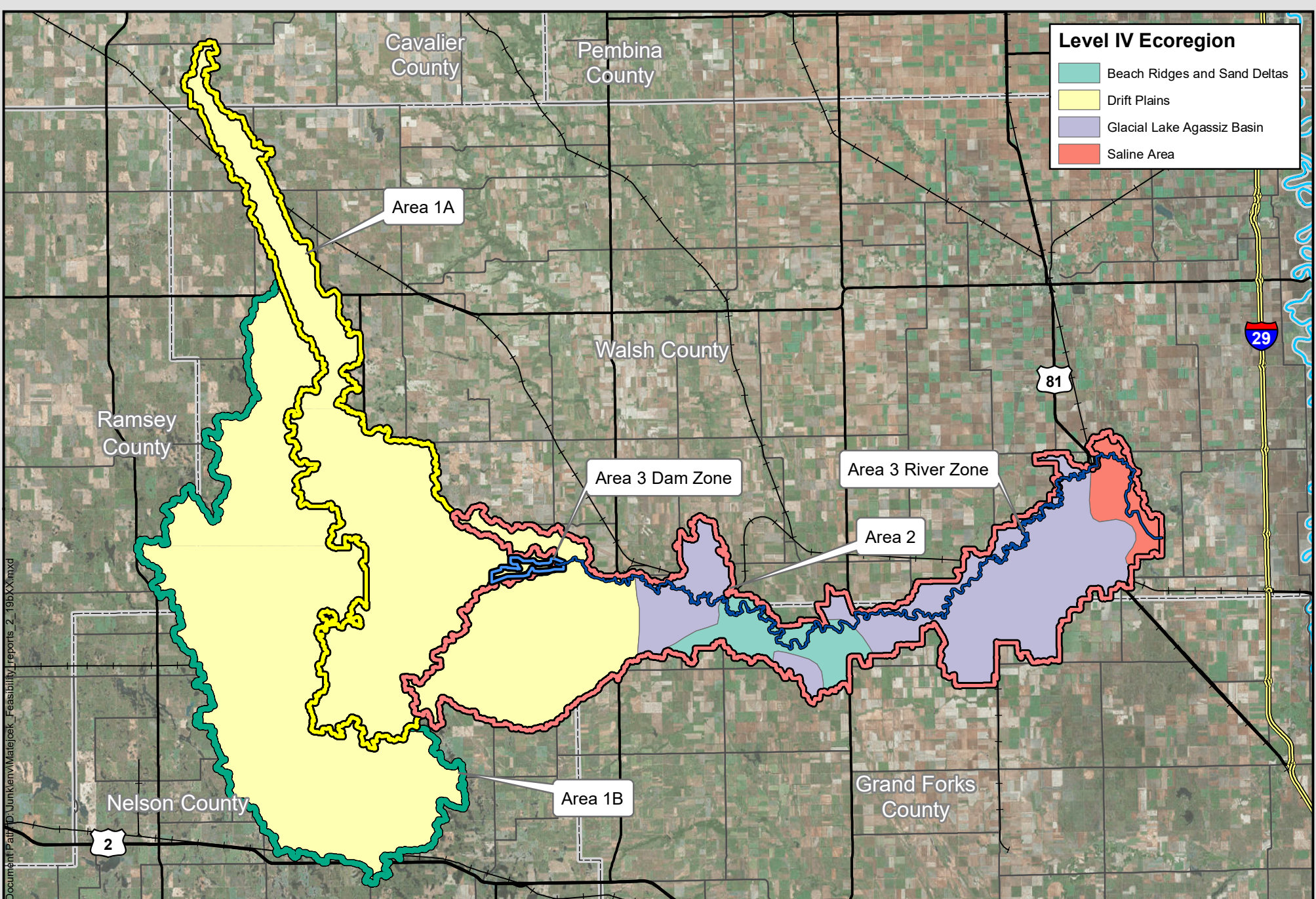
Exhibit 04.1: State and Federal Lands: Area of Interest (1A, 1B, 2, and 3)

Middle-South Branch Forest River Dam No. 1 (Matejcek Dam)
Feasibility Study and Plan of Work
Forest River Joint Water Resource District

1 inch = 6 miles

0 6 12

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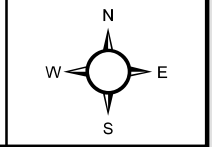
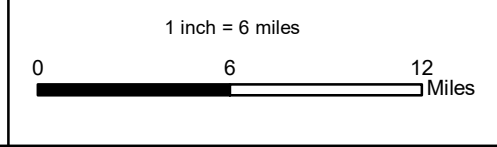
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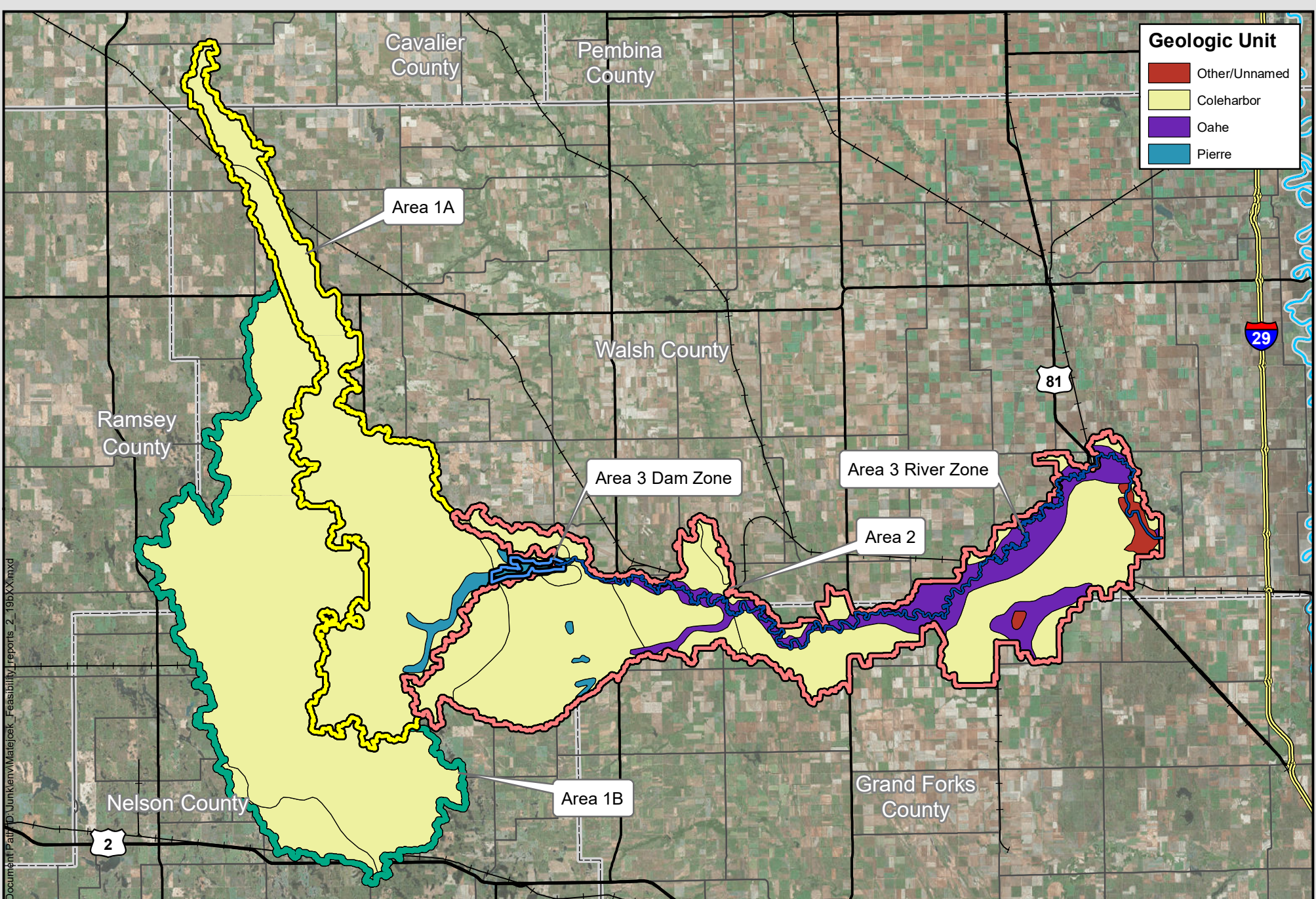
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Exhibit 05.1: Ecoregions Map: Area of Interest (1A, 1B, 2, and 3)

Middle-South Branch Forest River Dam No. 1 (Matejcek Dam)
 Feasibility Study and Plan of Work
 Forest River Joint Water Resource District





Geologic Unit

- Other/Unnamed
- Coleharbor
- Oahe
- Pierre

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Exhibit 05.2: Geologic Units Map: Area of Interest (1A, 1B, 2, and 3)

Middle-South Branch Forest River Dam No. 1 (Matejcek Dam)
Feasibility Study and Plan of Work
Forest River Joint Water Resource District

1 inch = 6 miles

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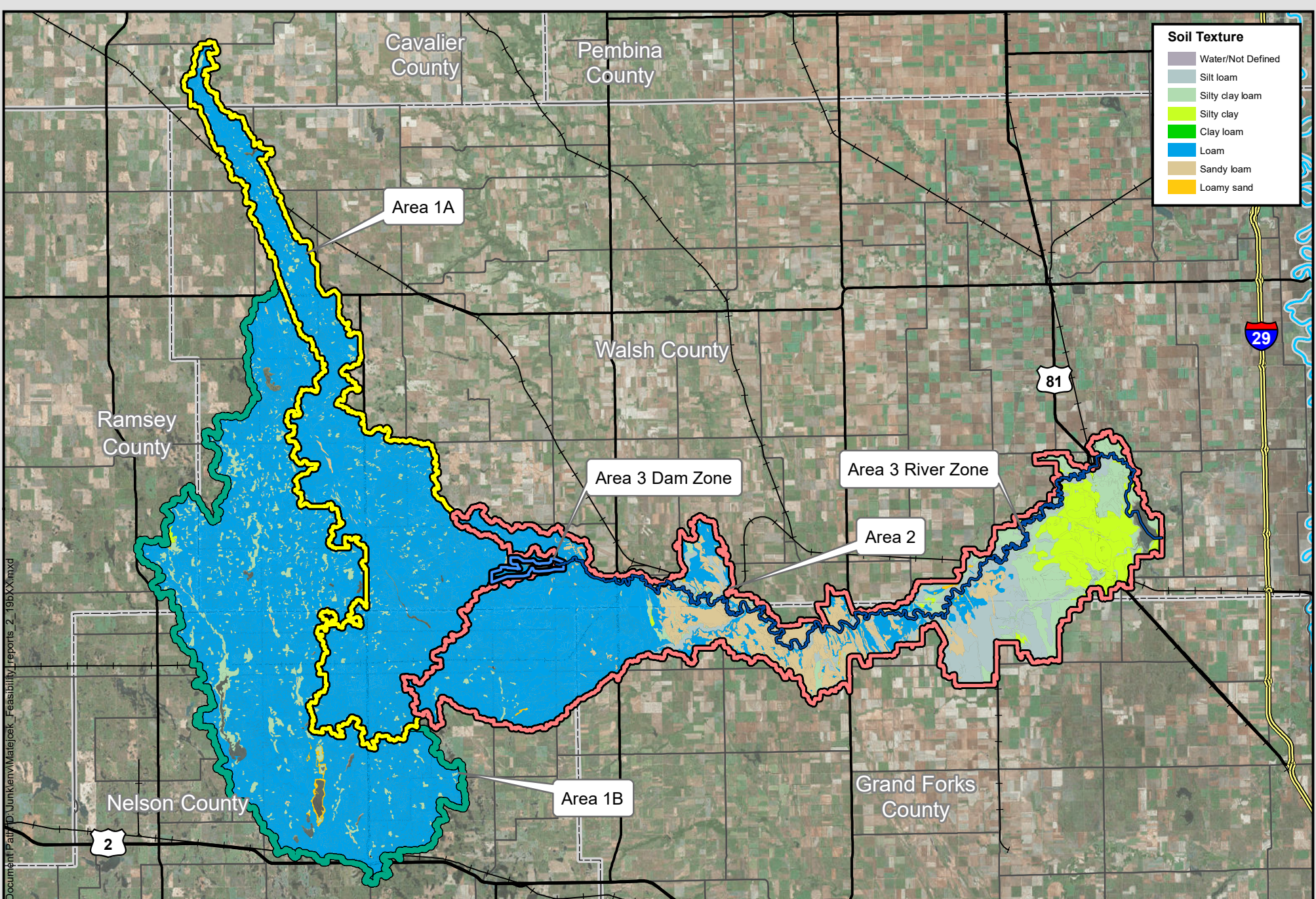
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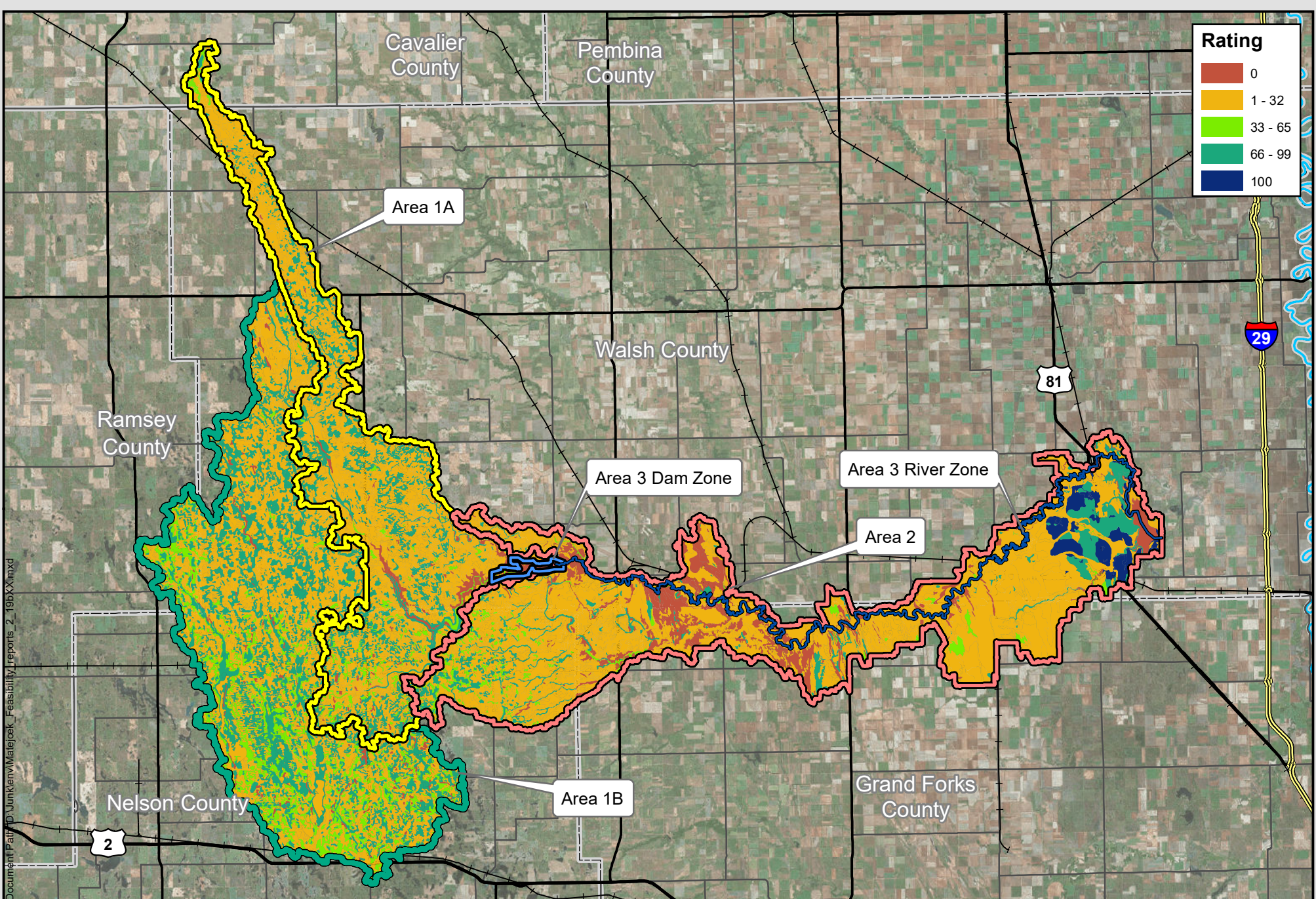
Exhibit 05.3: Soil Texture Map: Area of Interest (1A, 1B, 2, and 3)

Middle-South Branch Forest River Dam No. 1 (Matejcek Dam)
Feasibility Study and Plan of Work
Forest River Joint Water Resource District

1 inch = 6 miles

0 6 12

Miles



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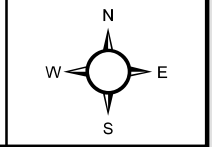
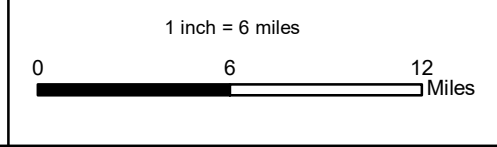
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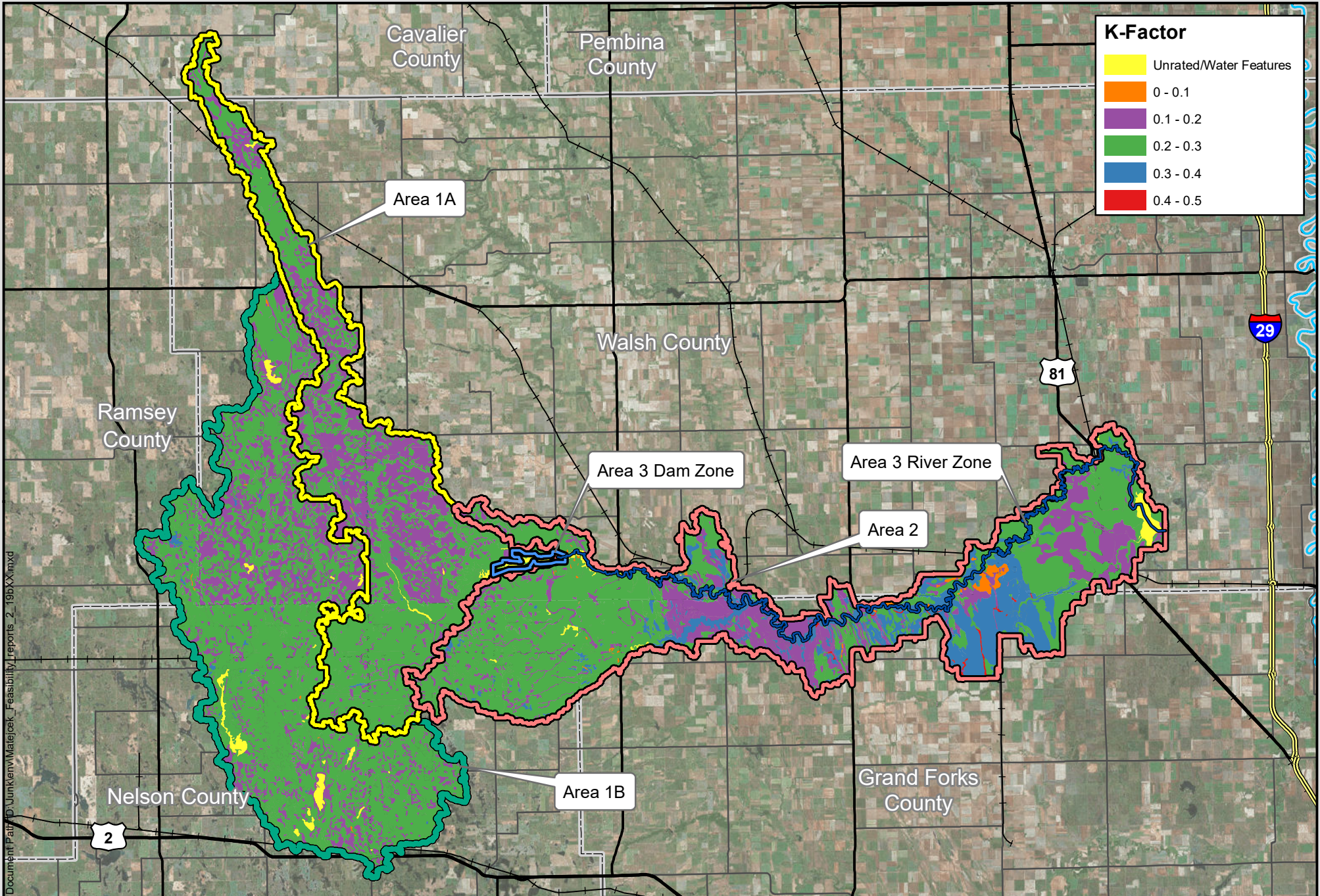
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Exhibit 05.4: Hydric Soil Ratings: Area of Interest (1A, 1B, 2, and 3)

Middle-South Branch Forest River Dam No. 1 (Matejcek Dam)
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Forest River Joint Water Resource District





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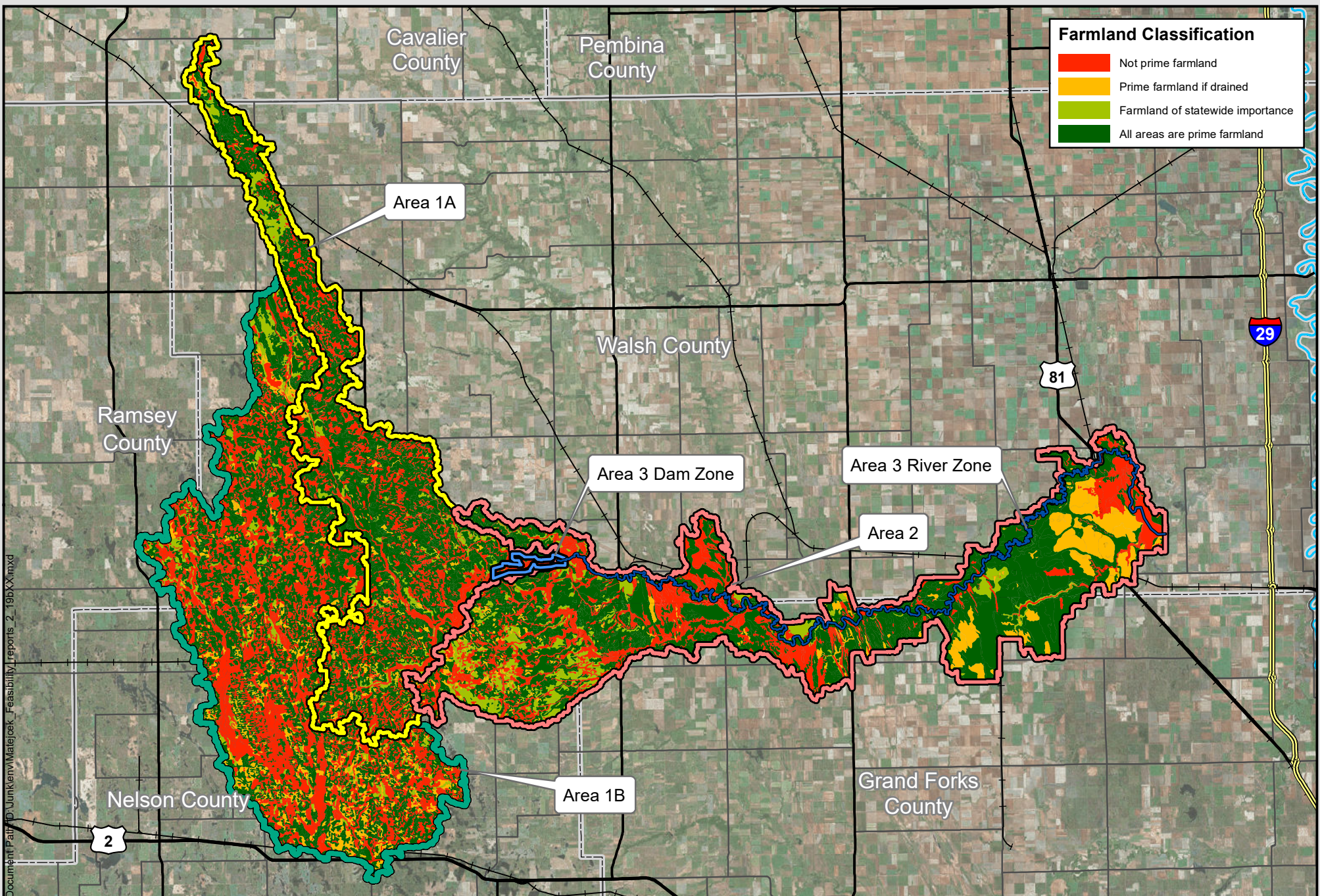
Exhibit 05.5: K-Factor (Rock Free): Area of Interest (1A, 1B, 2, and 3)

Middle-South Branch Forest River Dam No. 1 (Matejcek Dam)
Feasibility Study and Plan of Work
Forest River Joint Water Resource District

1 inch = 6 miles

0 6 12

Miles



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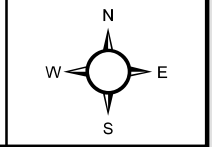
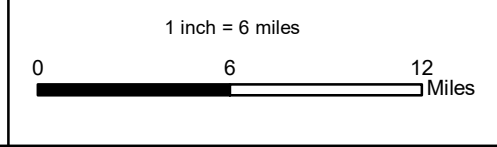
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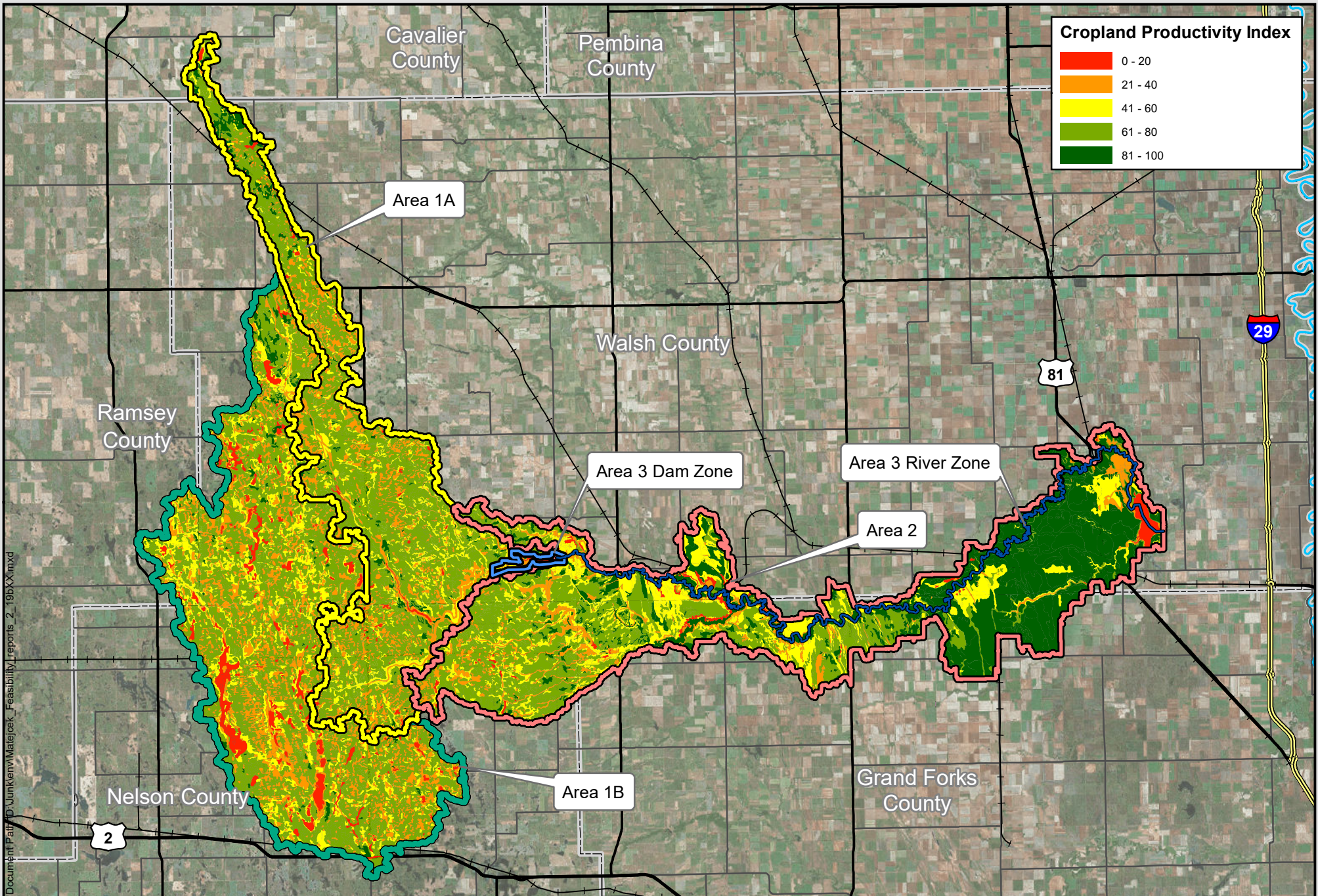
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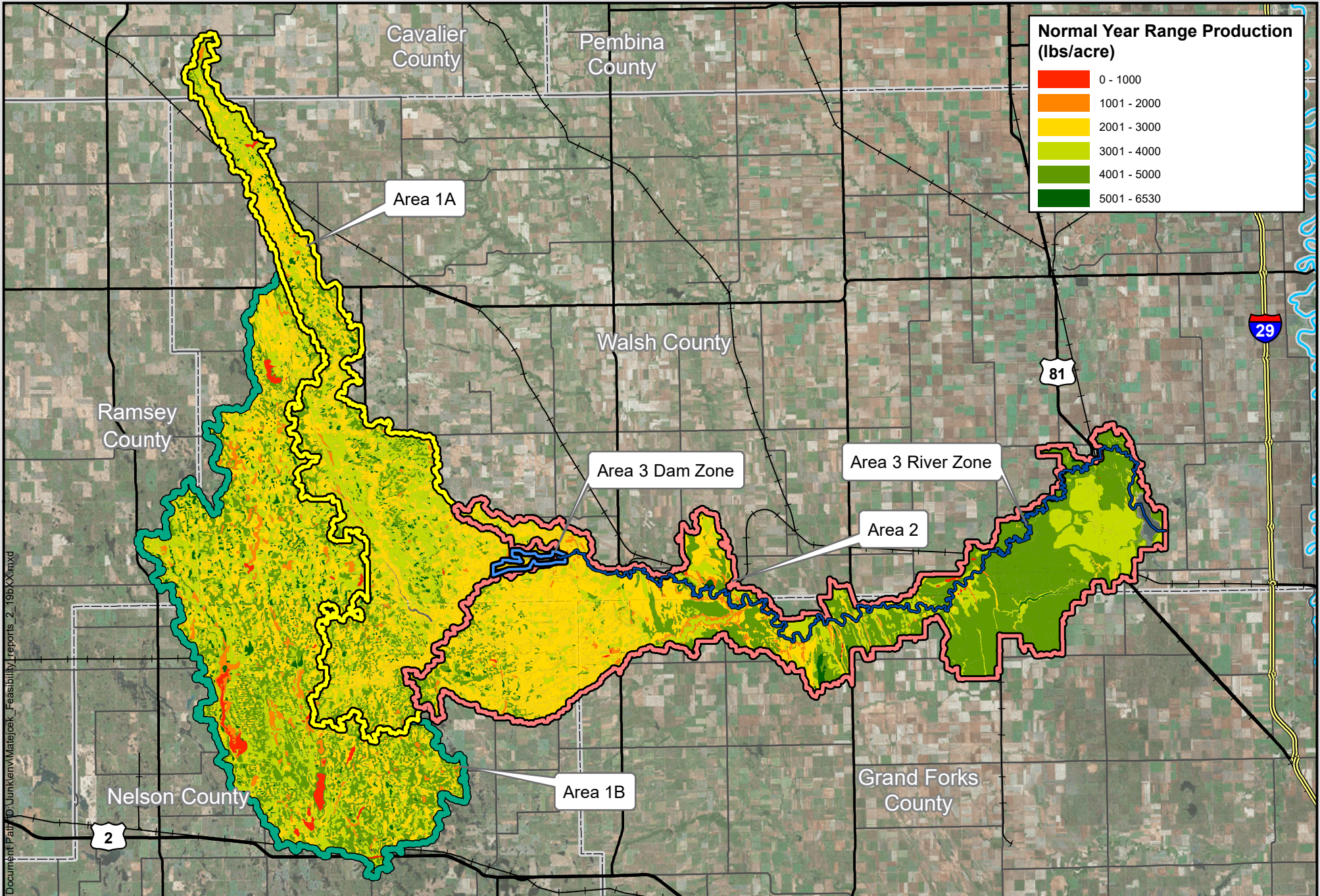
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Exhibit 06.1: Farmland Classification Map: Area of Interest (1A, 1B, 2, and 3)

Middle-South Branch Forest River Dam No. 1 (Matejcek Dam)
Feasibility Study and Plan of Work
Forest River Joint Water Resource District







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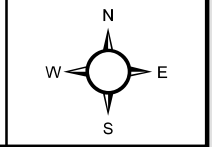
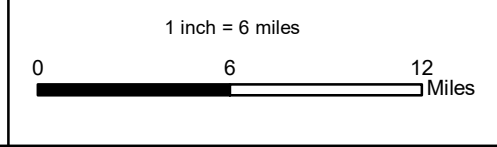
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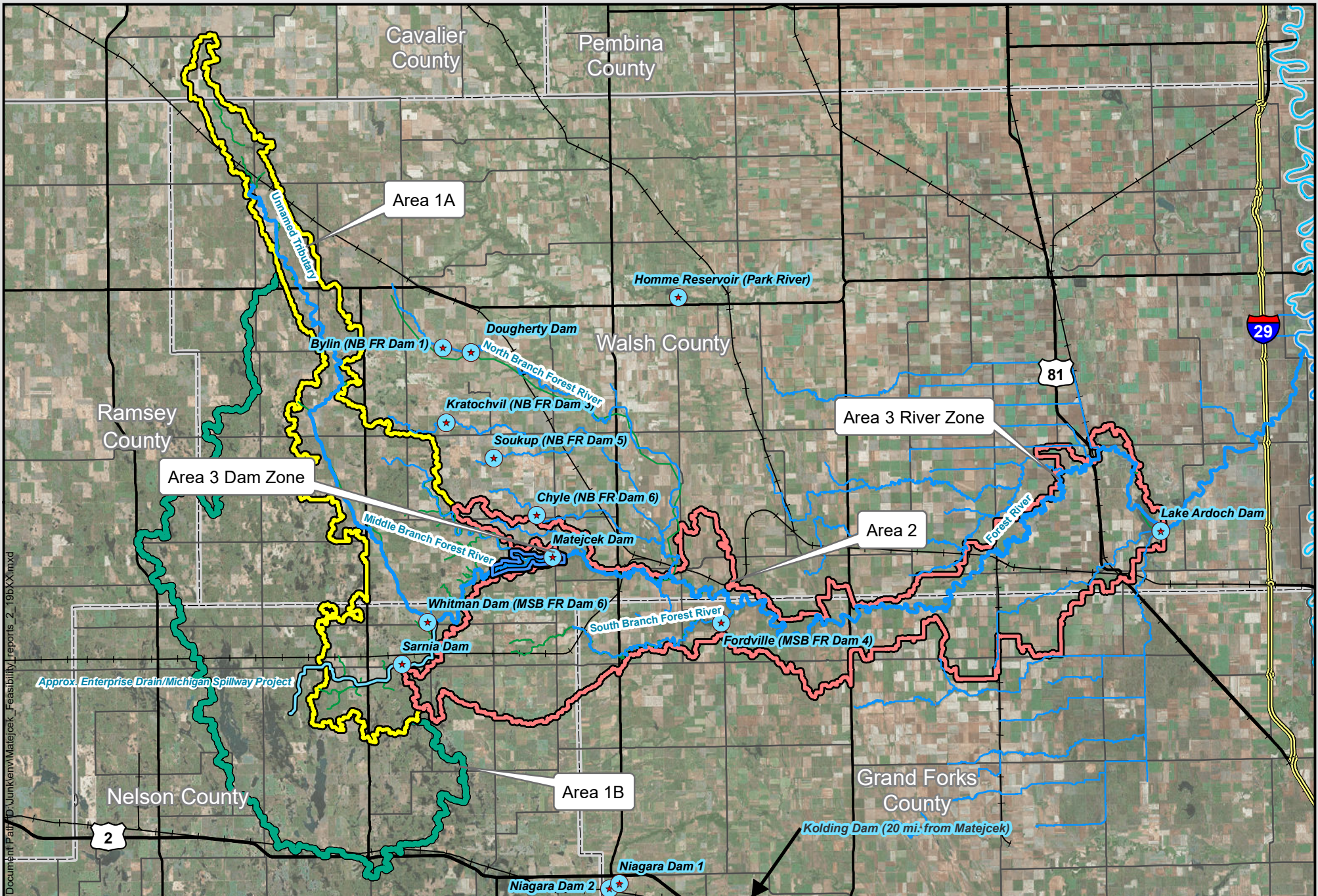
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Exhibit 06.3: Normal Year Range Production: Area of Interest (1A, 1B, 2, and 3)

Middle-South Branch Forest River Dam No. 1 (Matejcek Dam)
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Exhibit 07.1: Rivers and Dams Map: Area of Interest (1A, 1B, 2, and 3)

Middle-South Branch Forest River Dam No. 1 (Matejcek Dam)
Feasibility Study and Plan of Work
Forest River Joint Water Resource District

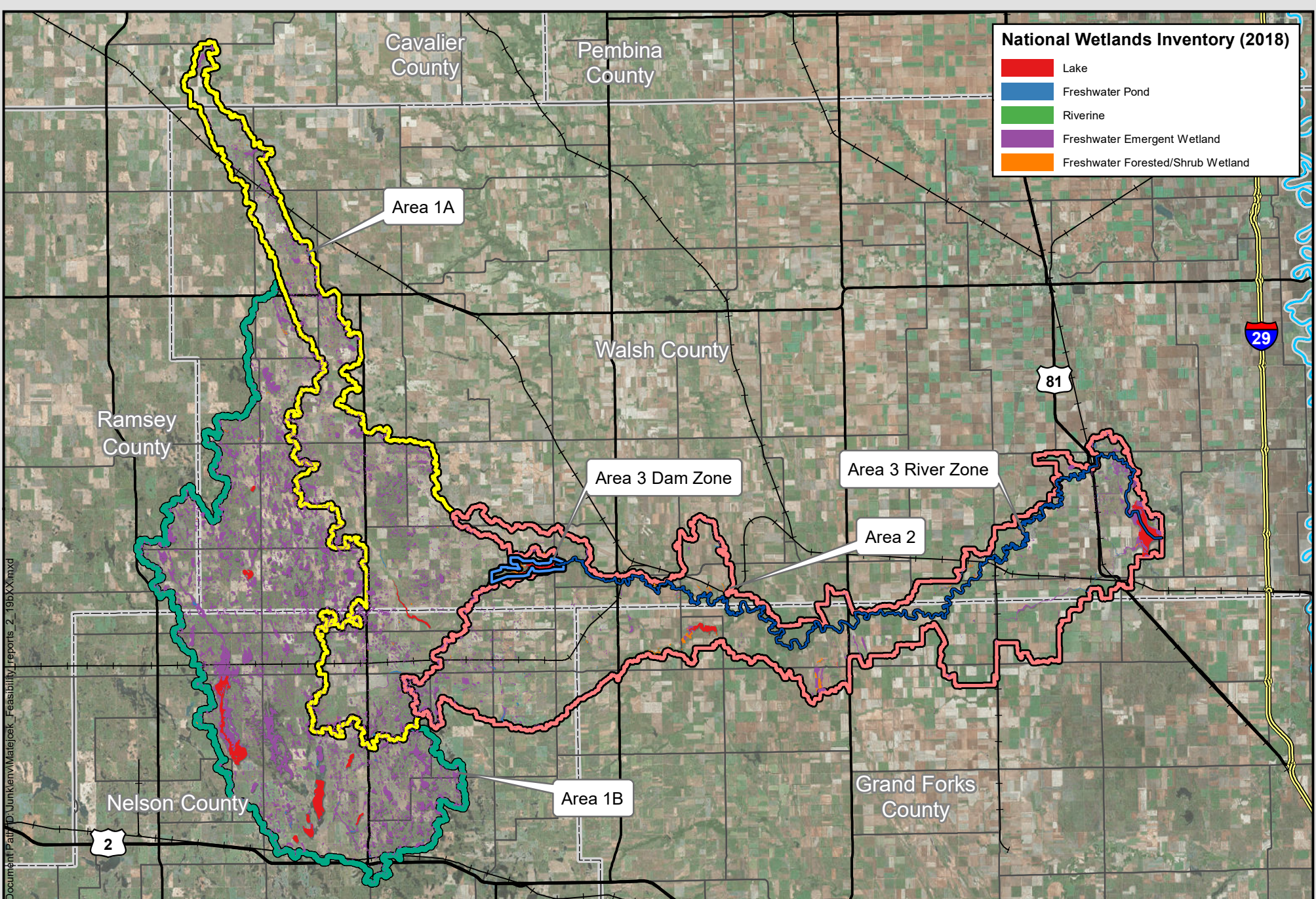
1 inch = 6 miles

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National Wetlands Inventory (2018)

- Lake
- Freshwater Pond
- Riverine
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland

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Exhibit 07.2: National Wetlands Inventory Map: Area of Interest (1A, 1B, 2, and 3)

Middle-South Branch Forest River Dam No. 1 (Matejcek Dam)
Feasibility Study and Plan of Work
Forest River Joint Water Resource District

1 inch = 6 miles

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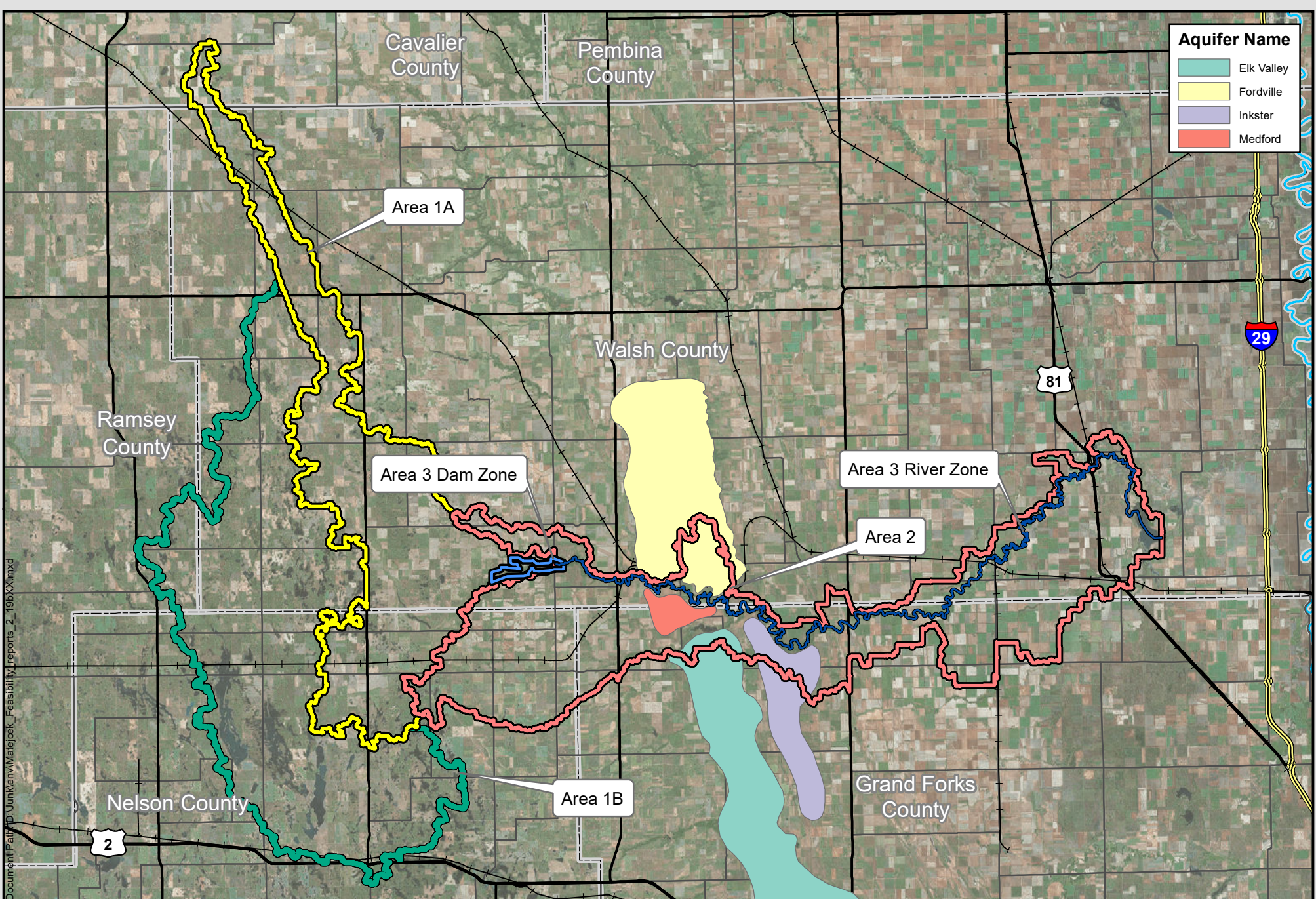
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Exhibit 08.1: Surficial Aquifers Map: Area of Interest (1A, 1B, 2, and 3)

Middle-South Branch Forest River Dam No. 1 (Matejcek Dam)
 Feasibility Study and Plan of Work
 Forest River Joint Water Resource District

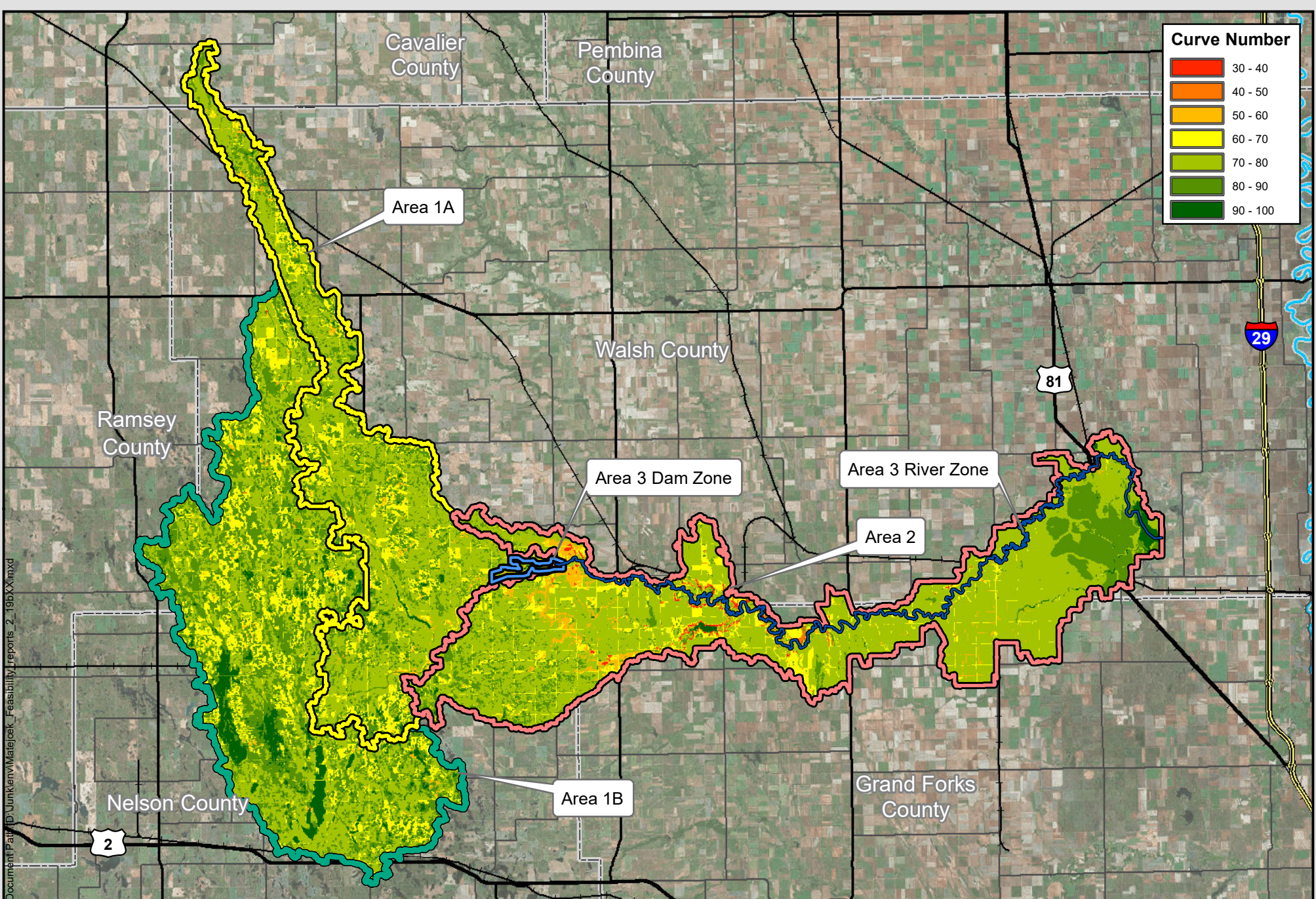
1 inch = 6 miles

0

6

12

Miles



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08.2

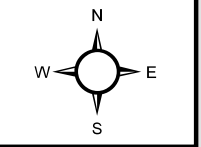
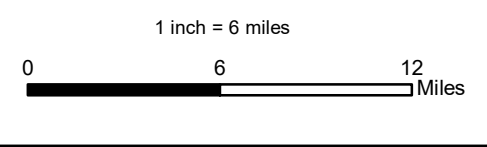
Scale: AS SHOWN Drawn by: NRI Checked by: DJ Project No.: 7135-0033 Date: 4/12/2019 Sheet: 1 of 1

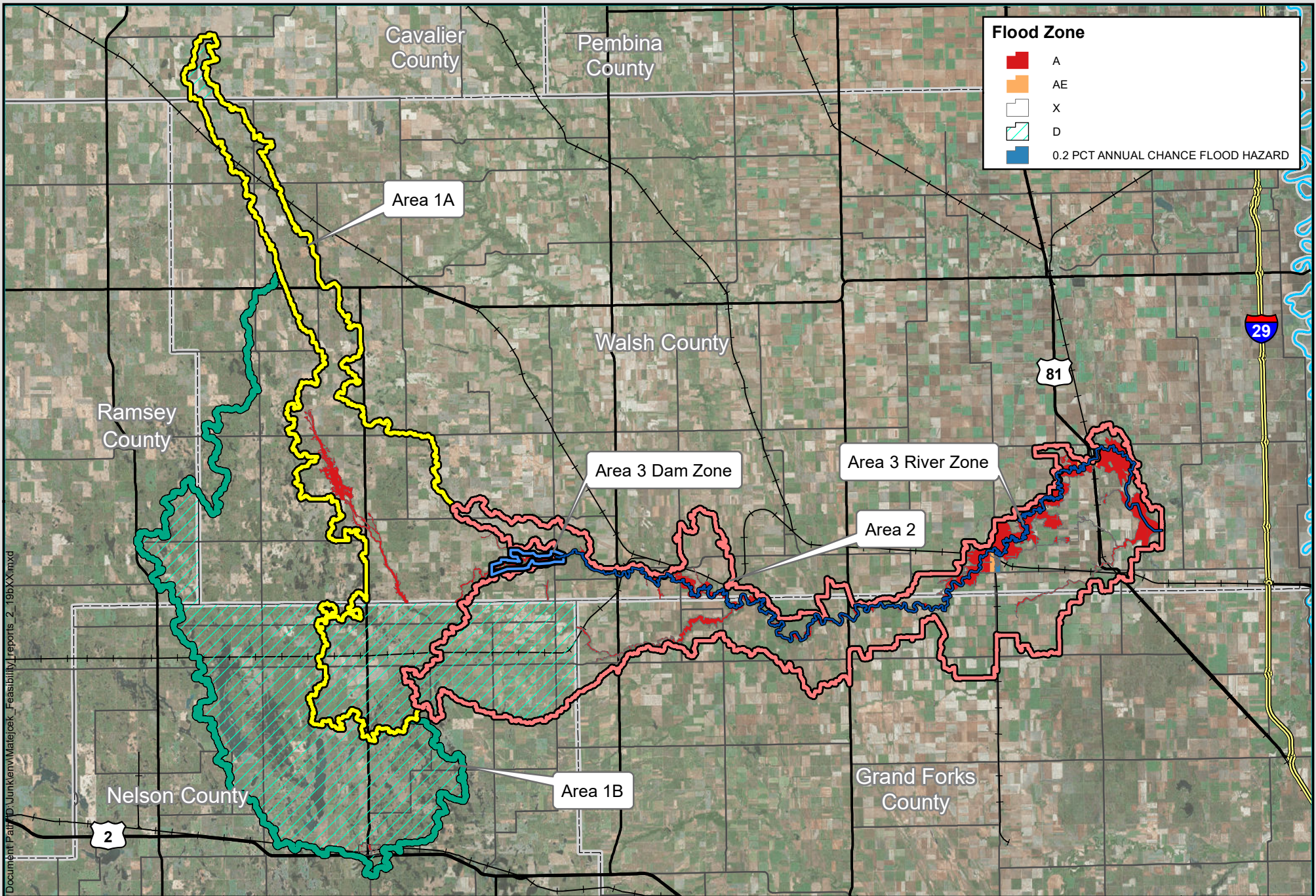
HOUSTON
ENGINEERING INC.

1401 21st Avenue N
Fargo, ND 58102
701.237.5065

Exhibit 08.2: NRCS 24-Hour Curve Number: Area of Interest (1A, 1B, 2, and 3)

Middle-South Branch Forest River Dam No. 1 (Matejcek Dam)
Feasibility Study and Plan of Work
Forest River Joint Water Resource District





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08.3

Scale: AS SHOWN
 Drawn by: NRI
 Checked by: DJ
 Project No.: 7135-0033
 Date: 4/12/2019
 Sheet: 1 of 1

HOUSTON
 ENGINEERING INC.

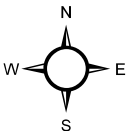
1401 21st Avenue N
 Fargo, ND 58102
 701.237.5065

Exhibit 08.3: FEMA Flood Zone Map: Area of Interest (1A, 1B, 2, and 3)

Middle-South Branch Forest River Dam No. 1 (Matejcek Dam)
 Feasibility Study and Plan of Work
 Forest River Joint Water Resource District

1 inch = 6 miles

0 6 12 Miles



APPENDICES

APPENDIX A

PLAN OF WORK & SCHEDULE



MIDDLE-SOUTH BRANCH FOREST RIVER DAM NO. 1 (MATEJCEK DAM)
SUPPLEMENTAL WATERSHED PLAN-ENVIRONMENTAL ASSESSMENT
WALSH COUNTY WATER RESOURCE DISTRICT
PLAN OF WORK & SCHEDULE



						FY 2019												FY 2020																	
						Q1			Q2			Q3			Q4			Q1			Q2			Q3			Q4								
Major Task Item	Task Description	Total Labor Hours	Total Labor Costs	Total Subconsultants	Total Costs	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep						
1	Purpose and Need for Action; Public Participation	174	\$ 27,548.00	\$ -	\$ 27,548.00				X	X	X	X	X	X	X	X																			
	Feasibility Report and Plan of Work	90	\$ 13,444.00	\$ -	\$ 13,444.00				X	X	X																								
	Develop Public Participation Plan	8	\$ 1,400.00	\$ -	\$ 1,400.00				X	X	X																								
	Assemble Project Team	8	\$ 1,424.00	\$ -	\$ 1,424.00				X	X	X																								
	Obtain Public, Landowner, and Agency Input	40	\$ 6,344.00	\$ -	\$ 6,344.00										X	X																			
	Adopt Initial Purpose and Need	16	\$ 2,824.00	\$ -	\$ 2,824.00											X																			
	NRCS Review Point 1	12	\$ 2,112.00	\$ -	\$ 2,112.00											X																			
2	Data Collection; Resource Inventory	780	\$ 105,828.00	\$ 215,457.00	\$ 321,285.00		X	X	X	X	X	X	X	X	X	X	X																		
	Engineering Field Surveys	152	\$ 23,076.00	\$ 25,000.00	\$ 48,076.00		X	X	X			X	X																						
	Geologic Investigation	0	\$ -	\$ 169,099.00	\$ 169,099.00				X	X	X	X																							
	Watershed Hydrology Studies	144	\$ 19,692.00	\$ -	\$ 19,692.00				X	X	X	X	X	X																					
	Hydraulics and Stability Analysis	280	\$ 34,776.00	\$ 9,338.00	\$ 44,114.00				X	X	X	X	X	X																					
	Environmental Evaluations	156	\$ 20,200.00	\$ -	\$ 20,200.00								X	X	X																				
	Archeological and Historic Resources	0	\$ -	\$ 2,000.00	\$ 2,000.00								X	X	X																				
	Economic and Social Effects	0	\$ -	\$ 10,020.00	\$ 10,020.00									X	X																				
	Relay Techincal Info. & Revise P/N as necessary	36	\$ 5,972.00	\$ -	\$ 5,972.00										X	X																			
	NRCS Review Point 2	12	\$ 2,112.00	\$ -	\$ 2,112.00												X																		
3	Preliminary Development of Alternatives; Establish Alternatives for Detailed Review	786	\$ 105,978.00	\$ 66,669.00	\$ 172,647.00										X	X	X	X																	
	Identify & Evaluate Structural Rehab Alternatives	472	\$ 62,040.00	\$ 9,000.00	\$ 71,040.00										X	X																			
	Obtain input from Project Team	32	\$ 5,440.00	\$ -	\$ 5,440.00												X																		
	Identify & Evaluate Decommission Alternative (assumed No-Action)	56	\$ 8,316.00	\$ 54,669.00	\$ 62,985.00										X	X																			
	Identify & Evaluate Non-Structural Alternative	214	\$ 28,070.00	\$ 3,000.00	\$ 31,070.00										X	X																			
	NRCS Review Point 3	12	\$ 2,112.00	\$ -	\$ 2,112.00													X	X																
4	Detailed Alternative Review; Environmental Consequences; Preferred Alternative	1811	\$ 233,116.00	\$ 78,874.00	\$ 311,990.00														X	X	X	X	X	X	X										
	Finalize Design and Complete Supporting Documentation	1319	\$ 163,794.00	\$ 19,894.00	\$ 183,688.00														X	X															
	Develop Land Rights Maps for Alternatives	22	\$ 2,750.00	\$ -	\$ 2,750.00															X															
	Evaluate Environmental Effects	60	\$ 8,230.00	\$ -	\$ 8,230.00																X	X													
	Draft "Environmental Consequences" Section of the Plan-EA	28	\$ 3,740.00	\$ -	\$ 3,740.00																		X												
	Economic Analysis For Each Alternative	16	\$ 2,592.00	\$ 37,980.00	\$ 40,572.00																X	X													
	Field Assessments (If needed beyond data collected in Task Item 2)	38	\$ 5,020.00	\$ 15,000.00	\$ 20,020.00																			X	X										
	Develop Mitigation Strategy	98	\$ 12,728.00	\$ -	\$ 12,728.00																	X				X									
	Dam Breach Review	56	\$ 7,148.00	\$ -	\$ 7,148.00																X														
	Identify the NED Alternative	66	\$ 10,462.00	\$ -	\$ 10,462.00																		X												
	Identify the Locally Preferred Alternative	20	\$ 3,560.00	\$ -	\$ 3,560.00																		X												
	Draft "Preferred Alternative" Section including Economic/Structural Tables	76	\$ 10,980.00	\$ 6,000.00	\$ 16,980.00																		X												
	NRCS Review Point 4	12	\$ 2,112.00	\$ -	\$ 2,112.00																			X											
5	Prepare Draft Watershed Plan-EA	129	\$ 18,548.00	\$ 9,000.00	\$ 27,548.00																				X	X									
6	Finalize Watershed Plan-EA	84	\$ 11,800.00	\$ -	\$ 11,800.00																					X	X								
Total						3764	\$ 502,818.00	\$ 370,000.00	\$ 872,818.00																										

APPENDIX B

STATEMENT OF WORK



STATEMENT OF WORK FOR COOPERATIVE AGREEMENT
67-6633-18-XXX
WALSH COUNTY WATER RESOURCE DISTRICT

I. PURPOSE

Develop a Supplemental Watershed Plan-Environmental Assessment (EA) of Environmental Impact Statement (EIS) for the Middle South Branch Forest River Watershed Forest River Dam #1, Matejcek Dam. Matejcek Dam is a high hazard potential dam, constructed in 1966 through funding and technical assistance provided by the Natural Resource Conservation Service (NRCS) Watershed Program, and owned and operated by the Walsh County Water Resource District (WCWRD). The dam was constructed for the purposes of flood control, wildlife, and recreation. As documented in the 2010 Assessment Report completed by Gannett Fleming under contract with NRCS, the auxiliary spillway and riser structure do not meet current NRCS or North Dakota State Water Commission (NDSWC) dam safety standards. In terms of 100-year activation criteria, the crest elevation of the auxiliary spillway is 8.7 lower than would be required to meet NRCS TR60 and 7.8 feet lower than would be required to meet ND SWC criteria. The auxiliary spillway is projected to completely breach during the freeboard design hydrograph event. The principal spillway does not meet the 10-day drawdown requirement for the principal spillway hydrograph event. In addition, the low-level drawdown gate is inoperable and there are numerous geotechnical and seepage related deficiencies with the structure. At risk from a structure failure includes a maximum population of 40 individuals, 34 structures, 2 state highways, multiple county/township roads, recreational facilities, historic/cultural resources, and degradation of river, wetland, and riparian habitat.

II. OBJECTIVES

The Watershed Protection and Flood Protection Act (Section 14 of PL-83-566, as amended), authorizes financial and technical assistance to rehabilitate aging flood control dams originally constructed with the assistance of the NRCS Watershed Program.

Rehabilitation is defined as all work necessary to extend the service life of a dam and to meet applicable safety and performance standards. Through the course of the planning process the need for the project will be identified, and the purposes and needs that can be practically accomplished will be determined, and a preferred alternative will be identified. It is anticipated that the WCWRD will continue to seek assistance through the NRCS PL-83-566 program for funding assistance in completion of a final engineering design in 2021, and then construction potentially in 2022.

Matejcek Dam is located within the Forest River Watershed, in which a current NRCS Regional Conservation Partnership Program (RCPP) funded PL-566 Watershed Operations Plan has been ongoing with the WCWRD since 2016. Much of the hydrology, hydraulics, resource inventory work, and public/agency input that has been developed through the course of that planning process to date will be directly applicable to the rehabilitation planning effort.

III. RESPONSIBILITIES OF THE PARTIES

A. The Recipient will:

1. Complete all procurement and contract administration functions necessary to hire a professionally licensed engineering firm and/or appropriately qualified technical services firms with the appropriate disciplines to perform interdisciplinary watershed planning services for the Matejcek Dam Rehabilitation Project.

STATEMENT OF WORK FOR COOPERATIVE AGREEMENT
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2. Ensure that the scope of technical services are within the subset of “watershed rehabilitation” activities as defined in Section IV of this document. Technical services related to final engineering design and permitting activities are not within the scope of this agreement, and would be incorporated into a new standalone project agreement if the Recipient and NRCS choose to continue work on the project beyond this agreement.
3. Provide a minimum of 30% of the total actual costs for technical services, on an individual invoice basis, and all costs in excess of the federal share of \$500,000.00 to complete the plan. Based on the initial estimate, the total project cost will be \$873,000.00; therefore the recipient’s share is estimated at \$373,000.00 (or 42%). Actual costs for planning work are expected to vary. Payments will be on an individual invoice basis, as the project progresses; however, the federal reimbursement by review point will not exceed the totals listed in Section IV of this document.
4. Ensure consultant billings between this cooperative agreement, for Watershed Rehabilitation Planning on Matecjek Dam, and RCPP Watershed Operations Planning on the Forest River Watershed (Cooperative Agreement 66-6633-15-011) are correctly allocated and well documented in the accounting records. Federal statute does not allow RCPP funds to be utilized for Watershed Rehabilitation Planning.
5. Designate an individual (Project Liaison) to serve as liaison between the Recipient and NRCS and identify that person to NRCS in writing along with a list of his or her duties, responsibilities and authorities.
6. Hold and save NRCS free from any and all claims or causes of action whatsoever resulting from the obligations undertaken by the Recipient under this agreement or resulting from the work provided for in this agreement.
7. Provide quarterly reports of progress, as well as invoices for technical services provided.

B. The NRCS will:

1. Provide a maximum of 70% of the total actual costs for technical services, on an individual invoice basis, to a maximum federal cost share of \$500,000.00 to complete the Supplemental Watershed Plan-EA/EIS. Payments will be on an individual invoice basis, as the project progresses; however, the federal reimbursement by review point will not exceed the totals listed in Section IV of this document. Only those costs for technical services incurred after the date of the Cooperative Agreement signature by NRCS, are reimbursable.
2. Provide initial technical review at milestone points as outlined in the Expected Accomplishments and Deliverables section of this agreement. Review comments will be preliminary in nature, may be incomplete, and will be typically provided via informal phone or email communications.
3. If an Environmental Impact Statement (EIS) is determined to be necessary for the project, NRCS will file a Notice of Intent and Record of Decision in the National

STATEMENT OF WORK FOR COOPERATIVE AGREEMENT
67-6633-18-XXX
WALSH COUNTY WATER RESOURCE DISTRICT

Register. If an Environmental Assessment (EA) is determined to be adequate, NRCS will prepare a Finding of No Significant Impact and publish its availability.

4. Complete final technical review and approval of the Supplemental Watershed Plan, per Part 502.11 of the National Watershed Planning Manual (NWPM), including pursuit of exceptions to the National Economic Development Plan if determined necessary. A formal written report will be provided to the Recipient, containing findings and recommendations for correcting identified deficiencies.

C. The Recipient and NRCS will:

Jointly work to ensure that public funds are spent in a prudent manner for the intended purpose of this agreement. Each party will communicate issues and concerns with work progress or quality in a clear and timely manner. Either party may terminate this agreement at any point in time, for ongoing issues related to adequate progress or technical quality.

IV. EXPECTED ACCOMPLISHMENTS AND DELIVERABLES

The work consists of the performance of any part or all inventories, surveys, preliminary designs, and planning necessary to complete an NRCS acceptable combined Watershed Plan and EA/EIS. Work shall conform to NRCS regulations and policy documents, standards, technical guidelines, and references.

NRCS policy documents include, but not limited to, the following:

- General Manual (GM)
- National Engineering Manual (NEM)
- National Operations and Maintenance Manual (NO&M)
- National Watershed Program Manual (NWPM)
- Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies (P&G)

NRCS technical guidelines include

- National Watershed Program Handbook (NWPH)
- National Planning Procedures Handbook, (NPPH)
- National Engineering Handbooks (NEH)
- Natural Resources Economics Handbook, (NREH), Part 611 Water Resources Handbook for Economics
- National Environmental Compliance Handbook (NECH)
- National Cultural Resources Procedures Handbook (NCRPH)
- National Handbook of Conservation Practices (NHCP)

Technical references include:

- NRCS Technical Releases (TR) and Technical Notes (TN)
- ND NRCS Hydrology Manual

Project Specific NRCS supplied materials include:

- As-built Drawings MSB Forest River Dam No 1

STATEMENT OF WORK FOR COOPERATIVE AGREEMENT
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As-built Drawings Installation of Copper Waterstop, MSB Forest River Dam No 1
As-built Drawings Auxiliary Drain, MSB Forest River Dam No 1
Inspections and O&M Reports
Dam Assessment Report

The sponsor and contractor are responsible to review the accuracy of the supplied materials and inform NRCS of any inaccuracies.

A. Purpose and Need for Action, Public Participation

1. A Feasibility Report and Plan of Work will be prepared and will summarize the studies completed to date, including relevant work completed through the RCPP funded planning effort, and describe the remaining work needed. The report will meet the requirements outlined in the NWPM, Parts 501.20 and 501.21.
2. Development of Public Participation Plan. A Public Participation Plan will be developed as outlined in the NWPM Part 501.24, including development of a comprehensive mailing list of agencies, groups and individual stakeholders. The plan will outline federal, state, local, and tribal consultations and cooperating agencies.
3. Assemble a project team and a technical team (interagency review team) to assist in guiding the project. The NRCS State Conservation Engineer (SCE), or his/her designee, will serve as a member of both teams.
4. Send out letters of invitation to the U.S. Army Corps of Engineers (USACE) (as a cooperating agency), U.S. Fish and Wildlife Service (USFWS) (as a cooperating agency), Federal Emergency Management Agency (FEMA) Region 8, Walsh County Commissioners, Walsh County Soil and Water Conservation District, the Walsh County Floodplain Administrator, ND State Water Commission, ND Game and Fish Department, ND Department of Transportation, ND Department of Health, ND State Historical Society, the Red River Retention Authority, and all tribal nations whose ancestral lands include the project area.
5. Complete the process of obtaining initial public, landowner, and agency input on resource problems, concerns, and opportunities in the watershed as outlined in the public participation plan.
6. Adopt an initial Purpose and Need statement based on the feasibility report, available technical information, and public and agency input. The need portion of the statement will contain as much quantitative detail on damage extents as possible; however, it may be amended with additional information gained through analysis as planning progresses.

Review Point #1: submit documentation of Section A. 1-6 listed above to the NRCS SCE for technical review. The maximum federal reimbursement amount for these items is \$16,000.00.

B. Data Collection, Resource Inventory

1. Complete engineering surveys including: sediment/bathymetric survey, apparent property line location, and topographic surveys including auxiliary spillway cross sections and profile, top of dam profile, embankment cross sections, principal spillway geometrics and elevations. Cross sections, as well survey information for houses, roads, and bridges, will be required within the breach zone and 100-year floodplain downstream of the dam. The limit of the breach inundation study shall extend downstream to where the maximum breach

STATEMENT OF WORK FOR COOPERATIVE AGREEMENT
67-6633-18-XXX
WALSH COUNTY WATER RESOURCE DISTRICT

inundation water surface elevations converge with the base flood elevations (100-year recurrence interval flood). A proposed plan for the survey work will be completed and submitted to NRCS for concurrence prior to starting survey efforts. The plan will include proposed methodology, accuracy, and level of detail. The survey work will include the following, at a minimum:

- ✓ Profiles, with points at a 50-foot interval maximum spacing, along the centerlines of the dam, principal spillway, outlet works, and auxiliary spillway.
- ✓ Cross sections, taken at a 50-foot maximum spacing along each profile centerline of the dam, principal spillway, outlet works, and auxiliary spillway.
- ✓ River channel centerline profile, with points at a 500-foot interval maximum spacing, downstream of the dam through the full extents of the breach zone.
- ✓ Cross sections of the bankfull river channel downstream of the dam, through the full extents of the breach zone, at intervals of no more than 500 feet and immediately upstream and downstream of all crossing structures. It is expected that LIDAR data will be used for floodplain elevations outside of the bankfull channel, however survey work to verify accuracy in forested areas is required.
- ✓ Foundation elevations of all structures valued at over \$50,000 located within the breach zone extents.
- ✓ A sediment and bathymetric survey of the reservoir area utilizing multi-frequency sonar equipment capable of recording original bed and top of accumulated sediments, in conjunction with GPS survey equipment, with a grid spacing not to exceed 500 feet in any direction.
- ✓ A minimum of 4 permanent survey benchmarks to serve as horizontal and vertical control points during construction shall be established at the site. Permanent markers shall be set in concrete with a minimum length of 4 feet with an iron rod located in the center of the concrete. Markers will be set at convenient locations that will not be subject to disturbance during construction.
- ✓ Survey records, to include all electronic data collected and a consolidated Civil3D file of all field survey work, will be provided to NRCS.

Complete geologic investigations and resulting report under the requirements of NEM Part 531 and NEH Part 631 for Group A Structures, including: conducting subsurface investigations, obtaining samples for lab testing, soil mechanics tests, analysis of foundation conditions and slope stability of current structure. Geologic reconnaissance should be completed to develop the Plan of Investigation described in NEM Part 531-Geology, Subpart A-Geologic Investigation, Section 531.7D. The Plan of Investigation must be submitted to NRCS for concurrence prior to starting the preliminary geologic investigation.

The subsurface exploration is anticipated to consist of 3 test borings in the auxiliary spillway to determine geologic profile for use in spillway integrity evaluation and 3 test borings within the dam embankment footprint to characterize embankment and foundation soils. The three test borings in the embankment will be outfitted with vibrating wire transducers to allow for measurement of pore water pressures within the embankment and foundation stratum. Each of these test borings, once from the dam crest, one from the downstream bench, and one at the toe of the dam will be backfilled with two piezometric sensing zones each. Estimated total drilling lengths for the six truck (or track) accessible test borings are soil sampling of 150 feet and 60 feet of rock coring, based on review of the 1966 As-Built Drawings. Disturbed and undisturbed soil and rock samples will be collected,

STATEMENT OF WORK FOR COOPERATIVE AGREEMENT
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preserved, and transported to the laboratory for testing. The following laboratory tests are anticipated: grain sieve analysis with hydrometer, specific gravity, natural water content, Atterberg Limits, triaxial and direct shear strength, permeability, and crumb dispersion. The quantity of each test conducted will be determined based on stratigraphy encountered. Results of the subsurface exploration and laboratory testing will be tabulated and summarized in a geologic report.

2. Complete watershed hydrology studies, including data gathering as required. Much of the information required for this project is/will be available through the Forest River RCPP watershed planning effort. The evaluation of hydrologic and hydraulic parameters used to model the performance of the structure shall be performed using the most current data and state of the art computational methods. Analysis of higher frequency recurrence interval events (2, 5, 10 year) are expected to be important for economic analysis, representing crop damages during summer thunderstorm generated peak flow events. Lower frequency events (50, 100, 500 year) and the Probable Maximum Flood will be necessary, in conjunction with development of related NRCS Earth Dams and Reservoirs TR-60 design criteria required to size and proportion structural rehabilitation alternatives. Include description of how TR-60 guidance and adoption of NOAA Atlas 14 design precipitation data affects the functionality and safety of the dam. Evaluate current watershed hydrologic parameters (i.e. Runoff Curve Number and Time of Concentration) to accurately model structural functionality. Accumulate all historical flow information diverted to the watershed from the Enterprise and Michigan drain. Research and develop alternative future Enterprise and Michigan drains operating plan and prepare inputs for the HEC-HMS hydrologic model.
3. Complete hydraulics and stability analyses of existing structure and projected future without project action, for the existing structure condition, and all project alternatives examined in detail. Expand and compact relevant existing hydrology and hydraulics models to applicable extents to analyze alternatives. Develop Probable Maximum Precipitation (PMP) event using appropriate technical methodology (HMR 52). Update hydrology and hydraulics models based on new data obtained from geotechnical evaluations, topographic, and bathymetric surveys. Complete structural analysis of the existing structure, including riser components. Evaluate existing auxiliary spillway integrity on the basis of information derived from the onsite geologic investigation and associated soil mechanics testing.
4. Complete environmental evaluations as outlined in NWPM Parts 501.35 and 501.36, including (at a minimum): field determination and mapping of onsite wetlands, establishing air and water quality conditions, identifying land use classifications, evaluating sediment delivery from cropland through the use of a Geographic Information System (GIS) based Revised Universal Soil Loss Equation (RUSLE) analysis, highly erodible cropland, characterization of fish and wildlife habitat/populations, identification of threatened and endangered species, and field characterization and evaluation of riparian areas and stream channel stability. Some of this information is/will be available as the result of the Forest River RCPP watershed planning effort.
5. Complete evaluation of archaeological and historical resources, including: consultation with State Historic Preservation Officer (SHPO), NRCS Archaeologist, and Tribes and conducting Phase I, II, and III cultural resource studies. Some of this information is/will be available as the result of the Forest River RCPP watershed planning effort.

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6. Complete evaluation of general economic and social effects including recreation, visual concerns, emergency vehicle and school bus transportation routes, access to medical facilities, shopping, and markets, and effects to homes, businesses, and agricultural operations. Determine effects related to drawdown time of detention pool.
7. Relay technical information developed throughout the course of these efforts as outlined in the Public Participation Plan. Revise purpose and need as necessary to reflect analysis; in particular ensure that decisions on out of watershed drain systems are clarified in the purpose statement.

Review Point #2: submit documentation of Section B.1-8 to the NRCS SCE for technical review. If desired to maintain efficiency on the part of the Sponsor's engineering consultant, NRCS will provide review of partial submittals for these elements. The maximum federal reimbursement amount for these items is \$200,000.00.

C. Develop Structural Alternatives for Dam Rehabilitation

1. Identify all practical structural rehabilitation alternatives to bring the dam up to NRCS and NDSWC Dam Safety Standards. Engineering analyses will be conducted to determine viable structural dam rehabilitation alternatives. In addition to a Roller Compacted Concrete (RCC) spillway alternative, as noted in the 2010 Assessment Report, include an evaluation of alternatives that would increase principal and auxiliary spillway capacities in conjunction with an earthen spillway recognizing the resulting increase to the BFE and related LOMR (and other NFIP related actions) that would be required. Evaluate structural rehabilitation alternatives on the basis of feasibility and impacts to the identified resource concerns such as public safety, economics, environmental, social, cultural, floodplain management, and land use.
2. Obtain input from the project team, technical team, cooperating agencies, and others to identify structural rehabilitation alternative(s) to be carried forward to detailed evaluation per the National Environmental Policy Act (NEPA) process.

D. Develop Nonstructural Alternatives

1. No Action (Future Without Project) Alternative
 - Hold meeting with the NRCS, WCWRD, and NDSWC representatives to determine the likely long-term plans for Matejcek Dam without federal funding. *(Note: this scope assumes that state and local financing limitation will prevent rehabilitation of the dam, and decommissioning will be required.)*
 - Evaluate or adopt RCPP documented relevant trends in land use changes such as wetland/range/forest conversion to cropland and installation of new surface and subsurface drainage systems. Update H&H models if necessary.
 - Complete conceptual/preliminary engineering analysis to provide detailed evaluation of alternative.
 - Conduct interdisciplinary technical review meetings as necessary to review summary results and forecasting analyses.
2. Decommissioning Alternative
 - Analyze decommissioning of Matejcek Dam with additional environmental remediation for elevations below the normal pool. This alternative involves restoring the stream/river by re-connecting the upstream and downstream channel in a non-erosive manner and restoring the stream/river. Dam embankment would be excavated to allow

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normal flows and up to 100-year flood flows through the site in a non-erosive manner. Accumulated sediment may need to be removed if directed by regulatory agencies. The decommission alternative would be developed in consideration of guidance in NRCS National Engineering Handbook, Part 653, Stream Corridor Restoration: Principles, Processes, and Practices.

- Evaluate or adopt RCPP documented relevant trends in land use changes such as wetland/range/forest conversion to cropland and installation of new surface and subsurface drainage systems. Update H&H models if necessary.
- Complete conceptual/preliminary engineering analysis to provide detailed evaluation of alternative.
- Conduct interdisciplinary technical review meetings as necessary to review summary results and forecasting analyses.

3. Non-Structural Alternative(s)

- Identify any suitable alternatives available for nonstructural measures such as removal or floodproofing all structures and facilities within the breach inundation area and includes estimated costs for relocation, property acquisition, demolition, decommissioning utilities, septic, wells and similar facilities and site stabilization/restoration.
- Evaluate or adopt RCPP documented relevant trends in land use changes such as wetland/range/forest conversion to cropland and installation of new surface and subsurface drainage systems. Update H&H models if necessary.
- Complete conceptual/preliminary engineering analysis to provide detailed evaluation of alternative.
- Conduct interdisciplinary technical review meetings as necessary to review summary results and forecasting analyses.
- Provide clear documentation of the rationale behind the decision to eliminate alternatives considered, but eliminated, from further detailed study. Narrative descriptions in the Supplemental Watershed Plan are required for Alternatives Considered, But Not Developed in Detail. The descriptions should clearly show why they do not reasonably provide for complete, effective, efficient and /or acceptable solutions.

- E. Obtain input from the project team, technical team, cooperating agencies, and others to identify alternatives to be carried forward to detailed evaluation per the National Environmental Policy Act (NEPA) process. A minimum of one alternative is required, however as many alternatives that appear to be nearly equivalent may be carried forward to full evaluation. Provide clear documentation of the rationale behind the decision to eliminate alternatives considered, but eliminated, from further detailed study. Narrative descriptions in the Supplemental Watershed Plan-EA/EIS are required for Alternatives Considered, But Not Developed in Detail. The descriptions should clearly show why they do not reasonably provide for complete, effective, efficient and /or acceptable solutions

NRCS Review Point #3: Submit all items outlined in Sections C through E with supporting technical materials for review to the ND SCE. The maximum federal reimbursement amount for these items is \$108,000.00.

STATEMENT OF WORK FOR COOPERATIVE AGREEMENT
67-6633-18-XXX
WALSH COUNTY WATER RESOURCE DISTRICT

F. Complete Supporting Documentation

1. The Contractor shall prepare drawings and reports to adequately convey the design approach and methods.
2. Preliminary drawings shall consist of a cover sheet, overall site map, detailed site map, plans, profiles, elevations, cross sections, and details needed to describe the work to be constructed.
3. The plans and profiles from geologic investigation should be included.
4. Preliminary structural drawings should be included.
5. The design report should consist of computations pertinent to the work completed including but not limited to correspondence, flood routings, geology reports, soil mechanics testing reports, hydraulic, slope stability, foundation and structural design computations, and a list of applicable NRCS specifications and standard drawings required. The folder shall include a detailed design report to explain the design assumptions, methodology, and references used for each design component and or consideration. Drawings that are necessary for proper explanation of the subject matter shall be included in the folder. The folder shall be partitioned and indexed in a logical manner.
6. Engineering models and data will be provided electronically to NRCS.

G. Develop Landrights Work Maps.

Develop landrights work maps (also termed real property acquisition map) as outlined in NWPM Part 504, Subpart A, 504.3. Landrights work maps shall be prepared electronically with the latest Digital Orthophoto Quarter Quadrangle (DOQQ) as the background. The landrights work map(s) shall show physical features of the project area, major project features, project boundaries, easement limits, apparent property lines, utilities with owners' information, and the minimum area and rights needed for each project measure.

H. Environmental, Social Effects, and Economic Analysis of Alternatives

1. Evaluate effects of the alternatives for all resources and concerns identified during the Scoping process. Conduct interdisciplinary review meetings as necessary to review environmental consequence determinations.
2. Complete a final draft version of "Environmental Consequences" (NWPM Part 501.38).
3. Complete comprehensive cost estimates for alternatives, including construction costs, mitigation, land acquisition, operations and maintenance (P&G 2.12.5).
4. Complete an economic analysis of each alternative.
5. Field assessment of feasible alternatives as needed to determine unavoidable adverse impacts to wetlands, uplands, cultural resources, or other identified relevant concerns. Describe impacts (context and intensity) for the relevant concerns, including cumulative effects in Supplemental Watershed Plan.
6. Develop mitigation strategy to address adverse impacts, including an estimate of all related costs.
7. Calculate and document monetary and dam breach fatality estimates for each alternative.

STATEMENT OF WORK FOR COOPERATIVE AGREEMENT
67-6633-18-XXX
WALSH COUNTY WATER RESOURCE DISTRICT

I. Identify the National Economic Development Plan Alternative (NED).

1. Identify the NED Alternative that best addresses the technical, environmental, social, and economic concerns for the rehabilitation of this structure. The NED is the alternative which maximizes net economic benefits consistent with protecting the Nation's environment.
2. Communicate alternative development and consequences to the public and Stakeholders Group, and solicit input.
3. Work with Sponsors and NRCS to determine the Preferred Alternative. If the Preferred Alternative is different than the NED alternative, then the Sponsors will need to pursue an exception from the Chief NRCS. Assist the Sponsors, if requested, in preparation of an exception letter to be provided to NRCS-ND for forwarding the Chief, NRCS ((P&G 1.10.2).

NRCS Review Point #4: Submit all items outlined in Sections F through I, with supporting technical materials, for review to the ND SCE. The maximum federal reimbursement amount for these items is \$160,000.00.

J. Prepare Preliminary Supplemental Watershed Plan EA/EIS and Appendices

1. The plan will include, but is not limited to, development of the Preliminary Watershed Plan and EA or EIS for technical review by NRCS-ND, the Sponsor and others directly involved in the planning.
2. The plan must disclose all assumptions, data sources, models, and methodologies to support each interdisciplinary team member's analysis and recommendations.
3. The consultant must facilitate a public and interagency review of the preliminary plan. All comments require a written response by the consultant, and documentation in final plan.

NRCS Review Pont #5: Submit Preliminary Supplemental Watershed Plan-EA/EIS to NRCS for review as listed in Section J 1-3. The maximum federal reimbursement amount for this item is \$14,000.00.

K. Assemble final Supplemental Watershed Plan-EA/EIS, including all Appendices

1. The consultant must respond, in writing, to each comment by NRCS and sponsor, and make required changes to plan.
2. A draft final Supplemental Watershed Plan-EA/EIS should be provided to NRCS and Sponsor for concurrence to finalize plan.
3. The final Supplemental Watershed Plan should be provided to NRCS and sponsor.

NRCS Review Pont #6: Submit Final Supplemental Watershed Plan-EA/EIS to NRCS. Provide a minimum of five hard copies, as well as an electronic version of the Supplemental Watershed Plan-EA/EIS and all supporting information.

V. PERIOD OF PERFORMANCE:

Date of Signature to September 30, 2020

STATEMENT OF WORK FOR COOPERATIVE AGREEMENT
67-6633-18-XXX
WALSH COUNTY WATER RESOURCE DISTRICT

VI. MILESTONES & BUDGET SUMMARY

Review Point	Activity	2018	2019				2020			
		Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
1	Purpose and Need for Action; Public Participation		X							
2	Data Collection; Resource Inventory				X					
3	Development of Alternatives: Structural for Rehabilitation, No Action, Decommissioning, Structural for Rehabilitation, Nonstructural for Detailed Review						X			
4	Land Rights Work Map; Environmental, Social, Economic Analysis of Alternatives, Identify NED Alternative							X		
5	Preliminary Supplemental Watershed Plan-EA/EIS								X	
6	Final Supplemental Watershed Plan-EA/EIS									X

APPENDIX C

PUBLIC PARTICIPATION PLAN
PUBLIC SCOPING MEETING PRESENTATION
PUBLIC SCOPING MEETING RESPONSES



Matejek Dam Public Participation

Anticipated Milestone Dates	Primary Objectives	Tasks	Interdisciplinary Team Meeting	Public Meeting
	Complete the process of obtaining public, landwowner and agncy input. Adopt an initial Purpose and Need Statement	Assemble the Public Participation Plan to guide the public input and participation throughout the process.		
		Develop Interdisciplinary and Technical Project Teams. The teams will be developed based on requirements in the NWPM Section 501.3/NWPH Section 601.3. The Interdisciplinary Team will be made up of Federal, State, and Local agencies that have an expertise or authority over the proposed action.		
		Send Invitation Letters to team members to verify representatives for agencies and confirm the roster for the Interdisciplinary Team.		
		Conduct Public Meeting to Obtain Local Input. An initial public meeting will be held based on the Public Participation Plan. This meeting will serve to inform the public within the watershed area of the study tasks and schedule. The initial Public Meeting will allow for public input to be gathered about the Need for the Proposed Action.		X
		Conduct an Interdisciplinary Team Meeting. The interdisciplinary team will review the Purpose and Need Statement and to review the required concerns for NEPA. These concerns are highlighted in the NWPM 501.24. Information required to develop information required in NWPH Sections 606.18 and 606.19. . Information will be provided to the interdisciplinary team prior to meeting to allow for sufficient review.	X	
Aug. 2019		NRCS REVIEW POINT. 1		
	Gather project data and technical information. Review technical information with the Inderdisciplinary Team, identify environmentally sensitive areas to guide alternatives.	Data collections and resource evaluations will be conducted by the Technical Team including engineering surveys, geologic investigations, hydrology studies, hydraulics analysis, enviornmental evaluations, archaelolgical and historic studies and economic and social evaluations.		
		Conduct an Interdisciplinary Team Meeting. The interdisciplinary team will review technical information. Resource data will be presented to the Interdisciplinary Team. Resource data will be discussed to identify potential environmentally sensitive areas to aid in alternative development. Resource data will also be reviewed and discussed to identify resource opportunities to achieve goals in the Purpose and Need Statement.	X	
Sept. 2019		NRCS REVIEW POINT. 2		
	Develop project alternatives, review alternatives with the Inderdisciplinary Team, identify the NED alternative and identify the list of alternatives to be carried forward.	The Technical Team will develop structural and nonstructural project alternatives.		
		Conduct a meeting with the NRCS, WCWRD, and the NDSWC to determine the likely long term plan for the project without federal funding.		
		Conduct an Interdisciplinary Team Meeting. The interdisciplinary team review the project alternatives. They will review each alternative & the NED alternative, adverse impacts, and benefits. Concerns voiced by each team member will be documented. Information will be provided to the interdisciplinary team prior to meeting to allow for sufficient review.	X	
		The Technical Team will develop draft list of alternatives to be carried forward based on the technical informaiton and input from the Interdisciplinary Team.		
		Conduct an Interdisciplinary Team Meeting. The interdisciplinary team will review the project alternatives to be carried forward. Information will be provided to the interdisciplinary team prior to meeting to allow for sufficient review.	X	
Nov. 2019		NRCS REVIEW POINT. 3		
	Identify the enviornmental consequences of the alternatives carried forward. Conduct the economic analysis of the alternatives and mitigation strategies, obtain public and agency input on the proposed alternatives.	The Techncial Team will develop project work maps, supporting documentation and environmental consequences of alternatives.		
		Conduct an Interdisciplinary Team Meeting. The interdisciplinary team will meet to review the environmental consequences of alternatives and provide input to the Technical Team.	X	
		The Technical Team will preport the economic analysis and mitigation strategies for project alternatives carried forward.		
		Conduct an Interdisciplinary Team Meeting. The interdisciplinary team will review the development of alternatives, the NED and the selection of the Preferred Alternative	X	
		Conduct Public Meeting to Obtain Local Input. The NED Alternative will be presented to the general public. This discussion will review work completed since the initial public meeting, review of each alternative, unavoidable adverse impacts, and benefits provided. The general public will be engaged to solicit comments and concerns with the proposed alternatives.		X
May 2020		NRCS REVIEW POINT. 4		
	Prepare the EA Document, obtain public and agency input and comments on the EA. Respond to Comments.	The Technical Team will prepare the Preliminary Plan/EA.		
		Conduct an Interdisciplinary Team Meeting. The interdisciplinary team will review the Preliminary Plan/EA. Information will be provided to the interdisciplinary team prior to meeting to allow for sufficient review.	X	
		Public Review of the EA		
		The Technical Team will respond to comments		
Jul. 2020		NRCS REVIEW POINT. 5		
	Revise the Document	Assemble the Final Plan/EA		
Aug. 2020		NRCS REVIEW POINT. 6		
	NRCS Approval of EA	Send Hardcopies of Final EA Document		



Rehabilitation of Middle-South Branch Forest River Dam No. 1 (Matejcek Dam)



**WALSH COUNTY WATER
RESOURCE DISTRICT**

**Scoping Meeting
July 29, 2019**

Agenda

- Background
- Purpose
- Dam and Watershed Plan History
- Dam Safety Concerns
- Flood Prevention Concerns
- Recreation Concerns
- Anticipated Alternatives
- Factors Considered
- Public Input



Applicable Agency Authority



Federal Watershed Protection and Flood Prevention Act

Public Law 83-566 Section 14(a)(1)

Rehabilitation means completion of all work necessary to extend the service life of dams and meet safety and performance standards.

Planning Team Structure



- **Planning Lead:** Natural Resources Conservation Service
 - **State Conservationist:** Mary Podoll
 - **State Conservation Engineer:** Christi Fisher, PE
- **Sponsoring Local Organization:** Walsh County Water Resource District
 - **Secretary:** Jennifer Lindenberg
 - **Chairman:** Daryl Campbell
 - **Vice-Chairman:** Larry Tanke
 - **Manager:** Albin Jallo
- **Planning Technical Lead:** Zach Herrmann, PE (*Houston Engineering, Inc.*)





Purpose and Need

Purpose: Bring Matejcek Dam into compliance for current federal and state dam safety standards for dam performance, design, and safety while maintaining current flood prevention and recreation opportunities.

Need:

- Dam Performance, Design, and Safety
- Flood Prevention
- Recreation

Planning Process



- Purpose and Need for Action; Public Participation
- Data Collection and Resource Inventory
- Development of Alternatives (Structural and non-Structural)
- Evaluation of Alternatives
- Preliminary Supplemental Watershed Plan (EA/EIS)
- Final Supplemental Watershed Plan



Agency Participation – State & Federal



Federal

- USACE
- USFWS
- FEMA



US Army Corps
of Engineers



FEMA

State

- ND State Water Commission
- ND Game & Fish Department
- ND Department of Transportation
- ND State Historical Society
- ND Department of Environmental Quality





Agency Participation - Local

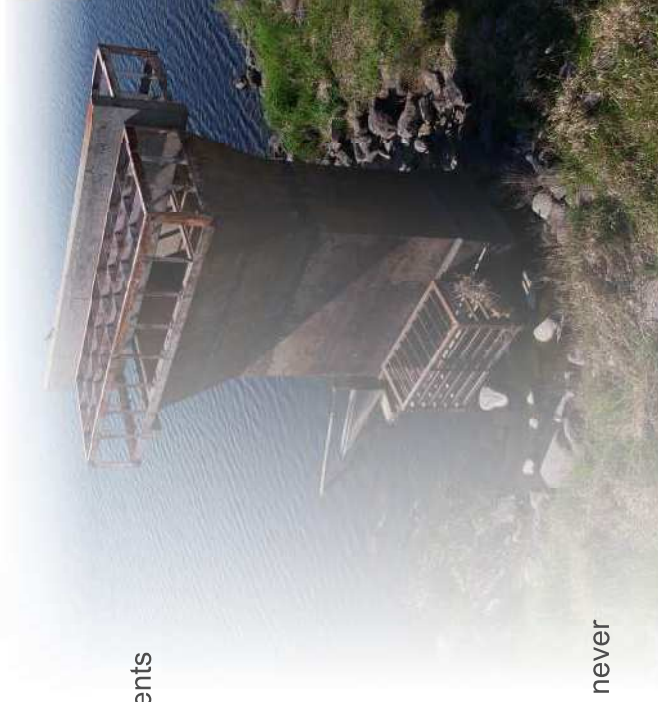
- Tribal Entities
- Walsh, Nelson, & Grand Forks County
 - Commissions
 - Water Resource Districts
 - Departments of Emergency Management
 - Soil Conservation Districts
 - Highway Departments



Watershed Work Plan - History



- Part of a Watershed Work Plan for the Middle-South Branch of the Forest River (SCS, 1961)
- Sponsored by various local Soil Conservation and Flood Control Districts
- Annual flood damage estimated at \$134,542 in 1961 Dollars
- Plan included a combination of Land Treatment Measures and Structural Improvements
- Estimated Annual benefits at \$92,155 in 1961 Dollars
- Resulted in a Benefit-Cost Ratio of 1.65:1 (SCS, 1961)
- Three Flood Retarding Structures were constructed:
 - Matejcek Dam (Dam No. 1)
 - Fordville Dam (Dam No. 4)
 - Whitman Dam (Dam No. 6)
 - Controlled a total of 179.2 square miles of drainage area
 - Fish and Wildlife Pools were eventual modifications
- Fairdale Drain was not part of the initial plan but was later added and constructed
- Channelization project on the Lower Forest River was included in the initial Plan but never constructed



Matejcek Dam Overview

General Data		
Year Design	1964	
Year Constructed	1966	
Purpose(s)	Flood Control, Wildlife, and Recreation	
Original Hazard Classification	Significant	
Current Hazard Classification	High	
Design Life	50 years	
Original Design Drainage Area	45.9 sq. mi.	
Revised Drainage Area (Direct) ^[1]	121.2 sq. mi.	
Revised Drainage Area (Indirect) ^{[1][4]}	171.9 sq. mi.	
Dam Height	60 feet	
Maximum Dam Height	86.6 feet	
Embankment Length	1,150 feet	
Embankment Top Width ^[2]	32 feet	
Embankment Upstream Slope	3.5 H:1 V	
Embankment Downstream Slope	2.5 H:1 V	
Critical Elevations (Elevations are based on as-built information)		
Elevation (MSL) ^[3]		
Top of Dam	1366.0	
Auxiliary Spillway Crest	1360.8	
Principal Spillway Riser Tower Crest	1354.2	
Principal Spillway Orifice Inverts	1334.8	
Principal Spillway Outfall Invert	1295.8	
Principal Spillway Stilling Basin Invert	1278.6	
Reference Point		Storage
		Surface Area
Top of Dam	9,144 acre- feet	
Auxiliary Spillway Crest	7,725 acre - feet	
Principal Spillway Riser Tower Crest	6,162 acre - feet	
Principal Spillway Orifice Inverts	2,745 acre - feet	
	252.8 acres	
	221.7 acres	
	134.8 acres	

[1] Revised using available LiDAR information.

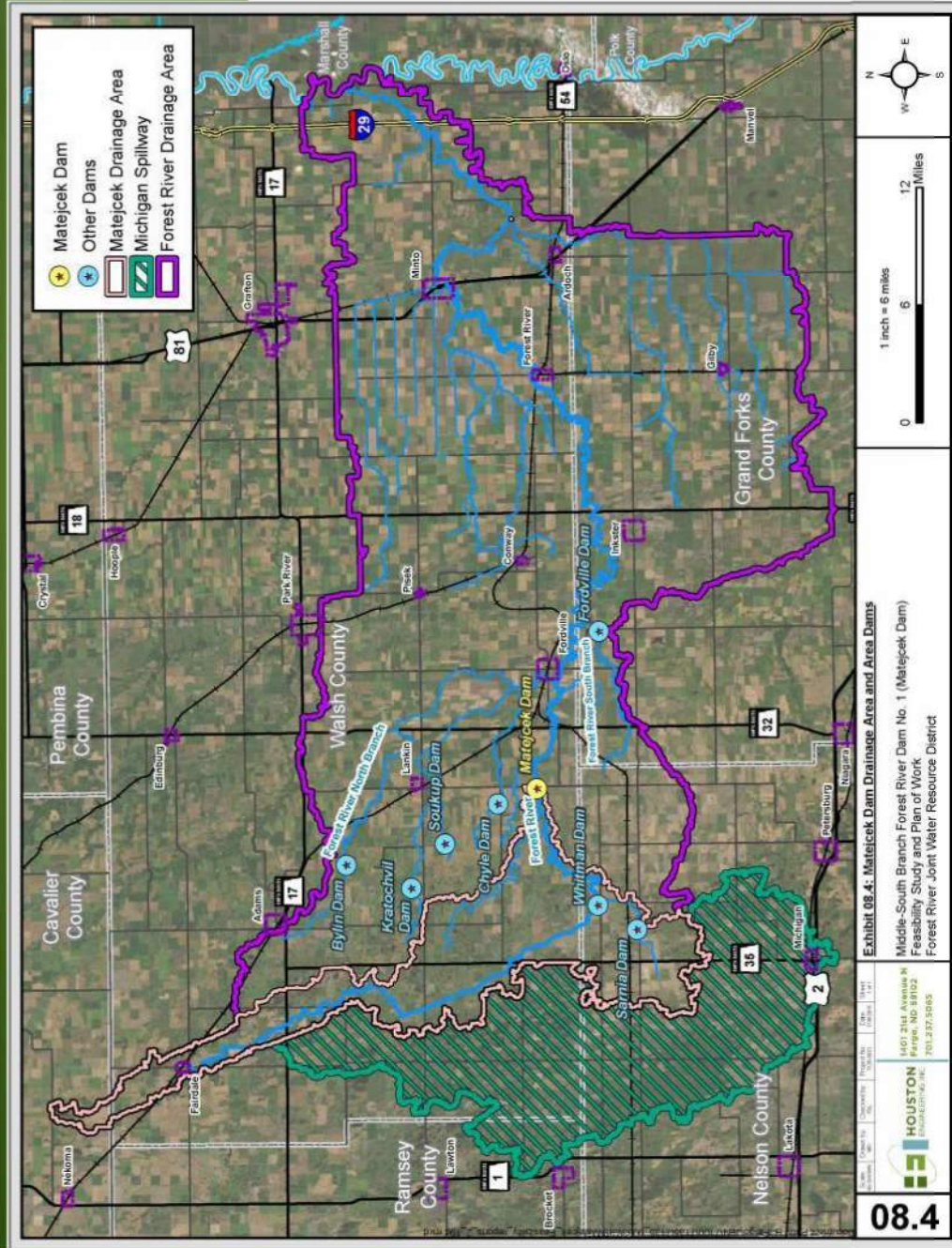
[2] Includes roadway width of Walsh County Road 14.

[3] Add 1.20 feet to convert MSL vertical datum to NAVD 1988 vertical datum (approximate).

[4] Indirect drainage area is the Michigan Spillway Project drainage area, which has a regulated discharge of 50 CFS.



Watershed Map

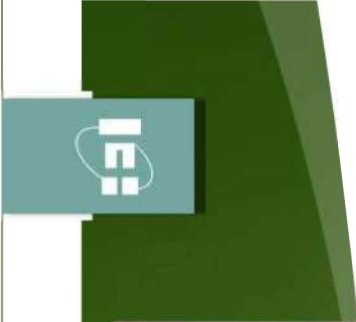




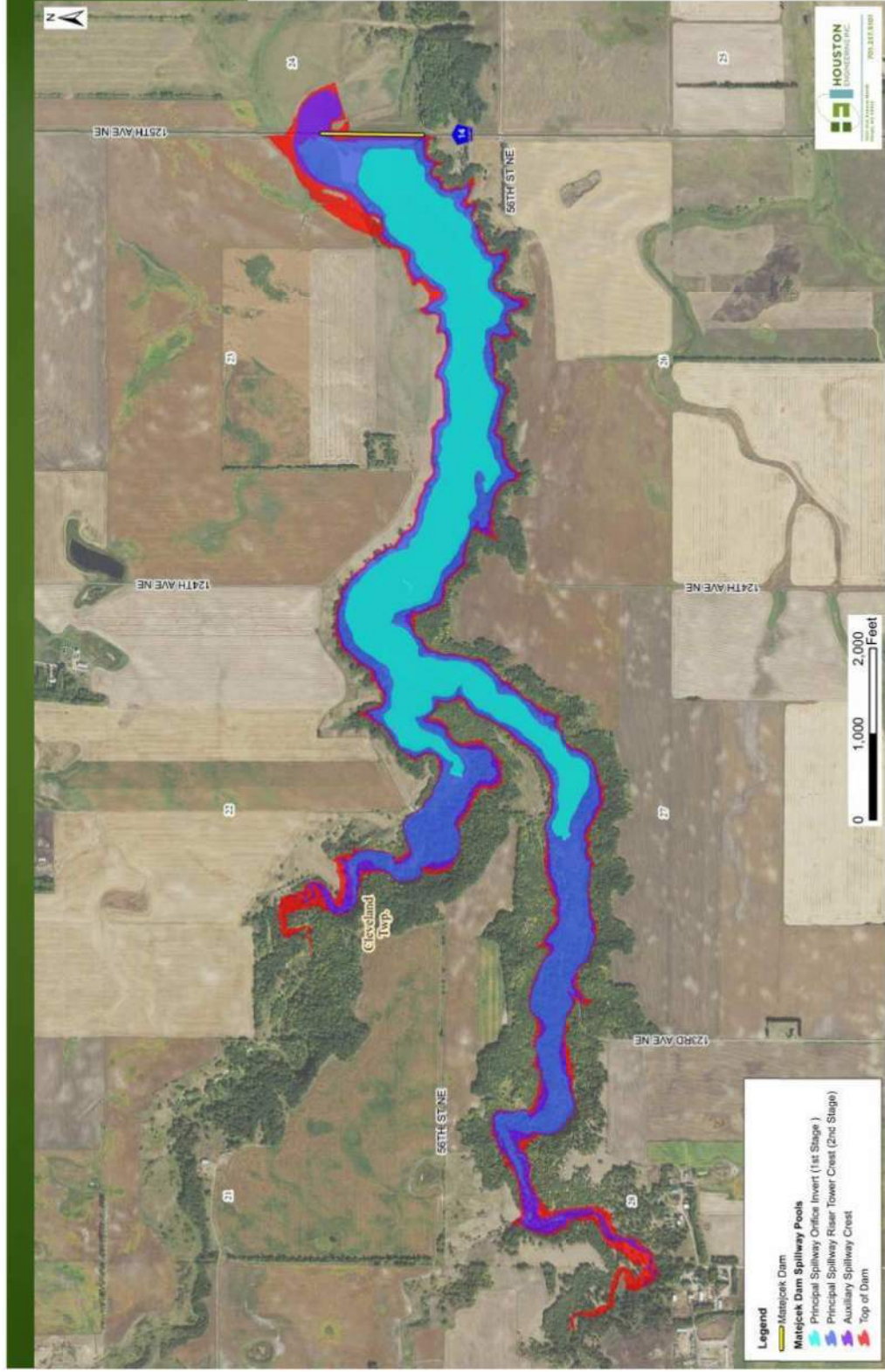
Plan View



[illegible]



Site Map of the Pool



Downstream Risk



Breach Analysis *(From Dam Assessment Report – subject to revision)*

- Peak breach discharge estimated at 201,700 cubic feet per second – resulting in a wave 80 feet in height at the Dam site
- Up to 28 potentially inhabitable structures flooded
- Up to 6 of these structures were within 1.5 miles of the dam

Downstream risk results in a High Hazard Designation



Hazard Classification/Dam Safety Standards TR-60 Federal Requirements

Precipitation Depth (Inches)			
Standard	Significant Hazard	High Hazard	
Principal Spillway	6.6	7.4	
Auxiliary Spillway	7.0	12.0	
Freeboard	9.5	22.7	

Runoff Volume (Approximate Ac-Ft)			
Standard	Significant Hazard	High Hazard	
Principal Spillway	14,000	17,500	
Auxiliary Spillway	27,200	56,900	
Freeboard	41,800	123,800	

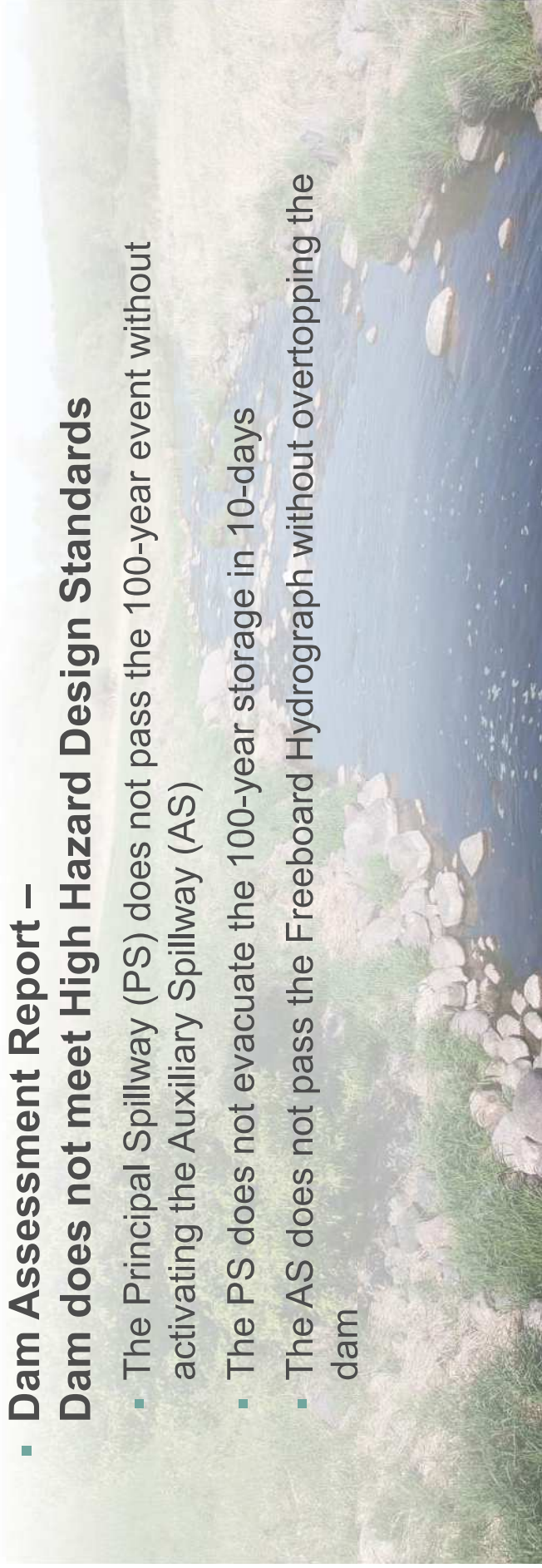
*Probable Maximum Precipitation is being updated and subject to revisions.

** ND Dam Safety Guidelines are being updated.

Dam Safety - Classification



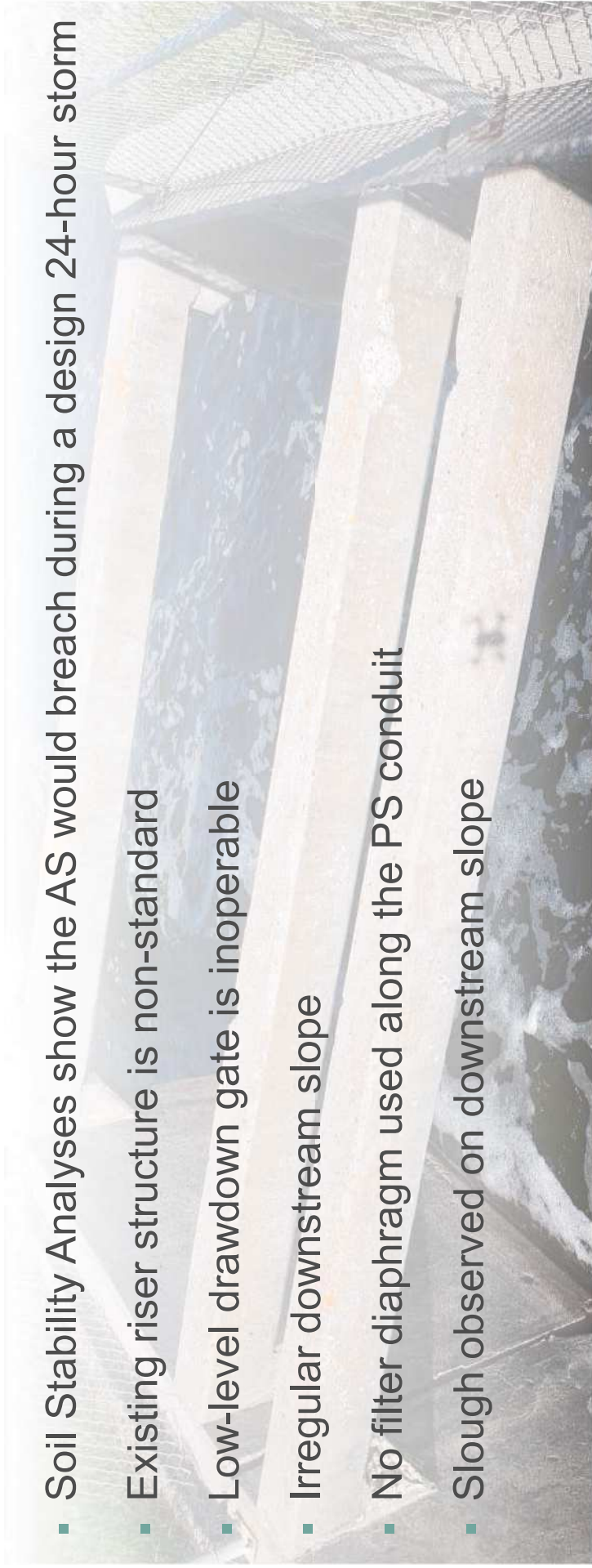
- **Dam Assessment Report –
Dam does not meet High Hazard Design Standards**
 - The Principal Spillway (PS) does not pass the 100-year event without activating the Auxiliary Spillway (AS)
 - The PS does not evacuate the 100-year storage in 10-days
 - The AS does not pass the Freeboard Hydrograph without overtopping the dam





Dam Safety – Other Concerns

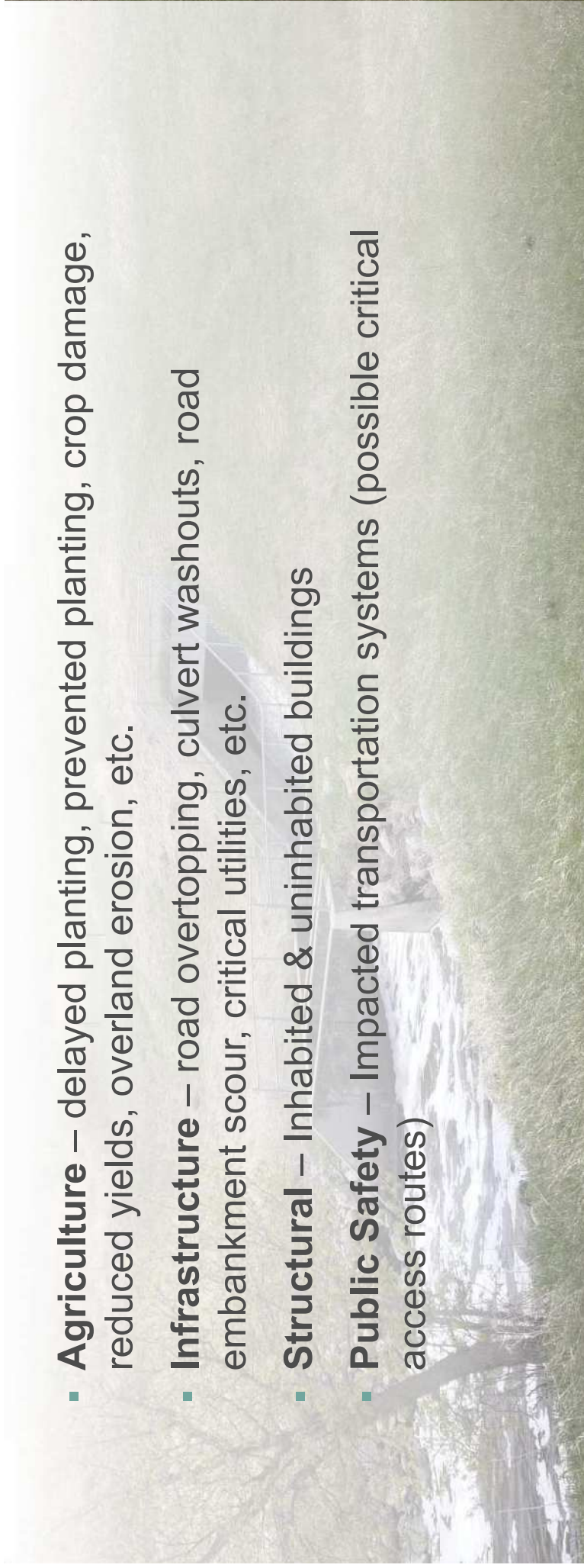
- Soil Stability Analyses show the AS would breach during a design 24-hour storm
- Existing riser structure is non-standard
- Low-level drawdown gate is inoperable
- Irregular downstream slope
- No filter diaphragm used along the PS conduit
- Slough observed on downstream slope



Flood Prevention

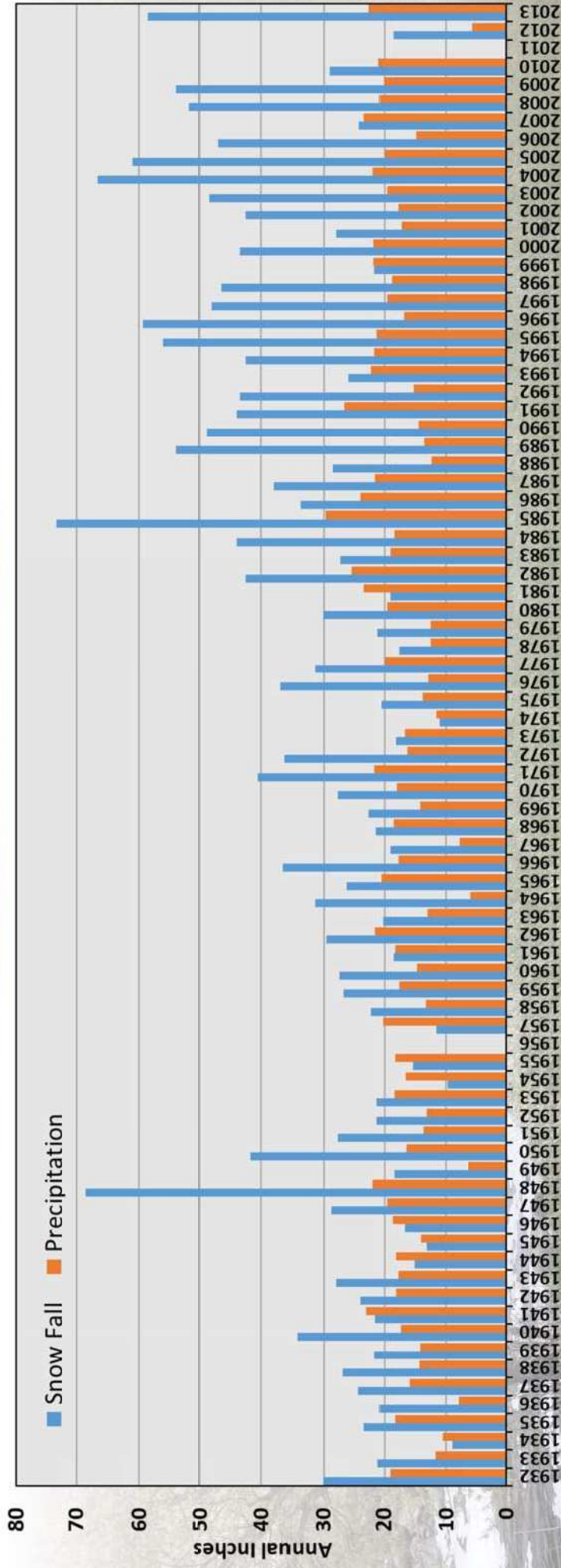


- **Agriculture** – delayed planting, prevented planting, crop damage, reduced yields, overland erosion, etc.
- **Infrastructure** – road overtopping, culvert washouts, road embankment scour, critical utilities, etc.
- **Structural** – Inhabited & uninhabited buildings
- **Public Safety** – Impacted transportation systems (possible critical access routes)



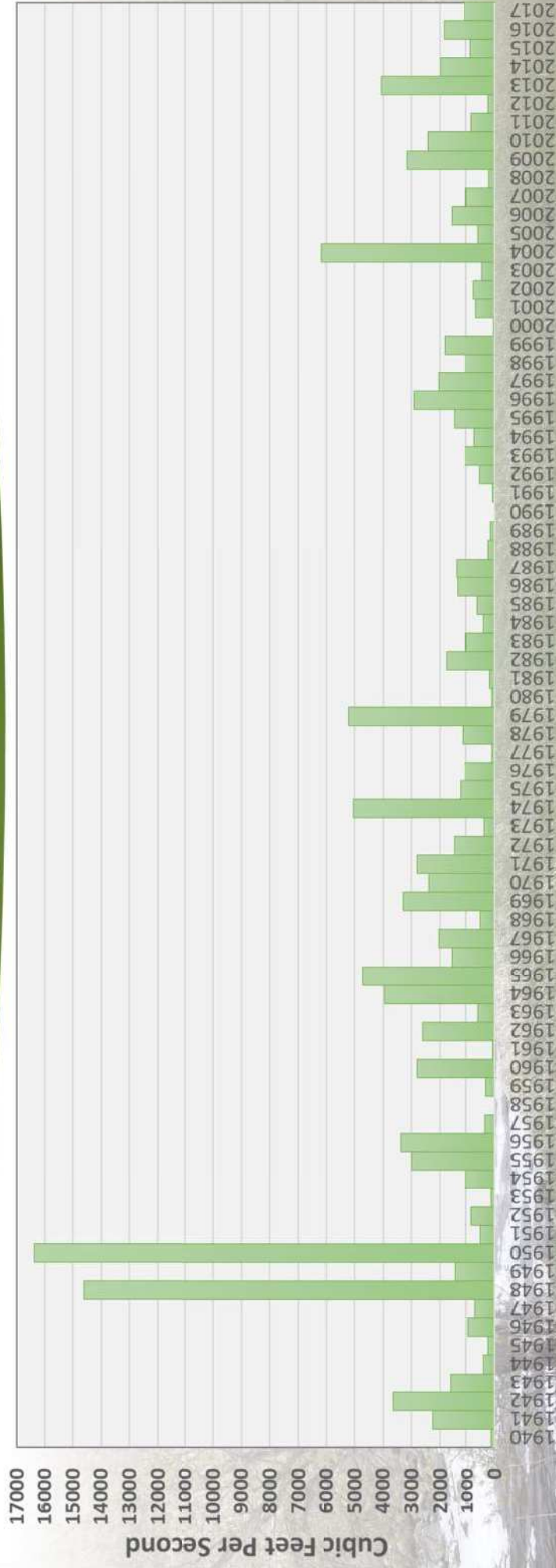
Flood Trends

Historic Observed Rainfall and Snowmelt at Petersburg, ND



Flood Trends

Annual Peak Stream Flow
Forest River at Fordville, ND (USGS Gage 5084000)

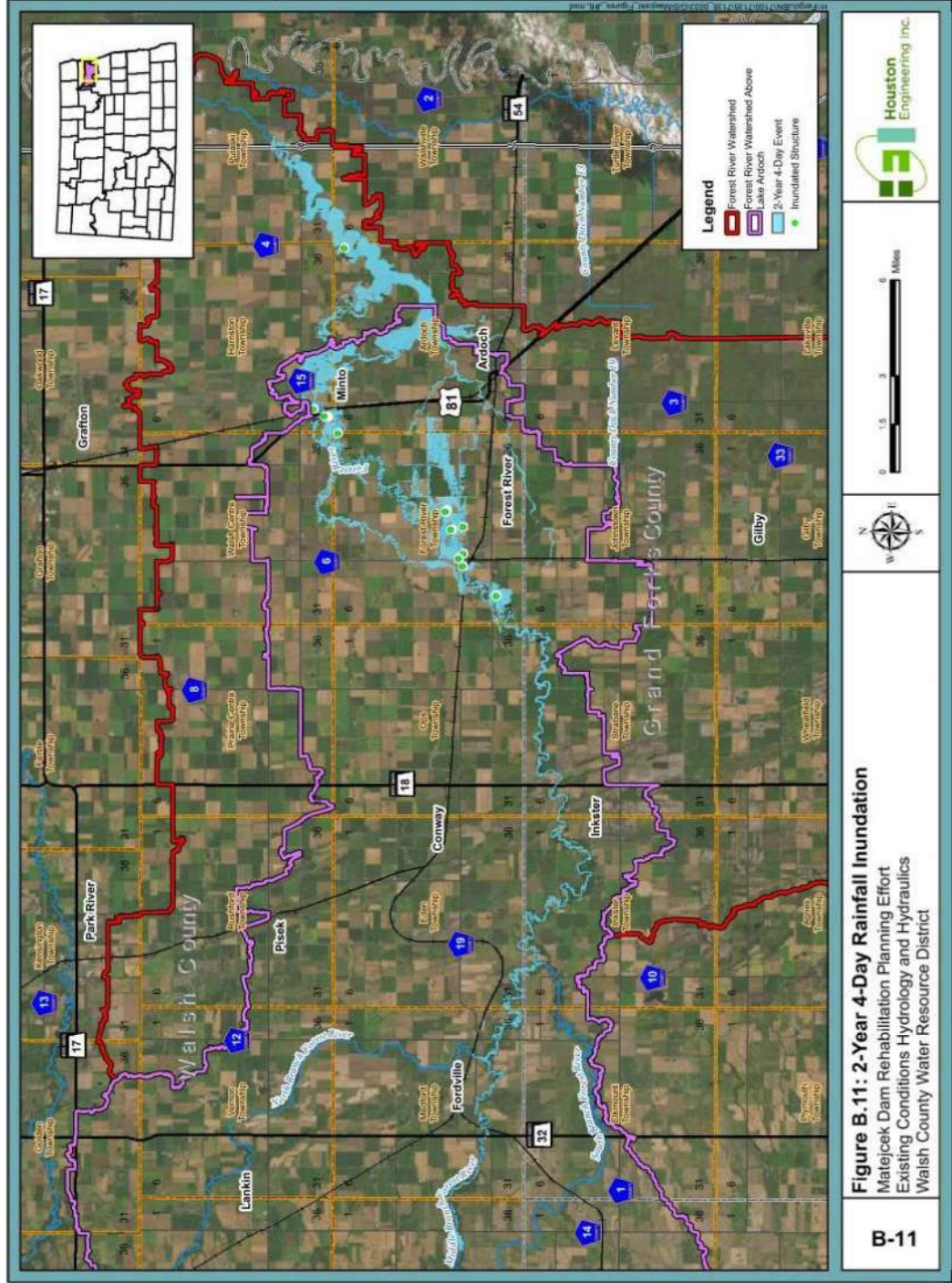
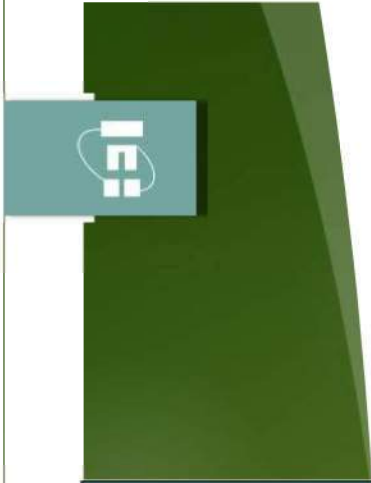


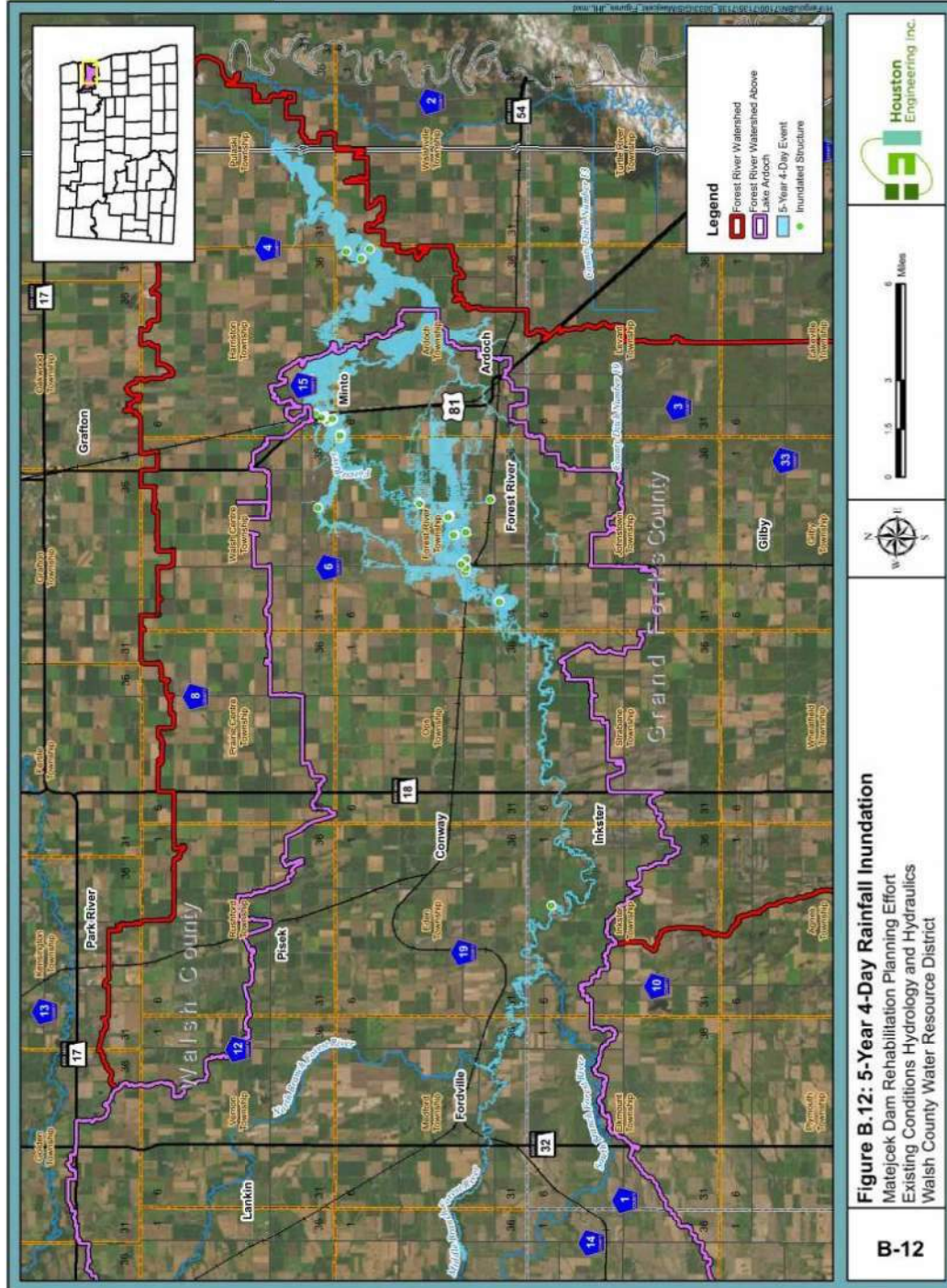
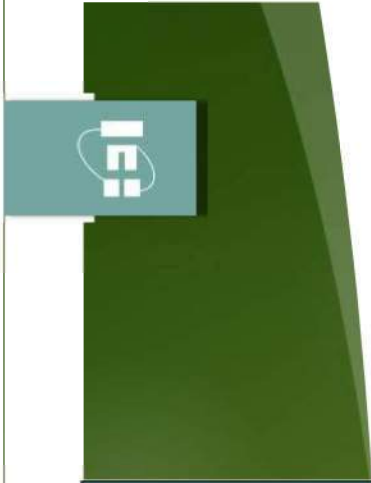
Hydrology and Hydraulics



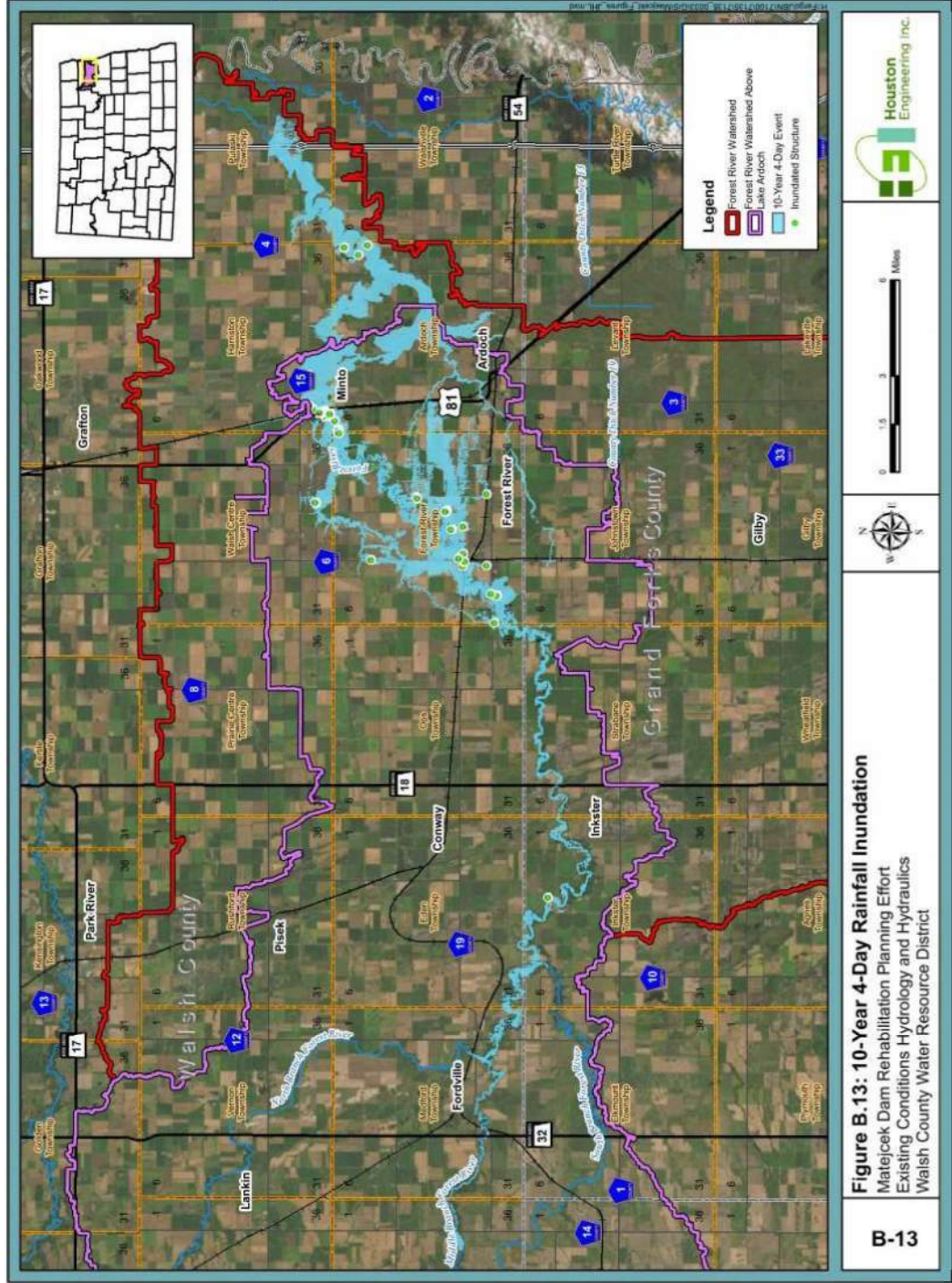
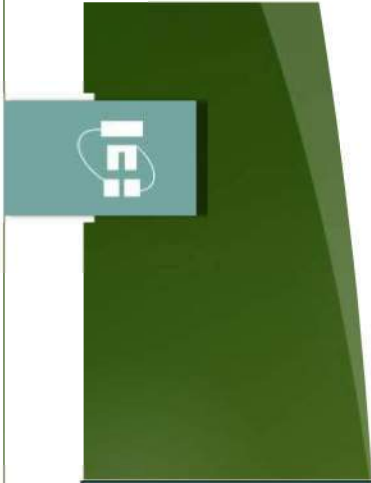
- HEC-HMS hydrologic model developed to estimate flood flow and timing characteristics for the Forest River Watershed
- HEC-RAS unsteady state hydraulic model was developed estimate flood elevations using HEC-HMS results
- Hydrology and hydraulic models were calibrated to historic rainfall events
 - June 2016
 - May 2010
- Synthetic rainfall events were modeled (Source – Atlas 14)
- Model used to determine inundated acreages, duration of flooding, and potential damages to structures.
- Review of results determine the 4-day duration rainfall is the most damaging rainfall event.

Return Period	24-Hour Rainfall (in.)	4-Day Rainfall (in.)	10-Day Rainfall (in.)
2-year	2.0	2.7	3.6
5-year	2.5	3.3	4.3
10-year	3.0	3.9	5.0
25-year	3.8	4.9	5.9
50-year	4.4	5.6	6.7
100-year	5.1	6.4	7.5
500-year	7.0	8.6	9.6

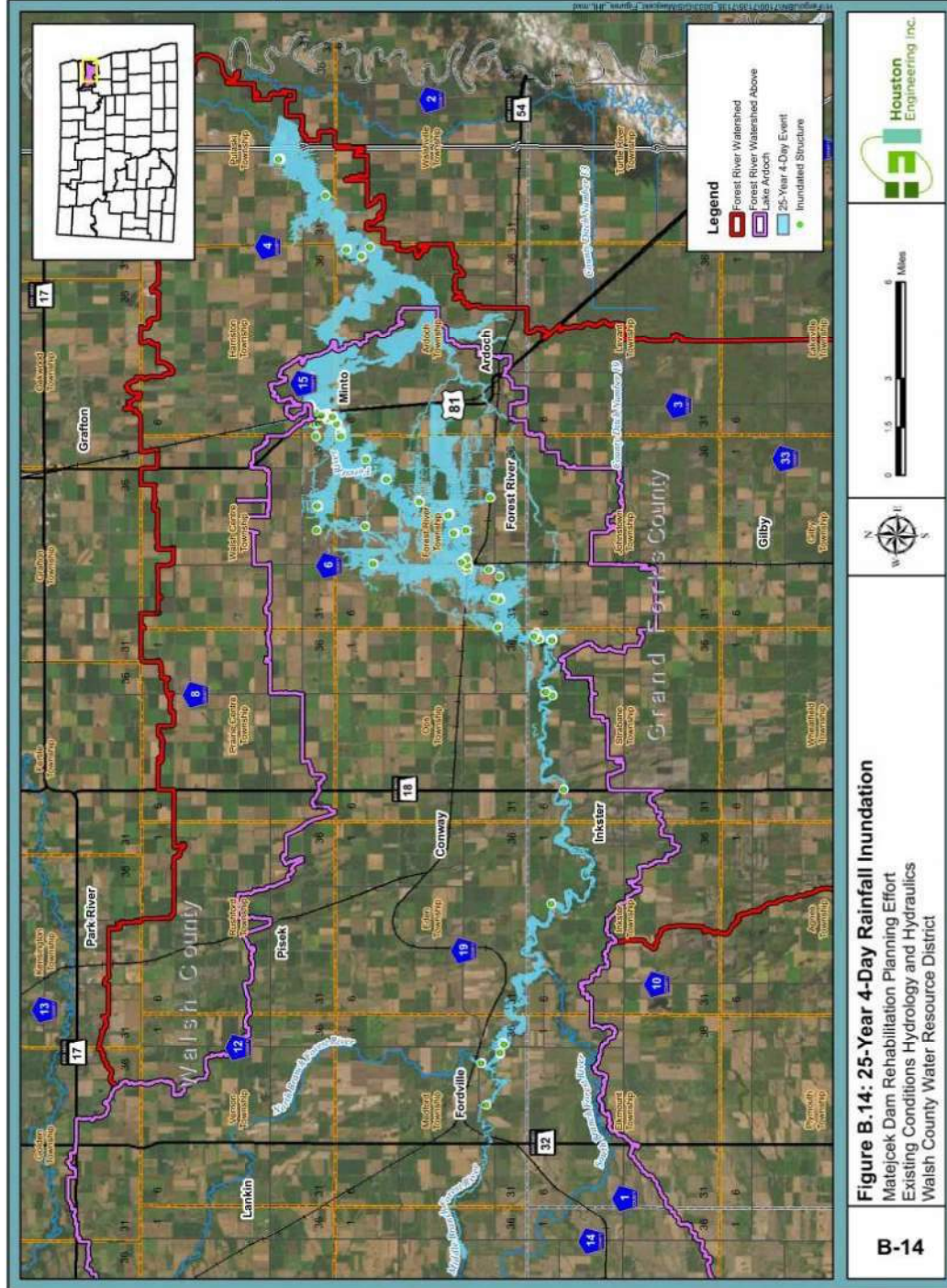
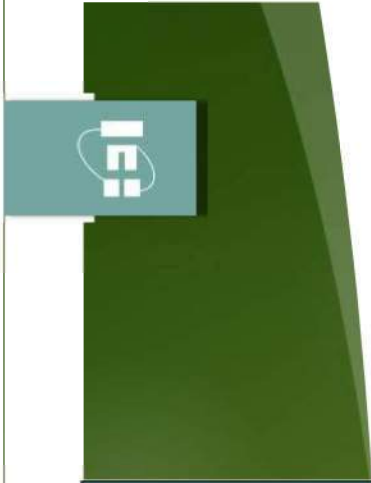




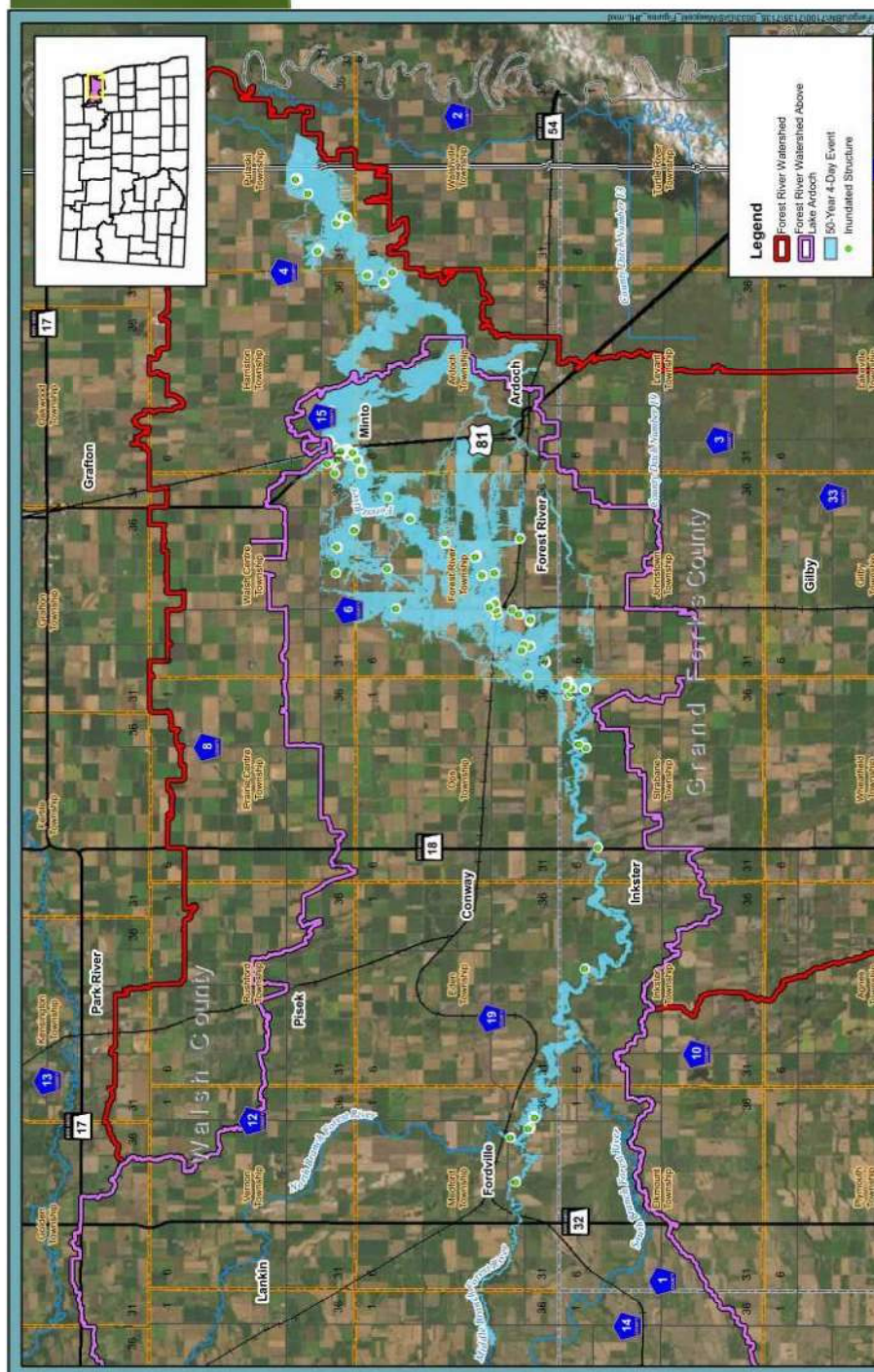
4-Day Rainfall Depth: 3.34 inches
Total Inundation: 10,557 Acres
Inundated Structures: 61



4-Day Rainfall Depth: 3.94 inches
Total Inundation: 13,130 Acres
Inundated Structures: 86



4-Day Rainfall Depth: 4.85 inches
Total Inundation: 16,894 Acres
Inundated Structures: 148

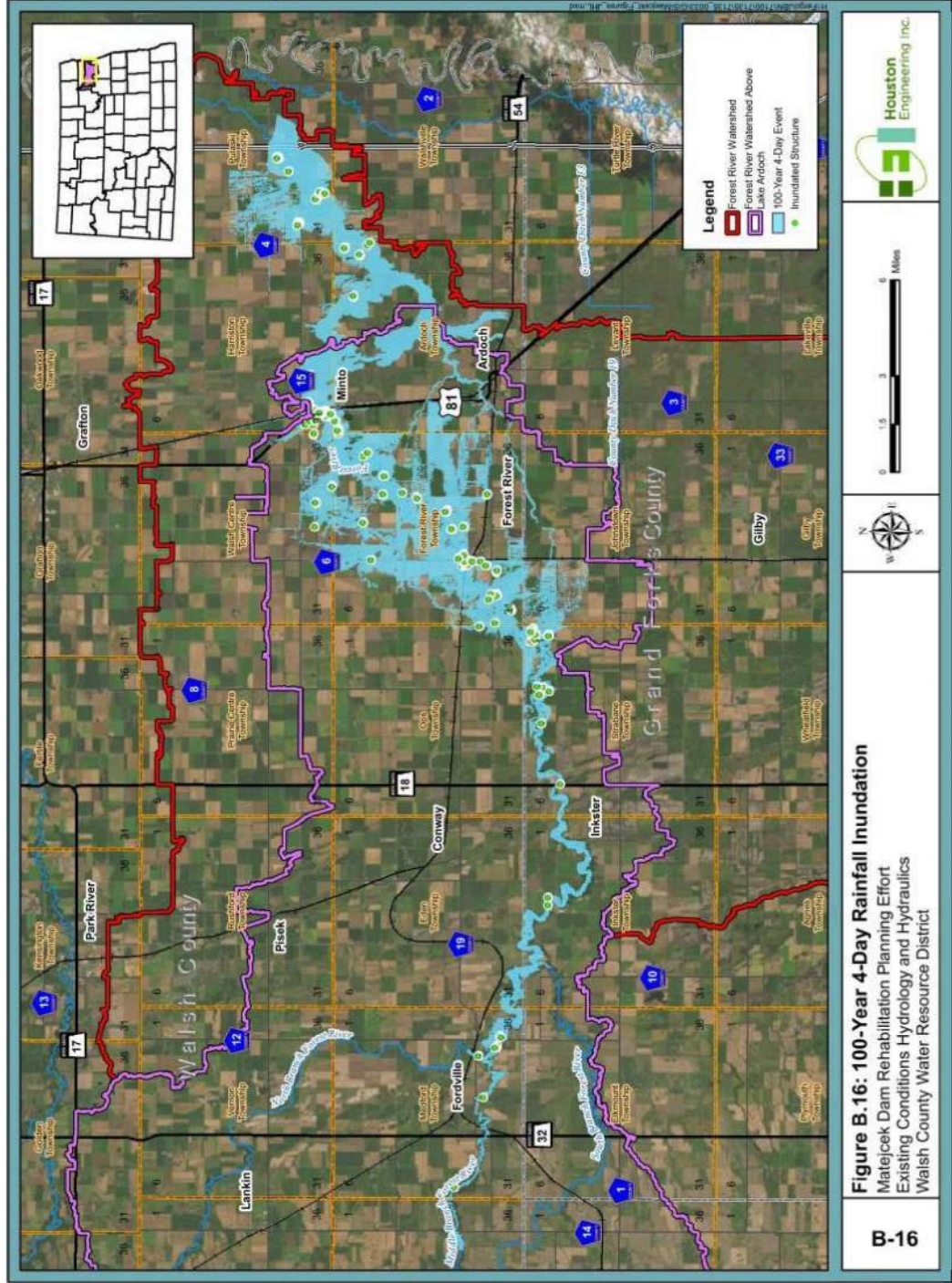
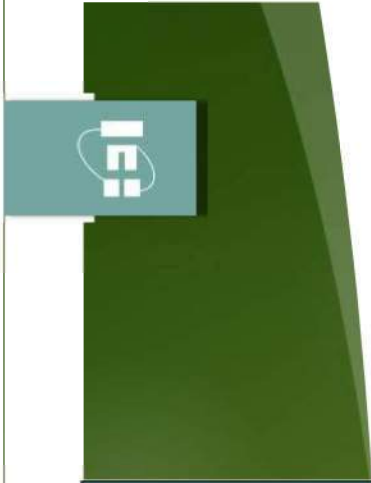


4-Day Rainfall Depth:	5.62 inches
Total Inundation:	20,296 Acres
Inundated Structures:	215

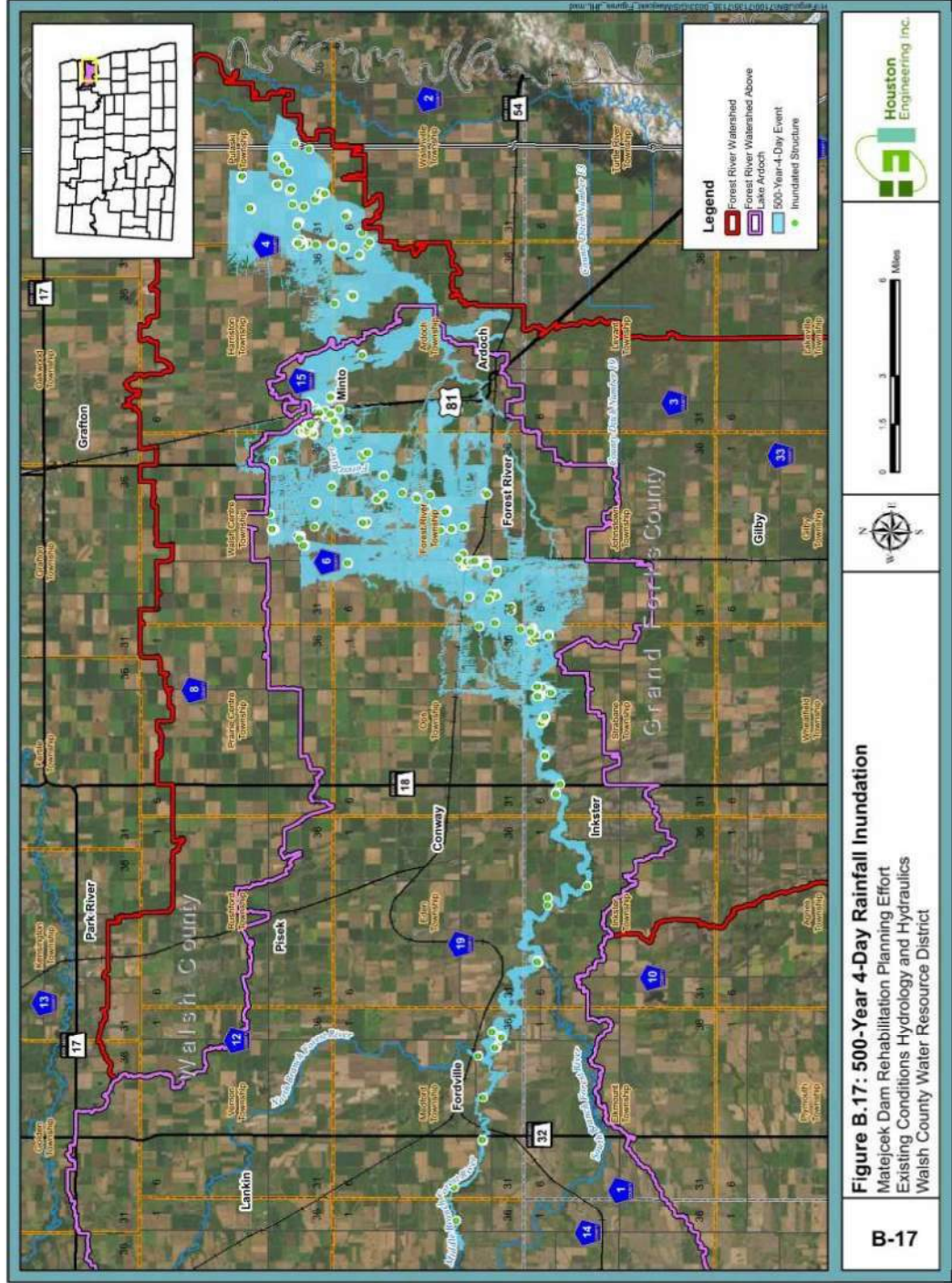
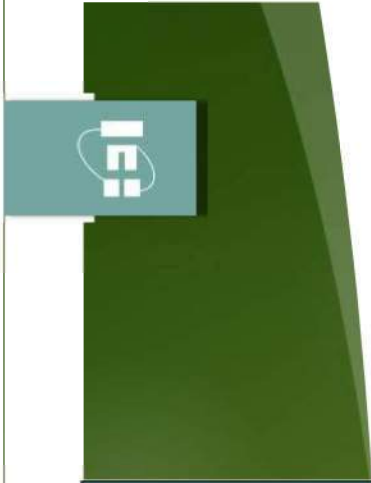
Figure B.15: 50-Year 4-Day Rainfall Inundation
Matejcek Dam Rehabilitation Planning Effort
Existing Conditions Hydrology and Hydraulics
Walsh County Water Resource District

B-15

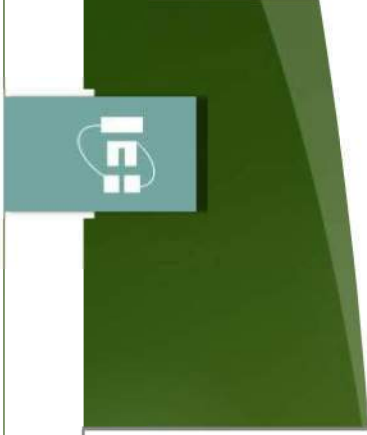




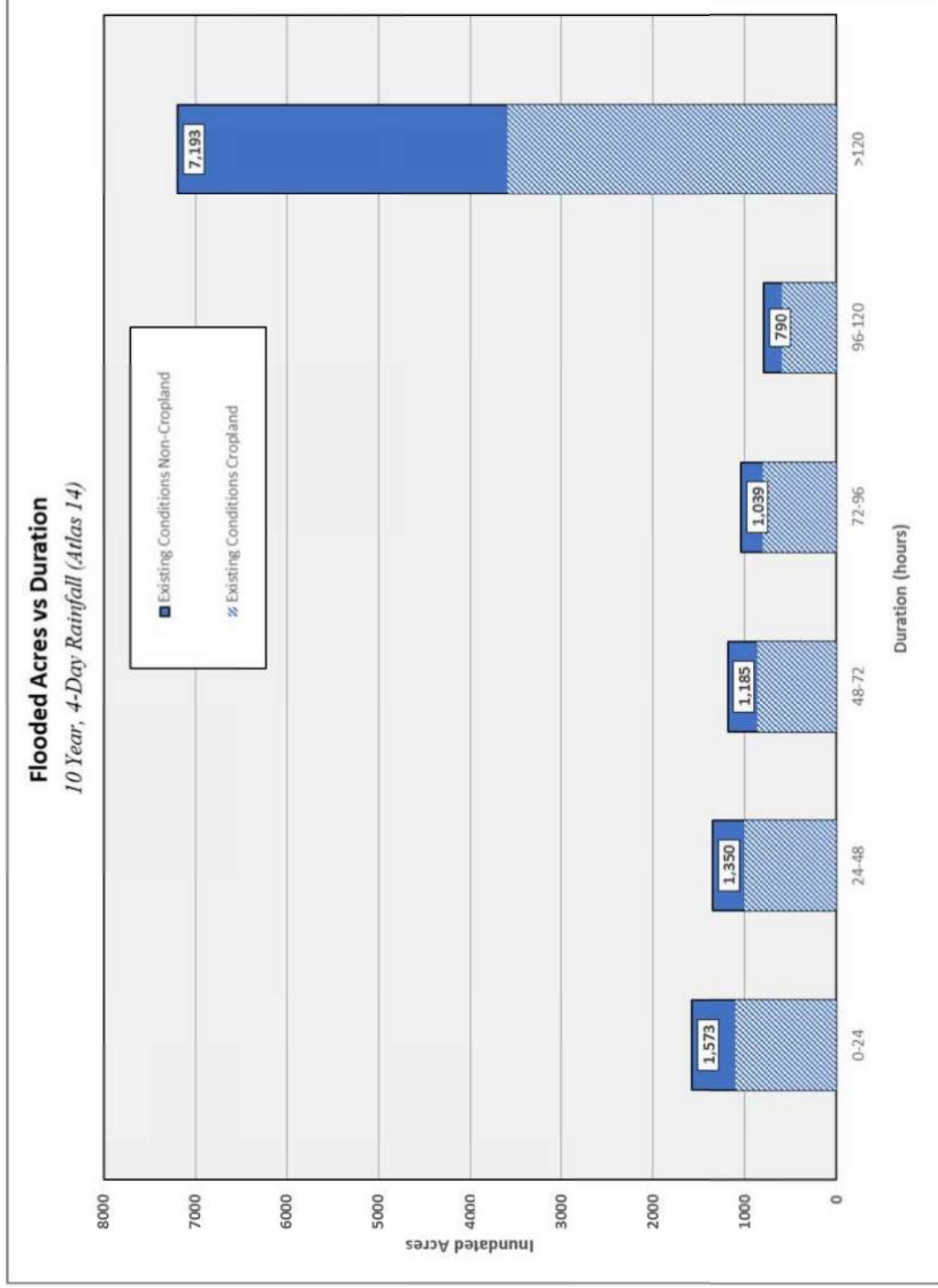
4-Day Rainfall Depth: 6.44 inches
Total Inundation: 23,855 Acres
Inundated Structures: 262

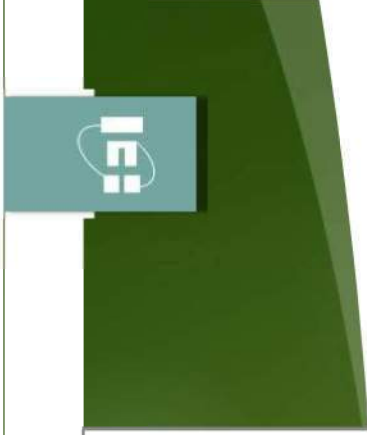


4-Day Rainfall Depth: 8.60 inches
Total Inundation: 35,374 Acres
Inundated Structures: 663

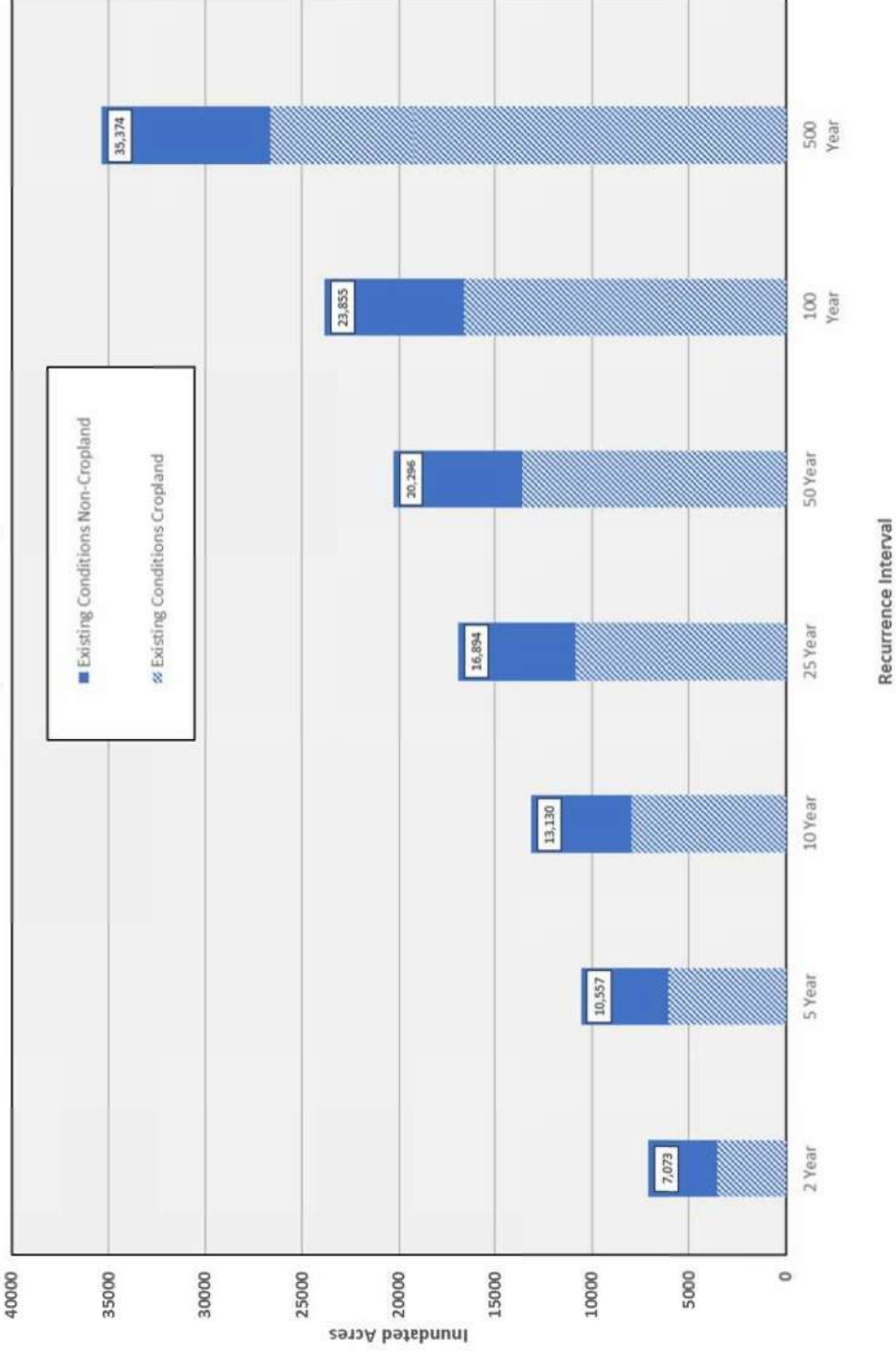


Existing Flood Characteristics





Flooded Acres vs Recurrence Interval
4-Day Rainfall (Atlas 14)



Existing Flood Characteristics

Recreation



- 130-acre lake with 5 miles of shoreline
 - Max depth = 44 feet
 - Average depth = 19 feet
- Amenities:
 - Boat Access
 - Public Beach
 - Day-Use Picnic Areas
 - Campground
 - Playground
 - Hiking Path
- Fishery includes:
 - Black Crappie
 - Northern Pike
 - Tiger Muskie
 - Walleye
 - Yellow Perch
 - White Suckers



Water Quality Fishery Impacts

- Low Dissolved Oxygen Concentrations
- Significant Fish Kill in Winter of 2017-2018
- Significant Fish Kill in Winter of 2018-2019
- Limited-to-no gamefish species present



Alternatives



- No Action
- Decommissioning
- Rehabilitation to High Hazard Criteria
- Remove Downstream Flood Risk and Rehabilitate to Reduced Hazard Classification





Factors Considered

- Technical Feasibility
- Economic Efficiency
- Public Health and Safety
- Environmental
- Social Considerations (Recreation)
- Cultural and Historic Resources
- Other Unique Factors

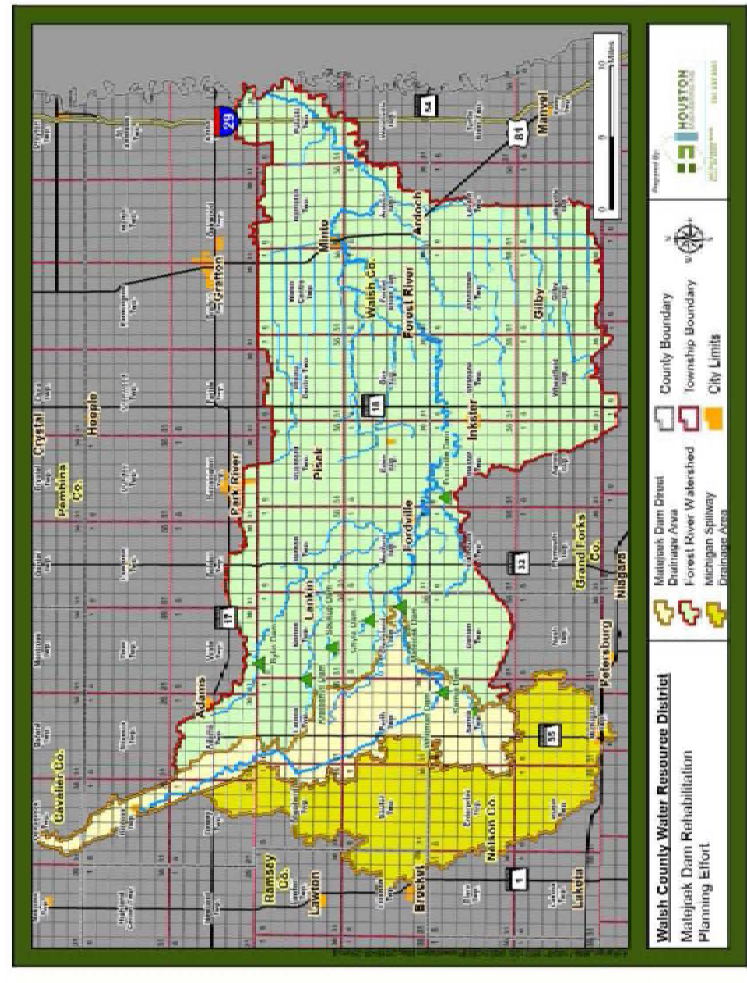


Planning Process Timeline



- Purpose and Need for Action; Public Participation..... *August 2019*
- Data Collection and Resource Inventory..... *September 2019*
- Development of Alternatives (Structural and non-Structural)..... *January 2020*
- Evaluation of Alternatives..... *April 2020*
- Preliminary Supplemental Watershed Plan (EA/EIS)..... *June 2020*
- Final Supplemental Watershed Plan..... *September 2020*

Public Input



COMMENT SHEET

Middle-South Branch Forest River Dam No. 1 (Matejcek Dam)

Public Scoping Meeting – July 29, 2019

at any comments or concerns regarding this project.

(You may also indicate areas of concern on the reverse side of the attached map.)

turn up with you for more information? YES NO
provide your name, address, email address, and phone number:

umber:

drop this form off at the conclusion of the meeting, email, or mail back to:

Middle-South Branch Forest River Dam No. 1
c/o Walsh County Water Resource District
600 Cooper Avenue
Grafton, ND 58237
mailto:matejcek@houstonians.com

for taking the time to complete this comment form. Please return any completed questionnaire to the
Walsh County Water Resource District before leaving.

ould like more time to complete, please return no later than FRIDAY, AUGUST 30, 2019 using the
mail instructions above. Completed forms may also be dropped off at the Walsh County Water Resource
office.

Thank You!!



Comment sheets are due by Friday, August 30, 2019

Thank You



July 29, 2019 @ Minto Community Center

NAME & CITY

NAME & CITY

Charles Varnan, Lakota	Cathy Butch Fordville
Mary Ann Ryan Inkster	Jay Sturken Park River
Ben Varnan Lakota	Todd Morgan Great Fork
Frank Matejcek Inkster	Brad Naylor Mont
Chris Schultz Inkster	Brad Becker Inkster
Ernie Pore Pset	Ken Waly Fordville
Clarence Matejcek Thompson	Scott Halst Gilby
Danell Jall Fordville	Gary Ferguson Forest River
TED BIRKHOLZ INKSTER.	Jason Flanders Minto
Jon McMillan Fordville	David Sateron Michigan NA
James Schanick Minto	Shane Whaley Fordville
Tom Perdue GF	Dennis Ruorik minto
Randy Gjestvang Fargo	Sarah Johnston Walsh Co. 3 Rivers Soil Conservation Dist.
Keith Weston Fargo	Yari Villanueva Walsh Co 3 Rivers Soil Conservation Dis
Dana Smestad Fordville	
Les Jall Minto	
Ron Matejcek Brackel	
Lept Matejcek Brackel	
Jauren Will Gwyd	
Brian Brintwell Fordville	
Nicole Brintwell Fordville	

Walsh County Water Resource District

Matejcek Dam NRCS Rehab Study

Public Scoping Meeting

July 29, 2019 @ Minto Community Center

NAME & CITY

NAME & CITY

But a new, whole
LAURENCE BURMAN
We drivers and
Kalina Haugen boss and
Johnny Macle Fordhill and

COMMENT SHEET

Middle-South Branch Forest River Dam No. 1 (Matejcek Dam)

Public Scoping Meeting – July 29, 2019

Please list any comments or concerns regarding this project: This meeting gave statements
As to the watershed. However most people, myself included
thought we would learn of ways or ways to correct the problem,
which was not even proposed. Have more solid information before
the next meeting is held.
(You may also indicate areas of concern on the reverse side of the attached map.)

May we follow up with you for more information? YES NO

Please provide your name, address, email address, and phone number:

Name: Joe A. McMillan

Address: 5472 G Rd 12B Fordville, ND 58231

Email: jmpolar.com@gmail.com

Phone Number: 701-331-0631

Please drop this form off at the conclusion of the meeting, email, or mail back to:

EMAIL: Middle-South Branch Forest River Dam No. 1
matejcek@houstoneng.com

MAIL: Middle-South Branch Forest River Dam No. 1
c/o Walsh County Water Resource District
600 Cooper Avenue
Grafton, ND 58237

Thank you for taking the time to complete this comment form. Please return any completed questionnaire to the Walsh County Water Resource District before leaving.

If you would like more time to complete, please return no later than **FRIDAY, AUGUST 30, 2019** using the email/mail instructions above. Completed forms may also be dropped off at the Walsh County Water Resource District office.

Thank You!!



COMMENT SHEET

Middle-South Branch Forest River Dam No. 1 (Matejcek Dam)

Public Scoping Meeting – July 29, 2019

Please list any comments or concerns regarding this project: _____

(You may also indicate areas of concern on the reverse side of the attached map.)

May we follow up with you for more information?



NO

Please provide your name, address, email address, and phone number:

Name: Brad Narloch

Address: PO Box 28 - Minto, ND 58261

Email: bradnarloch@hotmail.com

Phone Number: 701-520-8341

Please drop this form off at the conclusion of the meeting, email, or mail back to:

 **EMAIL:** Middle-South Branch Forest River Dam No. 1
matejcek@houstoneng.com

MAIL: Middle-South Branch Forest River Dam No. 1
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Thank You!!



WALSH COUNTY
North Dakota
50 cfs Pumping



I attended the meeting at the Minto Community Center in Minto on July 29, 2019. This meeting was to inform the people on the Matejeck Dam condition. I counted about 40-45 people who attended this meeting which represented a lot of the downstream area from the Matejeck Dam to the town of Minto. My son and I farm about 5,000 acres which about 2,000 acres are very heavily impacted by the flow of the Forest River. In the 45 years that I have witnessed the Forest River flooding there has been a increase in field erosion and road damage and local road closures. We here in the lower Forest River desperately need help. The Forest River water shed is a large water shed district. The lower end of the district cannot handle the water flow from the three branches of the Forest River. Today's weather seems to be more violence. The weather will dump 1/4 of our annual rainfall in one rain event. With this weather of extremes we must continue to maintain or flood protection like the Matejeck Dam. There has also been a sizeable amount of surveying and planning for a overflow channel just south of the Town of Forest River. This project would reduce the residential flooding in the towns of Forest River and Minto. This project would also reduce the breakouts on the main channel of the Forest River during peak flow times. These river breakouts have been eroding acres and acres of farm land, damaging Township roads, County roads and bridges. With such grade from the west the water comes so fast we defiantly need to step up flood control.

Sincerely,

Brad Narloch

Minto ND

A handwritten signature in black ink that reads "Brad Narloch". The signature is written in a cursive, flowing style with a large initial "B".

COMMENT SHEET

Middle-South Branch Forest River Dam No. 1 (Matejcek Dam)

Public Scoping Meeting – July 29, 2019

Please list any comments or concerns regarding this project: Need to address upper watershed drainage when rehabing dam. Get SCD involved thru PMTAPP to ID areas that need land treatment. Get Water Quality data to help determine why there was such a big fish kill. Consider storing more water for flood protection. (You may also indicate areas of concern on the reverse side of the attached map.) Need a new O&M plan.

May we follow up with you for more information?

☒ YES

☐ NO

Please provide your name, address, email address, and phone number:

Name: Red River Retention Authority

Address: 1120 28th Ave N., Ste C

Email: rrra@ideacone.net

Phone Number: 701-566-2121 or 701-356-6644

Please drop this form off at the conclusion of the meeting, email, or mail back to:

EMAIL: Middle-South Branch Forest River Dam No. 1
matejcek@houstoneng.com

MAIL: Middle-South Branch Forest River Dam No. 1
c/o Walsh County Water Resource District
600 Cooper Avenue
Grafton, ND 58237

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COMMENT SHEET

Middle-South Branch Forest River Dam No. 1 (Matejcek Dam)

Public Scoping Meeting – July 29, 2019

Please list any comments or concerns regarding this project: WHAT EVER HAPPENED
TO DRAINAGE DITCH IN SECTION 5+6, JOHNSTOWN TWP
TO TAKE FLOOD PRESSURE OFF FOREST RIVER & MINTO CITIES?
IT WOULD BE STRAIGHT SHOT FOR WATER TO FLOW FROM
MATEJCEK DAM (You may also indicate areas of concern on the reverse side of the attached map.)

May we follow up with you for more information?

☒ YES

☐ NO

Please provide your name, address, email address, and phone number:

Name: JIM SCHAMILLER

Address: 651 - HARVEY AVE, MINTO, ND 58261

Email: _____

Phone Number: 701-248-3359

Please drop this form off at the conclusion of the meeting, email, or mail back to:

EMAIL: Middle-South Branch Forest River Dam No. 1
matejcek@houstoneng.com

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Grafton, ND 58237

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Thank You!!



COMMENT SHEET

Middle-South Branch Forest River Dam No. 1 (Matejcek Dam)

Public Scoping Meeting – July 29, 2019

Please list any comments or concerns regarding this project: What changed to make it "High Hazard?"
What is the rehabilitation plan, Remove + Build New, Notification to
down stream Land owners vs public Notice not reaching all
impacted (Written letter)

(You may also indicate areas of concern on the reverse side of the attached map.)

May we follow up with you for more information?

☒ YES

☐ NO

Please provide your name, address, email address, and phone number:

Name: Chris Schulz

Address: 3821 35th Ave NE Inkster ND 58233

Email: _____

Phone Number: 701-865-4255

Please drop this form off at the conclusion of the meeting, email, or mail back to:

EMAIL: Middle-South Branch Forest River Dam No. 1
matejcek@houstoneng.com

MAIL: Middle-South Branch Forest River Dam No. 1
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600 Cooper Avenue
Grafton, ND 58237

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COMMENT SHEET

Middle-South Branch Forest River Dam No. 1 (Matejcek Dam)

Public Scoping Meeting – July 29, 2019

Please list any comments or concerns regarding this project: I support the reconstruction of Matejcek Dam to retain more water and to operate as originally intended for flood control. It is important for both up stream and down stream land owners that this Dam Function as intended and be maintained.

(You may also indicate areas of concern on the reverse side of the attached map.)

May we follow up with you for more information?

☒ YES

☐ NO

Please provide your name, address, email address, and phone number:

Name: John Steffen

Address: 4175 111th Ave NE Michigan, ND 58259

Email: steffenm@polarcomm.com

Phone Number: 701-247-3058

Please drop this form off at the conclusion of the meeting, email, or mail back to:

EMAIL: Middle-South Branch Forest River Dam No. 1
matejcek@houstoneng.com

MAIL: Middle-South Branch Forest River Dam No. 1
c/o Walsh County Water Resource District
600 Cooper Avenue
Grafton, ND 58237

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Thank You!!



WALSH COUNTY
North Dakota



COMMENT SHEET

Middle-South Branch Forest River Dam No. 1 (Matejcek Dam)

Public Scoping Meeting – July 29, 2019

Please list any comments or concerns regarding this project:

Hovey Slough area must be considered and be recognized as a part of the acreage of both Whitman/Matejcek Dam watershed for discharge south east. Where Flooding is the issue here we must strongly support Matejcek Dam be raised the pool for retention ~~now~~ to put it down stream. We have opportunity on a mainstem for an enhanced structure and recreation may be secondary benefits.
(You may also indicate areas of concern on the reverse side of the attached map.)

May we follow up with you for more information?

☒ YES

☐ NO

Please provide your name, address, email address, and phone number:

Name: Ben Varnson

Address: 4877 112th Ave NE, Lakota, ND 58341

Email: benvarnson@yahoo.com

Phone Number: 701-739-3900

Please drop this form off at the conclusion of the meeting, email, or mail back to:

EMAIL: Middle-South Branch Forest River Dam No. 1
matejcek@houstoneng.com

MAIL: Middle-South Branch Forest River Dam No. 1
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600 Cooper Avenue
Grafton, ND 58237

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WALSH COUNTY
North Dakota

