CENTER TO GRAND FORKS 345 KV TRANSMISSION LINE PROJECT

Application to the North Dakota Public Service Commission for a Certificate of Corridor Compatibility

Case No: PU-09-670

Minnkota Power
MPC COOPERATIVE, INC.

February 2011

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List of Abbreviations

Abbreviation	Definition
AADT	Average Annual Daily Traffic
AC	alternating current
ACSR	Aluminum conductor steel reinforced
ACSS	Aluminum conductor steel supported
Act	North Dakota Energy Conversion and Transmission Facility Siting Act
AES	Alternatives Evaluation Study
APLIC	Avian Power Line Interaction Committee
application	Certificate of Corridor Compatibility Application
ATV	all-terrain vehicle
BMP	Best Management Practice
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
Commission	North Dakota Public Service Commission
CPI	center pivot irrigation
CREP	Conservation Reserve Enhancement Program
CRP	Conservation Reserve Program
dB	decibel
dBA	A-weighted decibel
DC	direct current
DOT	North Dakota Department of Transportation
EHS	extra-high-strength
EMF	electric and magnetic fields
EMI	electromagnetic interference
EPA	Environmental Protection Agency
ESA	Endangered Species Act of 1973, as amended
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulations
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FPPA	Farmland Protection Policy Act
GAP	Gap Analysis Program
GIS	Geographic Information System
Guidelines	Commission's Guidelines for Energy Conversion and Transmission Facility Siting
HVDC	high voltage direct-current
Hz	Hertz
IEEE	Institute of Electrical and Electronics Engineers
kV	kilovolt

Abbreviation	Definition
MBTA	Migratory Bird and Treaty Act
MCS	Macro-Corridor Study
Minnkota	Minnkota Power Cooperative, Inc.
MW	megawatt
NAC	Noise Area Classifications
NDAC	North Dakota Administrative Code
NDCC	North Dakota Century Code
NDGF	North Dakota Game and Fish Department
NDLD	North Dakota State Land Department
NDPR	North Dakota Parks and Recreation Department
NEPA	National Environmental Policy Act
NERC	North American Electric Reliability Corporation
NESC	National Electricity Safety Code
NHI	Natural Heritage Inventory
NHPA	National Historic Preservation Act
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRCS	Natural Resource Conservation Service
NRHP	National Register of Historic Places
NMPA	Northern Municipal Power Agency
NWI	National Wetland Inventory
NWR	National Wildlife Refuge
OPGW	optical ground wire
OSHA	Occupational Safety and Health Administration
PA	Programmatic Agreement
PLOTS	Private Lands Open to Sportsmen
PLSS	Public Land Survey System
PPA	power purchase agreement
Project	Center to Grand Forks Transmission Line Project
ROW	right-of-way
Rules	NDAC Energy Conversion and Transmission Facility Siting
RUS	Rural Utilities Service
SHPO	State Historic Preservation Office
Square Butte	Square Butte Electric Cooperative
SSURGO	Soil Survey Geographic soils data
STATSGO	General State Soil Geographic
SVC	Static VAR Compensator
SWPPP	Storm Water Pollution Prevention Plan
TNC	The Nature Conservancy

Abbreviation	Definition
TW	trapezoidal wire
USACE	U.S. Army Corps of Engineers
USDA	U,S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
WDA	Wildlife Development Area
WHO	World Health Organization
WMA	Wildlife Management Area
WPA	Waterfowl Production Area
Young 2	Milton R Young Station Unit 2

1.0 Introduction

Minnkota Power Cooperative, Inc. (Minnkota), proposes to construct, operate, and maintain a 345 kilovolt (kV) transmission line and substation modifications from Center, North Dakota to Grand Forks, North Dakota called the Center to Grand Forks 345 kV Transmission Line Project (Project) (Case No. PU-09-670). Minnkota submits this application for a Certificate of Corridor Compatibility and respectfully requests that the North Dakota Public Service Commission (Commission) approve the Corridor developed for the Project (Project Corridor). The Project Corridor is approximately 247 miles long and begins at the Center 345 kV Substation near Center, North Dakota, and continues east to the Prairie Substation in Grand Forks, North Dakota.

Minnkota is a wholesale electric generation and transmission cooperative headquartered in Grand Forks, North Dakota. Incorporated on March 28, 1940, Minnkota provides, on a nonprofit basis, wholesale electric service to 11 retail/member-owner distribution cooperatives, which are the members and owners of Minnkota. The member systems' service areas encompass 34,500 square miles in the eastern third of North Dakota and northwestern Minnesota that contains an aggregate population of approximately 300,000 people. These cooperatives serve more than 116,000 retail customers including many of the region's schools, farms, homes, and businesses.

The primary source of baseload generation for the rural cooperatives is the Milton R. Young Generation Station located approximately 24 miles northwest of Bismarck, North Dakota, near the community of Center, North Dakota. Minnkota also serves as the operating agent for the Northern Municipal Power Agency (NMPA) members with respect to their 30 percent share of the output from the Coyote Station near Beulah, North Dakota, and associated transmission facilities. NMPA is the energy supplier for 12 municipal utilities located within the Minnkota service area. In addition, Minnkota has acquired, through power purchase agreements (PPAs) with large wind developers, significant North Dakota-based wind energy resources, totaling about 357 megawatt (MW) of nameplate capacity.

1.1 Compliance with the Energy Conversion and Transmission Facility Siting Act Chapter 49-22

The North Dakota Energy Conversion and Transmission Facility Siting Act (Act) requires an application for a Certificate of Corridor Compatibility to meet the criteria set forth in North Dakota Century Code (NDCC) Chapter 49-22. The siting of a transmission facility is to be made in an orderly manner compatible with environmental preservation and the efficient use of resources (NDCC Section 49-22-02). Consistent with this requirement, Minnkota's policy is to locate and design the Project to minimize environmental impacts and utilize existing corridors and section lines to the extent practical.

Within this application, Minnkota presents the information required by the Act. In addition, Minnkota discusses in this application its consideration of the exclusion areas, the avoidance areas, the selection criteria, and the policy criteria set forth in North Dakota Administrative Code (NDAC) Section 69-06-08-02 when selecting the Project Corridor. Also, detailed transmission line design and technical information has been provided so as to allow a thorough evaluation of the Project Corridor.

1.1.1 Rural Utilities Service Planning Documents

Minnkota is requesting financing assistance from the U.S. Department of Agriculture (USDA) Rural Utilities Service (RUS) to construct the Project. RUS administers the USDA's Rural Development Utilities Program and is required to complete an environmental analysis under the National Environmental Policy Act (NEPA) (7 Code of Federal Regulations (CFR) Part 1794) prior to approving financing assistance. The RUS requires preparation of four documents, i.e., an Alternative Evaluation Study (AES), a Macro-Corridor Study (MCS), a Scoping Report, and an Environmental Assessment (EA).

Beginning in March 2009 and on-going, Minnkota initiated a public involvement process for the Project. This is an effort to inform and gather data from the public, agencies, and tribal governments on the Project. Minnkota held five public open house meetings in May 2009, presented the Project at thirteen county commissioner meetings, met with a variety of state and federal agencies at a North Dakota Inter-Agency meeting, sent letters to tribal representatives, and held an additional open house meeting in August 2009.

The objective of the outreach efforts was to educate interested stakeholders on the Project need and description, and gather information to develop potential corridors. To achieve this objective, Minnkota publicized the Project and public meetings through press releases, local advertisements, informational postcards to the public, and letters to county commissioners, agencies, townships, and tribes. In addition, a toll free Project information hotline and website were established to offer resources and to collect input.

Following RUS guidance, Minnkota prepared an Alternative Evaluation Study (AES) to identify the Project's purpose and need and system alternatives for meeting capacity requirements utilizing the alternating current transmission system (see Appendix A for a copy of the AES). The AES was approved by the RUS in October 2009. Please reference Section 2.2 of this application for more information on the Alternatives that were studied.

In October 2009, Minnkota completed a Macro-Corridor Study (MCS) to begin the process of identifying corridors for potential routes (see Appendix B for a copy of the MCS). Development of the MCS was a tiered process that narrowed a large study area into preliminary study corridors and then into macro-corridors. The MCS provided information about environmental, land use, social, cultural, and permitting factors for the macro-corridors. The macro-corridors evaluated for the Project were typically 6 miles wide, while some portions of the macro-corridors were 8 miles wide, such as near the Milton R Young Unit 2 Generation Station (Young 2) and the Prairie Substation. Study corridors were developed by considering the following criteria:

- Parallel existing rights-of-way (transmission lines, pipelines, railway, or roads), survey lines, section/field lines, and natural division lines;
- Avoid populated areas;
- Avoid major environmental natural features (Lake Ashtabula, Jamestown Reservoir, National Wildlife Refuges, Wildlife Management Areas, Wildlife Development Areas);
- Cross major rivers at areas in the vicinity of existing transmission line crossing;
- Avoid public airports;
- Maximize transmission system reliability (e.g., maintain maximum distance from existing Minnkota system transmission lines);

- Minimize length; and
- Follow the Commission's Exclusion and Avoidance Area Criteria set forth in NDAC Section 69-06-08-02.

The purpose of the MCS was to identify potential constraints (natural or human resources that conflict with the location of new transmission line facilities) and opportunities (locations or areas well suited for the location of new transmission line facilities) that were considered when developing the macro-corridors. Generally, constraint areas were avoided, or at least minimized during the macro-corridor development process, and opportunities were used, to the extent practicable, to develop corridors between the two substations. Within the backdrop of constraints and opportunities, practical considerations such as total project length and potential cost issues were also considered.

In November 2009, the RUS held public and agency scoping meetings across the macro-corridors to gain input on opportunities and constraints within the macro-corridors. The goals of the public and agency meetings were to answer questions, provide information regarding the Project description, location, and need, and identify concerns regarding the potential environmental impacts. The agency meetings discussed compliance and permitting requirements and covered the range of issues to be addressed in the EA. In March 2010, the RUS released a Scoping Report for the Project. The Scoping Report summarized the public scoping process and inter-agency consultation regarding the macro-corridors and potential Project alternatives. The Scoping Report can be found in Appendix C.

Following the release of the Scoping Report, the EA process began for the Project (see Appendix D). Comments from the Scoping Report and state and federal agencies, Native American tribes, governmental representatives, and the public were consulted to provide input on potential Project impacts and refine the macro-corridors to develop route alternatives. Through the EA process, three 1,000-foot-wide route alternatives and 38 1,000-foot-wide segment alternatives were developed within the macro-corridors. Through the NEPA process and EA analysis of route and segment alternatives, Minnkota selected a preferred 1,000-foot-wide route alternative. In November 2010, the RUS released the EA for public and agency review during a 30-day-long EA comment period. The EA Comment Report was being prepared at the time this Corridor application was prepared. Comments on the EA were used in developing this Corridor application and will further be considered for the Route Permit application.

The preferred route alternative within the EA was further refined based on landowner discussions and is presented as the Project Corridor within this Corridor application.

1.1.2 Letter of Intent and Waiver of One-Year Notice

In October 2009, Minnkota submitted a Letter of Intent (LOI) to submit an application for a combined Certificate of Corridor Compatibility and Route Permit and a request for a waiver of the one-year notice period between filing the LOI and Certificate of Corridor Compatibility and Route Permit application. The LOI was accepted and the waiver request was granted by the Commission in November 2009. See Appendix E for copies of this correspondence.

1.1.3 Request for Commission Guidance Regarding a Route Proposal

In February 2010, Minnkota submitted a letter to the Commission requesting guidance on routing issues, including a Minnkota-specific routing proposal that addressed unique Project

challenges. In April 2010, the Commission discussed the proposal at a working session. In a May 2010 letter to Minnkota, the Commission made the following recommendations: (1) that separate proceedings be conducted for a Certificate of Corridor Compatibility application and a Route Permit application for the Project; (2) that Minnkota not seek a 1,000-foot-wide route, noting that a preferable approach may be for Minnkota to seek approval of a 1,000-foot-wide corridor for the Project; and (3) that Minnkota identify the proposed centerline and preliminary structure locations (although the preliminary structure locations need not be surveyed) prior to the public hearings on the Route Permit application for the Project. Further, the Commission stated that it would review the timing of plan and profile submittals after receiving the Route Permit application for the Project. See Appendix E for copies of the aforementioned correspondence.

1.1.4 Waiver of Corridor Width Requirement

In July 2010, Minnkota filed an application with the Commission for a waiver of the corridor width requirement set forth in NDAC Section 69-06-04-02(1)(b), which states that "[t]he width of a corridor must be at least ten percent of its length, but not less than one mile . . . or greater than six miles . . . unless approved by the Commission." Minnkota requested that the Commission allow Minnkota to propose an up to 1,000-foot-wide corridor in its Certificate of Corridor Compatibility application for the Project. In August 2010, Minnkota filed a letter requesting that the Commission consider its application for a waiver of the corridor width requirement concurrently with this Certificate of Corridor Compatibility application.

The tiered Project development process discussed in Section 1.1.1 demonstrates that Minnkota's 1,000-foot-wide Project Corridor is the result of an extensive pre-application routing process that provides the basis for Minnkota's request for approval of its 1,000-foot-wide Project Corridor. Through the MCS to EA process, which involved in-depth environmental review and multiple opportunities for agency, tribal, governmental representative, and public input, Minnkota developed a viable 1,000-foot-wide Corridor within the six-mile-wide macro-corridors that meets the Exclusion Area and Avoidance Area criteria set forth in NDAC Section 69-06-08-02.

Essentially, the NEPA-compliance requirement changed Project development from the traditional two-step process (i.e., Certificate of Corridor Compatibility and Route Permit), to a four-step process (i.e., MCS, EA, Certificate of Corridor Compatibility, and Route Permit). Although completed as a precursor to the NEPA process, the MCS process provided the six-mile-wide corridor analysis that would typically be conducted during the Certificate of Corridor Compatibility process, and the EA required identification and analysis of three 1,000-foot-wide routes and multiple segment alternatives, which resulted in Minnkota identifying the 1,000-foot-wide Corridor for the Project that is presented within this application. As discussed in more detail in Minnkota's application for waiver of the corridor width requirement, under the circumstances presented, granting Minnkota's waiver request is appropriate.

1.1.5 Waiver of Procedures

Minnkota submits this application for a Certificate of Corridor Compatibility for the purposes of siting an approximately 247-mile-long, 345 kV transmission facility. Along with review of this application, Minnkota also requests review of its application for a waiver of the corridor width requirement, as discussed above. Therefore, pursuant to NDCC Section 49-22-07.2, Minnkota requests that the Commission waive the following procedure and time schedule requirements:

1. That the Commission hold a separate hearing on an application for a waiver of the corridor width requirement and a Certificate of Corridor Compatibility application, as may be required by NDCC Sections 49-22-08 and 49-22-13, and NDAC Section 69-06-01-02. Minnkota requests that the Commission hold a single consolidated hearing on its application for a waiver of the corridor width requirement and this Certificate of Corridor Compatibility application.
2. That mylar maps and stereo-pair aerial photographs be submitted, as required in the Commission's 1979 Energy Conversion and Transmission Facility Siting Guidelines (Guidelines) regarding Certificate of Corridor Compatibility and Route Permit applications. Geographic Information System (GIS) maps that meet the intent of this requirement are provided in this application.

The Commission's Guidelines with respect to Waiver of Procedures applications require discussion of the following: the facility's description; need for the facility; cost of the facility; and justification for the request for waiver, together with evidence that the facility will produce minimal adverse effects. As discussed below, granting Minnkota's procedure and time schedule waiver requests is appropriate because the Project will produce minimal adverse effects, the waivers are necessary to avoid significant delay to the Project, and granting the waivers will not inhibit review of the corridor width requirement waiver application or this Certificate of Corridor Compatibility application.

Description

Minnkota proposes to construct, own, and operate an approximately 247-mile-long, 345 kV transmission line extending from the existing Center 345 kV Substation at the Milton R. Young Generation Station located about 4.5 miles southeast of the town of Center, North Dakota, in Oliver County, to the existing Prairie Substation located adjacent to the city of Grand Forks, North Dakota, in Grand Forks County. The purpose of the Project is to transmit the power generated by Young 2 via the AC transmission system to Minnkota's service territory in eastern North Dakota and northwestern Minnesota. The Project will create a direct link to Minnkota's service territory, while providing a major improvement to the regional transmission grid and a sound technical solution to the well-documented northern Red River Valley voltage stability issue. Detailed information regarding the Project and Project Corridor is provided throughout this application. Minnkota proposes to develop the Project on the schedule set forth in Section 1.3 of this application.

The Project utilizes a base design that will accommodate the output capacity of Young 2, with sufficient margins for outage contingencies. Minnkota has received interconnection requests for proposed wind projects seeking to interconnect to the Project. Although the base design will afford a certain amount of additional transmission capacity, future modifications and/or improvements may be required in order to accommodate these interconnection requests, and the parties requesting interconnection would be financially responsible for any system upgrades or modifications required to facilitate interconnection. However, wind development companies who have filed interconnection requests are not yet willing to commit to their requests from both financial and design perspectives. Due to this inherent uncertainty associated with large wind projects in the early stages of development, Minnkota must proceed with the base design in order to meet its obligations for reliability and load serving capability.

Need

The need for the Project and how it will further the public interest is described in greater detail in Section 2.0 of this application.

Cost

The estimated total cost of construction is $312 million (2009 dollars) based on 959.6 kcmil Suwannee TW type ACSR conductor, mono-pole structures, an assumed line cost of $1.1 million per mile, and an estimated cost of $37 million for substation upgrades.

The substation costs represent estimated expenditures at existing facilities. The estimate for modifications to the Center 345 kV Substation is $14 million, of which $3 million is for substation improvements and $11 million represents the cost of two new 345/230 kV 360 MVA power transformers. The estimate for modifications to the Prairie Substation is $22 million of which $11 million is for improvements and additions and $11 million is for one new transformer equivalent to the two Center units and relocation of an existing transformer from Center 345 kV Substation to Prairie Substation.

The primary operating and maintenance cost for a transmission line is the cost of inspections, usually done quarterly by air and once per year by ground. Annual operating and maintenance costs for transmission lines vary depending upon the setting, the amount of vegetation management necessary, storm damage occurrences, structure types, materials used and the transmission line's age. For 115 kV through 345 kV transmission lines, past experience has shown that annual costs are approximately $300 to $500 per mile.

Justification for Waivers

Section 49-22-07.2 of the Act provides that the Commission may waive procedures upon a finding that "the proposed facility is of such length, design, location or purpose that it will produce minimal adverse effects." Granting the requested waivers is appropriate because, Minnkota's Project satisfies this requirement.

In selecting the Project Corridor, Minnkota took into consideration the input provided by federal and state agencies, Native American tribes, governmental representatives, and the public both prior to and during the NEPA process (see Sections 6.0 and 8.11 of this application). Minnkota has also thoroughly analyzed the Corridor using the criteria set forth in Section 49-22-09 of the Act (see Section 8.0 of this application); the Avoidance Area, Exclusion Area, Policy and Selection Criteria set forth in NDAC Section 69-06-08-02 (see Section 3.0 of this application); and the Commission's Guidelines (see Table 1.1-1 in Section 1.1.5 of this application, and the Sections referenced therein). Based upon Minnkota's thorough investigation and analysis, as demonstrated in this application, locating the Project within the Corridor proposed will produce minimal adverse effects.

Furthermore, waivers of the procedures and time schedules requested are necessary in order to prevent potentially significant delay to the Project, which, in turn, could result in the Project being unable to timely meet the need discussed in Section 2.0. Granting the particular waivers requested will also not inhibit review of either the corridor width waiver application or this Certificate of Corridor Compatibility application.

For these reasons, Minnkota respectfully requests that the Commission grant the requested waivers.

1.1.6 Certificate of Corridor Compatibility

Table 1.1-1 outlines the information required to fulfill the requirements to obtain a Certificate of Corridor Compatibility from the Commission using the Commission's Guidelines and identifying where these requirements are addressed in this application.

Table 1.1-1. Certificate of Corridor Compatibility Completion Checklist

State Authority	Description	Section
Chapter 49-22	**Commission Guidelines: Energy Conversion and Transmission Facility Siting**	**1.1**
Section A	**Description**	**1.2, 4.2**
1.	Type: Describe the type of transmission facility addressed in this application. The description shall include the purpose of the facility and the technology to be employed.	1.0, 1.2, 2.1, 4.2.1
2.	Product: Describe the type, source, and final destination of the product to be transmitted by the proposed facility.	1.2.2
3.	Size and Design:	4.0
a.	Provide a description of the size and design of the ELECTRICAL facility including, but not limited to, the following:	4.2.1, 4.2.2, 4.2.3, 4.2.4
1.	Width of right of way;	4.2.1
2.	Estimated span lengths;	4.2.1
3.	Anticipated type of structure;	4.2.1
4.	Approximate length of facility	1.0, 1.2, 4.1
5.	Voltage; and	4.2.1
6.	The requirement for a general location of any new associated facilities.	4.2.4
b.	Provide a description of the size and design of the pipeline facility including, but not limited to, the following:	N/A
4.	Time Schedule: Provide the anticipated time schedule for the accomplishment of the following events:	1.3
a.	Certificate of Corridor Compatibility;	1.3
b.	Route Application;	1.3
c.	Route Permit;	1.3
d.	Construction start date;	1.3
e.	Construction complete; and	1.3
f.	In-service date.	1.3

State Authority	Description	Section
Section B	**Studies**	
	Provide a copy of any evaluative studies or assessments of the environmental impact of the proposed facility submitted to any federal, regional, state, or local agency.	See Appendices A, B, D, F and G. MCS, AES, Scoping Report, Cultural Resources Class I Literature Search, Raptor Nest Survey, and an EA were performed for areas that encompass the Project Corridor. The aforementioned documents are appended to this application. Additional environmental studies and surveys will be completed once a route is identified.
Section C	**Need for Facility**	**2.0**
1.	An analysis of the need for the proposed facility based on present and projected demand for the product to be transmitted by the facility, including the most recent system studies supporting the analysis of the need.	2.1
2.	A description of any feasible alternative methods of serving the need.	2.2
3.	A statement justifying any deviations from the most recent Ten-Year Plan which the proposed facility may present.	2.3
Section D	**Location**	**Figures, 4.1**
1.	Select a study area, which includes the proposed corridor, of sufficient width to enable the Commission to evaluate the factors addressed in Section 49-22-09, NDCC.	1.2.1
2.	Identify and map the criteria that led to the proposed corridor location within the study area.	Figures, 1.2.1, 3.0, 3.1, 3.2, 3.3, 3.4, 3.5, 3.6
3.	Discuss the relative value of each criteria and how the proposed corridor location was selected giving consideration to all criteria.	1.2.1, 3.0, 3.1, 3.2, 3.3, 3.4, 3.5, 3.6
4.	The criteria to be evaluated shall include at a minimum all of the following which are within the study area:	3.0
a.	Exclusion areas;	3.1
b.	Avoidance areas;	3.2
c.	Selection criteria;	3.3
d.	Policy criteria;	3.4
e.	Design and construction limitations; and	3.5
f.	Economic considerations.	3.6
5.	Discuss the general mitigative measures that will be taken to minimize adverse impacts which result from a route location in the proposed corridor.	5.1.3, 5.2.3, 5.3.3, 5.4.3, 5.5.3, 5.6.3, 5.7.3, 5.8.3, 5.9.3, 5.10.3, 5.11.3, 5.12.3, 5.13.3, 5.14.3, 5.15.3, 5.16.3
6.	List the qualifications of the people in the various disciplines that contributed to the corridor location study	9.0

State Authority	Description	Section
7.	Maps	Figures
a.	Map the criteria within the study area showing the proposed corridor. Several different criteria may be shown on each map, depending on the map scale and the density and nature of the criteria. Minimum map scale shall be ½ inch = 1 mile. All maps shall be at the same scale unless otherwise specified.	Figures
b.	Furnish one set of Mylar maps, separate from the application, of the same scale as the criteria maps and showing the same basic features as the criteria maps, including the study area, but not the proposed facility location.	N/A. See Section 1.1.3
Chapter 49-22-09	**Factors to be considered in evaluating applications and designation of sites, corridors, and routes.**	**8.0**
1.	Available research and investigations relating to the effects of the location, construction, and operation of the proposed facility on public health and welfare, natural resources, and the environment.	8.1
2.	The effects of new energy conversion and transmission technologies and systems designed to minimize adverse environmental effects.	8.2
3.	The potential for beneficial uses of waste energy from a proposed energy conversion facility	8.3
4.	Adverse direct and indirect environmental effects which cannot be avoided should the proposed site or route be designated.	8.4
5.	Alternatives to the proposed site, corridor, or route which are developed during the hearing process and which minimize adverse effects.	8.5
6.	Irreversible and irretrievable commitments of natural resources should the proposed site, corridor, or route be designated.	8.6
7.	The direct and indirect economic impacts of the proposed facility	8.7
8.	Existing plans of the state, local government, and private entities for other developments at or in the vicinity of the proposed site, corridor, or route.	8.8
9.	The effect of the proposed site or route on existing scenic areas, historic sites and structures, and paleontological or archaeological sites.	8.9
10.	The effect of the proposed site or route on areas which are unique because of biological wealth or because they are habitats for rare and endangered species	8.10
11.	Problems raised by federal agencies, other state agencies, and local entities	8.11

1.2 Project Summary

The Project consists of approximately 247 miles of new, high voltage AC transmission line from the existing Center 345 kV Substation at the Milton R. Young Generation Station located about 4.5 miles southeast of the town of Center, North Dakota in Oliver County, to the existing Prairie Substation located on the western boundary of the city of Grand Forks, North Dakota in Grand Forks County (Figure 1). The Project will deliver energy from existing baseload generation to Minnkota's cooperative members. While final engineering and design have not been completed, the majority of the line will be constructed with single-pole steel structures. Typical structures will be approximately 140-feet-high and placed approximately 1,000-feet apart. The typical right-of-way (ROW) will be approximately 150-feet-wide.

1.2.1 Study Area and Project Corridor Development Summary

Project Corridor development is discussed in more detail in Section 1.1.1. Minnkota identified a need for additional power generation in northeast North Dakota and northwest Minnesota. Transmission constraints in this area were also threatening the stability of the regional transmission system. Minnkota defined a Study Area, rectangular in shape, that encompassed an area from Young 2 near Center, North Dakota (in the west), to Grand Forks and Fargo, North Dakota (in the east). The Study Area was narrowed into preliminary study corridors, based upon the criteria discussed in Section 1.1.1. At first, the preliminary study corridors were developed to terminate in Grand Forks and Fargo. System impact studies indicate that a termination in Grand Forks supports a higher North Dakota load serving limit for the regionally limiting contingency. Voltage stability limits for prior-outage contingencies were also shown to be higher for the Grand Forks alternative. Fargo was not recommended as an end point due to the increased benefits shown from terminating in Grand Forks (see the AES provided in Appendix A).

Minnkota began the route development process by preparing the AES to identify alternatives for meeting capacity requirements and also prepared a MCS to begin the process of identifying a corridor for potential routes. The MCS was developed for the RUS and provided information about environmental, land use, social, cultural, and permitting factors for the macro-corridors within the Study Area (see the MCS provided in Appendix B). The RUS conducted a series of public meetings and an agency meeting to gain input on opportunities and constraints within the macro-corridors. The Scoping Report summarizes the comments collected during the meetings and a 30-day comment period (see the Scoping Report provided in Appendix C). Based on comments from the Scoping Report, public and agency input, and Minnkota's review of the macro-corridors, an EA was developed and a preferred Project Corridor was selected and is presented in this application (see the EA provided in Appendix D).

The factors addressed in NDCC Section 49-22-09 were considered in evaluating the Project Corridor for a 345 kV transmission line and are discussed in Section 8.0. All exclusion and avoidance area criteria were considered in selecting the Project Corridor. Minnkota sought to avoid residential areas, irrigated land, recreational areas, wildlife, and conservation areas to the extent practicable. Minnkota also considered utilizing existing rights-of-way and Public Land Survey System (PLSS) lines, crossing agricultural fields, and interconnecting with existing infrastructure where possible, such as with the existing substations at both ends of the Project. This is consistent with the Commission's Policy Criteria for transmission corridors and routes (see NDAC Sections 69-06-08-02(2)(e), 69-06-08-02(4)(i), and 69-06-08-02(4)(g)), which encourage applicants to avoid residences and to maximize benefits by coordinating facilities and utilizing existing and proposed rights-of-way and corridors.

1.2.2 Product

The Project will transmit Young 2 output from the existing Center 345 kV Substation (located northeast of the Milton R. Young Generation Station, near Center, North Dakota) to the existing Prairie Substation in Grand Forks, North Dakota. The line is intended to be energized at 345 kV AC. Much of the energy transmitted on the new transmission line will be used to serve Minnkota customers in North Dakota and Minnesota.

1.3 Project Schedule

Minnkota's construction schedule will be set by satisfactorily reaching a number of milestone agreements and obtaining required approvals. The in-service date is dependent upon board approvals, as well as permitting and development activities. Minnkota is targeting construction to begin in summer/fall 2011, provided that Minnkota can secure all preconstruction permits and approvals. No Project expansions or additions are anticipated at this time.

1. **Certificate of Corridor Compatibility:** Minnkota anticipates the Certificate of Corridor Compatibility will be issued in the second quarter of 2011.
2. **Route Application and Permit:** Minnkota will submit a separate Route Permit application for the Project. Minnkota anticipates the Route Permit will be issued in the third quarter of 2011. It is critical for Minnkota to receive the Certificate of Corridor Compatibility and Route Permit as soon as possible, as completing this step will allow Minnkota to move forward with other commitments associated with the Project, including ordering long-lead-time equipment and securing other permits and approvals.
3. **Equipment Procurement, Manufacture, and Delivery:** Minnkota will order the transmission and substation components as soon as practicable. Once the components have been ordered, delivery is anticipated to occur so as to allow construction to be completed by the 1st quarter 2013.
4. **Construction:** Project construction is expected to begin in summer/fall 2011, subject to obtaining applicable permits. Construction will take approximately twenty months to complete.
5. **Test and Operations:** Minnkota expects system commissioning will occur in 1st quarter 2013.
6. **In-Service Date:** The expected in-service date is 1st quarter 2013.

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2.0 Need for Facility

2.1 Needs Analysis

Over the past ten years, Minnkota's load has grown at a rate of 2.9 percent annually (AES). In addition, Minnkota's 2009 Load Forecast Study showed that load will continue to grow at a rate of approximately 1.9 percent annually over the next 25 years (Minnkota 2010a). In order to adequately serve this future load growth, Minnkota must increase its baseload generation resources. In particular, additional baseload generation is needed by the winter of 2013 to address an increased need for electricity to serve new residences, commercial accounts, and pipeline pumping projects (Minnkota 2010a).

To address the need for additional baseload generation resources, Minnkota recently entered into an agreement to amend an existing power purchase agreement (PPA) with Minnesota Power, a division of ALLETE, and Square Butte Electric Cooperative (Square Butte). Pursuant to this agreement, Minnesota Power released to Minnkota the rights to its share of generation from the Square Butte-owned Young 2 generation station. This allows Minnkota to increase its allocation of generation from Young 2 from 50 percent to 100 percent over the next several years. In return, Minnkota has agreed to release its rights for transmitting power from Young 2 via the Square Butte high-voltage direct-current (HVDC) transmission line that terminates near Duluth, Minnesota. Square Butte, in turn, sold the HVDC transmission line to Minnesota Power. The new agreements between Minnkota, Minnesota Power, and Square Butte provide Minnkota with additional baseload power supply without the need to construct a new coal-fired plant, and provide Minnesota Power with existing transmission facilities to develop and deliver substantial wind energy from North Dakota to its consumers in Minnesota.

The agreement with Minnesota Power and Square Butte will enable Minnkota to begin acquiring additional baseload generation from Young 2 in early 2013. However, because the existing HVDC transmission line will no longer be available to carry the full generation output of Young 2, the power generated by Young 2 will need to be transmitted via the AC transmission system to Minnkota's service territory in eastern North Dakota and western Minnesota.

Regional transmission-system studies for the eastern North Dakota and northwestern Minnesota area since 2005 have demonstrated the need for improvements due to systemic voltage instability and load serving issues. In addition, these studies have found that the existing AC transmission system is already operating at capacity without any additional load growth. System studies indicate that additional transmission into the northeastern part of North Dakota from the area of concentrated generation in central North Dakota is the preferred alternative in order to address these issues within Minnkota's service territory. The purpose of this Project is to address future load growth, system voltage stability, and load serving issues in Minnkota's service territory. In order to fulfill its obligations for future load growth, Minnkota must increase its baseload generation resources.

The Project will provide a direct link to Minnkota's service territory, while providing a major improvement to the regional transmission grid and a sound technical solution to the northern Red River Valley voltage stability issue, which is documented in the AES. The Project has the potential to support wind generation development in North Dakota. Therefore, the Project will be the optimal alternative to address the needs of Minnkota's service area and the region.

2.2 Alternatives

Minnkota conducted an AES on the Project for the RUS, which discussed system alternatives for addressing Minnkota's Young 2 output transmission requirements utilizing the AC transmission system. As discussed in the AES, regional transmission studies and Minnkota-specific system studies have shown that the best solution for addressing Minnkota's transmission requirements, as well as for meeting the voltage stability and load-serving capability needs of the Red River Valley region, is to construct a new transmission facility. The Project is needed to replace the capability of transmitting the output of Young 2 over an existing HVDC transmission line, and to improve regional electrical system reliability.

The AES analyzed specific alternatives to the Project (i.e., No Action, 230 kV Line, and 345 kV Line from Center to Fargo) to provide the required load serving capability to meet anticipated customer demand into the future and to provide voltage stability support for the northern Red River Valley (Table 2.2-1).

Table 2.2-1. System Alternatives

Action	Description
No Action	Young 2 generation is placed on existing system.
New Transmission - 230 kV Center to Grand Forks	Transmission line consisting of a 230 kV line from the Center Substation, near Center, to the Prairie Substation, in Grand Forks.
New Transmission - 345 kV Center to Grand Forks	Transmission line consisting of a 345 kV line from the Center Substation, near Center, to the Prairie Substation, in Grand Forks.
New Transmission - 345 kV Center to Fargo	Transmission line consisting of a 345 kV line from the Center Substation, near Center, to the Maple River Substation, near Fargo.
Optional Corridor Concept for Interconnection Requests	Tap the proposed 345 kV transmission line to Grand Forks, near Finley, North Dakota, and develop a 345 kV line section between Finley and Fargo. Develop a new 345 kV substation near Finley.
Underground Transmission Line	Underground construction of the entire 345 kV transmission line.

2.2.1 No Action

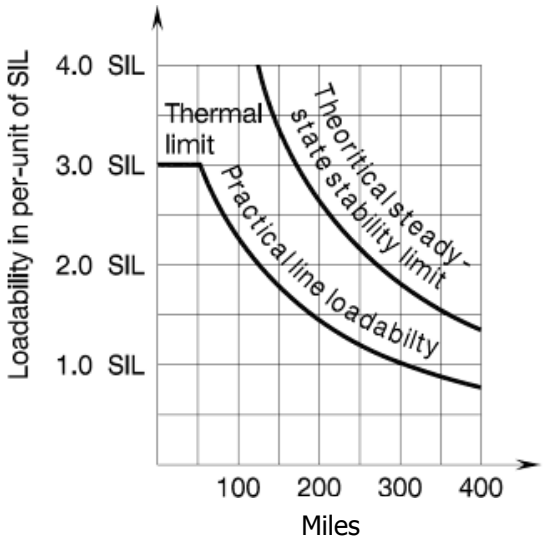
The "No Action" alternative would place Young 2 generation on the existing transmission system. The substantial wind generation development at the Square Butte bus and subsequent reallocation of Young 2 outlet would result in significant dynamic stability and steady state impacts on the AC transmission system in the North Dakota coal field region, based on studies completed in June 2009. The studies indicated the "no transmission addition" option is not feasible due to these impacts and a new transmission line is required to transition the output of Young 2 off of the HVDC line and onto the AC system. Therefore, not constructing the Project may result in other facilities being built.

2.2.2 New Transmission - 230 kV Center to Grand Forks

Minnkota conducted a study in 2005[1] to assess the options for providing a transmission outlet for a possible third unit addition at the Milton R Young Station. At that time, the assumed generator size was 250 MW and the output was assumed to be delivered to Grand Forks. Even at 250 MW, a 230 kV line resulted in a significant increase in power flowing through the Western Area Power Administration's (WAPA) transmission system. A new 230 kV line for the full output of Young 2 (455 MW) would cause far more serious impacts to the existing AC system.

In addition, a transmission line's ability to transport increasing amounts of electric power is referred to as the line's loading limit. It is generally constrained by the line's thermal limit. When a transmission line is short, the impedance of the conductor is smaller and therefore the line can be loaded up to its capacity, or thermal limit, and still maintain stable voltage (steady state stability). The longer the transmission line becomes, however, the higher the impedance of its conductor and the lower its ability to maintain acceptable steady state voltage. In short, as a line's length increases, its practical loading limit becomes less than its thermal limit. As a result, a longer line provides less load-serving capacity than a shorter line of the same voltage. Diagram 2.2-1 below illustrates the relationship between line length and practical loadability. Due to the length of the proposed line and the amount of output from Young 2, Minnkota concluded that 230 kV is not an acceptable voltage for the Project.

Diagram 2.2-1. Transmission Line Loadability Limits



Note: The above transmission line loadability curve is for 60 Hz uncompensated overhead lines and based on Figure 6.1.2 from Power System Analysis and Design, Glover/Sarma, at 217 (PWS Publishers 1987). "SIL" refers to "surge impedance load," which is the power delivered to an electric load that is equal to a transmission line's characteristic impedance. For a 230 kV line, the SIL is approximately 145 MW.

2.2.3 New Transmission - 345 kV Center to Grand Forks

A new 345 kV line from Center to Grand Forks is the best performing transmission alternative to meet Minnkota's load serving needs as well as provide voltage support for the northern Red

[1] Young 3 Transmission Study Report with Generator Cruise Rating of 250 MW; Tim Bartel, Senior Systems Engineer, Minnkota Power Cooperative, Inc., January 11, 2005.

River Valley and Bemidji, Minnesota areas. This conclusion is based on the technical analyses previously performed by regional planners and by feasibility studies recently performed for Minnkota by its consultant.

This line would provide voltage support to the Bemidji area and the Red River Valley. The dynamic stability performance for the 345 kV line from Center to Grand Forks requires less mitigation compared to the 345 kV line from Center to Fargo and the voltage stability performance significantly increases voltage stability limits in the Red River Valley and Bemidji areas.

2.2.4 New Transmission - 345 kV Center to Fargo

Dynamic stability performance would be acceptable with a new 345 kV line from Center to Fargo. There are required mitigations that may include capacitor additions at the Groton, South Dakota, 345 kV Substation, a Static VAR (volt-ampere reactive) Compensator (SVC) at the Jamestown Substation or the Maple River Substation, and a capacitor at the Jamestown Substation or the Maple River Substation. The voltage stability limits are lower for the 345 kV line from Center to Fargo compared to the 345 kV line from Center to Grand Forks alternative. A lower stability limit equates to a lower load serving capability for the region.

Voltage stability performance was compared for the two 345 kV AC transmission alternatives. Based on study results, it can be concluded that the introduction of a 345 kV source into the Grand Forks area significantly increases voltage stability performance in the Red River Valley and Bemidji, Minnesota areas. This alternative, in general, exhibits higher voltage stability limits compared to the Fargo alternative. In cases where these alternatives had previously exhibited similar performance (without the proposed CapX2020 Fargo to St. Cloud 345kV line), results show that the addition of the Fargo to St. Cloud line tilts the balance more in favor of the 345 kV Center to Grand Forks alternative.

2.2.5 Underground Transmission Line

Undergrounding of transmission lines similar in size to the Project would result in significant construction, operation, and maintenance issues, and, in turn, significant costs. Undergrounding of electric utility infrastructure is a technically feasible option for lower voltage distribution lines. It is common today to see lower voltage distribution lines that connect to homes and businesses buried directly in the ground. In the case of distribution lines, undergrounding offers aesthetic and environmental benefits while posing relatively few construction, maintenance, and operations challenges.

However, the complexity and cost of undergrounding increases as the voltage increases. As a result, undergrounding is never used for transmission facilities similar in size to this Project because it is not technically feasible and cannot be connected to other transmission systems. The cost for underground construction depends upon a variety of factors specific to a project, but represents the more complicated engineering, increased construction time, and specialized material and labor requirements.

Minnkota has estimated the transmission line cost for the Project to be about $1.1 million per mile in 2009 dollars. If technically feasible, the estimated cost range for the same voltage line to be placed underground would be $11 million to $16.5 million per mile. This cost range for an underground line does not include the cost for substations, with the large inductors that are necessary approximately every 20 miles to counteract the greater line charging currents associated with undergrounding. In addition, there are increased line losses and maintenance

expenses incurred throughout the useful life of an underground line compared to an overhead line. Because of the significantly greater expense, typically installation of underground transmission has been limited to locations where physical circumstances allow no other option or where overhead construction is prohibited. Examples include congested downtown centers where there is no space available between city streets and adjacent buildings for adequate clearance.

While underground lines reduce visual impacts (other than at the overhead/underground transition locations) and may minimize surface impacts after construction, there are distinct environmental consequences. The predominant environmental impact from the construction, operation, and maintenance of underground transmission lines arises from the need to develop and maintain a ROW totally cleared of woody vegetation. The construction activities for an overhead line are concentrated around the line's structures, with the areas between structures left relatively undisturbed except for the removal of trees that could interfere with the energized conductors. A narrow pathway between structures is often all that is necessary to string the conductors. With underground construction, however, the entire ROW must be cleared for construction activities along the entire length of the corridor. This increases impacts to wetland areas due to the installation of access roads capable of supporting heavy construction equipment, trenching activities, and cable installation. These wetland impacts would be permanent if a permanent access road appropriate for heavy equipment use were constructed to allow quick access to repair the underground line in the event of an incident taking it out of service.

Additional facilities are required for underground transmission line construction to control the thermal performance of the underground line. With larger capacity lines, gas-insulated line technology must be employed to provide the heat removal requirements that are necessary. Typical overhead transmission lines are bare conductor, and ambient temperature and wind across the lines are adequate to remove and disperse heat from the line. In high voltage underground lines, a separate cooling system is required to remove and disperse heat away from the enclosed underground containment. Cooling systems have only been feasible on short underground transmission systems, and have not been developed for longer line length applications. A transmission line of the length being considered on the Project would require multiple cooling systems for the entire length of the line.

Underground lines also present challenging reliability and service issues. While overhead lines are subject to more frequent outages than underground lines, service is usually quickly restored by the automatic re-closing of circuit breakers, resulting in only a momentary outage of the transmission line. The lower incidence of outages with underground cables is offset by the fact that the outages are much longer. This is because re-closing circuit breakers is not recommended until it is verified that there is no fault in the underground cable.

Restoration of a faulted underground line also takes much longer due to the difficulty in locating the fault and accessing the site to make repairs. Repairing failures in high voltage extruded dielectric cables is typically not done. Instead, the cable is completely replaced between man-hole splice points that are generally located every 1,500 to 2,000 feet along the cable. This is expensive and very time consuming, with restoration taking several weeks or longer depending upon the location and difficulty of access. Replacing cable involves bringing in heavy equipment, including cable reels weighing 30,000 to 40,000 pounds, during all seasons of the year. If the failure is in a splice, it may be feasible to make a repair at the splice location without having to replace large quantities of cable, but access is still required for equipment and personnel. If the

fault occurs in a wetland area where all-season roads are not maintained, restoration can be further delayed as matting is installed to gain access to the manholes used to replace the failed cable.

Based on the AES results, Minnkota determined that none of the evaluated system alternatives were able to meet the identified need as well as or at a comparable cost to the Project.

2.3 Ten-Year Plan

Minnkota filed a Ten-Year Plan with the Commission in July 2010. This Project is consistent with the Ten-Year Plan on file with the Commission.

3.0 Transmission Facility Corridor Criteria

The Project Corridor selection included an inventory and suitability analysis of criteria listed in NDAC Section 69-06-08-02, including exclusion and avoidance area criteria; selection criteria that relate to minimizing potential land use and environmental impacts; policy criteria that relate to maximizing public benefits; and design and construction limitations. Minnkota also included economic considerations. Figure 2 displays Project Corridor siting criteria used to determine the location of the Project Corridor.

3.1 Exclusion Areas

Per Section 69-06-08-02(1), the following geographical areas (Table 3.1-1) shall be excluded in the consideration of a route for a transmission facility, and shall include a buffer zone of reasonable width to protect the integrity of the area. Exclusion areas are mapped for the Project Corridor in Figure 3.

Table 3.1-1. Exclusion Areas

Geographic Area	Present within Project Corridor[1]	Present within Project Vicinity[2]	Proposed Buffer	Section Addressed
Designated or registered national: parks; memorial parks; historic sites and landmarks; natural landmarks; monuments; and wilderness areas	Not present within Project Corridor	Not present within Project Vicinity	No impacts are anticipated and no buffer is proposed.	5.2; 5.7; 5.8
Designated or registered state: parks; historic sites; monuments; historical markers; archaeological sites; and nature preserves	Not present within Project Corridor	Not present within Project Vicinity	No impacts are anticipated and no buffer is proposed.	5.2; 5.7; 5.8
County parks and recreational areas; municipal parks; and parks owned or administered by other governmental subdivisions	Not present within Project Corridor	Potentially Present: Municipalities (Aneta, Northwood, Grand Forks) are located within 1 mile of Corridor	No impacts are anticipated and no buffer is proposed.	5.2, 5.8

Geographic Area	Present within Project Corridor[1]	Present within Project Vicinity[2]	Proposed Buffer	Section Addressed
Areas critical to the life stages of threatened or endangered species	Missouri River (100% of Corridor width) is designated critical habitat for federally threatened piping plover. River will be spanned by the transmission line. Minnkota is working with the USFWS on the Missouri River crossing for the Project Corridor.	Missouri River is designated critical habitat for the federally threatened piping plover.	Minnkota has engaged the U.S. Fish and Wildlife Service (USFWS) in the Section 7 consultation process to ensure that the Project will not jeopardize the continued existence of any listed species or adversely modify critical habitats. No direct impacts within critical habitat expected; transmission line will span Missouri River, with structures being placed about 150-feet-away (back) from river's edge. Minnkota will not construct the Missouri River crossing during the typical breeding season for the piping plover.	5.2, 5.8, 5.14; 5.15, 5.16
Areas where animal or plant species that are unique or rare to this state would be irreversibly damaged	Areas containing unique or rare plant or animal species are present within the Project Corridor, but these areas and unique or rare species will not be irreversibly damaged by the Project.	6 Species of Concern are present within Project Vicinity, but no animal or plant species considered unique or rare to the state will be irreversibly damaged by the Project.	See Section 5.16.3 for a list of mitigation and minimization measures Minnkota has identified. The Project is not expected to result in the listing of or jeopardizing of continued existence of any wildlife species, and will not violate any wildlife protection laws. Some examples of mitigation and minimization measures include shield wire marking, spanning the Missouri River, constructing the Missouri River crossing between November and the following March, pre-construction piping plover surveys, and designing the transmission line following Avian Powerline Interaction Committee (APLIC) standards.	5.2, 5.8, 5.15, 5.16

[1] Features present within Project Corridor encompass 50% or less of the Corridor's width, unless otherwise indicated.

[2] Project Vicinity indicates area within 1 mile of Corridor unless otherwise indicated.

3.2 Avoidance Areas

Per Section 69-06-08-02(2), the following geographical areas (Table 3.2-1) shall not be considered in the routing of a transmission facility unless the applicant shows that under the circumstances there is no reasonable alternative. In determining whether an avoidance area should be designated for a facility, the Commission may consider, among other things, proposed management of adverse impacts; orderly siting of facilities; system reliability and integrity; efficient use of resources; and alternative routes. Avoidance areas are mapped for the Project Corridor in Figure 3.

Table 3.2-1. Avoidance Areas

Avoidance Area	Present within Project Corridor[1]	Present within Project Vicinity[2]	Proposed Buffer	Section Addressed
Designated or registered national: historic districts; wildlife areas; wild, scenic or recreational rivers; wildlife refuges; and grasslands	- 2 Waterfowl Production Areas (WPAs) (Hoornaert and Gaub). - 1 Wildlife Development Area (WDA) (East Park Lake)	- 10 WPAs (Barlow, Bauers, Delfs, Ehni, Faul, Gaub, Hoornaert, Schindler, Tande, Topp) - 3 WDAs (East Park Lake, Kindschi, Indian Hills) - 1 National Wildlife Refuge (NWR) (Sibley Lake)	Minnkota will route the transmission line along field breaks and section lines to avoid the WPAs and WDA present within the Project Corridor. Access will be maintained and recreational activity may continue.	5.2; 5.7; 5.8; 5.12; 5.15
Designated or registered state: wild, scenic, or recreational rivers; game refuges; game management areas; management areas; forests, forest management lands; and grasslands	1 Wildlife Management Area (WMA) (Wilbur Boldt)	2 WMAs are within 1 mile (Wilbur Boldt, Wells County)	Minnkota will route the transmission line along field breaks and section lines to avoid the WMA present within Project Corridor. Access will be maintained and recreational activity may continue.	5.8; 5.12; 5.14
Historical resources which are not specifically designated as exclusion or avoidance areas	- 11 previously recorded archaeological resources within SHPO's database - 12 historic structures were previously recorded within SHPO's database	- 63 previously recorded archaeological resources within SHPO's database - 57 historic structures previously recorded within SHPO's database.	No previously recorded archaeological or architectural resources will be impacted by construction or operation of the Project. Minnkota will conduct cultural resource field surveys prior to construction to avoid impacting any cultural resource sites identified. Sensitive information was redacted from Figure 3.	5.7
Areas that are geologically unstable	Not present within Project Corridor	Not present within Project Vicinity	No impacts are anticipated and no buffer is proposed.	5.11

Avoidance Area	Present within Project Corridor[1]	Present within Project Vicinity[2]	Proposed Buffer	Section Addressed
Within 500 feet of a residence, school, or place of business	7 homes	28 homes located 500 to1,000 feet from Corridor centerline (adjacent to Corridor)	Minnkota will develop a route to avoid occupied homes by maximizing setbacks to the extent practicable within Project Corridor. In some instances, it may be preferable for a route to pass within 500 feet of an occupied residence due to other routing factors. Minnkota will work with landowners affected to obtain a waiver of the 500-foot setback requirement. If unable to obtain the requested waiver, a viable route that complies with the 500-foot setback from all occupied residences will be developed within the Project Corridor.	5.2; 5.3; 5.9
Reservoirs and municipal water supplies	Not present within Project Corridor	3 municipalities (Aneta, Grand Forks, Northwood)	Minnkota does not anticipate direct or indirect effects to reservoirs and municipal water supplies.	5.3; 5.11; 5.12
Water sources for organized rural water districts	The McClusky Canal will be crossed by the Project Corridor. Rural water pipelines may potentially be present.	The McClusky Canal will be crossed by the Project Corridor. Rural water pipelines may potentially be present.	The McClusky Canal will be crossed by the Project Corridor, but no impacts are anticipated and water will be available to rural water districts. Minnkota will conduct a survey for underground utilities and does not anticipate direct or indirect effects to rural water districts.	5.3; 5.11
Irrigated land. This criterion shall not apply to an underground transmission facility.	1 central pivot irrigation (CPI) system located within Project Corridor	10 central pivot irrigation (CPI) systems located within Project Vicinity	CPI systems will be avoided to the extent practicable, and where impacts will occur, Minnkota will work with landowners to ensure final structure placement accommodates system functionality.	5.2; 5.9

Avoidance Area	Present within Project Corridor[1]	Present within Project Vicinity[2]	Proposed Buffer	Section Addressed
Areas of recreational significance which are not designated as exclusion areas	- North Country National Scenic Trail (100% of Project Corridor width) - Lewis and Clark National Historic Trail (100% of Project Corridor width). No reasonable alternative exists to crossing these trails - Chain of Lakes Recreation Area (McClusky Canal)	- North Country National Scenic Trail - Lewis and Clark National Historic Trail - Chain of Lakes Recreation Area - Fort Trotter Trail	Minnkota will span trails and the Chain of Lakes Recreation Area (McClusky Canal). Visual impacts will be minimized by placement of structures away from these features to the extent practicable. Access will be maintained and recreational activity may continue.	5.8

[1] Features present within Project Corridor encompass 50% or less of the Corridor's width, unless otherwise indicated.

[2] Project Vicinity indicates area within 1 mile of Corridor unless otherwise indicated.

3.3 Selection Criteria

Per Section 69-06-08-02(3), a corridor shall be designated only when it is demonstrated to the Commission by the applicant that any significant adverse effects resulting from the location, construction, and maintenance of the facility, as they relate to the following, will be at an acceptable minimum or that those effects will be managed and maintained at an acceptable minimum (Table 3.3-1). Figures 2, 3 and 4 identify the selection criteria for the Project.

Table 3.3-1. Selection Criteria

Selection Criteria	Potential Adverse Effects	Section Addressed
The impact upon agriculture:		
Agricultural production	Permanent impacts will occur as a result of structure placement along the route centerline and fiber optic station locations; impacts are approximately 78.5 square feet per structure. Temporary construction impacts such as soil compaction and crop damage within the ROW will likely occur; approximately 2,827 square feet per structure. Minnkota will work with landowners to minimize impacts to their land.	5.9
Family farms and ranches	7 homes are present within the Corridor. Minnkota will work with landowners to minimize impacts to their land and farming and/or ranching operations.	5.2; 5.9
Land which the owner demonstrates has soil, topography, drainage, and an available water supply that cause the land to be economically suitable for irrigation	Irrigated land is present within the Corridor; however, Minnkota will work with landowners to minimize impacts to their land.	5.9
Surface drainage patterns and ground water flow patterns	No impacts are anticipated to rivers, streams, drainageways, or floodplain resources. To minimize impacts during construction, a National Pollutant Discharge Elimination System (NPDES) permit and a Storm Water Pollution Prevention Plan (SWPPP) will be prepared and Notice of Intent (NOI) submitted to the North Dakota Department of Health. Minnkota will span all rivers and streams to the extent practicable. No structures will be placed within a regulatory floodway.	5.11, 5.12
The impact upon:		
Noise sensitive land uses	7 homes within Corridor and 28 homes located 500 to1,000 feet from the Corridor centerline (adjacent to the Corridor). These homes may experience short-term effects during construction such as elevated noise levels and increased vehicle traffic. However, no noise impacts are anticipated during Project operation. Closest occupied structure from the Center 345 kV Substation is about 5,380 feet and from Prairie Substation is about 2,880 feet. No impacts to noise sensitive land uses are anticipated due to substation upgrades.	5.5
The visual effect on the adjacent area	The transmission line will be visible to individuals traveling on adjacent roads and to residences and landowners that live close to the transmission line and substations. Corridor selected minimizes the number of residences potentially impacted by the line. Minnkota sited the Corridor along field lines away from residences to the extent practicable.	5.6

Selection Criteria	Potential Adverse Effects	Section Addressed
Extractive and storage resources	5 gravel pits are located within Corridor. Minnkota will avoid or span these resources.	5.2; 5.9
Wetlands, woodlands, and wooded areas	Wetland surveys will be completed prior to construction to avoid or minimize the placement of transmission structures within wetlands. The most common wooded areas are shelterbelts in fields and around residences and buildings. Some rivers and streams crossed by the Corridor may have a wooded, riparian fringe. If impacts to wetlands and woodlands cannot be avoided, options to minimize impacts will be considered and mitigation will be proposed consistent with regulatory requirements.	5.9; 5.13; 5.14
Radio and television reception and other communication or electronic control facilities	1 communication tower within Corridor. No impacts anticipated.	5.3; 5.9
Human health and safety	Once construction is complete, the transmission line will span all roads and therefore will not impede emergency services. Minnkota conducted an analysis of electric and magnetic field (EMF) calculated levels for the Project (as shown in Table 5.4-4). Results of the analysis show that calculated EMF levels for maximum operating conditions and normal operating conditions are below published guidelines. Minnkota will design the Project to meet National Electric Safety Code (NESC) standards. Safety concerns related to electric fields are sufficiently addressed by adherence to the NESC. No additional mitigation is required or anticipated.	5.3; 5.4
Animal health and safety	No impacts to livestock are anticipated. Impacts to wildlife populations are expected to be minimal. Potential avian collisions may occur, but are anticipated to be relatively small. Minnkota has committed to marking the shield wires in select areas and designing the line and structures per APLIC guidelines.	5.4; 5.9; 5.15; 5.16
Plant life	The land is primarily agricultural in nature. The most common type of rare plant community in the Project Corridor is cottonwood-green ash floodplain forests near the Missouri and Sheyenne Rivers. Permanent impacts to plant life will occur at structure and fiber optic station locations and areas of tree clearing. Areas of temporary construction impacts will be restored.	5.14

3.4 Policy Criteria

Per Section 69-06-08-02(4), the Commission may give preference to an applicant that will maximize benefits that result from the adoption of the following policies and practices, and in a proper case may require the adoption of such policies and practices (Table 3.4-1).

Table 3.4-1. Policy Criteria

Policy Criteria	Suitable Policy or Practice of Applicant	Section Addressed
Location and design	Minnkota's policy is to locate and design to minimize environmental impacts and utilize existing corridors.	1.1; 1.2.1
Training and utilization of available labor in this state for the general and specialized skills required	Minnkota will use local labor to the extent practicable.	5.1.1; 5.1.2; 5.1.3
Economies of construction and operation	Minnkota will utilize specialty contractors with proven experience in large transmission projects. Economy is obtained by originating and terminating into existing jointly owned substation facilities.	2.2.2; 5.1.1; 5.1.2; 5.1.3
Use of citizen coordinating committees	Minnkota will work with landowners of properties crossed by the Project to site the transmission line, and it is not anticipated that citizen coordinating committees will be necessary.	6.0
A commitment of a portion of the transmitted product for use in this state	Energy transmitted by the Project will be used in Minnkota's service territory, which includes North Dakota.	1.0; 1.2; 2.0
Labor relations	No labor relations will be affected.	5.1.1; 5.1.2; 5.1.3
Coordination of facilities	Minnkota will coordinate with area utilities regarding the location of the facilities to maximize benefits and minimize duplication of efforts.	1.2.1; 1.2.2
Monitoring of impacts	Minnkota will monitor BMPs utilized during construction to minimize environmental impacts and will monitor construction compliance with the commitments made in this application and applicable permit conditions, including the Commission's Order.	5.10.3; 5.14.3; 5.15.3
Utilization of existing and proposed rights-of-way and corridors	One of the primary goals in locating the Project Corridor was to maximize use of existing rights-of-way, corridors, and field breaks. Paralleling opportunities may exist along 61.3 miles within the Corridor.	1.2.1; 5.2.2
Other existing or proposed transmission facilities	Paralleling opportunities may exist along 61.3 miles within the Corridor; Project will utilize the existing Center 345 kV Substation and Prairie Substation.	1.2; 1.2.1; 4.2.4; 5.2.2

Minnkota's policy #5-LA-1 clarifies its position relative to environmental laws and regulations, and states that:

> *It is a policy of Minnkota Power Cooperative to obey all laws and comply with all regulations promulgated pursuant to those laws affecting and governing the operation of Minnkota.*

> *This is especially emphasized in the area of environmental laws and regulations. Each employee must be aware that there may be environmental responsibilities and requirements relating to their job at Minnkota. Each employee must follow rules they are instructed to observe relating to compliance with these legal responsibilities and requirements.*

Minnkota's environmental policies are consistent with Commission policy criteria outlined in NDAC Section 69-06-08-02(4).

3.5 Design and Construction Limitations

Design and construction limitations for a transmission line within the Project Corridor are primarily associated with the location of the transmission line. The Project Corridor is the most direct route that also minimizes impacts to the criteria identified in Section 69-06-08-02.

Wetland impacts will be avoided or minimized through careful routing of the transmission line and associated facilities. Within the Project Corridor, a route will be designed to minimize impacts to existing conservation areas, including wetlands. The exact locations of USFWS grassland and wetland conservation easements and Natural Resource Conservation Service (NRCS) – Conservation Reserve Program (CRP) and Conservation Reserve Enhancement Program (CREP) parcels are not currently available. Minnkota will work with the USFWS, local NRCS offices, and landowners to determine the location of these easements and to avoid or minimize impacts. If impacts cannot be avoided, Minnkota will work with the appropriate agency and landowner to determine the appropriate action.

Following geotechnical exploration, it may become necessary to utilize special structures to avoid sensitive environmental features or different materials such as a specific footing design to accommodate for soil features or other design limitations. The Missouri River crossing may require a special structure, such as three pole structure so that each phase is supported by a pole.

3.6 Economic Considerations

There are several economic considerations in deciding where the Project should be routed. Overall, minimizing the length decreases the cost to construct the transmission line due to less material and ROW needed and less potential affects upon the land use. Additionally, as explained in Section 2.2, this line design is the most economical and efficient alternative to deliver the electricity.

The single-pole, self-supporting design will have a smaller footprint on the land thereby minimizing environmental impacts. Another consideration in decreasing cost is in minimizing the number of corner structures required for the transmission line. Corner structures increase the cost of projects since special structures and engineering are typically required. Minnkota attempted to minimize the Project's costs while simultaneously considering exclusion areas, avoidance areas, selection criteria, policy criteria, and landowner concerns.

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4.0 Engineering and Operational Design

The information in Section 4.0 is subject to change as Project development continues. These sections and updated engineering and operation design information will be finalized in Minnkota's application for a Route Permit.

4.1 Corridor Description

The Project Corridor is approximately 247 miles long. The Project Corridor proceeds northeast out of the Center 345 kV Substation for about 0.5 mile to the section line, then proceeds due east along the section line for about 8 miles, before turning northeast on a cross-country path for about 1 mile. The Project Corridor then proceeds east for approximately 3 miles to the Missouri River. It crosses the Missouri River about 0.16 miles north of the existing HVDC transmission line on the west side of the river and about 0.5 miles north of the existing HVDC transmission line on the east side of the river. After crossing the Missouri River and State Highway 1804 diagonally for 2 miles, the Project Corridor proceeds due east along 279th Ave NE for about 2 miles. The Project Corridor then proceeds north for 2 miles to 305th Ave NW before turning northwest for 0.7 miles. The Project Corridor then proceeds north for 4 miles along a section line, and then east for about 5.5 miles along a quarter-section line to within 0.5 mile west of State Highway 41.

The Project Corridor proceeds north for about 8.0 miles parallel to State Highway 41, turns east for 2 miles along State Highway 41, and follows State Highway 41 to the north for about 9 miles; within this segment the Project Corridor spans the McClusky Canal. The Project Corridor turns east for 2 miles along 3rd Street NW to the McLean/Sheridan County line. The Project Corridor proceeds diagonally, cross-country for about 10 miles to the east side of Center Ave. in Sheridan County. At that point the Project Corridor proceeds east about 0.25 mile north of 10th St NE for about 28.5 miles to State Highway 3, crossing the McClusky Canal and State Highway 14, then proceeds north for about 2 miles along State Highway 3. The Project Corridor turns east along 12th St NE for about 15.5 miles, crossing U.S. Highway 52, then turns north for about 1.5 miles on a quarter-section line. The Project Corridor turns east along a quarter-section line for about 27 miles, crossing State Highway 30 and U.S. Highway 281; where it turns south for 1 mile to the quarter-section line, and continues east for 4 miles along the quarter-section line to turn south for 0.5 mile to 12th St NE (Foster/Eddy County line) where it travels 12 miles to the east.

To bypass the towns of McHenry and Binford, the Project Corridor goes south for 3 miles, then east for 12.5 miles along 3rd St NE/9th St NE, and north for 3 miles to 12th St NE. Along 12th St NE, the Project Corridor heads east for about 20.5 miles, across the Sheyenne River and State Highway 45, to about 0.5 mile east of 120th Ave NE in Steele County where the Project Corridor travels north for about 6 miles on the quarter-section to Aneta. At Aneta, the Project Corridor goes northeast, diagonally, cross-country for about 7.5 miles to 6th Ave NE in Grand Forks County. The Project Corridor travels east along 6th Ave NE for about 7 miles, then north for about 0.2 miles along 41st St NE. The Project Corridor then proceeds east for 9.5 miles and turns north for 2 miles along the quarter-section line (about 0.5 mile west of 31st St NE). Then the Project Corridor travels east along 8th Ave NE for about 4.5 miles. At 27th St NE, the Project Corridor travels north for about 0.5 mile and then travels east for about 4 miles to the existing WAPA 230 kV transmission line. Then, the Project Corridor proceeds northeast, diagonally, cross-country for about 4.5 miles adjacent to the WAPA line, then north for about 4 miles on the west side of 19th St NE, where it turns to go east for almost 5 miles. At 0.5 mile

west of 14th St NE, the Project Corridor heads north for 0.5 mile and then proceeds 1.5 miles into the Prairie Substation.

4.2 Description of Proposed Facilities

In general, a high-voltage transmission line consists of three phases, each at the end of a separate insulator string (or v-string configuration), all physically supported by structures. Each phase consists of one or more conductors. When more than one conductor is used to make up a phase, the term "bundled" conductors is used. Conductors are metal cables consisting of multiple strands of steel and aluminum wire wound together. There are also two shield wires strung above the electrical phases to prevent, to the extent possible, lighting from striking the phases. These wires are typically less than 1 inch in diameter. The shield wire can also include fiber optic cable that allows a path for substation protection and control equipment to communicate to equipment at other terminals on the transmission line. Transmission lines are constructed on a ROW, whose width is primarily dependent on structure design, span length, and the electrical safety requirements associated with the transmission line's voltage.

4.2.1 Transmission Structure and Right-of-Way Design

Transmission Structure

Single pole, self-weathering steel single circuit structures are proposed for the majority of the Project (Figure 5). The self-weathering steel oxidizes or rusts to form a dark reddish brown surface coating to protect the structure from further weathering. The steel single poles are placed on large concrete foundations, which are wider than the pole base. Table 4.2-1 outlines typical characteristics of 345 kV transmission line structures.

Table 4.2-1. Typical Characteristics of 345 kV Transmission Line Structures

345 kV Transmission Line	Details
Voltage (kV)	345 kV
ROW width (feet)	150
Approximate span length (feet)	1,000
Range of structure heights (feet)	130 - 150
Number of structures per mile	5 - 7
Minimum ground clearance beneath conductor (feet)	35 - 40
Depth of concrete footings for the poles (feet)	30 - 40
Diameter of concrete footings for the poles (feet)	7 - 10
Average area of permanent disturbance per structure (square feet)	78.5

Table 4.2-2 summarizes the structure designs and foundations for the single pole structures that will be used for the majority of the Project. Preliminary information about the Missouri River structures and structures near the Grand Forks Airport is also provided.

Table 4.2-2. Structure Design Summary

Line Type	Structure Type	Structure Material	ROW Width (feet)	Structure Height (feet)	Foundation Diameter (feet)	Span Between Structures (feet)
Project	Single Pole Davit Arm	Steel	150	130-150	7-10	1,000
Project near Grand Forks Airport	Two Pole H-Frame	Wood or Steel	150	62	5-7	600-800
Missouri River	Two Pole H-Frame	Steel	150	150-170	10-12	2,400-3,000
Missouri River	Three Pole	Steel	150	150-170	10-12	2,400-3,000

The transmission line will be designed to meet all relevant state codes, National Electric Safety Code (NESC), RUS standards, and other standards that Minnkota has adopted. Appropriate standards will be met for construction and installation and all applicable safety procedures will be followed during and after installation.

Conductors and Shield Wires

It is anticipated that each phase wire will consist of bundled conductors composed of two 959.6 kcmil (thousand circular mils) Suwannee TW (trapezoidal wire) type ACSR (aluminum conductor steel reinforced) cables. Each conductor has an outside diameter of 1.1 inches. The trapezoidal configuration of the aluminum strands allows more capacity than in an equal diameter conductor of standard ACSR design. Suwannee TW type ACSR consists of seven steel wires at the center surrounded by 26 trapezoidal shaped aluminum strands. The trapezoidal configuration of the aluminum strands reduces air gaps between strands. Two shield wires, also known as lightning protection wires, are planned. On one side, the shield wire will be optical ground wire (OPGW), and, on the other side, the shield wire will be 0.5-inch Extra High Strength (EHS) steel cable. OPGW consists of 24 strands of single mode fiber optics conductors in a steel tube wrapped with ten strands of steel wire around the fiber optic tube.

Right-of-Way Design

The majority of the new 345 kV transmission line facilities will be built with single pole structures, which typically require a 150-foot-wide ROW for the length of the transmission line. In some limited instances, where specialty structures are required for long spans, additional ROW may be needed for the transmission line. The additional ROW will be identified in the easement agreement with the landowner. If the transmission line is placed on property division lines across private land, the easement width to be acquired from each of the adjacent landowner(s) will vary.

At the present time, it is intended that the Project will not share ROW with existing features, rather, it will parallel ROWs of existing features. Throughout the route development process, Minnkota sought to identify areas to parallel existing linear features including roads. Identification of opportunities to parallel existing linear features minimizes the proliferation of new corridors.

Given the terrain in the area, construction of access roads outside of the 150-foot-wide ROW will generally not be needed. If obstructions exist that are completely blocking ingress and/or egress along the 150-foot-wide ROW corridor, such as flowing creeks, Minnkota will arrange with landowners to use existing field roads or create temporary access from state and county highways to access the structure locations.

Minnkota land agents will work individually with property owners to purchase easements for the new 345 kV line. Under the easement agreements, property owners will not be allowed to place any permanent structures within the easement area that will restrict complete access to the ROW inhibit maintenance of the line, or jeopardize safe operations of the transmission line.

The fiber optic regeneration sites required for the Project will be purchased in fee. These sites will likely be located near road crossings to provide all-weather access to the sites.

4.2.2 Right-of-Way Preparation, Construction, Restoration and Maintenance

Right-of-Way Preparation

Primarily agricultural and pasture lands will be crossed by the Project. For safety purposes, tree and shrub clearing may be required in some areas in the 150-foot-wide ROW. However, where safety requirements permit, trees and low growing shrubs will remain (generally less than 15 feet in height). Significant amounts of grading are not anticipated for preparation of the transmission ROW. Some grading will be required for the fiber optic regeneration stations and their associated access roads, as well as temporary access roads required for river crossings (if site conditions deem necessary).

Transmission Construction Procedures

Construction will begin after all federal, state, and local approvals are obtained, property and ROWs are acquired, soil conditions are determined, and final design is completed. The precise timing of construction will depend upon various requirements that may be in place due to permit conditions, weather conditions, and available workforce.

Transmission line structures are generally designed for installation at existing grades. Typically, structure sites with 10 percent or less slope will not be graded or leveled. At sites with more than 10 percent slope, working areas will be graded level or fill will be brought in for working pads. If the landowner permits, Minnkota prefers to leave the leveled areas and working pads in place for use in future maintenance activities. If the landowner does not wish to leave the area leveled, the site will be graded back to its original condition as much as possible, and all imported fill will be removed.

Six laydown areas will be established for the Project to handle delivery and temporary storage of equipment and materials necessary to construct the new transmission line facilities. Structures may either be delivered to the staked location or may be stored temporarily at a laydown area. When the structures are delivered to the location where they will be installed, they will be placed on the ROW out of the clear zone of any adjacent roadways or designated pathways.

After the ROW has been prepared, the structures will be placed within the transmission line ROW until the structure is set. Insulators and other hardware will be attached while the structure is on the ground. The structure will then be lifted, placed, and secured using a crane.

Minnkota proposes that all structures have a concrete foundation. Concrete trucks will be required to bring concrete from a concrete batch plant. Portable concrete batch plants may be utilized by the foundation contractor for the Project. Batch plants may be located within

laydown areas. If batch plants are located away from a laydown area the foundation contractor will be responsible for all appropriate permits and agreements. Holes will be drilled in preparation for concrete. Depending on soil conditions, drilled pier foundations for tangent (in-line structures) may vary in diameter from 7 to 10 feet for the Project structures , and be 30 to 40 (or more) feet deep. Drilled pier foundations for deadend structures (angle), which have higher load bearing capabilities, may vary in diameter from 11 to 15 feet, and be 45 to 87 (or more) feet deep. After the concrete foundation is set, the structure will be bolted to it.

Most of the construction activity will be limited to the area immediately around each structure. Little additional ground disturbance will be needed at the structure sites. The total area temporarily disturbed in the vicinity of each structure is expected to be confined to an area of about 60 feet in diameter (2,827 square feet). Temporary construction access roads may be needed to access structure locations and will be located within the ROW. If a temporary access road is needed outside of the ROW, Minnkota will use existing public and private roads where possible. Where no existing roads provide access and if needed, temporary access roads up to 30-feet-wide will be constructed and located through disturbed uplands (e.g., farmed land) once any necessary access easements have been secured from the landowner(s).

Once the structures have been erected, conductors will be installed by establishing stringing setup areas within the ROW. These areas are usually established every 2 miles along the route. Conductor stringing operations require brief access to each structure to secure the conductor wire to the insulator hardware and to install shield wire clamps once final sag is established. Stringing equipment generally consists of wire pullers, tensioners, conductor reels, shield wire reels, and sheave blocks. Stringing operations involve pulling lightweight cables or ropes through the stringing sheaves located at every structure site. This cable or rope will be used to pull the conductors through the sheaves under sufficient tension to keep the conductor from coming into contact with the ground. Temporary guard or clearance poles will be installed as needed over existing distribution or communication lines, streets, roads, highways, or other obstructions, after any necessary notifications are made and permits obtained. This ensures that conductors will not obstruct traffic or contact existing energized conductors or other cables.

Restoration Procedures

During construction, crews will attempt to limit ground disturbance wherever possible. Upon completion of construction activities, landowners will be contacted to determine if any damage has occurred as a result of the Project. If damage has occurred to crops, fences, or the property, Minnkota will fairly reimburse the landowner for the damages sustained. As is necessary, Minnkota may engage an outside contractor to restore the damaged property to as near as possible to the preconstruction condition. Disturbed areas will be restored to their preconstruction condition to the maximum extent practicable or as required by regulatory agencies. Post-construction reclamation activities include removing and disposing of debris, dismantling all temporary facilities (including laydown areas and temporary access roads), leveling or filling tire ruts, alleviating soil compaction, and reseeding non-cultivated areas disturbed by construction activities with vegetation similar to that which was removed.

Erosion control measures will be implemented as necessary to minimize runoff during construction. Specific measures will be determined once final design of the route is complete and a field review is made to determine any areas of concern. Erosion control measures such as silt fencing, straw bale fencing, mulching, seeding, or mesh fabric overlay will be installed when and where appropriate. Access routes to structure locations will be reviewed prior to the

mobilization of equipment so erosion concerns can be avoided or minimized. Construction crews exercise caution when equipment is within 50 feet of streams and rivers and will not drive equipment through streams or rivers crossed by the transmission line.

Maintenance Procedures

Transmission infrastructure has very few mechanical elements and is built to withstand normal weather extremes. With the exception of severe weather, such as tornadoes and heavy ice storms, transmission lines rarely fail. They are automatically taken out of service by the operation of protective relaying equipment when a fault is sensed on the system; such interruptions are usually only momentary. Scheduled maintenance outages are also infrequent. As a result, the average annual availability of transmission infrastructure is very high, in excess of 99 percent.

Over the life of the Project, Minnkota will use the ROW to perform inspections (usually by fixed wing aircraft), maintain equipment, and make repairs. Minnkota will also conduct routine maintenance to remove undesired vegetation that may interfere with the safe and reliable operation of the proposed line.

4.2.3 Easement/Right-of-Way Acquisition

For transmission lines, utilities typically acquire easement rights to accommodate the facilities. The evaluation and acquisition process includes title examination, initial owner contacts, survey work, document preparation, and payment.

The first step in the ROW process is to identify all persons and entities that may have a legal interest in the real estate upon which the facilities will be built. To compile this list, a ROW agent will complete a public records search of all land involved in the Project. A title report will then be developed for each parcel to determine the legal description of the property and the owner(s) of record of the property and to gather information regarding easements, liens, restrictions, encumbrances, and other conditions of record.

The next step is evaluation of a specific parcel. After landowners are known, a ROW representative will contact each property owner or the property owner's representative. The ROW agent will describe the need for the transmission facilities, explain how the specific project may affect each parcel, and seek information from the landowner about any specific construction concerns. The ROW agent requests the owner's permission for survey crews to enter the property to conduct preliminary survey work. Permission may also be requested to take soil borings to assess soil conditions and determine appropriate foundation design. Surveys will be conducted to locate section corners, cultural resources, wetlands, man-made features, and associated elevations to be used during the detailed engineering of the transmission line. All surveys will be performed by experienced professionals.

The ROW agent will then prepare an offer for the property owner(s) based on fair market value for the rights to build, operate, and maintain the transmission facilities within the easement area and reasonable access to the easement area. The landowner will be allowed a reasonable amount of time to consider the offer and present any documentation that the owner believes is relevant to determining the property's value. In some cases, the ROW agent may obtain options to purchase ROW for the proposed route.

Utilities are usually able to work with the landowners to address their concerns and an agreement is reached for the utilities' purchase of land rights. The ROW agent will prepare all of the documents required to complete each transaction. Required documents generally include:

option, notice of option, easement, and payment agreement. If an agreement cannot be reached, condemnation may be used.

Once sufficient ROW has been obtained and the construction phase begins, to the fullest extent that is possible, individual property owners will be advised of construction schedules, needed access to the site, and any vegetation clearing required for the Project. The ROW will be cleared of the amount of vegetation necessary to construct, operate, and maintain the transmission line, and landowners will be compensated for crop and property damages as provided for in the easement. To ensure safe construction of the transmission line, special consideration may be needed for fences, crops, or livestock. For instance, fences may need to be moved, or temporary or permanent gates may need to be installed; crops may need to be harvested early; and livestock may need to be moved. In each case, the ROW agent will coordinate these processes with the landowner. Where possible, temporary laydown areas will be limited to previously disturbed or developed areas. When additional property is temporarily required for construction, appropriate temporary easement agreements will be obtained from landowners for the duration of construction. These temporary easements will be limited to special construction access needs or additional laydown areas required outside of the proposed ROW.

4.2.4 Associated Facilities and Project Components

Center 345 kV Substation Upgrades

The Center 345 kV Substation is located about 4.5 miles southeast of the town of Center, North Dakota, and about 1 mile east of the Milton R. Young Generation Station in Oliver County. Most upgrades will occur within the existing substation's fenced boundary (ownership shared with Otter Tail Power Company). This will involve installing new 345 kV circuit breakers, 345 kV dead-end structures, one new and one replacement 345/230 kV transformer and associated bus work, new 345 kV switches and associated foundations, steel structures, and control panels. A line reactor for open line voltage control will also be required. The reactor will require a 22,500-square-foot (0.5 acre) expansion to the north end of the substation, beyond the existing fenced boundary but on Minnkota-owned property.

230 kV Tie Line

This approximately 1,500-foot-long 230 kV Tie Line will parallel the existing tie line on Minnkota-owned property. It will be needed to complete a second transmission-to-transmission interconnection between the Square Butte 230 kV Substation and the Center 345 kV Substation. The Square Butte 230 kV Substation is located approximately 0.2 miles south of the Center 345 kV Substation.

Square Butte 230 kV Substation

The Square Butte 230 kV Substation is located about 4.5 miles southeast of the town of Center, North Dakota and about 1 mile east of the Milton R. Young Generation Station in Oliver County. Existing 230 kV circuit breakers and line terminal equipment will be re-allocated from the existing HVDC tie line to the new 345 kV interconnect as part of the agreement with Minnesota Power. This activity will be completed within the existing substation footprint.

Prairie Substation Upgrades

The Prairie Substation is located within the city limits of Grand Forks, North Dakota in Grand Forks County. All upgrades will occur within the existing Minnkota-operated substation's fenced boundary. This will involve installing new 345 kV circuit breakers, 345 kV dead-end structures,

one new and one relocated 345/230 kV transformer and associated bus work, new 345 kV switches and associated foundations, steel structures, and control panels. New 230 kV circuit breakers will be added to accommodate interconnecting with the existing 230 kV ring bus. An existing transmission line termination will need to be moved to convert the ring bus into a breaker-and-a-half bus arrangement.

Fiber Optic Regeneration Stations

Four fiber optic regeneration stations will be required along the transmission line route to re-amplify the protection and control signals carried in the OPGW fiber optic. The stations will be placed about 50 to 55 miles apart. Permanent access roads will be constructed for the fiber optic regeneration stations. Each station will require a 12-foot by 18-foot fenced area, a small heated and air-conditioned control building to house the electronic equipment and a battery bank for backup power, and a 16-foot-wide permanent access road. These four stations will be placed at the base of a structure within the permanent 150-foot-wide ROW.

Laydown Areas

Up to six temporary laydown areas may be established for the Project. The six laydown areas are each approximately 10 acres in size. Each laydown area will be a temporary impact. The sites will be leveled (if necessary), graveled, and may have a perimeter fence. The laydown areas will accept delivery of and store equipment and materials necessary to construct the new transmission line facilities, be an area for pre-assembly work, and potentially locate portable concrete batch plant sites. Construction office trailers may be located within the laydown areas. These areas were selected for their location, access, security, and ability to efficiently and safely warehouse supplies. The areas are chosen to minimize excavation and grading. Disturbed areas will be restored to pre-construction condition or per landowner agreement. Minnkota plans to secure the right to use the laydown areas by obtaining easement agreements from affected landowners. Table 4.2-3 outlines the location of the laydown areas. Figures 2 and 3 show laydown area locations.

Table 4.2-3. Laydown Areas for the Project

Name	Acres	Public Land Survey
1	10	T142N R83W Section 33
2	11.4	T145N R79W Section15
3	10.0	T148N R73W Section 35
4	10.0	T147N R66W Section 7
5	10.0	T147N R60W Section 20
6	10.0	T149N R55W Section 6

Minnkota will have two laydown areas located on property currently owned and utilized by Minnkota for its operations. Laydown area 1 will be located at the Center 345 kV Substation (indicated in Table 4.2-3) and the second area located near the Prairie Substation that is currently utilized by Minnkota a laydown area and equipment yard.

Relocation of Transmission Line Structures at the Center 345 kV Substation

Relocation of two existing Minnkota-owned transmission line sections and addition of new structures will facilitate changing termination of the lines within the substation. All relocated structures will occur on Minnkota-owned property. This work will involve:

- Relocating the Center to Jamestown 345 kV Transmission Line. Overall line length will not change.
    - Remove existing structures including #2: Deadend, #1B: Tangent, #1A: Deadend.
    - Replace the existing #2: Deadend structure with a deadend structure at the same location.
    - Replace and relocate the existing #1B: Tangent and #1A: Deadend structures about 50 feet south of the existing locations.
    - Replace conductor between structures.
- Terminating the existing 230 kV Tie Line in a new bay within the substation. The new bay is approximately one span length south of the existing termination point.
    - Add three new structures and terminate at the new bay (two deadends and one tangent).
    - Replace conductor between structures.

Relocation of Transmission Line Structures at the Prairie Substation

Relocation of the existing Xcel Energy-owned 230 kV transmission line section and addition of new structures will facilitate changing termination of the line within the substation. All relocated structures will occur on Minnkota-owned property. This work will involve:

- Relocating the Prairie Substation to the WAPA 230 kV Transmission Line from a bay located in the northeast corner of the existing substation to a new termination point on the west side of the substation.
    - Remove the existing deadend structure going into the north side of the substation and replace with a tangent structure at the same location.
    - Add a new deadend structure to the northwest corner of the substation.
    - Add a new deadend structure to the west side of the substation near the new termination point on the west side of the substation.
    - Replace conductor between new structures.

State Highway Crossing and Construction Access Locations

The Project Corridor will cross state highways at 17 locations. Section 5.3.2 discusses the state highway crossing and access locations from west to east and potential impacts.

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5.0 Environmental Analysis

This section describes the environmental setting as it relates to the Project Corridor. The following subsections are divided into discussions about the description of the resource within the Project Corridor, potential impacts from a transmission line within the Project Corridor, and potential mitigation measures. The Project Corridor is 1,000-feet-wide.

The description of the resource describes the resources and environmental settings found in the Study Area. For purposes of analysis, the Study Area is the general area (typically 1 mile (i.e. Project Vicinity)) around the Project Corridor.

The Study Area includes portions of 11 counties in central and eastern North Dakota: Oliver, Burleigh, McLean, Sheridan, Wells, Foster, Eddy, Griggs, Nelson, Steele, and Grand Forks Counties. The general land cover within the Study Area consists primarily of agricultural lands including cultivated crops and livestock grazing, with dispersed areas of pasture/hay and woodland. Agriculture is one of the most important industries in North Dakota. Cultivated croplands are more prevalent in the eastern portion of the Project towards the Red River Valley, with approximately 60 percent cropland from Center, North Dakota (Center 345 kV Substation), to Mercer, North Dakota, to nearly 90 percent cropland from the Sheyenne River to Grand Forks, North Dakota (Prairie Substation). The primary cultivated crops include wheat, soybeans, and corn. Cattle are the major livestock produced in North Dakota. Center pivot irrigation units are present within the Study Area.

Prairies and wetlands are more prevalent in the western portion of the Study Area, toward the Missouri River. Historically, North Dakota was mostly prairie land cover. Prairie covers more land in the western portions of the Study Area and decreases towards the Sheyenne River and Red River Valley. Wetlands occur throughout the Study Area with a higher concentration in the Prairie Pothole Region of the upper Midwest. Wetlands are typically small, isolated depressions, but may also be found along drainages, rivers, and streams. Wetlands cover nearly 12 percent of the land within the western portion of the Study Area, and decrease to about 5 percent in the eastern portion due to the prevalence of cultivated crops. Wooded areas are not prevalent in North Dakota, as the historic land cover was prairie. Currently, the most common wooded areas are shelterbelts around residences and buildings. The major rivers may have a wooded, riparian fringe.

The Study Area contains undulating terrain in the western section within the Prairie Pothole region and near major rivers; otherwise, the eastern half is nearly level within the Red River Valley. Major watercourses within the Study Area include the Missouri, James, and Sheyenne Rivers.

The final location of the ROW for a transmission line within the Project Corridor is unknown at this time, and will be identified in the Route Permit application. In general, the ROW, once a location is determined, will be 150-feet-wide.

The impact discussion describes the potential effects from the Project Corridor. Impacts are discussed in terms of short-term vs. long-term and indirect vs. direct, depending upon the resource. Temporary and permanent impacts associated with the 230 kV Tie Line and the Center 345 kV Substation expansion are included in impact discussions. Temporary impacts associated with highway access areas and the six temporary laydown areas are included within the impact discussions.

Temporary and permanent impacts associated with the relocation of transmission line structures at the Center 345 kV Substation and Prairie Substation are not included within the impact discussions, since any impact would occur on previously disturbed Minnkota-owned property and within an area of the same land use; therefore, impacts would be the same as existing conditions.

The mitigation discussion provides potential measures to reduce or eliminate anticipated impacts identified for each resource area. Mitigation measures are not discussed for identified potential effects that are either not anticipated to occur under construction or operation of the Project or are anticipated to result in a positive effect. The mitigation discussion includes typical high voltage transmission line permit conditions issued by state and federal agencies, mitigation strategies proposed by Minnkota and additional mitigation measures that may be warranted.

5.1 Demographics

5.1.1 Description of Resources

The Project Corridor includes portions of 11 counties in North Dakota and several farm-based communities. The largest cities located near the Project Corridor include Grand Forks (population 49,321), Carrington (population 2,268), Cooperstown (population 1,053), and Northwood (population 959). The Spirit Lake Nation lands, which have the nearest minority population, are located approximately 10 miles north of New Rockford, North Dakota. The Project Corridor does not cross the Spirit Lake Nation lands, which are 11 miles north of the Project Corridor in Eddy County.

Economic Characteristics

Most counties in the Project Corridor identify agricultural practices as a foundation of both the social and economic fabric of the county. Aggregate mining for sand or gravel is also an important economic activity in rural areas and in several instances, this type of extractive land use contributes directly to county and local road projects or other developments. Minnkota's Milton R. Young Generation Station and the lignite mining operations at the nearby Center Mine, owned and operated by BNI Coal Ltd., are important regional sources of employment in the western portion of the Project Corridor.

As the Project Corridor follows from west to east, the employment base of counties closest to the city of Grand Forks, North Dakota diversifies. Table 5.1-1 lists the top four employment industries within Project Corridor counties.

Table 5.1-1. Top Occupations for Counties within the Project Corridor

County	Industry	Percent of Workforce
Burleigh	Management/Professional	36.5
	Sales and Office	28.8
	Service Occupations	16.0
	Production/Transportation	9.1
Eddy	Management/Professional	39.1
	Agriculture	19.1
	Service Occupations	17.9
	Sales and Office	16.5
Foster	Management/Professional	35.6
	Sales and Office	21.2
	Service Occupations	14.9
	Agriculture	13.5
Grand Forks	Management/Professional	32.2
	Sales and Office	25.4
	Service Occupations	20.1
	Production/Transportation	11.1
Griggs	Management/Professional	35.1
	Sales and Office	20.4
	Service Occupations	16.7

County	Industry	Percent of Workforce
	Agriculture	16.0
McLean	Management/Professional	31.8
	Sales and Office	22.1
	Service Occupations	16.5
	Construction	15.8
Nelson	Management/Professional	36.7
	Sales and Office	20.5
	Agriculture	16.2
	Service Occupations	14.8
Oliver	Management/Professional	35.2
	Agriculture	23.7
	Sales and Office	15.8
	Service Occupations	12.8
Sheridan	Management/Professional	43.0
	Agriculture	35.0
	Sales and Office	18.7
	Service Occupations	12.9
Steele	Management/Professional	38.8
	Agriculture	24.5
	Sales and Office	19.5
	Service Occupations	11.8
Wells	Management/Professional	33.6
	Sales and Office	21.4
	Service Occupations	18.2
	Agriculture	17.1

Sources: U.S. Census Bureau, Census 2000 Summary File 3, 2010.

Social Characteristics

Population characteristics considered relevant to the social setting of the Project Corridor include the total population, estimated population, per capita income, and poverty status. Communities in central North Dakota toward the west end of the Project Corridor have gradually experienced reductions in total population. In general, per capita incomes rise as the Project Corridor follows from the west end to the east end, a function of several factors including (but not limited to) higher cost of living, higher paying jobs, and higher property values. Aside from Oliver and Burleigh Counties, poverty levels are generally higher at the west end of the Project Corridor when compared to the east end of the Project Corridor.

Population by Race and Ethnicity

The Project Corridor is composed of a variety of racial and ethnic groups. Race is defined as a self-identification data item based on an individual's perception of his or her racial identity. Respondents to the 2000 Census selected the race(s) with which they most closely identified

themselves. Ethnicity is defined as a classification of a population that share common characteristics such as religion, cultural traditions, language, tribal heritage, or national origin. All counties within the Project Corridor have populations with 95 percent or higher of White/Caucasian. The remaining populations in all of the counties include Black/African American, American Indian, Hawaiian, some other race alone, or two or more races.

5.1.2 Impacts

The short-term impacts of the Project on demographic resources will be relatively minor. Permanent agricultural land conversion associated with the transmission line structure placement and the Center 345 kV Substation expansion (see Sections 5.2 and 5.14) will constitute a small socioeconomic impact to those landowners with facilities on their land. There is no indication that any minority or low-income population is concentrated in any one area of the Project Corridor, or that the transmission line will be placed in an area occupied primarily by a minority group.

Construction of the transmission line will provide temporary increases to the total personal income of the area by providing housing, lodging, food services, and general supplies to the major contractors. Opportunity exists for sub-contracting to local contractors for gravel, fill, and civil work. During peak construction an estimated 200 to 225 workers may be active at several locations along the Project. Additional personal income will also be generated by circulation and recirculation of dollars paid out by Minnkota as business expenditures and state and local taxes. Labor relations will not be affected.

As part of the federal scoping process for the Project, questions and concerns about property value were raised. Generally, it has been found that a new transmission line may potentially result in a small decline in residential property values in urban and suburban areas immediately following construction, but this effect diminishes after a few years. Studies of the effect of a transmission line on rural property values have concluded that power line structures and easements do not have a significant impact on rural property values. For instance, a recent study concluded that the differences in sale prices and market values for rural Wisconsin properties with a high-voltage electric transmission line were not statistically significant (1.11% to 2.44%) when compared to properties without a transmission line. The study also analyzed the impact of transmission line easement placement on sale price, and noted that sale price differences were greater for easements that crossed the middle of or diagonally across properties, while there was no sale price reduction where the easements ran along the edge or crossed only a small portion the property (Jackson 2010).

When the route for the transmission line is finalized, Minnkota will offer to conduct staking reviews with the landowner to minimize potential impacts to the land to the extent practicable. Minnkota will obtain an easement from each landowner whose property will be crossed by the Project. The easements allow Minnkota to locate transmission facilities on the property and enter for maintenance when needed. The landowner retains ownership of the land subject to the easement, which restricts certain activities within the easement in order to avoid compromising the safety and efficiency of the transmission line.

5.1.3 Mitigation

Socioeconomic impacts associated with the Project will be primarily positive due to an influx of wages and expenditures made at local businesses during construction and an increase in the county's tax base from the operation of the transmission line. Minnkota and the specialty

contractors will use local labor and sub-contractors to the extent practicable. Impacts to landowners will be minimized to the extent practicable by discussing final structure location with the landowner, establishing good lines of communication, negotiating easement payments, and maintaining communication with landowners throughout the Project Corridor. Easements will allow Minnkota to locate transmission facilities on the property and enter for maintenance when needed. In return, the landowner receives compensation comprised of the following, as applicable: a per acre impacted land value payment for the easement area (based on land-use type); a structure payment (based on land-use value and type); and a crop damage payment for damages caused by construction. Minnkota will pay higher easement payments for diagonal crossings. The Project is not anticipated to impact minority or low-income populations, so no mitigation measures are necessary.

5.2 Land Use

The Project Corridor includes portions of 11 counties in central and eastern North Dakota, which are primarily dominated by rural agricultural land use, i.e., pasture or cropland and nearby farmsteads. Less common types of land use in the vicinity of the Project Corridor include small farm-based towns, utility scale wind power generation, utility ROWs, airports, aggregate mining, wild game habitat, and livestock production. Larger urban areas are generally not present outside of Carrington, Cooperstown, and Grand Forks.

Data sources used to analyze land use in the Project Corridor include local, state, and federal agencies, nonprofit organizations, and field work conducted by Minnkota's consultants. Land use and land cover data were gathered from the North Dakota Gap Analysis Program (GAP) data (Strong et al. 2005). Mapping was completed using the ArcInfo license of ESRI® ArcMap™ 9.3.

5.2.1 Description of Resources

Agriculture

Land use within the Project Corridor primarily consists of agricultural production of cultivated crops and livestock with some dispersed areas used for hay production. Cultivated croplands generally increase as the Project Corridor follows towards the Red River Valley. As demonstrated by the high percentage of farmland across the Project Corridor, agriculture is one of the most important industries in North Dakota. Center pivot irrigation (CPI) systems are present within the Project Vicinity to supplement natural rainfall. Table 5.2-1 identifies acres of agricultural land use within the Project Corridor.

Table 5.2-1. Agricultural Land Use in Project Corridor

GAP Land Cover Category	Project Corridor	
	Acres in Corridor	Percent of Corridor
Cropland	16,822.2	56.0
Pasture	5,083.0	16.9
Total Agricultural Area	**21,905.2**	**72.9**

Source: ND GAP data (Strong et al. 2005).

Human Settlement

Farmsteads are widely distributed, but are typically located along rural roads running along section lines. In general, farmstead density increases as the Project Corridor follows from west to east. Small, farm-based communities are located within 1 mile of the Project Corridor; these communities range in size from unincorporated areas with a few houses to more established, incorporated municipalities. Incorporated municipalities within 1 mile of the Project Corridor include Aneta (population 284), Northwood (population 959), and Grand Forks (population 49,321). Other communities within the vicinity of the Project Corridor include Carrington (population 2,268) and Cooperstown (population 1,053). Populations were obtained from the 2000 U.S. Census. In addition to homes, more developed communities may include other structures such as businesses, schools and other government facilities, churches, and cemeteries.

North Dakota has established a 500-foot setback from occupied houses (NDCC Section 49-22-05.1 and NDAC Rules 69-06-08-02(2)(e)). Table 5.2-2 identifies the number of homes that are located within the 1,000-foot-wide Project Corridor.

Table 5.2-2. Number of Homes within Project Corridor

Distance from Project Corridor Centerline[1]	Number of Homes
Homes within 1,000-foot-wide Project Corridor	7
Homes 500 to 1000 feet from the Project Corridor Centerline (beyond but adjacent to the 1,000-foot-wide Project Corridor)	28

[1] Once a route is determined, shifting of the route within the Project Corridor will avoid homes or reduce impacts to homes within the Project Corridor.

Existing Infrastructure

Developed infrastructure in the vicinity of the Project Corridor includes federal, state, county, and township roads; utility scale wind farm development; utility ROWs; airports; radar facilities; and railroads. It is likely rural water lines are present in the Project Corridor (see Section 5.3). In some cases, existing infrastructure in the Project Vicinity is a compatible land use, while other infrastructure, such as airports and CPI systems, is not. Figures 2 and 3 display the location of various infrastructure types in the Project Vicinity. Table 5.2-3 shows the existing infrastructure within and near the Project Corridor.

Table 5.2-3. Existing Infrastructure within and near the Project Corridor

Infrastructure Type	
Point Features	**Count**
Communication Towers [1]	1
Utility Scale Wind Energy Turbines [1]	0
Cemeteries [1]	2
Center Pivot Irrigation Systems [1]	1
Airports [2]	1
Paralleling ROW	**Miles**
Transmission Line [3]	7.8
Highway	12.4
Other Roads[4]	41.1
Total Length of Corridor Parallel to Existing Corridors	**61.3**

1: Only features located within Project Corridor are included in this count.
2: Features located within 1 mile of the Project Corridor are included in this count.
3: This analysis includes existing transmission lines paralleling highways.
4: Features include graded and drained roads, gravel, paved, trail, and unimproved roads.

Although wind farm development is increasing in North Dakota, the exact size and location of future wind farm developments are uncertain at the present time. In general, a transmission line may be seen as a benefit to a wind energy project for movement of energy.

Existing ROWs (transmission lines, pipelines, railway, or roads) in the Project Corridor present opportunities for paralleling as these features are typically disturbed corridors and are considered compatible with the construction and operation of new transmission lines. In some cases, these ROWs may present siting challenges or have to be spanned.

No commercial or general aviation airports are present within the Project Corridor, but one private airstrip is present within 1 mile (R. Leep Airstrip). Nearby airport facilities are predominantly general aviation airports, but some are smaller private facilities. Portions of the Project Corridor fall within Airport Zones C and D of the Grand Forks International Airport.

Mining Resources

Due to the glacial history of the landscape, several aggregate mines are found in this region of North Dakota. These areas are typically used for gravel or sand extraction. The mines are often expanding and their operation requires the use of heavy machinery. Transmission line development may be compatible with aggregate resource extraction, if structure placement and overhead lines will not interfere with future operations at the mining facility.

Five gravel pits are located within the Project Corridor. Figure 2 displays the location of gravel pits and other mines in the vicinity of the Project Corridor. Coal surface mines are present near the western Project Corridor, but are not crossed by the Project Corridor.

Conservation Areas

USFWS grassland and wetland easements and NRCS CRP and CREP parcels are present in the Project Corridor. These areas have been assigned various levels of legal protection, which generally prohibit development. These areas are intended to serve as wildlife habitat, to protect rare natural features or to preserve water quality. USFWS and NRCS easements typically retain private ownership and are generally considered confidential by these agencies. As such, information about the location and scope of potential impacts to these resources is limited.

The Project Corridor will not cross any National Forest or National Grassland areas. Minnkota's consultant coordinated with USFWS to determine the preliminary extent of grassland and wetland easement parcels. Minnkota's consultant will coordinate with the USFWS to determine exact locations of grassland and wetland easement parcels for the Route Permit application. Grassland easements are surface easements that minimize impacts to land cover. Wetland easements protect the wetland basin(s) within the easement land.

Private Lands Open to Sportsmen (PLOTS) is a voluntary program offered to landowners by the North Dakota Game and Fish Department (NDGF), which provides landowners with monetary compensation for allowing public access to their land for fishing or hunting. Land parcels are typically enrolled in the PLOTS program for two to three years, but some are under a long-term agreement. The location of these parcels is made public by the NDGF. Some CRP parcels are enrolled in the PLOTS program; therefore, locations are within the state's GIS data, although not all CRP parcels are participating. PLOTS lands are displayed on Figure 6.

The Nature Conservancy (TNC) and Ducks Unlimited own property near the Project Corridor, which is used specifically to provide habitat for rare species native to North Dakota and nesting areas for waterfowl along the migratory pathway. These areas are generally concentrated near the Missouri River and none are located within one mile of the Project Corridor. TNC lands are displayed on Figure 6.

State Surface Tracts

The North Dakota State Land Department (NDLD) manages the State Surface Tracts and School Trust lands in North Dakota, which were granted at statehood for the support of primary and secondary education. Several Surface Tracts are located within the Project Corridor. Some of these tracts have identifiable assets in addition to the current pastureland use, such as

aggregate deposits, potential for wind tower placement, or cultivated land. One of NDLD's primary concerns was reducing the potential for wind development on these tracts; however the presence of a transmission line does not preclude a tract from wind development. NDLD provided comments on the Project where they discussed (1) Tracts not recommended for the electric transmission line and (2) Tracts that can accommodate the electric transmission line. In addition, some tracts were not addressed by the NDLD in their Project comments. Table 5.2-4 identifies the tracts within the Project Corridor. State Surface Tracts are shown on Figure 6.

Table 5.2-4. State Surface Tracts within Project Corridor

NDLD Recommendation						Total	
Not Recommended		Minimally Impacted		Not Addressed			
Count	Acres	Count	Acres	Count	Acres	Count	Acres
7	224.1	4	159.4	4	103.7	15	487.2

5.2.2 Impacts

Agriculture

Land use in the Project Corridor is dominated by agricultural cropland, which totals about 56 percent of the area. The most common form of agricultural land use is row crops. Although agricultural land use along the Project Corridor is common, the only land permanently removed from production will be the area directly affected by structure placement and fiber optic regeneration stations (and associated fiber optic regeneration station roads); the area directly under the transmission line that is outside of the structure will continue to be used for agriculture. Where appropriate, the Project will follow existing field edges or cross fields in a manner designed to minimize impacts to plowing and harvest patterns or as discussed with the landowner in the easement agreement. In addition, Minnkota will offer to stake individual structure locations on each landowner's property for their visual review and input.

For construction that takes place outside of the winter months, temporary impacts to agriculture could occur as a result of construction activity. These impacts could include, but are not limited to, loss of planting opportunity, crop damage, and soil compaction. Minnkota will work directly with landowners to minimize impacts and to provide appropriate compensation for lost planting opportunities and crop damage. If necessary, soils compacted by construction activities will be restored using a deep tillage practice, such as sub-soiling.

An effect of the Project may be potential interference with agricultural activities, such as maneuvering equipment around structures and aerial spraying. Landowners may conduct aerial spraying to apply pesticides, fungicides, and fertilizers. Aerial spraying is typically conducted by small aircraft with low flying altitudes.

After the Project is constructed, aerial sprayers will need to employ the same flight patterns as used when working adjacent to tree rows, distribution lines, or communication structures.

Human Settlement

Short-term impacts to residents and local business owners in the Project Vicinity primarily will be related to disruption caused by temporary construction activities, such as elevated noise levels and increased vehicle traffic.

The NESC requires certain clearances between transmission line facilities and buildings for safe operation of the transmission line. Minnkota will develop a route for the Project sufficient to maintain clearances required to safely operate the transmission line.

In the event that a structure is located within the ROW required for a new transmission facility, that structure will be voluntarily displaced; meaning the structure will be purchased by Minnkota and the structure will be moved from the area.

Seven homes are located within the Project Corridor (Table 5.2-2). Minnkota will develop a route to avoid these structures by maximizing the setbacks to the extent practicable or obtain a waiver from the affected landowner to route the transmission facility within 500 feet of the residence. Assuming the route will avoid these houses or Minnkota obtains a waiver to site the transmission line within 500 feet of a house, long-term effects upon residences will be visual in nature and building restrictions within the ROW. These homes and the 28 homes located 500 to 1,000 feet from the Project Corridor Centerline (adjacent to the Project Corridor), may experience short-term effects during construction such as elevated noise levels, increased fugitive dust, and increased vehicle traffic.

Existing Infrastructure

A transmission line within the Project Corridor will not impact airports or wind turbines. Two potential wind energy facilities may be located within the Project Corridor. Minnkota is in communication with the wind energy project developer. One communication structure is located within the Project Corridor, but can be avoided by route selection. Two cemeteries are located within the Project Corridor. Minnkota will minimize impacts to the cemeteries.

One CPI system is located within the Project Corridor. This system can be avoided by a route within the Project Corridor. Ten CPI systems are located within 1 mile of the Project Corridor. Typically, CPI systems are located in the center of a quarter-section and have a 360 degree rotation for field irrigation. To assess potential impact, point data was used to identify the CPI system locations and a half-mile buffer was added to determine the rotation in relation to the Project Corridor.

Approximately 61 miles of the Project Corridor may contain existing utility corridors. The most common type of existing corridor occurs along non-highway roads, such as rural section roads.

Mining Resources

Lignite mining is active near the western terminus, at the BNI Center Mine. The current location of this mine is approximately 6 miles west of the Center 345 kV Substation. The mining operation is expanding south. Impacts to coal mining are not anticipated for a transmission line within the Project Corridor. Minnkota will work with landowners to minimize potential impacts to future gravel operations.

Conservation Areas

USFWS maintains grassland and wetland conservation easements within the Project Corridor. A grassland easement would be impacted by placement of a structure within the easement. A

wetland easement would be impacted by placement of a structure within a wetland under easement, but placement of a structure in the uplands of a wetland easement does not constitute an impact. Minnkota will work with local wetland management districts and landowners to determine the exact location and size of these easements and to avoid or minimize impacts by a route.

NRCS maintains CRP easements in the Project Corridor; however, this data is not publically available because the contracts are considered confidential. Following approval of a corridor for the Project, Minnkota will work with local NRCS and landowners to determine the location of CRP easements. No impacts to TNC holdings and Ducks Unlimited property are anticipated.

State Surface Tracts

The NDLD indicated that some tracts have identifiable assets in addition to the current pastureland use, such as aggregate deposits, wind farm development, or cultivated land that may be impacted by construction of the Project. One of NDLD's primary concern was reducing the potential for wind development on these tracts, however the presences of a transmission line does not preclude a tract from wind development. Seven tracts are located within the Project Corridor that are "not recommended" by the NDLD for transmission line development.

5.2.3 Mitigation

Agriculture

Within the Project Corridor, a route will be designed to minimize impacts to agricultural land use. Several options are available to mitigate impacts, including:

- Working with the landowners to site the ROW so as to minimize impacts on their property.
- Siting the final ROW along existing field edges.
- Crossing fields parallel to existing plowing patterns or by crossing fields at 90 degree angles.
- Constructing the proposed route during the winter months when possible.
- Monetarily compensating landowners for crop damage caused by construction or operation and maintenance activities.

Human Settlement

Within the Project Corridor, Minnkota will develop a route to avoid occupied homes by maximizing setbacks to the extent practicable within the Project Corridor. In some instances, it may be preferable for the route to pass within 500 feet of an occupied residence due to other routing factors and, in such cases, Minnkota will work with the landowners affected to obtain a waiver of the 500-foot setback requirement. However, if Minnkota is unable to obtain the requested waiver, a viable route that complies with the 500-foot setback from all occupied residences can still be developed within the Project Corridor.

Residents and local business owners in the Project Vicinity primarily will be affected by temporary construction activities and long-term aesthetic changes. In addition, landowners may be affected by changes in land use by creation of a ROW. Specifically, agricultural land will be temporarily disrupted during construction. To minimize impacts to landowners, Minnkota will utilize the following mitigation measures:

- The exact location of structure sites, the ROW, and other disturbed areas will be determined with landowner's input.
- The minimum area necessary will be disturbed.
- Construction activities will be limited to the ROW, unless access permission across adjacent property is obtained from the landowner(s).

Landowner compensation will be established in conjunction with easement acquisition for each landowner. As discussed in Section 5.1.3, compensation is based on the footprint of the easement's impact upon the property, the number of structures, and crop damage.

Existing Infrastructure

Within the Project Corridor, a route will be designed to minimize impacts to existing infrastructure. Mitigation for impacts to public airports, cemeteries, wind energy facilities, and communication structures will not be required as these features will be avoided or minimized by a route. The CPI system will be avoided to the extent practicable and Minnkota will work with the landowner to ensure that final structure placement accommodates system functionality. Minnkota will continue to work with the wind energy project development company.

Minnkota will work with pipeline operators and railway companies to route the transmission line to minimize impacts to their facilities during construction and operation. Minnkota will continue to work with the Federal Aviation Administration (FAA) and does not anticipate any impacts to airspace and glide slope intercept for public airports near the Project Corridor.

Aggregate Mining

Within the Project Corridor, a route will be designed to minimize impacts to existing aggregate resources. If impacts are unavoidable, structure placement could be designed to avoid areas where future extraction is planned, or by increasing the structure height in these areas to accommodate for the operation of large, heavy equipment.

Conservation Areas

Within the Project Corridor, a route will be designed to minimize impacts to existing conservation areas. The exact locations of USFWS grassland and wetland conservation easements and NRCS CRP parcels are not currently available. Minnkota will work with USFWS, local NRCS offices, and landowners to determine the location of these easements and to avoid or minimize impacts. If impacts cannot be avoided, Minnkota will work with the appropriate agency and landowner to determine the appropriate action.

State Surface Tracts

Within the Project Corridor, a route will be designed to minimize impacts to existing resources on State Surface Tracts. Minnkota will work with NDLD to minimize impacts and will complete a Right-of-Way Permit application to cross State Tracts.

5.3 Public Services

5.3.1 Description of Resources

Public services generally refer to services provided by government entities to their citizens. Public services are often those services that are used to benefit public health and safety, such as education and emergency services (fire, ambulance, and police). Public services are concentrated within the municipalities near the Project Corridor. There are three municipalities within 1 mile of the Project Corridor (Aneta, Grand Forks, and Northwood). Fiber optics, pipelines, transmission lines, rural water lines, and associated facilities also currently exist within or are crossed by the Project Corridor.

Airports

No commercial or general aviation airports are present within the Project Corridor, but one private airstrip is present within 1 mile (R. Leep Airstrip). The Grand Forks International Airport has planned improvements for the existing airport layout because of a forecasted increase in aircraft operations. According to the July 2006 Land Use Compatibility Plan for Grand Forks International Airport, the future plans include construction of two additional runways. Grand Forks International Airport intends to make additional upgrades, including extending the current main runway and existing crosswind runway. As previously mentioned, portions of the Project Corridor fall within Airport Zones C (flight corridor zone) and D (airspace protection buffer area) of the Grand Forks International Airport.

Roads

County and township (section line) roads characterize the existing roadway infrastructure in and around the Project Corridor. The Project Corridor will cross state highways at 17 locations (Table 5.3-1). The average daily traffic volumes on the area's highways are documented in Figure 7. Determining the specific capacity of any highway is a complex process; however, general estimates are used for planning purposes. For purposes of comparison, the functional capacity of a two-lane paved rural highway is approximately 5,000 vehicles per day, or average annual daily traffic (AADT). In general, the state highways in and near the Project Corridor carry higher levels of traffic than the average for rural North Dakota, but represent only a fraction of the roadway capacity.

5.3.2 Impacts

Many public services near or within the Project Corridor are located within municipality boundaries, but rural water, fiber optic, transmission lines, and distribution lines are located outside of municipalities. Several of these municipalities have medical centers, hospitals, fire stations, police stations, and schools. There will be no direct or indirect effects to these public services with this Project.

Potential impacts to public services, mainly emergency services, are related to construction activities that may disrupt roadways and access. Generally, construction activities will be staged such that public roads will not be closed for any substantial period. Emergency access for local residents, should they need emergency services, will be provided by halting construction and relocating equipment so emergency vehicles could access the residence. Once construction is complete, the transmission line will span all roads and therefore will not impede emergency services.

A transmission line within the Project Corridor is not anticipated to have any long-term negative direct or indirect effects to public services. The Project will have a positive effect on public services by providing improved reliability and capacity to meet the growing demands for electrical service in the Project Vicinity. The added transmission will reduce the risk of brownouts (leading to potential blackouts) by providing transmission for additional baseload power to the Minnkota service area. Aside from the identified electrical impacts that are being addressed and mitigated through existing processes with neighboring utilities, Minnkota does not anticipate additional direct or indirect impacts to existing utilities from this Project.

Airports

Transmission lines can present an important safety concern to airports and aircraft. The FAA has established guidelines to determine the appropriate setback distance for tall structures, including transmission lines, from public use airports and heliports. Federal Aviation Regulation (FAR) Part 77 establishes standards and notice requirements for reporting airspace obstructions for objects currently impacting or that could impact navigable airspace around aviation facilities. FAR Part 77 defines a series of imaginary surface zones surrounding airports that specify height restrictions for structures based on slope ratios. These imaginary surfaces include the primary surface, horizontal surface, conical surface, approach surface, precision instrument approach surface, and the transitional surface. According to FAR Part 77, "an object will be considered an obstruction to a public airport (excluding seaplane bases and heliports) if it is of greater height" than any of the aforementioned imaginary surfaces. Each of these imaginary surfaces have corresponding slopes, based in part on the airport's use designation, flight volumes, and plane size capabilities. All surfaces are measured at the mean sea-level elevation of the airport.

Furthermore, certain objects such as steel pole transmission line structures have the potential to conflict with the operation of airport navigational aids and weather observation station facilities, including radar facilities used for aircraft navigation. These facilities may require routing regulations similar to those applicable to airports and airstrips.

According to the Land Use Compatibility Plan for Grand Forks International Airport (July 2006), an airspace review will be required for all structures within Zone C and Zone D. If the FAA determines there will be air navigation impacts once a ROW is selected, Minnkota will file the required notice with the FAA pursuant to the requirements set forth by FAR Part 77, Subsection 13.

Roads

The maximum construction workforce is expected to generate increased vehicle trips on local roadways. Using any combination of state and county highways and other township roads throughout the Project Corridor, the traffic impacts are considered minimal. Since many of the area roadways have limited traffic currently, the anticipated increased vehicle traffic during peak construction represents a large percentage increase and will be perceptible to daily users of the roads. Slow moving construction vehicles may cause delays on smaller roads, similar to farm equipment during harvest. In addition, delays may occur as the transmission line is being strung across a roadway. These impacts will be short term and temporary.

Two of the 17 potential state highway construction access locations may require a temporary impact within Department of Transportation (DOT) ROW. No permanent impacts are anticipated. Table 5.3-1 shows the state highway crossing and access locations from west to east

and potential impacts. As necessary, Minnkota will apply for approval from the North Dakota Department of Transportation for an access permit.

Table 5.3-1. State Highway Crossing and Construction Access Locations

ND Hwy	North or East Access[1]	South or West Access[1]	Temporary Impact Anticipated	Description of Temporary Impact
25	Drive off access	Existing field access	Yes	Remove and replace fence east side
1804	Existing field access	Existing field access	No	N/A
83	Drive off access	Drive off access	Yes	Remove and replace fence both sides
41	Access from side road	Drive off access	No	N/A
200	Drive off access	Access from side road	No	N/A
14	Existing field access	Existing field access	No	N/A
3	Drive off access	Access from side road	No	N/A
52	Access from side road	Drive off access 500' south	No	N/A
30	Drive off access	Existing field access	No	N/A
281	Existing field access	Existing field access	No	N/A
20	Existing field access	Existing field access	No	N/A
1	Existing field access	Existing field access	No	N/A
45	Access from side road	Access from side road	No	N/A
32	Existing field access	Existing field access	No	N/A
15	Existing field access	Existing field access	No	N/A
18	Drive off access	Drive off access	No	N/A
1806	Drive off access	Drive off access	No	N/A

1 Existing field access - Construction access will be via existing field access which is adequate in size and strength to handle construction equipment.

Drive off access - Construction access will be through existing shoulder which is shallow enough and has adequate strength to handle construction equipment.

Access from side road - Construction access will not be along highway, but rather will access ROW via side road close to crossing location.

5.3.3 Mitigation

Proper safeguards will be implemented for construction and operation of the facility. The Project will be designed according to local, state, and NESC standards regarding ground

clearance, crossing utilities clearance, building clearance, strength of materials, and ROW widths. Construction crews and/or contract crews will comply with local, state, and NESC standards regarding facility installation and standard construction practices. Minnkota will establish industry safety procedures that will be followed during and after installation of the transmission line, including clear signage during all construction activities.

Airports

Minnkota will continue to work with the Grand Forks International Airport and the FAA and does not anticipate any impacts to airport navigational aids, weather observation station facilities, airspace, and glide slope intercept for public airports near the Project Corridor. Following consultation with the Grand Forks International Airport and the FAA, no impacts are anticipated; thus, it is not anticipated that any mitigation will be necessary.

Roads

Minnkota will ensure that all safety requirements are met during the construction and operation of the transmission line and any accompanying facilities. Additionally, when crossing roads or railroads during stringing operations, guard structures may be utilized as necessary to eliminate traffic delays and provide safeguards for the public. Minnkota is working with counties and townships to develop construction traffic plans. With the construction traffic plans, proper safeguards, and protective measures implemented as described above, no additional mitigation should be needed.

5.4 Human Health and Safety

Human health and safety concerns include potential issues such as electric and magnetic fields (EMF) (collectively referred to as electromagnetic fields), stray voltage, and air quality. The majority of the information in this section was obtained from federal and state agencies and national and international organizations, including the National Institute of Environmental Health Sciences (NIEHS), U.S. Environmental Protection Agency (EPA), and World Health Organization (WHO).

5.4.1 Description of Resources

Electric and Magnetic Fields

EMF, as it relates to transmission lines, references two separate fields: electric fields and magnetic fields. Electric fields are produced by the line voltage, and magnetic fields are produced by the electric current in the lines. An electric field results from the voltage on an electrical wire as caused by electric charges, and electric fields can exert forces on other nearby charges. The intensity of the electric field is related to the voltage of the line and proximity to the conductor. Electric fields are measured in volts per meter (V/m) or kilovolts per meter (kV/m) where 1 kV = 1,000 V.

A magnetic field is created when charges move along a wire. The moving charges produce an electric current. The intensity of the magnetic field is proportional to the current flow through the conductors and proximity to the conductor. Magnetic fields are measured in milligauss (mG) or microTeslas (uT). Peak magnetic field levels can vary considerably depending upon the amount of current carried by the line.

Electric fields and magnetic fields are produced both by the natural world around us and the electricity we use on a daily basis. The earth's steady electric field is approximately 100 V/m and the earth's steady magnetic field is approximately 550 mG. However, thunderstorms can temporarily increase the electric field in a given location to several thousand V/m. The EMF produced by electrical equipment varies in time at a frequency of 60 cycles per second or "60 Hz." According to the Electric Power Research Institute (EPRI), the average household background 60-Hz magnetic field is between 0.5 and 4 mG with an average of 1 mG, and the average 60-Hz electric field is 1-20 V/m. Table 5.4-1 displays typical 60-Hz magnetic field levels from common household appliances. The EMF produced by electrical appliances and transmission lines are considered to be extremely-low-frequency (ELF) fields. Both the electric and magnetic fields that constitute EMF are strongest close to the sources of voltage and current, and decrease rapidly with distance.

Table 5.4-1. Typical 60 Hz Magnetic Field Levels From Common Household Appliance

Appliance	Median Magnetic field 6 inches from appliance (mG)	Median Magnetic field 2 feet away (mG)
Refrigerator	2	1
Vacuum cleaner	300	10
Electric oven	9	-
Dishwasher	20	4
Microwave oven	200	10
Hair dryer	300	-
Computers	14	2
Fluorescent lights	40	2

Source: NIEHS 2002

The frequency of transmission line EMF in the United States is 60 Hertz (Hz) (60 cycles per second). High frequency EMF are associated with radio, TV, radar, and cell phone signals.

There are no standards established for safe levels of exposure to 60-Hz EMF. Although some states have established standards or guidelines with regard to transmission line electric and magnetic fields, there are no North Dakota published guidelines for EMF. The standards and guidelines established by other states are displayed in Table 5.4-2.

Table 5.4-2. State EMF Standards and Guidelines for Transmission Lines

State/Line Voltage		Electric Field (kV/m)		Magnetic Field (mG)	
		On ROW	Edge ROW	On ROW	Edge ROW
Florida[c]	69-230 kV	8.0	2.0[f]	--	150
	230-500 kV	10.0	2.0[f]	--	200
	>500 kV	15.0	5.5[f]	--	250[e]
Massachusetts		--	1.8	--	85
Minnesota		8.0	--	--	--
Montana		7.0[a]	1.0[b]	--	--
New Jersey		--	3.0	--	--
New York		11.8	1.6	--	200
		11.0[d]			
		7.0[a]			
Oregon		9.0	--	--	--

[a]*Maximum for highway crossings*
[b]*May be waived by the landowner*
[c]*Magnetic fields for winter-normal, maximum line current-carrying capability*
[d]*Maximum for private road crossings*
[e]*Includes 500 kV double-circuit lines built on existing ROW's*
[f]*Includes the property boundary of a substation*
--No Guidelines

Some organizations have set EMF advisory limits that serve as guidelines for permissible EMF exposure levels. For example, the International Commission on Non-Ionizing Radiation Protection (ICNIRP) recently established a continuous magnetic field exposure limit of 2,000 mG and a continuous electric field exposure limit of 4,200 V/m (4.2 kV/m) for members of the general public. The American Council of Governmental Industrial Hygienists (ACGIH) has set a Threshold Limit Value for occupational exposure to 60 Hz magnetic fields of 10,000 mG and electric fields of 25,000 V/m (25 kV/m). Table 5.4-3 displays EMF guidelines established by health and safety organizations.

Table 5.4-3. Electric and Magnetic Field Exposure Guidelines for Power-Line Fields

Organization	Electric Field (kV/m)		Magnetic Field (mG)	
	General Public	Occupational	General Public	Occupational
ICNIRP (2010)	4.2	8.3	2,000	4,200
IEEE (2002)	5	20	9,040	27,100
ACGIH (2009)	--	25	_	10,000

ICNIRP – International Commission on Non-Ionizing Radiation Protection
IEEE – Institute of Electrical and Electronic Engineers
ACGIH – American Conference of Governmental Industrial Hygienists

Minnkota conducted an analysis of calculated EMF levels for the Project. Table 5.4-4 shows the calculated EMF levels for a transmission line route within the Project Corridor. The phrase "On ROW" refers to the location directly under the transmission line and the phrase "Edge ROW" refers to a distance 75 feet from directly underneath a transmission line. Computations were performed using industry standard approaches as outlined in the Transmission Line Reference Book – 345kV and Above; Second Edition, 1982, Electric Power Research Institute, Inc., Palo Alto, CA, USA, and modified by data approaches developed by Bonneville Power Administration and Washington State University.

Table 5.4-4. Preliminary Calculated EMF Levels for the Project

Project Load Condition	Electric Field (kV/m)		Magnetic Field (mG)	
	On ROW	Edge ROW	On ROW	Edge ROW
Normal Operating Condition[a]	2.4	1.2	70	42
Maximum Operating Condition[b]	3.7	1.2	277	93

[a]*Normal Operating Condition was assumed to be 404 MVA for winter-normal at maximum allowable voltage.*
[b]*Maximum Operating Condition was assumed to be that condition of operating parameters which would result in the highest field levels.*

Electric and Magnetic Field Research

Concerns about potential health effects of EMF from transmission lines were first raised in the late 1970s, triggered by a weak statistical correlation between living in proximity to utility distribution systems and childhood leukemia cases. There has been much public debate and research regarding ELF-EMF for over 35 years. Considerable research has been undertaken to understand how electric and magnetic fields interact with the physical nature of matter. Because

electric fields are blocked by ordinary substances that conduct electricity, such as skin, foliage, and house structures, magnetic fields have been the focus of most of the research regarding possible health effects to both humans and livestock. While there are numerous internet sites devoted to EMF (whether from transmission lines, cell phones, or radio frequency signals), the vast majority of public-health agencies believe that EMF from transmission lines do not cause health problems. In part, these scientific consensus groups note the physical impossibility of any health effect (or adverse biological effect) being caused by exposure to low-frequency, low-intensity magnetic fields. Exhaustive reviews of the health effects from power-frequency fields conclude that the evidence of health risk is weak and there is little laboratory evidence correlating extra low frequency EMF exposure with health risk, as demonstrated in the following discussion.

EMF and Leukemia

After reviewing more than two decades of research, NIEHS scientists concluded that the overall pattern of results suggests a weak association between increasing exposure to EMF and an increased risk of childhood leukemia (NIEHS 1999). ICNIRP reviewed the scientific evidence relating to extremely low magnetic fields and increased risk of childhood leukemia and concluded that the evidence "is too weak to form the basis for exposure guidelines"(ICNIRP, 1998, 2010). Several scientific organizations including the American Medical Association (AMA 1994), American Cancer Society (ACS 2010), American Physical Society (APS 2005), and National Academy of Sciences (NAS 1997) have stated that the body of evidence in regard to ELF-EMF, particularly magnetic fields, indicates that exposure to these fields do not present a human health hazard.

A large number of credible, scientific organizations have come to similar conclusions about ELF-EMF and public health:

- The epidemiology studies on EMF are not based on actual EMF exposures and show weak and generally inconsistent correlations between estimates of EMF exposure and health statistics.
- Laboratory research has not been able to establish either cause and effect relationship between exposure to magnetic fields and any human disease, or a plausible biophysical or biological mechanism by which exposure to EMF could cause cellular changes that would lead to disease.
- The magnetic fields produced by power lines do not have the energy necessary to break chemical bonds and cause DNA mutations, and hence cannot interfere with basic biological function at the molecular level.

Many public health agencies (e.g. American Cancer Society, Environmental Protection Agency, Food and Drug Administration, Centers for Disease Control) have not established numerical guidelines for power line EMF, because they have not found scientific studies sufficiently supportive of the need to set either a EMF exposure guideline or a "safe distance" criterion. No legitimate public health agency has proposed that an "unsafe" region exists in the proximity of overhead transmission lines.

EMF and Livestock

The vast amount of laboratory animal research focused on EMF effects on living organisms has not demonstrated that power line magnetic fields affect reproductive function. In addition, a

considerable amount of research on EMF and livestock (particularly cows) has been conducted in Quebec, Canada and has been funded by Hydro-Quebec. A recent joint study conducted by McGill University, Ministere de l'Agriculture, des Pecheries et de l'Alimentation du Quebec (MAPAQ) and the Quebec Dairy Committee exposed cows to high levels of EMF. This study did not show any changes in the hormonal profile and dairy production of Holstein cows. This, in addition to several other studies conducted since the 1970s, provide reassurance that no biological disorder can be attributed to the exposure of livestock to EMFs generated by high-voltage transmission lines. In addition, no harmful effect on the health, productivity, fertility, reproduction, or behavior of livestock exposed to EMFs has been observed, and typical EMF exposures are not anticipated to be harmful to farm animals.

In addition, Minnkota, and other utilities in agricultural regions of the country, have operated 345 kV systems for many years. Through the years, no statements concerning the potential adverse effects of the 345 kV power system on cattle were received.

EMF and Implantable Medical Devices

Implantable medical devices, for example cardiac pacemakers, defibrillators, neurostimulators, and insulin pumps may experience interference from strong EMF. The 2004 EPRI report indicated that implantable medical devices may be more susceptible to interference from electric fields than to magnetic fields. Electric fields will be strongest directly under the transmission line and decrease with increasing distance from the transmission line towards the ROW edge. Although no actual real-world events have been reported in people near high-voltage transmission lines, laboratory research has shown the following potential effects can occur to pacemakers exposed to electric fields:

- Rate increasing.
- Erratic pacing.
- Switching to asynchronous pacing or fixed-rate pacing.
- Single beat inhibition (i.e., a single beat is missed by the pacemaker).
- Total inhibition.

Research completed by Toivonen et al. (1991) indicated that the lowest field intensity suggestive of possible interference was in electric fields ranging from 1.2 to 1.7 kV/m (near a 110 kV power line), but some pacemakers maintained normal function in electric fields up to 8 kV/m (near a 400 kV power line). The 15 patients in this study collectively had 12 different models of pacemakers from four manufacturers. Scholten et al. (2005) concludes that the risk of interference inhibition of unipolar cardiac pacemakers from high voltage power lines in everyday life is small. In the unlikely event a pacemaker experiences interference, the pacemaker goes into a default pacing mode and then returns to its normal operation when the person moves away from the source of the interference. Modern bipolar devices are much less susceptible to interactions with electric fields. Dyrda et al.'s (2009) review of Trigano et al. (2005) concluded "risks with bipolar sensing [in pacemakers] appeared negligible." In addition, major manufacturers (Medtronic and Guidant) of pacemakers and implantable medical devices have indicated that electric fields below 6 kV/m are unlikely to cause interactions affecting operation of most of their devices (Tower Project 2005). Scholten (2004) indicated that moving 20 meters away from the point directly underneath the line (two 380 kV circuits) resulted in the most precipitous drop in electric fields.

Induced Voltage

Induced voltage is an electrical condition through which very low levels of voltage are transferred to and may be measured in objects in the near vicinity of a high voltage transmission line. Near objects could be buildings, fences, pipelines, railways, or other equipment in very close proximity to the transmission line. The electric field from a transmission line can interact with a conductive object, such as a metal fence, which is in proximity to the transmission line. This will induce a voltage on the object, the magnitude of which is dependent on many factors, including the weather; object shape, size, orientation, and capacitance; object to ground resistance; and object location along the ROW. Electrically grounded objects exhibit no induced voltage, but if nearby objects are insulated or semi-insulated from the ground and a person touches them, a small current will pass through the person's body to the ground. This might be accompanied by a spark discharge and mild shock, similar to what can occur when a person walks across a carpet and touches a grounded object or another person. Induced voltage from capacity coupling normally is not a problem. Where it is, the problem can be mitigated with proper grounding of the affected objects.

Stray Voltage

Stray voltage is a condition that can occur on the electric service entrances to structures from distribution lines (i.e., the smaller, lower-voltage electric line that brings power from utility substations to your house, barn, and other farm buildings), not transmission lines (i.e., the electric line that brings power from the generation source to substations and hence to the distribution system). Transmission lines do not, by themselves, create stray voltage because they do not connect to businesses or residences. Stray voltage describes a special case of voltage developed on the grounded neutral of the electrical wiring system of a farm and/or a utility's electric power delivery system. If this voltage reaches sufficient levels, animals coming into contact with grounded devices may receive a mild electric shock that can cause a behavioral response. The term stray voltage is often applied incorrectly to other electrical phenomena such as electric fields, magnetic fields, and electric current flowing in the earth or on grounding systems.

Air Quality

Corona consists of the breakdown or ionization of air within a few centimeters of transmission line conductors and hardware. Usually some imperfection such as a sharp edge, a protrusion on hardware, a scratch on the conductor, or water is necessary to cause corona. Corona can produce ozone and oxides of nitrogen in the air surrounding the conductor. Ozone also forms in the lower atmosphere from lightning discharges and from reactions between solar ultraviolet radiation and air pollutants, such as hydrocarbons from auto emissions. In the case of air pollutants, the natural production rate of ozone is directly proportional to temperature and sunlight and inversely proportional to humidity. Thus, humidity or moisture, the same factor that increases corona discharges from transmission lines, inhibits the production of ozone from air pollutants. Ozone is a very reactive form of oxygen molecules, and it combines readily with other elements and compounds in the atmosphere. Because of its chemical reactivity, ozone is relatively short-lived.

5.4.2 Impacts

Electric and Magnetic Fields

EMF will be strongest directly under the transmission line and decrease with increasing distance from the transmission line towards the ROW edge. Minnkota conducted an analysis of EMF calculated levels for the Project (as shown in Table 5.4-4). As load changes on the transmission line the electric current flow changes, therefore the magnetic fields change.

At the maximum-load operating condition under the transmission line, the electric field is 3.7 kV/m and the magnetic field is 277 mG. This would be considered the worst-case scenario for the Project. The results of Minnkota's analysis show that calculated EMF levels for the Project under maximum operating conditions and normal operating conditions are below the published guidelines from organizations (such as ICNIRP and ACGIH)) (Table 5.4-3) and the states (Table 5.4-2) that have published safe-exposure guidelines.

The effects that may occur to a person with an implantable medical device are usually temporary and the medical device generally resumes normal function once the person is removed from the source of electric fields. At levels associated with high-voltage transmission lines, a transmission line within the Project Corridor will not have regular, temporary interference with implantable medical devices. No other EMF-related impacts to humans or animals are anticipated.

Induced Voltage

The main concern with induced voltage on an object is the current flow through the person to ground if a person were to touch an ungrounded metal object under the lines. There are no anticipated induced voltage impacts expected as a result of the construction or operation of a transmission line within the Project Corridor.

Insulated electric fences used in livestock operations may pick up an induced charge from transmission lines. Usually, the induced charge will drain off when the charger unit is connected to the fence. When the charger is disconnected either during maintenance or when the fence is being built, minor shocks may result, but can be avoided by grounding the wire when disconnected from the charger is attached.

Minnkota anticipates crossing perpendicular to railways and underground pipelines. As discussed below, Minnkota will utilize appropriate mitigation measures to prevent induced voltage impacts to railway or pipeline facilities.

Stray Voltage

There are no anticipated stray voltage impacts as a result of the construction or operation of a transmission line within the Project Corridor.

Air Quality

No impacts to air quality due to the operation of the transmission line are anticipated. The federal government has regulations regarding permissible ambient air concentrations of ozone and oxides of nitrogen. North Dakota has incorporated these federal ambient air quality standards into its air quality rules. The ambient air quality standard for ozone is 0.075 ppm based upon a three-year average of the annual fourth-highest daily maximum 8-hour average (40 CFR §50.15) concentration. Humid conditions and rain may cause transmission line insulators to release corona-discharge electricity, converting oxygen to ozone. Calculations done for a 345 kV

project showed that the maximum 1-hour concentration during foul weather (worst case) will be 0.0007 ppm, which is far below both federal and state standards.

Temporary air quality impacts caused by construction-vehicle emissions and fugitive dust from ROW clearing and construction may occur, but will be minimal and temporary.

5.4.3 Mitigation

The NESC provides standards regarding clearance to ground, clearance to crossing utilities, clearance to buildings, strength of materials, and ROW widths. Minnkota will design the Project to adhere to NESC standards. The U.S. Occupational Safety and Health Administration (OSHA) regulates worker safety in both construction and industrial settings and has developed and enforces regulations that are designed to protect workers from potential accidents. Minnkota will require OSHA-compliant safety procedures that will be followed during and after installation of the transmission line, including clear signage during all construction activities.

Electric and Magnetic Fields

As demonstrated by the conclusions of the numerous studies presented in Sections 5.4.1 and 5.4.2 and the results of Minnkota's analysis of calculated EMF levels, normal operating conditions and maximum operation conditions would create EMF levels nearby the lines that would be below published guidelines. Minnkota does not anticipate any affects from EMF associated with a route within the Project Corridor; thus it is not anticipated that any mitigation will be necessary.

Induced Voltage

The transmission lines will be equipped with protective devices (breakers and relays located where transmission lines connect to substations) to safeguard the public in the event of an accident. The protective equipment will de-energize the transmission line should such an event occur. In addition, the substation facilities will be properly fenced and accessible only by authorized personnel.

As part of the design and engineering process, a transmission line within the Project Corridor will be designed to eliminate any induced voltages in objects in close proximity to the line. NESC clearances will be met, and the transmission line engineered in such a way as to ensure that induced voltages are minimized. To ensure that any electric discharge from induced voltages does not reach unsafe levels, the NESC requires that any discharge be less than 5 milliamperes (ma). Following construction, Minnkota will assure, as necessary, that any fixed object, such as a fence or other large permanent conductive object close to or parallel to the transmission line, will be grounded so any discharge will be less than the 5 ma NESC limit.

Insulated electric fences used in livestock operations may pick up an induced charge from transmission lines. Potential shocks can be prevented by shorting out one or more of the fence insulators to ground with a wire when the charger is disconnected or installing an electric filter to ground charges induced from a power line, while still allowing the charger to be effective.

Stray Voltage

Transmission lines do not, by themselves, create stray voltage because they do not connect to businesses or residences. No impacts from stray voltage are anticipated; therefore no mitigation is proposed.

Air Quality

Best Management Practices (BMPs) will be used to control fugitive dust during construction, including operating vehicles at reduced speeds and use of water and dust abatement methods. Dust suppression will be required of the construction contractors who will access and maintain the ROW and haul roads during construction. Minnkota or the construction contractors will apply for a permit from the State Water Commission for water appropriations related to construction purposes.

5.5 Noise

5.5.1 Description of Resources

Noise is defined as unwanted sound. Noise may include a variety of sounds of different intensities across the entire frequency spectrum. Noise is measured in units of decibels (dB) on a logarithmic scale. Because human hearing is not equally sensitive to all frequencies of sound, certain frequencies are given more "weight." The A-weighted decibel (dBA) scale corresponds to the sensitivity range for human hearing. Noise levels capable of being heard by humans are measured in dBA. A noise level change of 3 dBA is barely perceptible to average human hearing. A 5 dBA change in noise level, however, is clearly noticeable. A 10 dBA change in noise levels is perceived as a doubling or halving of noise loudness, while a 20 dBA change is considered a dramatic change in loudness.

Cumulative noise increases occur on a logarithmic scale. If a noise source is doubled, there is a 3 dBA increase in noise, which is barely discernible to the human ear. For cumulative increases resulting from sources of different magnitudes, the rule of thumb is that if there is a difference of greater than 10 dBA between noise sources, there will be no additive effect (i.e., only the louder source will be heard and the quieter source will not contribute to noise levels). Table 5.5-1 below provides noise levels associated with common, everyday sources and places the magnitude of noise levels discussed here in context.

Table 5.5-1. Noise Levels Associated with Common Sources

Sound Pressure Level (dBA)	Noise Source
140	Jet Engine (at 25 meters)
130	Jet Aircraft (at 100 meters)
120	Concert
110	Pneumatic chipper (powered by compressed air or hydraulics)
100	Jointer/planer
90	Chainsaw
80	Heavy truck traffic
70	Business office
60	Conversational speech
50	Library
40	Bedroom
30	Secluded woods
20	Whisper

Source: A Guide to Noise Control in Minnesota, MPCA (revised, 1999)

For this Project's design process, Minnkota has adopted the following criteria that is consistent with other 345 kV transmission projects in the area, such as the CapX2020 Fargo to St. Cloud Project. The land use activities associated with residential, commercial, and industrial land have been grouped together into Noise Area Classifications (NAC). Each NAC is assigned daytime (7 a.m. to 10 p.m.) and nighttime (10 p.m. to 7 a.m.) limits for land use activities within the NAC.

The limits are expressed as a range of permissible dBA within a one hour period; L50 is the dBA that may be exceeded 50 percent (30 minutes) of the time within an hour, while L10 is the dBA

that may be exceeded 10 percent (six minutes) of the time within an hour. Residences, which are typically considered sensitive to noise, are classified as NAC 1. Table 5.5-2 shows the daytime and nighttime limits in dBA for residential areas (NAC 1).

Table 5.5-2. Noise Limits by Noise Area Classification (dBA)

Noise Area Classification	Daytime		Nighttime	
	L10	L50	L10	L50
1	65	60	55	50

The state of North Dakota does not regulate noise with measureable standards. There has been recent comment on proposed noise level targets, which were prepared by the North Dakota Legislative Council for the Energy Development and Transmission Committee. The proposed noise level targets reference 50 dB at the property line for noise sensitive land uses such as residences. As there is no weighting to this metric, Minnkota assumes that this is an un-weighted metric to account for predominant low frequency noise.

5.5.2 Impacts

Transmission Line

Construction activities would generate noise that is short-term and intermittent. Noise generated during operation of construction equipment and worker presence will create a short-term impact to nearby residences.

Transmission lines produce noise under certain conditions. The level of noise depends on conductor conditions, voltage level, and weather conditions. In foggy, damp, or rainy weather, transmission lines can create a crackling sound due to the small amount of electricity ionizing the moist air near the conductors. During heavy rain the background noise level of the rain is usually greater than the noise from the transmission line. As a result, people do not normally hear noise from a transmission line during heavy rain. During light rain, dense fog, snow and other times when there is moisture in the air, transmission lines would produce audible noise approximately equal to household background levels.

The Project was modeled using the Bonneville Power Administration CFI8X model to evaluate audible noise from high voltage transmission lines. The model was executed as a worst-case scenario benchmark, to ensure that noise was not under-predicted. Table 5.5-3 presents the predicted L50 for the proposed transmission line of the Project. The L50 is a noise level that would not be exceeded more than 50 percent of the time. Using the L50 for demonstrating compliance with nighttime L50 standard is the most conservative because the nighttime L50 is the most stringent of noise metrics (as noted in Table 5.5-3).

Table 5.5-3. Calculated Audible Noise for the Operation of Proposed Single/Double Circuit Transmission Line Designs (5 Feet Above Ground)

Structure Type	Noise L50 (At Pole, 5' height, dBA)
Single Pole, 345 kV/Single Circuit Tangent	45

The Commission's guidelines require that the transmission facility is no closer than 500 feet from a residence unless a waiver is granted. Therefore, it was assumed that any residences within

500 feet of a transmission facility would fall within the NAC 1 category. As such, L50 from the Project must not exceed nighttime levels of 50 dBA at these residences. Noise levels generated by the Project would be the same at night as those generated during the daytime, compliance with the nighttime levels (more restrictive) would also demonstrate compliance with the daytime noise standards due to greater noise sensitivity of humans at night.

Noise associated with the operation of the Project at the centerline of the Project Corridor and within 500 feet of the Project Corridor centerline is not predicted to exceed the nighttime L50 standard. Minnkota anticipates that coronal noise, the electrical breakdown of air into charged particles caused by the electrical field at the surface of conductors, from the transmission line will be far enough away from residences so as to not be heard above the ambient noise produced by wind and other natural phenomena.

Substation

The loudest noise levels associated with substation operation are when the cooling fans and oil pumps are in operation. Both of the substations proposed for transmission and equipment upgrades are located on Minnkota property. Noise levels around the substations are not anticipated to increase as a result of these upgrades.

5.5.3 Mitigation

No long-term noise impacts are anticipated, thus no mitigation is anticipated. Construction activities will generate noise that is short-term and intermittent. Noise impacts associated with construction will be mitigated in noise sensitive areas by limiting the hours of work to daytime hours. Heavy equipment used in construction will be equipped with sound attenuation devices, such as mufflers, to minimize the daytime noise levels.

5.6 Visual Impacts

5.6.1 Description of Resources

The discussion of visual quality and aesthetics is based on a qualitative review of the existing landscape environment surrounding the Project Corridor. Visual and aesthetic resources within the Project Corridor were identified through discussions with state and local agency officials, review of comprehensive land use plans, and other local and regional plans, comments received from participating citizens at open houses, and through a review of aerial photography and field observation. Generally, visual and aesthetic resources within the Project Corridor and surrounding vicinity include historic residential or commercial structures, parklands, cultivated agricultural land, rural open space areas (i.e. rolling pasture lands, CRP), water features, and wooded and shrubland draws.

The landscape topography crossed by the Project Corridor is a mixture of agriculture, farmsteads, fallow fields, large open vistas, and gently rolling hillside topography. The Project Corridor is primarily located in sparsely populated rural areas of North Dakota, where the landscape is mostly flat to rolling agricultural lands that can be classified as rural open space. Rural residences and farm buildings (inhabited and uninhabited) scattered along rural county roads are focal points in the open space character of the landscape crossed by the Project Corridor. Scattered areas of forest and tree cover occur throughout the Project Corridor, primarily in areas considered unsuitable for farming, or planted as protection from the wind and sun around rural residences or farmsteads. Many residents have surrounded their homes with a mix of deciduous and coniferous trees that serve as natural windbreaks, shade, and enhanced privacy for homes.

High scenic integrity and significance areas include river and open water features, historic structures, tree stands, public recreation areas, and scenic byways (State Highways 1804 and 1806). Land parcels along the Project Corridor considered to contain outstanding natural features and warrant protection or management have been placed into state and federal conservation easement programs or fee trust lands such as Wildlife Management Areas (WMA) or wildlife habitat areas under the jurisdiction of the USFWS.

In addition to the naturally occurring landscape features and the scenic byway, historic structures are located at various points along the Project Corridor. Data from the State Historic Preservation Office (SHPO) and the National Register of Historic Places (NRHP) were obtained to identify historic structures along the Project Corridor. These structures serve many functions, such as cultural resources and tourist destinations.

5.6.2 Impacts

A new transmission line will create a new visual element within the vicinity of the Project Corridor. The visual impact of the transmission line could affect landowners who live along or near the roads that the Project Corridor follows or community residents who regularly travel along these roads. Depending on a viewer's physical location, the terrain conditions, and natural landscape features such as tree cover, the transmission structures could be visible for distances between 1.5 and 2 miles. A viewer's degree of discernable detail decreases as physical distance from an object increases. Beyond 2 miles in physical distance, the outline of structures most likely will not be seen. The transmission line wiring is unlikely to be seen clearly beyond distances of one-half to three-quarters mile.

As the Project Corridor extends from west to east towards Grand Forks, the number of rural residences gradually increases, thereby increasing the potential for visual impacts to homes near the transmission line. In addition, the Project Corridor crosses the Missouri and Sheyenne Rivers, which are areas considered visually sensitive by members of the public.

5.6.3 Mitigation

The transmission line within the Project Corridor will parallel field and section lines or be located in areas where compatible land uses have been identified by the public and agencies. Typical structures will be between 130- and 150-feet-tall, typically located just outside the field break or public road ROW. Many of these roads currently do not share a ROW with a transmission line, with the exception of power distribution lines serving rural residences and farmsteads.

Several areas the Project Corridor crosses may be considered visually sensitive, specifically the crossing points of the Missouri River, Sheyenne River, James River, Goose River, McClusky Canal, and various creeks. As part of the routing process, care will be taken to avoid the placement of structures in ecologically sensitive areas, typically identified by the public as areas of scenic significance, and additional care will be taken to avoid visual impacts to the greatest extent practicable. Minnkota intends to work with landowners in the Project Corridor to minimize the impact of the transmission line to the surrounding landscape and limit the removal of trees.

A transmission line within the Project Corridor will be a contrast to surrounding land uses, and Minnkota will continue to work with landowners and public agencies to identify concerns related to the transmission line and aesthetics. In general, mitigation includes enhancing positive effects as well as minimizing or eliminating negative effects. Potential mitigative measures include the following:

- Where feasible, the location of pole structures, ROWs, and other disturbed areas will be determined by considering input from landowners or land management agencies to minimize visual impacts.
- Structure types (design) will be uniform to the extent practical. Minnkota proposes to use self-weathering single circuited, single pole steel structures. . The height of the structure may be reduced, as feasible, to minimize impacts within the areas of high scenic importance. The self-weathering structure will turn a brownish color to help blend in with the landscape.
- Structures will be placed at the maximum feasible distance from scenic highway, waterway, and trail crossings, within the limits of structure design.
- Care will be taken to preserve the natural landscape; construction and operation will be conducted to prevent any unnecessary destruction, scarring or defacing of the natural surroundings in the vicinity of the work.
- To the greatest extent possible, waterways will be crossed in the same location as existing disturbances, such as utility lines or roads.

5.7 Cultural Resources

As the lead agency for the federal permitting process, the RUS is coordinating compliance with both the Section 106 procedures of the National Historic Preservation Act of 1966, as amended (NHPA)(16 U.S.C. § 470 et seq.), and the steps taken to meet NEPA requirements.

5.7.1 Description of Resources

Although there is no one accepted definition, cultural resources refer to historic, aesthetic, and cultural aspects of the human environment. These can include natural and built resources, and the relationship that people have to those resources. Those cultural resources that meet specific evaluation criteria developed by the National Park Service (NPS) may qualify for listing in the NRHP. Those cultural resources listed on or eligible for listing on the NRHP are designated "historic properties" under the NHPA. Historic properties can include archaeological and historical resources as well as traditional resources and use areas identified as having special meaning for specific communities. Archaeological and historic resources are those places that represent the visible or otherwise tangible record of human occupation. These resources vary in size, shape, condition, and importance, among other considerations; some are clearly evident on the landscape, while others are buried or only visible to knowledgeable people. For the purpose of this application, archaeological resources are typically underground or at the surface, while historic resources include standing structures such as bridges and buildings. Physical avoidance of cultural resources was a consideration in locating the Project Corridor.

Minnkota reviewed available records of identified cultural resources, including but not limited to those provided by the SHPO, to avoid them to the greatest extent possible, taking into consideration other natural resources and existing conditions. Minnkota recognizes that the list of known resources is limited to those identified through surveys in specific locations, often tied to urban and rural development and infrastructure. Resources are typically categorized by type with an indication of relative importance, more exactly whether or not these resources are significant. The database information provided by SHPO, however, did not include specific information or details on the type of property listed, and was useful mainly in identifying site location. The standard significance is one applied by federal agencies for compliance with federal regulations, typically Section 106 of the NHPA (as amended), and is useful when determining sites to avoid. The available background information illustrates the limited extent of previous archaeological site inventories. An archaeological inventory of the Project Corridor has not been conducted, so it is not possible to quantify the entirety of the potential archaeological impacts. Archaeologists often develop predictive models based on a number of factors, including but not limited to areas immediately adjacent to permanent water sources. These environments have a higher probability to contain pre-contact archaeological sites because of the possible variety and abundance of potable water and flora and fauna resources. This water-based factor has been referenced during coordination among state agencies and the SHPO for this Project. Therefore, Minnkota reviewed the location of the Project Corridor relative to known aquatic environments.

Field surveys will be conducted as Project permitting continues; some locations might then be subject to archaeological inventory and associated activities once Minnkota secures access to the ROW. Beginning in October 2010, some areas of the Corridor underwent pedestrian surveys. Subsurface testing of selected areas began after the pedestrian survey in late October 2010. When a route is identified, additional surveys for architectural resources as well as archaeological resources will occur. Architectural resource survey and inventory can occur during the winter months, but additional archaeological survey is dependent on weather conditions. It is presumed

that the archaeological survey would be completed after winter snows have melted and frost is out of the ground during the spring of 2011.

Physical avoidance of resources will be a consideration in locating the route. However, any resource that cannot be avoided will be treated according to the stipulations outlined in the Programmatic Agreement (PA) between RUS, SHPO, and other interested parties.

5.7.2 Archaeological Impacts

Minnkota reviewed records sent from the SHPO to identify known archaeological resources within the Project Corridor. The Class I literature review also included reports of previously surveyed areas relevant to the Project Corridor and Government Land Office maps (Appendix F). The resources are grouped into seven categories to aid in assessment. These are Mound sites (sites with or without burials or additional features), Stone Features (sites containing circles, cairns, effigies or other stone alignments), Isolated Finds (single or very few chipped or ground stone flakes, tools, or broken tools), Cultural Material Scatter (chipped stone, animal bone, tools, or ceramics, either historic or prehistoric), Habitation (prehistoric earthlodges, hearths, caches, depressions), Multicomponent (containing both prehistoric and historic habitation materials or features), Unknown (not enough information on site form to categorize the site), and Historic Districts.

The Spirit Lake Nation lands are located 11 miles north of the Project Corridor in Eddy County and the Knife River Indian Villages National Historic Site is located south of Washburn on the west end of the Project Corridor. These resources will not be impacted during construction or operation of the Project. Minnkota has contacted Native American tribes with interests in the Project Corridor and Study Area. Once the PA is finalized, Minnkota will follow the conditions as stated in the PA.

Since the ROW will be narrower than the Project Corridor, Minnkota anticipates that all direct impacts to archaeological resources could be avoided by spanning the resource or shifting the transmission line ROW. Seventy-four previously recorded archaeological resources are located within or within 1 mile of the Project Corridor (Table 5.7-1). There are no sites that are listed on the NRHP; however, one site within the Project Vicinity has been recommended eligible for listing. None of the remaining 73 sites have been evaluated for listing. As demonstrated in Table 5.7-1, within the Project Corridor and Project Vicinity there are 10 mound sites, 3 stone feature sites, 14 isolated finds, 29 cultural material scatters, 0 habitation sites, 18 unknown sites, and 0 multicomponent sites. Appendix F provides additional site detail.

Table 5.7-1. Corridor and Vicinity Archaeological Resources

County	Site Number	Site Type/Name	Within Project Corridor	Within Project Vicinity	NRHP Status	Location		
						T	R	S
Burleigh	32BLX183	Isolated find, chipped stone Primary KRF flake	-	X	Not evaluated	142	81	15
Foster	32FOX34	Isolated find, chipped stone Secondary KRF flake	-	X	Not evaluated	147	65	1

County	Site Number	Site Type/Name	Within Project Corridor	Within Project Vicinity	NRHP Status	Location		
						T	R	S
Foster	32FOX35	Isolated find, projectile point Side-notched point base	-	X	Not evaluated	147	65	1
Griggs	32GGX64	Isolated find-chipped stone	-	X	Not evaluated	147	60	2
Griggs	32GGX68	Isolated find-chipped stone	-	X	Not evaluated	148	59	35
Griggs	32GGX69	Isolated find-chipped stone	-	X	Not evaluated	148	59	35
Griggs	32GGX70	Isolated find-biface	-	X	Not evaluated	148	59	35
Griggs	32GGX72	Chipped stone	-	X	Not evaluated	148	59	34
McLean	32MLX47	Chipped stone, isolated find Secondary KRF flake	X	-	Not evaluated	143	80	31
McLean	32MLX62	Chipped stone, isolated find Secondary KRF flake	-	X	Not evaluated	143	80	31
Oliver	32OLX182	Isolated find, chipped stone KRF flake	-	X	Not evaluated	142	81	20
Oliver	32OLX183	Isolated find, chipped stone One quartzite chopper	-	X	Not evaluated	142	81	20
Oliver	32OL106	Cultural material scatter -flakes, tool, groundstone fragments, pottery sherds, bone fragments	-	X	Not evaluated	142	81	27
Oliver	32OL392	CM scatter, other rock feature, chipped stone Prehistoric cultural material scatter and cairn	-	X	Not evaluated	142	81	34
Oliver	32OL394	CM scatter, projectile point, chipped stone Prehistoric cultural material scatter, KRF plains side-notched point	-	X	Not evaluated	142	81	34
Oliver	32OL6	Cultural material scatter-ceramic sherds, bone, and chipped stone	-	X	Not evaluated – Recommended Eligible	142	81	28

County	Site Number	Site Type/Name	Within Project Corridor	Within Project Vicinity	NRHP Status	Location		
						T	R	S
Oliver	32OLX17	Cultural material scatter	-	X	Not evaluated	142	81	34
Oliver	32OLX188	Isolated find, chipped stone KRF flake	-	X	Not evaluated	142	81	34
Oliver	32OLX210	Isolated find-KRF secondary flake	-	X	Not evaluated	142	81	28
Sheridan	32SHX81	Isolated find, chipped stone One quartzite chopper	X	-	Not evaluated	147	76	11
Sheridan	32SHX117	Unknown	-	X	Not evaluated	147	78	33
Burleigh	32BL122	Unknown	-	X	Not evaluated	142	80	19
Burleigh	32BLX146	Stone circle At least 20 stone circles in pasture	X	-	Not evaluated	144	79	5
Foster	32FOX66	Cultural material scatter-chipped stone, projectile point	-	X	Not evaluated	147	62	7
Grand Forks	32GF10	Grave, mound, charcoal, projectile point, chipped stone, ground stone Period unknown, evidence of burned earth and human skeletal remains	-	X	Not evaluated	150	55	31
Grand Forks	32GF3474	CM scatter, ceramics, faunal remains, fire cracked rock, chipped stone Sparse cultural materials scatter consisting of flaking debris, FCR, small unidentifiable bone fragments, and a ceramic shard with no decoration and grit temper	-	X	Not evaluated	150	52	19
Grand Forks	32GF3485	CM scatter, faunal remains, chipped stone Debitage and bone	X	-	Not evaluated	150	52	15
Grand Forks	32GF3486	Remnant Beach	-	X	Not evaluated	150	52	29

County	Site Number	Site Type/Name	Within Project Corridor	Within Project Vicinity	NRHP Status	Location		
						T	R	S
Grand Forks	32GF3487	Cultural material scatter-historic artifact scatter, 200+ items	X	-	Not evaluated	150	52	21
Grand Forks	32GFX24	Listed as a Mound and Cultural material scatter	X	-	Not evaluated	150	52	19
Griggs	32GG112	Cultural material scatter-bone fragments, fire-cracked rock, a flake, and ceramic sherds	-	X	Not evaluated	148	159	36
Griggs	32GG113	Cultural material scatter-bone fragments and fire-cracked rock	-	X	Not evaluated	147	58	6
Griggs	32GG114	Cultural material scatter-fire-cracked rock, bone fragments, charcoal	-	X	Not evaluated	147	58	6
Griggs	32GG20	Unknown	-	X	Not evaluated	148	59	25
Griggs	32GG25	Cultural material scatter-sparse scatter of lithic debris and tools, and bone	-	X	Not evaluated	148	59	35
Griggs	32GG26	Mound-2 possible burial mounds	-	X	Not evaluated	158	59	35
Griggs	32GG30	Cultural material scatter-sparse scatter of lithics, bone, and groundstone	-	X	Not evaluated	148	59	35
Griggs	32GG31	Cultural material scatter-sparse scatter of lithic debris and tools, bone, and a core	-	X	Not evaluated	148	59	35
Griggs	32GG39	Cultural material scatter-sparse scatter of lithics and bone	-	X	Not evaluated	148	59	35
Griggs	32GG68	Mound-low linear mound	-	X	Not evaluated	148	59	35
Griggs	32GG69	Cultural material scatter-sparse lithic and bone scatter	-	X	Not evaluated	148	59	35
Griggs	32GG70	Stone circle-9 stone circles and 1 cairn	-	X	Not evaluated	148	59	35

County	Site Number	Site Type/Name	Within Project Corridor	Within Project Vicinity	NRHP Status	Location		
						T	R	S
Griggs	32GGX117	Mound-unknown prehistoric earthen mound	X	-	Not evaluated	147	59	1
Griggs	32GGX47	Rock Feature-Serpent effigy	-	X	Not evaluated	147	61	9
Griggs	32GGX60	Mound Probable mounds based on informants note	-	X	Not evaluated	147	60	11
McLean	32ML1140	Cultural material scatter, chipped stone-Sparse lithic scatter	-	X	Not evaluated	143	80	31
McLean	32ML871	Cultural material scatter, chipped stone, groundstone- 7 KRF flakes and 1 grooved maul	-	X	Not evaluated	143	80	31
McLean	32MLX2	Listed as unknown, period unknown	-	X	Not evaluated	143	81	13
Oliver	32OL361	Cultural material scatter, chipped stone-Sparse lithic scatter	-	X	Not evaluated	142	81	21
Oliver	32OL416	Cultural material scatter, chipped stone, projectile point-Sparse	X	-	Not evaluated	142	81	28
Oliver	32OL419	Unknown	-	X	Not evaluated	142	81	21
Oliver	32OL446	Unknown	-	X	Not evaluated	142	83	33
Oliver	32OL490	Cultural material scatter, chipped stone-Sparse lithic scatter	-	X	Not evaluated	142	82	28
Oliver	32OL575	Unknown	-	X	Not evaluated	142	83	29
Oliver	32OL591	Unknown	-	X	Not evaluated	141	83	4
Oliver	32OLX20	Cultural material scatter	-	X	Not evaluated	142	82	23
Sheridan	32SH259	Unknown	-	X	Not evaluated	147	76	10
Sheridan	32SH347	Mound-4 stone circles and 1 loosely packed mound	-	X	Not evaluated	147	76	10

County	Site Number	Site Type/Name	Within Project Corridor	Within Project Vicinity	NRHP Status	Location		
						T	R	S
Sheridan	32SH401	CM scatter, chipped stone Lithic scatter Other rock features, stone circle Two stone circles and three cairns (with an additional two possible circles and one possible cairn)	-	X	Not evaluated	146	78	7
Sheridan	32SHX85	Unknown	X	-	Not evaluated	147	76	10
Sheridan	32SHX86	Unknown	-	X	Not evaluated	147	76	9
Sheridan	32SHX88	Unknown	X	-	Not evaluated	147	76	9
Sheridan	32SHX90	Unknown	-	X	Not evaluated	147	76	16
Sheridan	32SHX93	Unknown	-	X	Not evaluated	147	75	18
Sheridan	32SHX11	Mound and Stone circle	-	X	Not evaluated	147	78	22
Sheridan	32SHX12	Mound and Stone circle	X	-	Not evaluated	147	78	26
Sheridan	32SHX103	Unknown	-	X	Not evaluated	147	78	32
Sheridan	32SHX104	Unknown	-	X	Not evaluated	147	78	32
Wells	32WE31	CM scatter, faunal remains, projectile point, chipped stone Possible stem of lanceolate or stemmed point, lithic scatter	-	X	Not evaluated	147	73	18
Wells	32WE47	CM scatter, faunal remains, chipped stone Sparse scatter of chipped stone and a few pieces of heavily weathered bone	-	X	Not evaluated	147	73	18
Wells	32WE48	Cultural material scatter- Chipped stone, projectile point, and one piece of weathered bone	-	X	Not evaluated	147	73	18

County	Site Number	Site Type/Name	Within Project Corridor	Within Project Vicinity	NRHP Status	Location		
						T	R	S
Wells	32WE49	Unknown	-	X	Not evaluated	147	73	18
Wells	32WE58	CM scatter, fire-cracked rock, chipped stone Dense CM scatter consisting of primary, secondary, and tertiary flakes, bifaces, cores, and FCR	-	X	Not evaluated	147	73	18
Wells	32WE59	Cultural material scatter- Chipped stone, KRF end scraper	-	X	Not evaluated	147	73	18

Minnkota anticipates no previously recorded archaeological resources within Table 5.7-1 will be impacted by construction or operation of the Project.

5.7.3 Architectural Impacts

Minnkota reviewed records sent from the SHPO to identify known historical structures within the Project Corridor. To help summarize the results of the SHPO records review, sites were grouped into categories as follows: Civic Buildings (post office, school, townhall), Farmstead Features (farmstead, house, ranch, elevator, windmill, dump, depression, foundation, corral, fence, barn), Cemetery (cemetery and burial), Bridge, Church, Trail, Railroad (track and facility), Town Site, Camp Site (camp and expedition), District, and Miscellaneous (steamboat, Sheyenne River, unknown).

Sixty-nine historic structures were previously recorded either within or within 1 mile of the Project Corridor (Table 5.7-2). Three sites are eligible for listing on the NRHP. The other 66 sites have not been evaluated for listing on the NRHP. There are 14 civic buildings, 28 farmstead features, 3 cemeteries, 8 bridges, 5 churches, 0 trails, 1 railroad, 3 town sites, 1 camp sites, 0 districts, and 6 miscellaneous. Appendix F provides additional site details.

Table 5.7-2. Architectural Properties within 1 Mile of Corridor

County	Site Number	Site Type/Name	Within Project Corridor	Within Project Vicinity	NRHP Status	Location		
						T	R	S
Nelson	32NE6	Sacred Heart Catholic Church	-	X	Not evaluated – Recommended Not Eligible	149	57	32

County	Site Number	Site Type/Name	Within Project Corridor	Within Project Vicinity	NRHP Status	Location		
						T	R	S
Burleigh	32BL119	CM scatter, depression, foundation, ceramics, faunal remains, glass, metal, wood Four depressions, three of which are the remains of structures, and light historic material scatter	-	X	Not evaluated	142	81	22
Burleigh	32BL651	School No. 2, Wilson Township	-	X	Not evaluated	144	79	6
Burleigh	32BLX131	Mercer's Ranch	-	X	Not evaluated	142	81	15
Burleigh	32BLX133	Painted Woods Post Office	-	X	Not evaluated	142	81	26
Burleigh	32BLX139	Grads Lake Post Office	-	X	Not evaluated	143	79	7
Burleigh	32BLX147	Issac Post Office	-	X	Not evaluated	144	79	7
Burleigh	32BLX19	Hoiland House	X	-	Not evaluated	142	81	24
Eddy	32ED206	Cultural material scatter-whiteware, sheet copper, rubber, bone, glass, crockery	-	X	Not evaluated	148	65	28
Eddy	32ED222	Bridge-No. 14-107-17.0 (According NDDOT it was replaced with a culvert)	-	X	Not evaluated	148	66	30
Eddy	32ED32	Marriage Octagonal Barn	-	X	Eligible	148	66	28
Eddy	32EDX2	Brantford Town site-cultural material scatter, depression, foundation	-	X	Not evaluated	148	65	35
Foster	32FO18	Windmill, depression, and cultural material-sparse historic debris	-	X	Not evaluated	147	65	4
Foster	32FO9	Dump and Foundation-2 modern dumps, pushed up foundation	-	X	Not evaluated	147	64	6
Foster	32FOX26	Barlow Post Office	X	-	Not evaluated	147	66	7
Foster	32FOX28	Barlow Post Office	-	X	Not evaluated	147	67	12

County	Site Number	Site Type/Name	Within Project Corridor	Within Project Vicinity	NRHP Status	Location		
						T	R	S
Foster	32FOX59	Nelson	-	X	Not evaluated	147	67	12
Foster	32FO30	Unknown	-	X	Not evaluated	147	66	6
Foster	32GFX14	Cable Post Office	-	X	Not evaluated	149	56	12
Grand Forks	32GF120	Farmstead-Alden Gronlie Octagon Elevator Site	X	-	Not evaluated	150	53	20
Grand Forks	32GF3217	Bridge No. 18-111-30.0	-	X	Not evaluated	150	55	34
Grand Forks	32GF3218	Bridge-No. 18-112-29.0	-	X	Not evaluated	150	55	35
Grand Forks	32GF3219	Bridge-No. 18-112-30.0	-	X	Not evaluated	150	55	36
Grand Forks	32GF3229	Bridge-No. 18-132-23.0	-	X	Not evaluated	150	51	31
Grand Forks	32GF3231	Bridge-No. 18-133-22.1	-	X	Not evaluated	150	51	21
Grand Forks	32GFX25	McRae Post Office	-	X	Not evaluated	150	53	25
Grand Forks	32GFX250	Bridge-No. 18-134-21.0	-	X	Not evaluated	150	51	22
Grand Forks	32GFX28	Unknown	-	X	Not evaluated	150	54	29
Grand Forks	32GFX29	Fergus Town site/Fergus Post Office	-	X	Not evaluated	150	56	28
Grand Forks	32GFX49	Listed as unknown historic	-	X	Not evaluated	151	51	19
Grand Forks	32GFX51	Listed as unknown historic	-	X	Not evaluated	151	51	23
Griggs	32GGX39	Grave of Sam Wannama	-	X	Not evaluated	147	60	20
Griggs	32GGX43	Camp Atchison	-	X	Not evaluated	147	60	29
Griggs	32GGX45	Wanamaker Monument	-	X	Not evaluated	147	60	29
Griggs	32GGX53	Ole Alfson Post Office	-	X	Not evaluated	148	59	30
Griggs	32GG74	Ottawa Church	-	X	Not evaluated	148	59	25
Griggs	32GG81	Homestead-1 standing structure, 2 stone foundations, barn foundation, well, and depression	-	X	Not evaluated	148	59	35
Griggs	32GG93	Romness Bridge	-	X	Eligible	147	58	7
McLean	32ML293	Zion Lutheran Cemetery	-	X	Eligible	145	79	10

County	Site Number	Site Type/Name	Within Project Corridor	Within Project Vicinity	NRHP Status	Location		
						T	R	S
McLean	32ML885	Dump, other, glass, metal, plastic, rubber, wood (gravel extraction pit used as a dump)	-	X	Not evaluated	145	73	23
Nelson	32NE4	Sundahl Lutheran Church	-	X	Not evaluated	149	57	32
Nelson	32NE5	Aneta Community Church	-	X	Not evaluated	149	57	32
Nelson	32NE70	Burlington Northern & Santa Fe	-	X	Not evaluated	149	57	32
Nelson	32NEX1	Aneta Post Office	-	X	Not evaluated	149	57	32
Nelson	32NEX61	House	X	-	Not evaluated	149	57	31
Nelson	32NEX69	House	X	-	Not evaluated	149	57	31
Nelson	32NEX70	House	X	-	Not evaluated	149	57	31
Nelson	32NEX71	House	X	-	Not evaluated	149	57	31
Nelson	32NEX72	House	X	-	Not evaluated	149	57	31
Oliver	32OL112	Unknown	-	X	Not evaluated	142	83	32
Oliver	32OL388	Depression-single historic depression	X	-	Not evaluated	142	81	28
Oliver	32OL436	Pricetown Site	-	X	Not evaluated	142	81	28
Oliver	32OL385	Depression and machinery-3 depressions, standing structure, two-track road, and several pieces of metal machinery	-	X	Not evaluated	142	81	20
Oliver	32OL386	Depression	-	X	Not evaluated	142	81	21
Oliver	32OL389	Depression-single historic depression	X	-	Not evaluated	142	81	28
Oliver	32OL435	Price School	X	-	Not evaluated	142	81	28
Oliver	32OLX21	Log Cabin-Hall Cooley	-	X	Not evaluated	142	82	24
Sheridan	32SH197	Dump-Trash from demolition and clearing of farmstead	-	X	Not evaluated	147	76	5
Sheridan	32SH198	Depression and foundation site-3 foundations and 2 depressions	-	X	Not evaluated	147	76	5

County	Site Number	Site Type/Name	Within Project Corridor	Within Project Vicinity	NRHP Status	Location		
						T	R	S
Sheridan	32SH335	Farmstead-1 foundation, 2 depressions, rock pile with trash	-	X	Not evaluated	147	76	5
Sheridan	32SH344	Hellman School No. 2	-	X	Not evaluated	147	76	8
Sheridan	32SH348	1920s Sod House with several later-date additions	-	X	Not evaluated	147	75	8
Steele	32ST173	Burlington Northern and Santa Fe Railroad	-	X	Not evaluated	147	57	3
Wells	32WE43	Corral-crosspole/barbed wire/picket fence	-	X	Not evaluated	147	73	18
Wells	32WE44	Burial-grave with 2 human remains	-	X	Not evaluated	147	73	18
Wells	32WE60	Dump-metal, fencing, wood, and rubber pile	-	X	Not evaluated	147	73	18
Wells	32WEX24	Delger Post Office	-	X	Not evaluated	147	72	9
Wells	32WEX26	Emrick (Doland) Towns	-	X	Not evaluated	148	69	31
Wells	32WEX38	Stavenger Lutheran Church	X	-	Not evaluated	148	68	28

Minnkota anticipates no previously recorded historic architecture properties in Table 5.7-2 will be directly impacted by construction or operation of the Project.

5.7.4 Mitigation

Construction activities for the Project occur in areas with previously identified archaeological and historic resources that have not been evaluated for listing on the NRHP. Minnkota will adhere to stipulations concerning historic property discovery outlined in a Programmatic Agreement (PA) with RUS, SHPO, and other interested parties, which include a survey methodology to document the existing conditions within the Project, identify the extent of resources within these areas, and if applicable, provide recommendations regarding NRHP eligibility prior to construction. During the Project engineering phase, Minnkota will strive to avoid historic properties or mitigate impacts by consulting with the parties in accordance with the PA to identify and implement appropriate responses to the effects. Where sites that have not been evaluated for significance (and therefore for determination of eligibility for listing on the NRHP) may be physically impacted by the Project, Minnkota would follow steps outlined in a PA to determine eligibility and mitigation of adverse effects. Such mitigative responses could include the items listed below.

- Preservation in place.
- Site stabilization.
- Protection from erosion.
- Documentation of existing conditions and any disturbance.
- Interpretation or data recovery, if necessary, as appropriate.
- Protection from looting/vandalism.
- Revegetating to counteract wind erosion.
- Fencing off sensitive areas during construction.
- Trees cut at ground level with stumps left in place.
- Informing construction crews on how to recognize resources and laws protecting resources
- Providing cultural sensitivity training to construction crews.

The construction contractor will be required to comply with environmental, cultural, archaeological, or historical guidelines as will be set forth as a result of Section 106. No known sites currently exist, and guidelines will include mandating the type of actions as discussed by the potential contractor. Actions would include notification and working with the proper and applicable authorities.

5.8 Recreational Resources

5.8.1 Description of Resources

Many recreational resources exist in the Project Corridor vicinity, including trails, rivers, lakes, federal lands, and state lands. Outdoor recreational opportunities include riding all-terrain vehicles (ATVs) and snowmobiles, hiking, boating, fishing, camping, swimming, hunting, and nature observation. Recreational resource and land management data were gathered from state and federal agencies. Figure 6 displays the location of managed recreation lands in the vicinity of the Project Corridor.

State-Managed Lands

NDGF's WMAs and North Dakota Parks and Recreation Department's (NDPR) state parks, nature preserves, and recreation areas play a large role in North Dakota's outdoor recreation system. There are no state parks, nature preserves, or recreation areas located within the Project Corridor. The Wilbur Boldt WMA is located within the Project Corridor. The Wells County WMA is located within 1 mile of the Project Corridor.

Federally Managed Lands

USFWS manages WPAs, WDAs, and National Wildlife Refuges (NWRs). The Bureau of Reclamation manages the Chain of Lakes Recreation Area/McClusky Canal through Sheridan, Burleigh, and McLean counties. East Park Lake, West Park Lake, Heckers Lake, and New Johns Lake are four in-line lakes on the McClusky Canal that make up the Chain of Lakes Recreation Area. These federally managed lands provide habitat for a variety of waterfowl, shorebirds, grassland birds, plants, insects, and wildlife as well as provide opportunities for public access and wildlife dependent recreation such as hunting, wildlife watching, photography, camping, boating, fishing, and ATV/snowmobile riding (see Figure 6).

As discussed in the Land Use section (5.2), USFWS also holds easements on private lands for the protection of wetland and grasslands resources. The purpose of wetland easements is to preserve the wetland areas, whereas the grassland easements preserve the wetland areas and adjacent grassland buffers for the reproduction and growth of waterfowl species. USFWS allows some hunting on these easements. Table 5.8-1 outlines the federal lands located within the Project Corridor. Table 5.8-2 displays the federal lands located within 1 mile of the Project Corridor.

Table 5.8-1. Federally Managed Lands within the Project Corridor

Resource Agency	Name
USFWS	Hoornaert WPA
USFWS	Gaub WPA
USFWS	East Park Lake WDA
Bureau of Reclamation	Chain of Lakes Recreation Area/McClusky Canal

Table 5.8-2. Federally Managed Lands within 1 Mile of the Project Corridor

Resource Agency	Name
USFWS	Bauers WPA
USFWS	Barlow WPA
USFWS	Delfs WPA
USFWS	East Park Lake WDA
USFWS	Ehni WPA
USFWS	Faul WPA
USFWS	Gaub WPA
USFWS	Indian Hills WDA
USFWS	Kindschi WDA
USFWS	Schindler WPA
USFWS	Topp WPA
USFWS	Tande
USFWS	Hoornaert WPA
USFWS	Sibley Lake NWR
Bureau of Reclamation	Chain of Lakes Recreation Area/McClusky Canal

Trails

NPS administers the North Country National Scenic Trail, which crosses seven states (New York, Pennsylvania, Ohio, Michigan, Wisconsin, Minnesota, and North Dakota). NPS explains that the trail is a collection of certified and proposed segments. Within North Dakota, beginning at Valley City, the trail follows the Sheyenne River to the Garrison Diversion then to the McClusky and New Rockford Canals. Most of the certified segments occur on public lands, i.e., USFWS, Bureau of Reclamation, and U.S. Forest Service (USFS). Currently, the NPS is reviewing segments on the western portion of the trail in order to connect with the Lewis and Clark National Historic Trail and the Knife River Indian Village National Historic Site (an NPS property). A portion of the trail runs parallel to the McClusky Canal and Chain of Lakes Recreation Area. Recreational opportunities include hiking and camping.

In addition, the NPS administers the Lewis and Clark National Historic Trail that crosses 11 states. The NPS attempts to preserve the remnants of the historic route of 1804-1806 Corps of Discovery Expedition and to provide a comprehensive interpretation of its history, including the American Indian perspective, to allow for better visitor understanding and appreciation of its significance. Recreational opportunities include canoeing the Missouri River and driving State Highways 1804 and 1806. Table 5.8-3 outlines the trails crossed by the Project Corridor.

Table 5.8-3. Trails Crossed by the Project Corridor

Trail Name	Associated Resource Land	County
North Country National Scenic Trail	McClusky Canal - Chain of Lakes Recreation Area	McLean County
North Country National Scenic Trail	McClusky Canal	Sheridan County
North Country National Scenic Trail	McClusky Canal	Griggs County
Lewis and Clark National Historic Trail	Missouri River and State Highways 1804 and 1806	Burleigh and Oliver Counties

National Heritage Area

A National Heritage Area is "a place designated by Congress where natural, cultural, historic and recreational resources combine to form a cohesive, nationally distinctive landscape arising from patterns of human activity shaped by geography." The Northern Plains Heritage Foundation received funding from Congress through the NPS to undertake a study to identify and evaluate a range of alternatives for managing, preserving, and interpreting the assemblage of nationally important historic sites, structures, stories, legends, and landscapes existing within the free flowing segment of the Missouri River in central North Dakota. The boundaries of the Northern Plains National Heritage Area are as follows: "The proposed east/west boundary of the study area encompasses a distance of ten miles across or approximately five miles from the banks of the free flowing segment the Missouri River. The north/south boundary encompasses an approximate eighty mile distance from the Huff Mandan Village south of Mandan to the Big Hidatsa Village north of Stanton ND" (NPHF 2010).

Automobile Tours

No designated state or federal scenic byways or backways are located within the Project Corridor. The Sakakawea Scenic Byway near Washburn is located north of the Project Corridor along State Highway 200A from Washburn to Stanton. State Highways 1804 and 1806 are a part of the Lewis and Clark National Historic Trail. State Highways 1804 and 1806 are located on the east and west sides of the Missouri River, respectively, and are crossed by the Project Corridor.

Other Recreational Resources

No additional designated recreational resources, such as boat landings, golf courses, and playgrounds/ball fields, are located within the Project Corridor. Within 1 mile of the Project Corridor there is a rifle club. The Project Corridor crosses the Missouri and Sheyenne Rivers, which are recreation resources for fishing, canoeing, and nature observation.

PLOTS is a voluntary program offered to landowners by the NDGF, which provides landowners with monetary compensation for allowing public access to their land for fishing or hunting. Within the Project Corridor there are 16 PLOTS lands totaling 494 acres. Within 1 mile of the Project Corridor there are 36 PLOTS lands totaling 6,132 acres.

TNC owns three properties near the western terminus of the Project Corridor: Cross Ranch Preserve, John E. Williams Memorial Nature Preserve, and Davis Ranch Preserve, located 3, 4.5,

and 10 miles away from the Project Corridor, respectively. Wildlife observation is allowed on TNC-owned lands.

5.8.2 Impacts

Direct impacts to recreational resources will be minimized to the extent feasible. Potential direct effects involve altering or physically changing recreation resources, conflicting with recreation area goals, or affecting accessibility to areas. Indirect effects are visual impacts to the scenic quality and natural appearance of the landscape as viewed from the recreational use area by a recreational user. The transmission line will span recreational resources to minimize impacts, such as rivers and lakes. In general, recreational impacts will be visual in nature and limited to individuals using public or private property in the corridor for hiking, hunting, fishing, or nature observation.

A transmission line within the Project Corridor will likely be visible from all recreational resources located within and adjacent to the Project Corridor and will have the potential to be visible from all recreation resources within approximately 1 mile of the Project Corridor depending on the surrounding topography.

The state managed Wilbur Boldt WMA and the federally-managed Hoornaert WPA, Gaub WPA, and East Park Lake WDA are located within the Project Corridor. A transmission line route may be sited within the Project Corridor to avoid these state and federal lands, therefore no impacts are anticipated. Minnkota is discussing a possible overhang easement with the NDGFD for the Wilbur Boldt WMA. It is anticipated that Minnkota will span the Chain of Lakes Recreation Area, thus no direct impacts are anticipated. An indirect effect may be visual in nature, but Minnkota has proposed to cross adjacent to State Highway 41, thereby reducing the potential visual impacts.

No impacts to other recreation resources, such as golf courses, parks, and camps are anticipated.

The Project Corridor will cross 2 trails. The transmission line will span the North Country National Scenic Trail in McLean, Sheridan, Griggs Counties. The transmission line will span the Lewis and Clark National Historic Trail at the Missouri River, State Highway 1804, and State Highway 1806. No structures will be placed directly in the trails and the trails will not need to be relocated or closed. Individuals using these trails will continue to have access to the trails. However, during construction there may be short periods of disruption with construction workers in the area.

The Project Corridor will cross the Northern Plains National Heritage Area. No structures will be placed within the Missouri River or block trail access. Individuals using the river and trails will continue to have access to the resources. However, during construction there may be short periods of disruption with construction in the area.

No impacts to TNC lands are anticipated. Individuals using PLOTS lands will have access under the transmission line to access the property. The transmission line will not impact recreational opportunities on PLOTS lands.

Users of the recreational areas and trails may experience short-term effects during construction such as elevated noise levels, increased fugitive dust, and increased vehicle traffic.

5.8.3 Mitigation

The Project will span existing trails, State Highways 1804 and 1806, and the Chain of Lakes Recreation Area/McClusky Canal. Since the Project is anticipated to avoid impacts to state and federal managed lands, no mitigation is proposed. If a transmission line route crosses state or federal managed lands, Minnkota will work with NDGF and/or USFWS to apply for the appropriate permits and minimize impacts. Since it is not anticipated that any recreational resources will be removed from service by implementation of the Project, no adjacent land will need to be converted or dedicated to recreational use or wildlife management. Secondary recreational uses of Project property may be allowable depending on security requirements. No other mitigation is anticipated to be necessary.

5.9 Effects on Land-Based Economics

5.9.1 Description of Resources

Agriculture

Agriculture is the primary land-based economic resource in the Project Corridor. The highest yield resources include wheat, corn, soybeans, hay, barley, and sunflowers. Much of the agricultural land is designated as "prime farmland," indicating land that is most desirable for agricultural production. Federal regulations define prime farmland as "land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses" (7 CFR, 657.5 (a) (1)). Prime farmland is discussed in Section 5.10. Livestock operations are also located within the Project Corridor vicinity including cattle, hogs, turkey, and sheep farms.

According to the North Dakota 2007 Agricultural Statistics published by the USDA, the state of North Dakota ranks 18th among the states in total crop cash receipts. In 2002 there were an estimated 30,619 farms in North Dakota, and in 2007 the number increased by 4 percent to an estimated 31,970 farms. Three of the counties within the Project Corridor (Grand Forks, McLean, and Wells) are ranked in the top 20 for the state's total value of agricultural products sold (USDA 2010).

In 2005, North Dakota had a total of 159 certified organic farms and ranked second in the country for number of certified organic cropland acres. North Dakota is the leader in production of organic oilseeds (flax and sunflowers), producing 50 percent of the total U.S. production (North Dakota Organic Advisory Board 2010).

Table 5.9-1 summarizes farmland, cropland, and agricultural production for all counties within the Project Corridor based on 2007 USDA census data.

The primary crop is wheat, and additional high production crops include hay, soybeans, corn, and barley. The number of farms increased in all counties from 2002 to 2007 with the exception of Sheridan and Oliver Counties. Grand Forks County is ranked third in the state for highest total agricultural products sold.

GPS

GPS navigation systems are becoming more common on farm equipment. GPS units collect location data from at least three or more satellites at any given time. The accuracy of the location data is dependent on the number of satellites and the strength of the signal. Since satellites are in constant motion above the earth, GPS units are constantly picking up and dropping satellite signals. At times there might be instances when the GPS unit is not able to connect to enough satellites and the required accuracy is not met.

In 2002, the Institute of Electrical and Electronics Engineers (IEEE) published a study that investigated the effects of overhead power lines on GPS receivers with respect to the effects of EMI (electromagnetic interference) generated by two mechanisms: corona noise and gap discharges. Measurements evaluated whether the GPS signal could be scattered by overhead conductors and if EMI could adversely affect the signal received. The study reported that exposure to corona noise or gap discharge noise did not cause a loss of satellite signal lock. However, it noted that the receiver may lose lock due to temporary poor satellite configurations, which may happen from many different sources, including poor satellite constellation (less than four visible satellites) and/or outages to the base station or transmitter.

Table 5.9-1. Agricultural Statistics for Counties within the Project Corridor

Statistic	Burleigh	Eddy	Foster	Grand Forks	Griggs	McLean	Oliver	Nelson	Sheridan	Steele	Wells
Number of Farms in 2007 (in 2002)	1,026 (946)	366 (325)	310 (309)	973 (863)	479 (423)	1,001 (918)	273 (307)	651 (598)	390 (393)	342 (318)	618 (579)
Average Farm Size in 2007 (acres) (in 2002)	857 (915)	1,029 (1,073)	1,290 (1,239)	848 (876)	848 (896)	1,162 (1,193)	1,384 (1,315)	845 (889)	1,282 (1,193)	1,175 (1,261)	1,225 (1,154)
Land Acreage in Farmland in 2007 (in 2002)	879,542 (865,524)	376,620 (348,786)	399,912 (382,932)	825,552 (755,592)	406,115 (379,022)	1,162,923 (1,094,748)	377,904 (403,619)	550,121 (531,591)	500,070 (468,745)	401,959 (401,035)	757,008 (668,049)
Total Market Value of Agricultural Products Sold in 2007 ($1000) (in 2002)	$82,236 ($45,060)	$47,231 ($21,189)	$94,959 ($39,716)	$255,594 ($144,840)	$63,305 ($29,735)	$163,440 ($84,271)	$53,389 ($22,579)	$85,369 ($41,198)	$52,488 ($24,677)	$102,344 ($52,199)	$144,758 ($61,275)
2007 Market Value of Crops Sold ($1000)	$50,682	$38,658	$75,607	$233,477	$56,624	$145,847	$24,326	$77,333	$43,742	$99,946	$132,852
2007 Market Value of Livestock and Other Uses Sold ($1000)	$31,555	$8,573	$19,352	$22,118	$6,680	$17,593	$29,063	$8,036	$8,746	$2,397	$11,906
Top Crop Items by Acres	Wheat, Hay, Sunflower seed	Wheat, Soybeans, Hay	Soybeans, Wheat, Corn	Wheat, Soybeans, Corn	Wheat, Soybeans, Corn	Wheat, Canola, Hay	Wheat, Hay, Corn	Wheat, Soybeans, Barley	Wheat, Hay, Barley	Soybeans, Corn, Wheat	Wheat, Soybeans, Corn

Source: USDA, National Agricultural Statistics Service (NASS), 2007 Census of Agriculture

Forestry

The Project Corridor is located primarily in pasture and cultivated land with some forested areas adjacent to farmsteads, waterways, and within state and federally managed lands. There are no economically important forestry resources within the Project Corridor.

Tourism

Minnkota identified tourism activities that are located within the Project Corridor along with resources within the vicinity that may be indirectly impacted by the Project because of viewshed effects or alteration of the landscape. The majority of tourism opportunities in the Study Area of the Project Corridor are associated with recreational resources including WMAs, WPAs, Bureau of Reclamation's Chain of Lakes Recreation Area, Cross Ranch State Park, TNC Nature Preserves, Missouri River, PLOTS, and the North Country National Scenic Trail.

Mining

North Dakota's most important mined products are petroleum, coal, and natural gas. Other mined products include sand, gravel, clays, and salt. Of these, only sand and gravel are produced in the area of the Project Corridor (see Section 5.2).

5.9.2 Impacts

Agriculture

A transmission line within the Project Corridor will result in permanent and temporary impacts to farmland. Permanent impacts will occur as a result of structure placement along a route. Minnkota estimates that permanent impacts will be about 78.5 square feet per structure. During construction, temporary impacts, such as soil compaction, crop damage, construction and use of access roads, and structure building within a route will occur. Minnkota estimates that temporary impacts will be 2,827 square feet per structure.

GPS

The IEEE study reported that exposure to corona noise or gap discharge noise did not cause a loss of satellite signal lock. On rare occasions, a transmission line structure may cause a temporary drop in GPS accuracy due to blockage of line-of-sight to one satellite, but this will only occur if the receiver, structure, and satellite are in a line, which is rare. Connection is usually restored within minutes and the GPS units return to normal function.

Forestry

No impacts to economically important forestry resources will occur, as these resources are not located within the Project Corridor.

Tourism

Refer to Section 5.8 for a discussion on the impacts to recreational resources.

Mining

No impacts are anticipated because the transmission line will be routed to avoid direct impacts to existing and future (if known) mining operations.

5.9.3 Mitigation

Agriculture

Minnkota will work with landowners to minimize impacts to all farming operations along the Project Corridor. By aligning the transmission line along existing ROW such as roads and section and field lines, impacts can be minimized. Minnkota will compensate landowners for any crop damage and soil compaction that may occur during construction. Areas disturbed during construction will be repaired and restored to preconstruction contours to the extent practicable so that all surfaces drain naturally, blend with the natural terrain, and are left in a condition that will facilitate natural revegetation, provide for proper drainage, and prevent erosion.

Drain tiles may be present along the transmission line route. Minnkota will work with the landowners to identify locations of drainage tiles along the route and will minimize interference with tiling, where possible. In the event that Minnkota encounters a tile that the landowner did not discuss, Minnkota will relocate the structure and repair the tile line, if damaged.

GPS

Some landowners use GPS navigation systems on farm equipment; however, interference with such systems is unlikely and, if it does occur, will be temporary. Following construction, Minnkota will provide GPS coordinates for the transmission line structures to landowners, if requested. No other mitigation measures should be necessary.

Forestry

The Project will be routed to minimize impacts to trees to the maximum extent possible. Minnkota will conduct a tree and shrub inventory of the route. Minnkota will follow the Commission's mitigation ratio of 2:1 for tree impacts.

Tourism

Refer to Section 5.8 for a discussion on the potential mitigation measures for recreational resources.

Mining

A transmission line will be routed to avoid direct impacts to existing and future (if known) mining operations. If they cannot be avoided, Minnkota will work with landowners and existing mine operations to identify the extent of current and planned mining operations and develop appropriate mitigative measures.

5.10 Soils

Soil Survey Geographic (SSURGO) soils data made available by the NRCS were analyzed using the ArcInfo license of ESRI® ArcMap™ 9.3.1 to determine impacts to prime farmland and to comply with the Farmland Protection Policy Act (FPPA). General State Soil Geographic (STATSGO) soil associations, which consist of groupings of soils with distinctive characteristics, were also reviewed as part of this analysis.

5.10.1 Description of Resources

Soils within the Project Corridor range from black loam in the Red River Valley to a more porous, sandy soil in the west. Gravel and cobble are relatively frequent soil components within the western Project Corridor.

Loam is ideal for agricultural uses because it retains nutrients and allows for water flow. This soil type is commonly considered prime farmland, and covers the majority of the eastern portions of the Project Corridor. The sandy, rocky, soil in the west is primarily used as pasture land.

Figure 8 displays the location of prime farmlands along the Project Corridor. Figure 9 displays the soil map units across the Project Corridor. Table 5.10-1 summarizes the 26 primary STATSGO soil series for the Project Corridor.

Table 5.10-1. STATSGO Soil Associations within the Project Corridor

Soil Association	Acres of Soil Type in Corridor	% of Corridor	Description of Primary Soil Series
Bearden-Antler (s4801)	1,193.8	4.0	The Bearden series consists of very deep, somewhat poorly drained, moderately to slowly permeable soils that formed in calcareous silt loam and silty clay loam lacustrine sediments. These soils are on glacial lake plains and have slopes of 0 to 3 percent.
Buse-Barnes (s4751)	280.4	0.9	The Buse series consists of very deep, well-drained soils that formed in loamy glacial till on moraines. These soils have moderate and moderately slow permeability. They have slopes of 3 to 60 percent.
Glyndon (s4728)	444.3	1.5	The Glyndon series consists of very deep, somewhat poorly drained soils that formed in silty glacial lacustrine sediments and delta sediments on glacial lake plains. They have moderate permeability in the upper part and moderately rapid permeability in the lower part. They have slopes of 0 to 3 percent.
Heimdal-Esmond-Emrick (s4770)	2,058.5	6.9	The Heimdal series consists of very deep, well drained, moderately permeable soils that formed in calcareous glacial till. These soils are on glacial till plains and moraines. Slope ranges from 0 to 40 percent.
Heimdal-Fram-Emrick (s4768)	1,561.9	5.2	
Heimdal-Fram-Emrick (s4769)	3,520.5	11.7	
Heimdal-Hecla-Embden-Egeland (s4732)	719.4	2.4	
La Prairie-Fairdale (s4779)	133.1	0.4	The La Prairie series consists of very deep, moderately well drained, moderately permeable soil that formed in loamy alluvium. These soils are on terraces and bottom lands in stream valleys. Slope ranges from 0 to 6 percent.
Lamoure-La Prairie-Heimdal-Emrick (s4782)	90.3	0.3	The Lamoure series consists of very deep, somewhat poorly drained or poorly drained soils formed in silty alluvium on flood plains. Permeability is moderate or moderately slow. Slopes are less than 2 percent.
Lankin-Gilby-Antler (s4739)	666.2	2.2	The Lankin series consists of deep, moderately well drained, moderately slowly permeable soils that formed in lacustrine sediments overlying till. These soils are on glacial lake plains and in interbeach areas and have slopes ranging from 0 to 3 percent.
Lohnes-Claire (s4749)	227.1	0.8	The Lohnes series consists of very deep, well drained, rapidly permeable soils that formed in coarse and medium sands. These soils are on glacial lake and outwash plains and have slopes ranging from 0 to 15 percent.
Miranda-Larson-Heimdal-Emrick (s4771)	277.6	0.9	The Miranda series consists of very deep, moderately well or somewhat poorly drained soils formed in till on uplands. Permeability is very slow. Slopes range from 0 to 9 percent.
Ojata-Bearden (s4785)	588.0	2.0	The Ojata series consists of deep, poorly drained, moderately slowly or slowly permeable soils that formed in silty lake sediments. These soils are on slightly depressed flats, swales, and channels in glacial lake and outwash plains and have slopes less than 1 percent.

Soil Association	Acres of Soil Type in Corridor	% of Corridor	Description of Primary Soil Series
Perella-Colvin-Bearden (s3435)	97.9	0.3	The Perella series consists of very deep, poorly drained soils that formed in lacustrine sediments. Saturated hydraulic conductivity is moderately high. These soils are in depressions on glacial lake plains. Slope ranges from 0 to 1 percent.
Renshaw-Divide-Arvilla (s4741)	555.3	1.8	The Renshaw series consists of very deep, somewhat excessively drained soils formed in loamy sediments and the underlying sand and gravel on outwash plains and terraces. Permeability is moderate in the upper part and very rapid in the underlying material. Slopes range from 0 to 25 percent.
Renshaw-Overly-Lankin-Brantford (s4740)	120.1	0.4	
Svea-Barnes (s4758)	827.1	2.8	The Svea series consists of very deep, well or moderately well drained soils that formed in calcareous till and local alluvium from the till. Permeability is moderate in the solum and moderate or moderately slow in the C horizon. These soils are on concave positions on till plains and have slopes ranging from 0 to 25 percent.
Svea-Buse-Barnes (s4760)	215.1	0.7	
Svea-Cresbard (s4764)	632.3	2.1	
Svea-Cresbard-Cavour-Barnes (s4766)	685.9	2.3	
Svea-Hamerly-Barnes (s4759)	2,256.1	7.5	
Svea-Kloten-Edgeley (s4752)	328.2	1.1	
Tiffany-Hecla-Glyndon-Embden (s4729)	200.2	0.7	The Tiffany series consists of very deep, poorly drained soils that formed in glacial outwash. These soils have moderately high or high saturated hydraulic conductivity. These soils are in depressions and on glaciolacustrine deltas and outwash plains. Slope ranges from 0 to 1 percent.
Tiffany-Swenoda-Barnes (s4730)	258.8	0.9	
Tonka-Svea-Hamerly-Barnes (s4754)	1,077.5	3.6	The Tonka series consists of very deep, poorly drained, slowly permeable soils that formed in local alluvium over till or glaciolacustrine deposits. These soils are in closed basins and depressions on till and glacial lake plains and have slopes of 0 to 1 percent.
Towner-Embden (s4762)	577.9	1.9	The Towner series consists of very deep, well or moderately well drained soils that formed in wind and water deposited sands over glacial till or lacustrine sediments. Permeability is rapid or moderately rapid in the upper part and moderate or moderately slow in the 2Bk and 2C horizons. These soils are on sand-mantled till or glaciolacustrine plains and have slopes ranging from 0 to 15 percent.
Trembles-Lohler-Havrelon (s4825)	87.8	0.3	The Trembles series are very deep, well and moderately well drained soils formed in alluvium. They are on floodplains, bottomlands, and low terraces. Slopes range from 0 to 4 percent.
Vallers-Svea-Hamerly-Buse-Barnes (s4756)	2,038.0	6.8	The Vallers series consists of very deep, poorly drained soils that formed in calcareous fine-loamy till on till plains, moraines and lake plains. These soils have moderately slow permeability. Slopes range from 0 to 3 percent.

Soil Association	Acres of Soil Type in Corridor	% of Corridor	Description of Primary Soil Series
Vebar-Reeder-Cabba-Amor (s4829)	139.1	0.5	The Vebar series consists of well drained, moderately deep, moderately rapidly permeable soils that formed in residuum weathered from soft calcareous sandstone. These soils are on uplands and have slope ranging from 0 to 65 percent.
Velva-LaDelle-Barnes-Arvilla (s4780)	455.9	1.5	The Velva series consists of very deep, well drained, moderately or moderately rapidly permeable soils that formed in stratified recent alluvium. These soils are on flood plains and low terraces and have slopes of 0 to 6 percent.
Wabek-Ruso (s4820)	262.4	0.9	The Wabek series consists of very deep, excessively drained, rapidly and very rapidly permeable soils formed in sand and gravel glaciofluvial deposits. These soils are on outwash plains, beach ridges, terraces, and terrace escarpments and have slope of 0 to 45 percent.
Walum-Kensal-Brantford-Binford (s4743)	202.3	0.7	The Walum series consists of very deep, moderately well drained, soils that formed in glaciofluvial sand and gravel containing appreciable amounts of shale. Permeability is moderately rapid above the sand and gravel and rapid or very rapid in the sand and gravel. These soils are on glacial outwash plains and have slopes ranging from 0 to 3 percent.
Williams-Bowbells (s4786)	1,791.1	6.0	The Williams series consists of very deep, well drained, moderately slow or slowly permeable soils formed in calcareous glacial till. These soils are on glacial till plains and moraines and have slope of 0 to 35 percent.
Wilton-Williams-Temvik-Mandan (s4797)	1,432.6	4.8	The Wilton series consists of very deep, well drained soils that formed in a silty loess mantle overlying till. Permeability is moderate in the silty loess mantle and moderately slow in the till. These soils are on uplands and have slopes of 0 to 9 percent.
Wyndmere-Barnes-Arvilla (s4747)	298.0	1.0	The Wyndmere series consists of very deep, somewhat poorly drained, moderately rapidly permeable soils formed in calcareous moderately coarse and coarse glaciofluvial and glaciolacustrine deposits. These soils are on delta, outwash, and glaciolacustrine plains, and on beach ridges. Slope ranges from 0 to 3 percent.
Wyndmere-Hecla-Embden-Arvilla (s4733)	511.6	1.7	
Zahl-Williams (s4792)	1,111.8	3.7	The Zahl series consists of very deep, well drained, moderately slow or slowly permeable soils that formed in calcareous glacial till. These soils are on glacial till plains, moraines, and valley side slopes and have slopes of 1 to 60 percent.
Zahl-Williams-Vida-Bowbells (s4787)	1,550.4	5.2	
Zahl-Zahill-Williams-Cabbart-Cabba (s4811)	539.0	1.8	

Source: USDA, NRCS. 2006.

Prime Farmland

Federal agencies have a mandate under the FPPA to minimize unnecessary and irreversible conversion of farmland to nonagricultural uses. A Farmland Conversion Impact Rating (Form AD-1006) may need to be completed by the NRCS for the Project.

Soils may be generally classified as Prime Farmland, Prime Farmland if Drained, and Farmland of Statewide Importance. Soils considered prime farmland are widespread throughout the Project Corridor, but are most densely concentrated along the central and eastern portions of the Project Corridor. In general prime farmlands are abundant in and east of Sheridan County. As the Project Corridor approaches the North Dakota/Minnesota border and Grand Forks, prime farmlands become more concentrated into large contiguous blocks of the landscape. Prime farmlands are less common in the vicinity of the Missouri River (McLean and Oliver counties) and west of Grand Forks in Nelson County.

Soils classified as Prime Farmland if Drained are more common along the eastern portions of the Project Corridor. These soils are generally concentrated into two areas. The western block of soils considered Prime Farmland if Drained is oriented along a northwest/southeast axis generally situated between Harvey and Carrington, North Dakota. The eastern block is concentrated in Grand Forks County, located southwest of the City of Grand Forks. This eastern block frequently abuts the contiguous blocks of prime farmland to form an expansive block covering most of the southwestern portions of Grand Forks County.

Soils designated as Farmland of Statewide Importance are less common along the Project Corridor. These soils are most common in the vicinity of Finley, North Dakota, in Steele and Grand Forks counties. These soils are not as widespread as prime farmlands at any location. Table 5.10-2 displays farmland classifications for the Project Corridor.

Table 5.10-2. Farmland Soil Classifications for Project Corridor

Farmland Classification	Acres	Percent
Prime Farmland	8,396.4	28.0
Prime Farmland if Drained	3,853.2	12.8
Farmland of Statewide Importance	3,455.5	11.5
Other Farmland	14,334.4	47.7
Total	**30,039.4**	**100.0**

Potentially Erodible Soils

The North Dakota soil databases do not have attributes to identify erodible or highly erodible soils. In general, soils of 6 percent or greater slope have a higher potential for erosion, if disturbed. Therefore, Minnkota calculated slope using GIS from the 30 meter National Elevation Dataset for North Dakota. In the Project Corridor, approximately 3,169 acres (11 percent of the Project Corridor) have a 6 percent or greater slope.

5.10.2 Impacts

Surface soils will be disturbed by site clearing, grading, and excavation activities at structure locations, pulling and tensioning sites, setup areas, and during the transport of crews, machinery, materials, and equipment over access routes (primarily along the transmission ROW). This

disturbance is minimal, and is generally less invasive than typical agricultural practices such as plowing and tilling. Soil compaction will occur on access roads, laydown areas, and along the transmission line ROW. Minnkota will attempt to utilize existing, disturbed areas for laydown areas to the extent practical.

During extended periods of saturation, soils can be prone to compaction and rutting. This is primarily expected to occur during construction, but could also occur if heavy equipment is driven over ROWs for maintenance during operation of the Project. Soil compaction has a restrictive action on water penetration, root development, and the rate of oxygen diffusion into soils. Low density and change of vegetation types may be an indirect effect of soil compaction. Soil characteristics that affect soil compaction include soil texture, soil moisture, and grain size. All soil types are susceptible to compaction and will also be susceptible to rutting if construction occurs when the upper layers of these soils are moist or near saturation.

Disturbed soils can be subject to erosion, defined as the detachment and transport of individual soil grains by wind or water. Erosion by wind is related to soil moisture, soil texture, organic matter content, soil structure, vegetative cover, and climate. Wind erosion often occurs on dry, fine sandy soils when vegetation cover is sparse and strong winds are prevalent. Water erosion is related closely to a soil's infiltration capacity and the coherence of the soil particles that comprise the soil. Soil properties that influence water erosion include soil texture, percent organic matter, soil structure, soil infiltration capacity, and soil permeability. Soils containing high proportions of silt and very fine sand are most erodible. Well-drained and well-graded gravels and gravel sand mixtures with little or no silt are the least erodible soils. Water erosion is also influenced by slope length and gradient, as well as frequency, intensity, and duration of rainfall and the amount of time bare soils are exposed. Erosion could be caused by site clearing and earthmoving in addition to natural processes.

5.10.3 Mitigation

To the extent practicable, soil disturbance and excavation activities on steep slopes will be avoided. Slopes of 6 percent or greater tend to have a higher potential for erosion and will require BMPs if soils are graded or cleared. All disturbed areas will be revegetated once construction is complete. Seed mixes will be specified based on site characteristics and in accordance with regulatory permits. Where disturbance and excavation cannot be avoided entirely, impacts will be minimized using BMPs. Sediment and erosion control plans will be developed that specify the types of BMPs necessary. Depending on the site, BMPs may include installation of silt fencing, straw bales, or ditch blocks and/or covering bare soils with mulch, plastic sheeting, or fiber rolls to protect drainage ways and streams from sediment runoff from exposed soils. Erosion controls will be inspected during construction, especially during significant precipitation events. Soil compaction will be treated and restored through tillage operations, using a subsoiler.

Impacts to prime farmland will be minimized by adjusting final structure placement to avoid these resources to the extent practicable. Soils classified as prime farmland will receive the highest priority for avoidance. Further impacts to prime farmlands will be minimized by paralleling the Project adjacent to existing ROW features and field lines. Minnkota will coordinate with NRCS to determine if anticipated impacts require evaluation under FPPA and will coordinate this review and possible mitigation measures. Unless specific permission is given by landowners, field crossings will not be oriented diagonally if this will disrupt normal farming operations.

5.11 Geologic and Groundwater Resources

Descriptions of the surficial and bedrock geology were obtained from digital GIS-based files obtained from the North Dakota Geological Survey, except as noted.

5.11.1 Description of Resources

Geology

Most of the Project Corridor is underlain by Quaternary-age glacial sediments deposited by glacial ice originating from the Keewatin Ice Sheet. Glacial till of the Coleharbor Group is the dominant type of surficial sediment. Bluemle (2006) describes the till as an unsorted, unbedded mixture of boulders, gravel, and sand in a matrix of silt and clay, yellowish-brown to olive-gray in color. Smaller pockets of cross-bedded sand, also part of the Coleharbor Group, exist near some streams. The most extensive (approximately 10 miles) of these is near Baldhill Creek in Griggs County. Coleharbor Group thickness averages 100 feet in the Project Corridor. Recent-age sediments, in the form of river-deposited clay, silt, and sand, and windblown sand, underlie most of the remainder of the Project Corridor. The only part of the Project Corridor where glacial and post-glacial sediments are absent is in the Sheyenne River valley, where the Pierre Formation (bedrock) has been exposed through erosion effects of the river and its tributaries.

Bedrock in the eastern two-thirds of the Project Corridor is primarily shale formed in offshore marine environments during the Cretaceous Period. The Pierre, Niobrara, and Belle Fourche formations are the major shale units present, and they range in thickness from 75 to 700 feet. Bedrock in the western third of the Project Corridor is composed of sandstone and lignite of the Tertiary and Cretaceous periods, which is generally 400 to 650 feet thick.

Groundwater

Groundwater resources in the Project Corridor exist in both surficial (unconsolidated) and bedrock aquifers. Major surficial aquifers are composed of river alluvium, such as along the Missouri River, and glacial outwash. These types of aquifers tend to be long and narrow in shape, and are not widespread in the Project Corridor. The Spiritwood Aquifer is a sand and gravel aquifer that trends north-to-south and intersects the Project Corridor in Griggs County. This aquifer is composed of sand and gravel that was deposited in a pre-existing bedrock valley, and is overlain by till in many areas. The depth to groundwater varies widely across the Project Corridor, and ranges from near the ground surface adjacent to streams, to more than 100 feet in topographically high areas underlain by thick till sequences.

5.11.2 Impacts

Impacts will be limited to the displacement of surficial sediments, bedrock, and groundwater during construction of structure foundations. A boring for structural foundations may extend 40 to 100 feet below ground surface depending on soil conditions and structure type. Boring diameter may be 7 to 10 feet. Given these values, the maximum volume of displaced soil and groundwater will be about 7,854 cubic feet (291 cubic yards) at a structure location. Construction spoils, including soil cuttings and boring stabilization fluids, will be disposed of offsite. Topsoil will be left on site, if desired by the landowner. Groundwater from dewatering will be discharged on site into an approved BMP structure.

The storage and use of fuels, greases, and other chemicals during construction has the potential to impact geologic materials and groundwater. In addition, there is potential for construction activities to encounter previously contaminated soil.

5.11.3 Mitigation

Impacts to geologic and groundwater sources will be avoided and/or mitigated by the following:

- The depth and diameter of structure foundations will be minimized during the design phase.
- In the event that previously contaminated soils are discovered during construction, the contractor will stop work immediately, contact the appropriate state agency, and consult with the agency with respect to an acceptable plan of action.
- A SWPPP will be produced that includes procedures for proper storage and disposal of all hazardous and non-hazardous wastes generated during the construction process.
- Controlled laydown areas may be used for refueling, for hazardous material loading and unloading operations, and to provide adequate spill cleanup materials and equipment. Spill impacts, if any, will be mitigated in compliance with applicable federal, state, and local cleanup standards.

5.12 Surface Water and Floodplain Resources

5.12.1 Description of Resources

There are many surface water resources (lakes, rivers, and streams) within or adjacent to the Project Corridor (Figure 10). The Missouri River is the largest watercourse that is crossed by the Project Corridor and is associated with large sandbars and wooded riparian habitat. In general, perennial watercourses are more frequent in the eastern half or the Project Corridor. Lakes are fairly evenly scattered throughout the vicinity of the Project Corridor.

Rivers, Streams, and Lakes

Three perennial rivers, one intermittent river, and one canal are crossed by the Project Corridor. While most of the streams and creeks crossed by the Project Corridor are intermittent in nature, aerial photography indicates that some of these intermittent surface waters may support open water for extended periods of time. While some "lakes" in North Dakota are in a traditional sense actually large wetlands, for the purpose of this application, lakes were identified according to surface waters that have been named "Lake." Table 5.12-1 summarizes surface waters crossed by the Project Corridor.

Table 5.12-1. Surface Water Crossed by the Project Corridor – From West to East

Surface Water	Number of Crossings	Comment
Named Rivers and Canals		
Missouri River – perennial	1	Approximate river width at crossing is 2,400 feet
McClusky Canal	2	Crossed in Sheridan Co. and McLean Co.; canal typically maintains perennial flow at crossings; surface water is typically 150 foot wide or less at crossings, upper banks at Sheridan crossing may be more than 300 feet wide
James River – perennial	1	Crossed in Eddy Co.; river 150 feet or less at crossing
Sheyenne River – perennial	1	Crossed in Griggs Co.; river is highly sinuous, meandering across an approximately 1,800-foot-wide apparent floodplain
Little Goose River – intermittent	1	Crossed in Grand Forks Co.; river 150 feet or less at crossing
Named Streams/Creeks with Open Water		
Yanktonai Creek – intermittent	1	Narrow meandering surface water that is crossed in McLean Co. near US 83
Painted Woods Creek – intermittent	1	Crossed in McLean Co.
Rocky Run – intermittent	3	Crossed in Eddy Co.; stream generally 50 feet wide except for crossing at Rosefield Slough, which is about 400 feet wide
Pickerel Lake Creek – perennial	1	Creek narrow (approximately 20 feet) at Griggs Co. crossing location
English Coulee – intermittent	5	Crosses three meanders of Coulee within 2.5 miles; crosses two ditched sections within 1.0 mile, near Prairie Substation
Named Lakes		
Yanktonai Lake	1	500-foot-wide crossing at west side of lake; lake is approximately 30 acres in McLean Co.
Rosefield Slough	1	422-foot-wide crossing at south side of slough in Eddy Co.

Surface Water	Number of Crossings	Comment
Round Lake	1	Crossing is 528 feet long at south side of lake in Eddy County.
Lake Norway	1	Crossed north side of 115 acre lake in Griggs Co.; crossing width ranges from 800 feet to 1,400 feet

Mapped FEMA Floodplains

For the Project Corridor, Federal Emergency Management Agency (FEMA) data is only available for the Missouri River. At the Project Corridor crossings, all Missouri River floodplain crossings are mapped as Zone A 100-year floodplains. Approximate FEMA floodplain width for the Project Corridor is 1.0 mile.

5.12.2 Impacts

Rivers, Streams, and Lakes

No direct short-term or long-term impacts to watercourses or lakes are expected as part of the construction and operation of the transmission line and associated facilities. Within the Project Corridor, all rivers, streams, and lakes could be spanned by a transmission line, including the crossing at the Missouri River.

The Devils Lake basin, located in northeastern North Dakota, has experienced dramatic increases in lake water levels. The current water level has inundated much of the surrounding area, causing displacement of residents and impacting surface transportation. The Sheyenne River was the natural outlet to Devils Lake at one time. Currently, the capacity of the constructed Devils Lake outlet may have to be increased to control flooding effects within the basin; as a result, flows within the Sheyenne River may increase. The Project will be designed to consider the potential for future increased flows in the Sheyenne River.

Applicable BMPs will be utilized to prevent indirect impacts due to runoff, erosion and sedimentation, or blockage of drainageways.

Perennial water sources will be used to obtain water for dust suppression and the concrete batch plant. Water for construction purposes will not be taken from USFWS wetland easements.

Mapped FEMA Floodplains

Floodplains, including mapped FEMA floodplains, will be spanned by a transmission line wherever feasible. At the Missouri River crossing, the 100-year FEMA floodplains appear to be too wide to be completely spanned by a transmission line. Based on the expected width of the Missouri River floodplain crossing and assuming a 1,000-foot-wide span between transmission structures, up to three transmission structures may be necessary to cross the floodplain (approximately 235.5 square feet of permanent impacts).

5.12.3 Mitigation

Rivers, Streams and Lakes

The Project will require a number of water resource permits, including coverage under the NPDES General Permit for Storm Water Discharges Associated with Construction Activities and associated SWPPP, Permit to Cross North Dakota Sovereign Lands, Section 404 (Clean Water Act) Permit, and Section 10 (Rivers and Harbors Act) Permit. The placement of

transmission line structures, land clearing that involves soil disturbance, or placement of construction mats may be considered a discharge of fill material that will require a permit from U.S. Army Corps of Engineers (USACE) pursuant to Section 404 of the Clean Water Act. These permits will require Minnkota to develop and implement BMPs for sediment and erosion control during construction and operation of the Project to protect topsoil and adjacent surface and groundwater resources, and to minimize soil erosion. Typical BMPs may include:

- Locate structures and disturbed areas away from rivers and lakes, where practicable;
- Contain stockpiled material, fuel, and chemicals, away from stream banks and lake shorelines;
- Install sediment and erosion control measures prior to construction, in accordance with sediment and erosion control plans and permits; maintain in good working order for the duration of construction;
- Use turbidity control methods prior to discharging wastewater from concrete batching or other construction operations to streams or other surface waters;
- Spread topsoil and seed in a timely manner;
- Avoid use of fertilizers, pesticides, or herbicides in or near waterbodies, including wetlands;
- Fuel construction vehicles outside of waterbodies, including wetlands, and use appropriate spill prevention and containment procedures; and
- Implement procedures to minimize and control inadvertent fluid returns during horizontal directional drilling operations, if they are used.

If Project structures cannot be sited such that impacts to jurisdictional water resources are avoided, compensatory mitigation under a USACE Section 404 may be required to replace the loss of aquatic resource functions in the watershed. Compensatory mitigation could include the restoration, establishment, enhancement, or preservation of wetlands or other aquatic resources to off-set Project impacts.

Minnkota will work with USACE to determine the 100-year flood stage of the Sheyenne River and place structures about 2 feet above the 100-year flood stage. This will accommodate potential flood effects on the Sheyenne River due to proposed improvements to the outlet of Devils Lake.

Dust suppression measures will be conducted by the foundation contractor who will build and maintain the ROW during construction. Minnkota or the foundation contractor will apply for a permit from the State Water Commission for water appropriations related to construction purposes.

Mapped FEMA Floodplains

Minnkota will work with local planning and zoning commissions to obtain any applicable permits and approvals for potential impacts within the FEMA 100-year floodplain at the Missouri River crossing.

5.13 Wetlands

5.13.1 Description of Resources

The Project Corridor spans an area that is generally described as part of the prairie pothole region. The prairie pothole region is characterized by numerous shallow freshwater lakes and wetlands that pockmark the landscape. This region, which extends from Canada south to South Dakota and Minnesota, provides waterfowl habitat that is estimated to produce 50 to 75 percent of North American waterfowl in any given year (Witsch et al. 2000).

The ecology of these wetlands is dictated by seasonal wet-dry cycles. Snowmelt and spring rains serve as the primary water sources, resulting in many seasonal wetlands that hold surface water early in the growing season and then dry out as the summer progresses. While some of these wetlands can be quite large (greater than 100 acres), the majority of pothole wetlands are less than 10 acres.

Some of these wetlands may have relatively high salinities that support plant communities that are tolerant of salty conditions. Saline wetlands, in some parts of North Dakota, also provide nesting habitat for the federally threatened piping plover.

Within the Project Corridor, wetlands tend to be most dense west of eastern Steele County, which forms the boundary of the Lake Agassiz Plain. In general, wetlands in the west half of the Project Corridor (from Wells County west) have been less disturbed by agricultural practices and, thus, retain a more natural state.

Wetlands are identified as shallow water systems that provide unique functions and values to the surrounding landscape, such as water quality protection, wildlife habitat, and flood storage. Wetlands connected to Waters of the U.S. (i.e., not isolated basins) are protected under Section 404 of the Clean Water Act and are regulated by USACE and the EPA. Wetlands within the Project Corridor may also be held in a USFWS wetland easement or grassland easement.

General wetland locations were obtained from the National Wetland Inventory (NWI) (Figure 10). Wetlands are located throughout the Project Corridor; the various wetland types are shown in Table 5.13-1. NWI data represents general locations and acreages of wetlands within the Project Corridor. Because the size of wetlands determined by the use of aerial photography is dependent on the year the photograph was taken and the level of water in the wetland at that time, the NWI data in North Dakota may not reflect the true size of wetlands. Therefore, wetland surveys will be completed prior to construction, which will indicate accurate wetland size.

Table 5.13-1. NWI Wetlands Identified within Project Corridor

Wetland Type	Acres	Percent of Wetland Type
Freshwater Emergent Wetland	1,620.8	89.7
Freshwater Forested/Shrub Wetland	13.9	0.8
Freshwater Pond	60.6	3.4
Lake	43.4	2.4
Riverine	68.9	3.8
Total	**1,807.6**	**100.0**

Source: USFWS NWI

5.13.2 Impacts

Wetland impacts will be avoided or minimized through careful siting of the transmission line and associated facilities. Minnkota will conduct a wetland survey and determination/delineation of the route. Wetland basin locations on USFWS easements need to be identified, with the assistance of the USFWS, during the Route Permit application process. If construction activities are likely to impact wetlands regulated by USACE or USFWS, Minnkota will notify the appropriate agency(s) and initiate the permitting process.

In general, assuming a 1,000-foot-wide span between transmission structures, a transmission line will permanently impact wetlands that are wider than the 1,000-foot span. Table 5.13-2 summarizes NWI wetlands that are greater than 1,000-feet-wide within the Project Corridor. As noted above, some of the NWI data may not accurately reflect the true wetland size. Wetland surveys will indicate actual wetland size. Temporary construction impacts may occur in association with a 30-foot-wide access road within the route.

Table 5.13-2. Project Corridor Crossings of NWI Wetlands Greater than 1,000 Feet

Estimated NWI Wetland Crossing Distance	Number of Crossings
1,000-2,000 feet	3
2,000-3,000 feet	1
Total	**4**

5.13.3 Mitigation

Permanent impacts to wetlands will be avoided to the extent practicable through refinement of Project design. The majority of the wetlands within the Project Corridor that may be permanently impacted by the Project appear to be isolated basins that likely do not fall under USACE jurisdiction. Surveys for USACE jurisdictional wetlands will be completed prior to construction. Permanent impacts to jurisdictional wetlands and waters will be mitigated according to the USACE regulatory requirements, as applicable. Permanent impacts to wetlands under USFWS easements will be avoided, if feasible. If wetlands are impacted on USFWS easements, Minnkota will work with the USFWS to obtain the appropriate permits.

Minnkota will use BMPs during construction and operation of the transmission line and associated facilities to protect topsoil and adjacent wetland resources and to minimize soil erosion. Practices may include containing excavated material, protecting exposed soil, stabilizing restored material, and revegetating disturbed areas with native species.

5.14 Vegetation

5.14.1 Description of Resources

Land cover along the Project Corridor is displayed on Figure 11 and shown in Table 5.14-1. GAP land cover data for North Dakota was used for this analysis (Strong et al. 2005).

Agricultural Vegetation

The general vegetative cover within the Project Corridor consists primarily of agricultural species used for grain and legume production such as wheat, corn, soybeans or sugar beets. Typically, areas used as cropland are established as monotypic communities. Pasture land is also common and is typically dominated by native or planted graminoid species. Many pastures are overgrazed and dominated by non-native grasses. Agricultural vegetative cover generally increases as the Project Corridor extends east, with percent cover ranging from approximately 60 percent cropland in the west to nearly 90 percent cropland in the east.

Prairie, Woodland and Wetland Vegetation

In the western sections of the Project Corridor, toward the Missouri River, prairie and wetland vegetation become more prevalent. Historically, North Dakota was mostly prairie land cover although much of the area has been modified for agricultural production. In the western portions of the Project Corridor, prairie cover is as high as 24 percent, decreasing to nearly 2 percent in the east. Typical species present in remnant prairies include bluestem (*Andropogon* spp*, Schizachyrium* spp.), needlegrass (*Achnatherum*), Indian grass (*Sorghastrum nutans*), and sideoats (*Bouteloua curtipendula*). Healthy prairie habitats can also include a variety of forbs such as prairie smoke (*Geum triflorum*), pasque flower (*Pulsatilla vulgaris*), and coneflower (*Echinacea* spp.*, Ratibida* spp.).

Wetlands occur throughout the Project Corridor as it traverses the Prairie Pothole Region of the upper Midwest. Wetlands are typically small, isolated depressions dominated by emergent vegetation, but also may be found along drainages, rivers, and streams. Common wetland vegetation includes reed canarygrass (*Phalaris arundinaceae*), prairie cordgrass (*Spartina pectinata*), and cattail (*Typha* spp.). Large wetland complexes are typically considered a constraint to transmission line development, as construction may require additional permitting, wetland specific BMPs, or structure placement which will cause permanent impacts. Furthermore, maintenance of new infrastructure and ROW could be more problematic in wet areas.

Wooded areas are not prevalent in North Dakota, making up a small percentage of vegetative cover within the Project Corridor (approximately 1.3 percent). Currently, the most common wooded areas are shelterbelts around residences and buildings. Some rivers and streams crossed by the Project Corridor may have a wooded, riparian fringe. Species commonly found in these wooded areas include deciduous species such as green ash (*Fraxinus pennsylvanica*), aspen (*Populus tremuloides*), burr oak (*Quercus macrocarpa*) and eastern cottonwood (*Populus deltoides*).

Land cover classes that may conflict with the construction and operation of a new transmission line include developed areas, woodlands, water crossings, and large wetland complexes.

Table 5.14-1. GAP Land Cover Types within the Project Corridor

GAP Land Cover Category	Acres in Corridor	Percent of Corridor
Barren/Sparse Vegetation	45.3	0.2
Cropland	16,822.2	56.0
Developed	94.4	0.3
Pasture	5,083.0	16.9
Prairie	4,115.1	13.7
Shrubland	1,128.0	3.8
Wetland	2,414.4	8.0
Woodland	336.9	1.1
Total	**30,039**	**100.0**

Impaired and Vulnerable Terrestrial Communities

NDPR maintains the North Dakota Natural Heritage Inventory (NHI) as a spatial reference to protected and rare species occurrences or sensitive natural communities. The database includes data pertaining to flora and fauna species. While this inventory has not been completed throughout the entire Project Corridor, data is available for the vicinity of the Missouri and Sheyenne Rivers.

This database has assigned each occurrence a state conservation ranking, standards developed in part by NatureServe (NatureServe 2010). These rankings range between S1 for species or communities which are critically imperiled (less than five occurrences regionally) to S5 for species or communities considered secure (common species). Some communities are not assigned a rank, or are considered historical or extirpated (NatureServe 2009). These rankings are valuable to determine the extent of rare communities present in a given location. Rare communities present in the vicinity of the Project Corridor include areas of high quality prairie such as dry-mesic tallgrass prairies or needle-and-thread mixed grasses, high quality woodlands such as floodplain forests or burr oak upland woodlands and high quality shrublands and high quality wetlands. These communities likely harbor a greater diversity of plant species than the surrounding landscape. Impaired or vulnerable terrestrial communities are shown in Table 5.14-2 for the Project Corridor.

Table 5.14-2. Impaired or Vulnerable Terrestrial Communities in Project Corridor

State Conservation Ranking	Common Community Names	Acres
S1	Dry Mesic Tallgrass Prairie	20.7
	Water Sedge Rich Fen	16.7
S2	Needle-and-thread Mixed Grass Prairie	47.8
S2/S3	Saltgrass Saline Meadow	5.3
S3	Bur Oak Upland Woodland	2.4
	Cottonwood-Green Ash Floodplain Forest	38.8
S3/S4	Western Wheatgrass Prairie	47.8
	Needlegrass-wheatgrass Prairie	23.0
	Total	**202.5**

Source: North Dakota Natural Heritage Inventory

5.14.2 Impacts

For all land cover, the extent of temporary and permanent impacts will be determined upon identification of a route within the Project Corridor. Permanent impacts will be limited to structure locations, Center 345 kV Substation expansion, river crossing access roads (if site conditions deem necessary) and fiber optic regeneration station and access road footprints.

Agriculture

Land use in the Project Corridor is dominated by agricultural cropland.

Prairie, Woodland, and Wetland Vegetation

The most common type of prairie habitat along the Project Corridor is dominated by a mixture of non-native vegetation, bluestem, needlegrass, and wheatgrass. Many prairie areas are degraded due to overgrazing. Permanent impacts to prairie areas will be limited to structure and fiber optic regeneration footprints.

In some areas, wetlands may share similar characteristics as prairie areas, but in many cases are degraded or dominated by non-native vegetation. Woodlands may be converted into grassland or scrublands due to clearing for a ROW. Woodlands that may be considered of higher biological integrity could include the cottonwood floodplains in the vicinity of the proposed Missouri River crossing.

Impaired and Vulnerable Terrestrial Communities

The most common type of rare community along the Project Corridor is cottonwood-green ash floodplain forests. Known occurrences of this community along this Project Corridor are adjacent to the Missouri River crossing. Western wheatgrass and needle-and-thread mixed grass prairies are the next most frequent type of community present along the Project Corridor. These communities are overlapping and present along the eastern bluffs of the Missouri River.

5.14.3 Mitigation

Agriculture

Mitigation of impacts to agricultural vegetation is addressed in Section 5.2.3. Minnkota will conduct a structure staking review with landowners, to the extent practical.

Prairie, Woodland, and Wetland Vegetation

Impacts to native vegetation will be minimized, when possible, by spanning habitats of higher quality. Where spanning is not feasible, impacts to native vegetation will be mitigated by re-establishing similar native species once construction is complete. Areas of non-native vegetation will be re-vegetated using native species appropriate for the local habitat, if approved by the landowner, to the extent practical.

Structure placement will be selected to avoid placement in wetland areas when possible. Mitigation, if required, will be completed in consultation with the USACE under Section 404 Permit requirements. Wetlands that do not require a Section 404 permit will be restored to preconstruction conditions.

Impacts to woodland vegetation will occur within the final ROW where these habitats are present. Minnkota will mitigate impacts to woodland areas using a 2:1 replacement ratio (based on the number of trees removed), per Commission requirements. If feasible, the replacement areas will be located in the vicinity of the impacts. Where functional woodlands will be removed (such as shelter belts), mitigation will be designed to replace the intended utility of the impacted woodland.

Impaired and Vulnerable Terrestrial Communities

Impacts to impaired and vulnerable terrestrial communities will be minimized in a similar manner as discussed above; however, BMPs to minimize the spread of non-native species will be employed. In impaired and vulnerable terrestrial communities, BMPs may include but not limited to the following actions:

- Where soil will be disturbed, the topsoil will be excavated separately from subsoil and stored in separate stockpiles.
- Disturbed soils will not be transported to a different location on the Project.
- The time which areas of disturbed soils are left bare will be minimized.
- Disturbed areas will be revegetated using a native seed mix which mimics native communities present near the area of disturbance.

5.15 Wildlife

5.15.1 Description of Resources

General Wildlife

In general, wildlife species present within the Project Corridor are typical of agricultural landscapes, pasture grasslands, and wetland habitat. Common mammals for these habitats include raccoon *(Procyon lotor)*, skunk *(Mephitis* spp.*)*, red fox *(Vulpes vulpes)*, rabbits *(Syvilagus* spp.*)*, bats (*Myotis* spp.), white-tailed deer *(Odocorleus virginianus)*, and coyote *(Canis latrans)*. The secondary ranges of pronghorn (*Antilocapra americana*) and mule deer (*Odocoileus hemionus*) include the western part of the Project Corridor. Typical birds include songbirds; waterfowl; raptors; and game birds, such as pheasant *(Phasianus colchinus),* gray partridge (*Perdix perdix*), and sharp-tailed grouse (*Tympanuchus phasianellus*). In general, birds nest in shelterbelts and fencerow trees, and on the ground in the grasslands associated with prairie remnants, conservation land, lightly grazed pasture, and riparian areas.

The Missouri and Sheyenne Rivers, in particular, provide corridors for migration and foraging of wildlife as well as ample cover for small mammals, raptors, waterfowl, upland game birds, and other common wildlife along the Project Corridor. Additionally, the area described as the Northwestern Great Plains Ecoregion, which includes the Project Corridor areas from western Wells County west to the Missouri River, includes relatively large tracts of grassland that provide native habitat for a variety of grassland species (USGS 2006).

Species of Concern in North Dakota

The NHI provides a system for identifying and prioritizing ecologically significant natural features in the state. Plant and animal species documented in the NHI have been assigned global and state ranks that describe the relative rarity of each species. The North Dakota Natural Heritage Program has used these ranks to help develop a list of plant and animal species considered to be Species of Concern in North Dakota (Dirk 2006a, 2006b). Species of Concern include those plant and animal species that have populations considered at risk in the state of North Dakota; but North Dakota Species of Concern do not receive legal protection under state and/or federal endangered species acts. Federally listed species are discussed in Section 5.16.

Table 5.15-1 provides the Species of Concern documented in the NHI within 1 mile of the Project Corridor. Species of Concern in North Dakota typically have been assigned a natural heritage state rank of S1, S2, or S3, as outlined below:

- **S1 Critically Imperiled** – Critically imperiled in the state because of extreme rarity or because some factor of its biology makes it especially vulnerable to extirpation from the state. Typically 5 or fewer occurrences or very few remaining individuals (less than 1,000). [Critically endangered in state.]
- **S2 Imperiled** – Imperiled in the state because of rarity or because of other factors making it very vulnerable to extirpation from the state. Typically 6 to 20 occurrences or few remaining individuals (1,000 to 3,000). [Endangered in the state.]
- **S3 Vulnerable** – Vulnerable in the state either because of rarity, or because it is found only in a restricted range (even if abundant at some locations), or because of other factors making it vulnerable to extirpation. Typically 21 to 100 occurrences or between 3,000 to 10,000 individuals. [Threatened in the state.] (NDNHI 2009)

Since areas within the Project Corridor have been studied by the State of North Dakota to varying degrees of completeness, the species represented by the NHI data best serve as a snapshot of the potential presence of sensitive species, and do not necessarily represent a comprehensive list of all sensitive species located within the Project Corridor. Hence, when assessing species records it may be important to consider the similarity of habitats when interpreting the available data.

In general, most Species of Concern are associated with high quality rare or unique habitats and landscape features. In the Project Corridor, most Species of Concern observations occur along the Missouri and Sheyenne Rivers (Figure 12). Other species observances not associated with a major river are associated with unique habitats, such as remnant native prairie, riparian woodlands, wetland complexes, or rock outcroppings.

Table 5.15-1 summarizes known raptor nests, owl nests, and sharp-tailed grouse leks near the Project Corridor. NDGF has recorded sharp-tailed grouse lek areas in Grand Forks County, in the vicinity of the English Coulee Retention Dam, and in Sheridan County near the Prophets Mountain area. On March 29 and 30, 2010, aerial surveys for raptor nests occurred within the Project Corridor (see Appendix G). The data from this survey is summarized in Table 5.15-2.

Table 5.15-1. Sensitive Species within and Adjacent to Project Corridor

Location	Species	Number
Within Corridor	NHI Species of Concern	0
	Raptor Nests*	0
	Burrowing Owl Nests	0
	Sharptail Grouse Leks	1
Within 1 mile of Corridor	NHI Species of Concern	6
	Raptor Nests*	0
	Burrowing Owl Nests	0
	Sharptail Grouse Leks	14
Within 2 miles of Corridor	Total Sharptail Grouse Leks (within 2 miles of centerline and includes the leks identified above)	21

**Raptor nests include bald eagle and ferruginous hawk. Does not include data from March 2010 raptor surveys.*

Table 5.15-2. March 2010 Raptor Nest Survey Results within and Adjacent to Project Corridor

Distance	Feature Type	Number
Within Corridor	Raptor Nest	10
	Raptor Observed	2
Within 1,000 feet of Corridor Limits (does not include Corridor)	Raptor Nest	5
	Raptors Observed	0

Source: Minnkota 2010b

USFWS made recommendations regarding nesting birds in a response letter received by Minnkota on June 2, 2009. The bald eagle and raptor nest surveys were conducted in consideration of the recommendations quoted below.

USFWS Bald Eagle Recommendations

The North Dakota Game and Fish (NDGF) bald eagle nest database indicated that bald eagle nests are located in the project area. We recommend conducting surveys to identify bald eagle nests along the proposed route in winter/early spring before trees have leaves that could screen possible nests. To avoid/minimize impacts to nesting bald eagles from transmission line construction activities, the Service recommends (1) keeping a distance between the activity and the nest (distance buffers: 660 feet if the activity will be visible from the nest; 330 feet if the activity will not be visible from the nest.) Clearing, external construction, and landscaping between 330 feet and 660 feet should be done outside breeding season. (2) maintaining preferably forested (or natural) areas between the activity and around nest trees (landscape buffers), and (3) avoiding certain activities during breeding season. The buffer areas serve to minimize visual and auditory impacts associated with human activities near nest sites. Ideally, buffers would be large enough to protect existing nest trees and provide for alternative or replacement nest trees. The Service's May 2007, National Bald Eagle Management Guidelines contain detailed information on protecting bald eagles from disturbance due to human activity. The guidelines can be accessed on the Service's website:
(http://www.fws.gov/migratorybirds/CurrentBirdIssues/Management/BaldEagle/NationalBaldEagleManagementGuidelines.pdf).

USFWS Migratory Bird Recommendation

Schedule constructions for late summer or fall/early winter so as not to disrupt waterfowl or other wildlife during the breeding season February 1 to July 15. If work is proposed to take place during the breeding season or at any other time which may result in the take of migratory birds or active nests, the Service recommends that the project proponent arrange to have a qualified biologist conduct a field survey of the affected habitats to determine the absence or presence of nesting migratory birds. If nesting migratory birds are found, we request you contact this office, suspend construction, or take other measures, such as maintaining adequate buffers, to protect the birds until the young have fledged. The Service further recommends that field surveys from nesting birds, along with information regarding the qualifications of the biologist(s) performing surveys, and any avoidance measures implemented at the project site, be thoroughly documented and that such documentation be shared with the Service and maintained on file by the project proponent at least until such time as construction on the Project has been completed.

5.15.2 Impacts

Both direct and indirect effects could occur to wildlife species as a result of the Project. Direct effects to wildlife are those effects that occur immediately or in proximity at the time of the activity. Indirect effects are those effects that are likely to occur later in time as a result of the activity.

Direct effects could include:

- Direct habitat modification and reduction associated with construction clearing or grading;
- Removal of raptor nests (excluding bald and golden eagle nests) during the breeding season;

- Introduction of sediment and fugitive dust through erosion and runoff during construction;
- Potential for displacement of ground nesting birds, such as sharp-tailed grouse, from lekking areas, particularly where the Project Corridor crosses near the Prophets Mountain in Sheridan County.
- Exposure to contaminants from fuels and chemicals that are used during construction and operation; and
- Injury or mortality associated with collisions with construction equipment and/or overhead transmission lines. Collisions are discussed in more detail below.

Raptors, waterfowl, and other bird species may be affected by the construction and placement of the transmission line and associated facilities. Avian collisions are a possibility after the completion of the transmission line. Waterfowl may be susceptible to transmission line collision, especially if the line is placed between agricultural fields that serve as feeding areas, or between wetlands and open water, which serve as resting areas. The transmission line shield wire is the part of the structure that is most likely to cause an avian collision. Additionally, the western half of the Project Corridor passes through the whooping crane migration corridor, which is discussed in Section 5.16.

Indirect effects could include:

- Habitat disturbances that result in habitat fragmentation and/or species crowding in adjacent habitat, interfering with behavior and/or migration;
- Introduction of invasive vegetation that could change on-site habitat conditions; and
- Interference with behavior or migration from noise created by construction and human activity.

5.15.3 Mitigation

Minnkota will use the following methods to address avian and other wildlife issues associated with the transmission line:

- Will continue to work with the USFWS and RUS to identify areas where both of the transmission line shield wires could be marked. As noted in Section 5.16, both of the shield wires would be marked in an alternating pattern, as appropriate, to mitigate for sections of route near suitable whooping crane habitat within the whooping crane migration corridor .
- The transmission line will be designed with consideration of the guidance found in Avian Power Line Interaction Committee's (APLIC) *Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006*.
- Preconstruction surveys of the route for wetlands and woodlands and associated facilities will be completed to minimize impacts to wildlife habitat.
- To discourage active nesting within areas to be temporarily or permanently disturbed by the Project, tree removal, ground clearing, or mowing will occur in late fall or early spring to discourage tree and ground nesting.

- If areas are not cleared in early spring before the breeding season, a qualified biologist will survey the construction ROW for active nests of protected species and provide a construction buffer.
- In case of permanent jurisdictional wetland impacts, any unavoidable loss of jurisdictional wetland habitat will be replaced with functionally equivalent wetlands, as required by applicable permits.
- Appropriate erosion control measures will be installed and maintained to reduce sediment transport to adjacent wetlands, streams, and river channels.
- If impacted, per the Commission's requirements, trees would be replaced at a 2:1 ratio, subject to landowner approval.
- Avoid refueling vehicles within 100 feet of a waterway's edge to minimize the potential for hazardous-materials spills reaching the waterway.
- Prompt restoration and re-vegetation of disturbed areas.
- Use native plant seed stock for re-vegetation.

The Project is not expected to result in the listing of or jeopardizing the continued existence of any wildlife species, and will not violate any wildlife protection law, including the Migratory Bird Treaty Act.

5.16 Rare and Unique Natural Resources

5.16.1 Description of Resources

The Endangered Species Act (ESA) of 1973, as amended, provides for the conservation of ecosystems upon which threatened and endangered species of fish, wildlife, and plants depend. Section 7 of the ESA requires federal agencies to insure that any action authorized, funded, or carried out by them is not likely to jeopardize the continued existence of listed species, or to modify their critical habitat. The RUS is developing a Biological Assessment (BA) to support their efforts to meet their responsibilities under Section 7(a) of the ESA. Through review of the BA, the RUS will make a determination of whether the Project will or will not affect a listed species or adversely modify critical habitat. Minnkota continues to consult with USFWS and RUS.

Federally threatened species are those species likely to become endangered within the foreseeable future throughout all or a significant portion of their range. Federally endangered species are those species already in danger of extinction throughout all, or a significant portion of, their range. Designated critical habitat is a specific geographic area(s) that is essential for the conservation of a threatened or endangered species and that may require special management and protection. Table 5.16-1 summarizes federally designated species and critical habitat that may occur within the Project Corridor.

Table 5.16-1. Federally Listed Species and Critical Habitat by Counties that are Crossed by Project Corridor

Species	Type	County Occurrences	Preferred Habitat	Habitat Present in Project Corridor
Endangered				
Interior least tern (*Sterna antillarum*):	Bird	Burleigh, McLean, Oliver	Nests along midstream sandbars of the Missouri and Yellowstone rivers.	Yes, Missouri River
Whooping crane (*Grus americana*)	Bird	All	Migrates through North Dakota during spring and fall. Prefers to roost in wetlands and stock dams with good visibility (i.e., no or minimal woody debris within wetland or on wetland fringe).	Yes
Pallid sturgeon (*Scaphirhynchus albus*)	Fish	Burleigh, McLean, Oliver	Known only from the Missouri and Yellowstone rivers. No reproduction has been documented in 15 years.	Yes, Missouri River
Gray wolf (*Canis lupus*)	Mammal	McLean, Oliver	Occasional visitor in North Dakota. Most frequently observed in the Turtle Mountains area of northern North Dakota.	No, Project greater than 75 miles from Turtle Mountains
Black-footed ferret (*Mustela nigripes*)	Mammal	Oliver	Exclusively associated with prairie dog towns. No records of occurrence in recent years, although there is potential for reintroduction in the future.	No. Large prairie dog towns capable of sustaining a ferret population are not present within the Project Corridor

Species	Type	County Occurrences	Preferred Habitat	Habitat Present in Project Corridor
Threatened				
Piping plover (*Charadrius melodus*)	Bird	Burleigh, Eddy, Foster, McLean, Oliver, Sheridan, Wells	Nests on midstream sandbars of the Missouri and Yellowstone rivers and along shorelines of saline wetlands.	Yes, Missouri River
Designated Critical Habitat				
Piping plover (*Charadrius melodus*)	Bird	Burleigh, Eddy, McLean, Oliver, Sheridan	Missouri River - Critical habitat includes sparsely vegetated channel sandbars, sand and gravel beaches on islands, temporary pools on sandbars and islands, and the interface with the river. Alkali Lakes and Wetlands – Critical Habitat includes: (1) shallow, seasonally to permanently flooded, mixosaline to hypersaline wetlands with sandy to gravelly, sparsely vegetated beaches, salt-encrusted mud flats, and/or gravelly salt flats; (2) springs and fens along edges of alkali lakes and wetlands; and (3) adjacent uplands 200 feet above the high water mark of the alkali lake or wetland.	Yes, at Missouri River crossing; No designated alkali lake and wetlands within Project Corridor
Delisted				
Bald eagle (*Haliaeetus leucocephalus*)	Bird	Possible in all counties crossed by Project Corridor	The bald eagle has been recently delisted from the ESA. However, the bald eagle is still protected by other federal laws including: the Bald and Golden Eagle Protection Act, the Migratory Bird Treaty Act, and the Lacey Act.	Possible; aerial surveys conducted on March 2010 documented one eagle nest in Eddy County about 1,700 feet south of Project Corridor (Minnkota 2010b)

Table 5.16-2 summarizes the known occurrence of federally threatened and endangered species within, and within 1 mile of, the Project Corridor. All NDPR occurrences represent past observation of piping plover and interior least tern along the Missouri River. USFWS has also indicated that these points along the Missouri River represent historic nesting sites of piping plover and interior least tern. Confirmed whooping crane migration sitings are scattered throughout the west half of the Project Corridor, from about the city of Carrington westward.

Table 5.16-2. Number of Federally Listed Species Occurrences within Project Corridor and one mile of Project Corridor

Distance	Species Occurrences	Number
Within Corridor	NDPR T&E Occurrences	0
	Whooping Crane Sightings	0
	Total T&E Species Observations	0
Within 1 mile of Corridor	NDPR T&E Occurrences	5
	Whooping Crane Sightings	2
	Total T&E Species Observations	7

Table 5.16-3 summarizes bald eagles that were observed with or near the Project Corridor during March 29-30, 2010, aerial surveys.

Table 5.16-3. Bald Eagle Nests and Observations Within and Adjacent to Project Corridor

Distance	Feature Type	Number
Within Corridor	Bald Eagles (Soaring)	0
	Bald Eagles (Perched)	4
	Total Bald Eagles Observed	4
Within 1,000 ft of Corridor Limits (does not include Corridor)	Bald Eagle Nest	0*
	Bald Eagle (Nesting)	0
	Bald Eagles (Soaring)	0
	Bald Eagles (Perched)	3
	Total Bald Eagles Observed	3

**Eagle nest located about 1,700 ft south of Corridor in Eddy County*

An active bald eagle nest was observed about 1,700 feet south of the Project Corridor in Eddy County. Most of the bald eagle observations were observed near the central part of the Project Corridor, within Foster, Eddy, and Wells counties (Minnkota 2010b).

5.16.2 Impacts

Due to the linear nature of the Project, impacts to potential terrestrial species habitat will be limited to the area within the ROW. Long-term habitat impacts will occur at permanent structure locations, permanent access roads at river crossing (if site conditions deem necessary) and fiber optic station locations. Where tree clearing is required; short-term impacts could occur at the 30-foot-wide temporary access road. Existing, adjacent habitat will be left undisturbed.

Table 5.16-4 summarizes potential impacts to federally listed species and critical habitat. Species with potential impacts are discussed in more detail in this section.

Table 5.16-4. Potential Impacts to Federally Listed Species and Critical Habitat

Species	Type	Direct Impact Anticipated	Indirect Impact Anticipated	Comment
Endangered				
Interior least tern (*Sterna antillarum*):	Bird	No	Possible	Corridor crosses historic nesting sandbars
Whooping crane (*Grus americana*)	Bird	Possible	Possible	Corridor runs perpendicular to the migration corridor and includes potential whooping crane stopover habitat
Pallid sturgeon *(Scaphirhynchus albus*)	Fish	No	No	No impacts to the Missouri River are expected
Gray wolf (*Canis lupus*)	Mammal	No	No	Greater than 75 miles from Turtle Mountains, an area that is occasionally used by gray wolf
Black-footed ferret (*Mustela nigripes*)	Mammal	No	No	No known populations in North Dakota; Corridor does not cross any known potential habitat (prairie dog towns)
Threatened				
Piping plover (*Charadrius melodus*)	Bird	No	Possible	Corridor crosses historic nesting sandbars
Designated Critical Habitat				
Piping plover (*Charadrius melodus*)	Bird	No	Possible	The Missouri River sandbars, which is designated critical habitat, will be spanned by the transmission line
Delisted				
Bald eagle (*Haliaeetus leucocephalus*)	Bird	No	No	No eagle nests will be impacted by the Project; transmission line will meet APLIC guidelines

Interior Least Tern

The Project Corridor spans the Missouri River across an historic nesting grounds sandbar. Aerial photography from 2009 indicates that sandbars are still present at these locations.

A direct impact to the interior least tern could occur in the event of a collision with the transmission line. While typical flight height information is not readily available, it is documented that, when searching for prey, the interior least tern hovers about 3 to 33 feet above water, which is lower than the expected height of the transmission line (Thompson et al. 1997). As such, direct impacts due to collision with the transmission line during feeding forays would be unlikely. Little information is available that establish flight heights during local movements or migration for the least tern. However, several generalizations about avian migration flight characteristics can be inferred from published literature and may aid in assessing collision risk for migratory least terns. Most birds migrate during periods of good weather and geographic features such as rivers or mountain ranges are used by birds to orient themselves during migration. Flight heights tend to be higher for migrating birds at night or with tailwinds than during daylight hours or with a headwind (Curry and Kerlinger 2004,Scanlon et al. 2010, Dolbeer 2006). Given these generalizations about avian migration, there may be an increased risk to least terns during migration when the prevailing winds are from the north/northwest and

during night-time hours. Static wires on the new transmission line would be marked with avian flight diverters in an alternating pattern near suitable habitat. Minnkota will work with the USFWS and RUS to identify marker device spacing to avoid collision impacts to least terns engaged in local movements and migration. Transmission conductor wires are generally constructed of a diameter (outside diameter of 1.382 inches) thick enough for birds to see during daylight movements. Helicopters will be employed to string transmission lines across Missouri River after breeding season.

Minnkota would design structure locations to avoid direct impacts to nesting habitat. Minnkota proposes to cross the Missouri River in one span; therefore no structures will be placed within the Missouri River or its sandbars. In addition, Minnkota proposes to cross the Missouri River near existing transmission lines. The Project will not cause a loss, fragmentation, or modification of sandbar habitat.

Fiber optic and regeneration stations will be located in upland habitats away from the Missouri River and will not impact or modify sandbar habitat.

Another direct impact could occur in the event that the installation of a new transmission line causes displacement of local nesting populations. The timing of construction at the Missouri River would be restricted such that construction activities would not be allowed during the nesting season from April through August. Minnkota proposes to construct at the Missouri River after August, from November to the following March. Structure locations will be designed to avoid direct impacts to nesting habitat.

The primary indirect effect will be the potential for complete avoidance by interior least tern of the nesting habitat located near the area of the transmission line during construction.

Whooping Crane

This region of North Dakota has seen conversion of native prairie and wetlands into agricultural land use beginning with 19th-century settlement, negatively impacting the quality and quantity of migration stopover habitat for numerous migratory birds. Construction of utility lines and roads, and the increased urban and industrial developments with the associated human disturbance near the Project Corridor vicinity have also negatively affected whooping cranes and migration habitat.

Potential direct effects to whooping cranes include mortality associated with collisions and permanent loss of habitat. According to USFWS, collisions with power lines are the greatest known source of mortality for fledged whooping cranes. Specifically, Stehn and Wassenich (2007) stated that shield wires are the wires most often struck by birds in flight. During preliminary discussions, USFWS commented that a new transmission line has the potential to affect whooping cranes during their annual spring and fall migration through North Dakota (Ellsworth, pers. comm.). The Project crosses perpendicularly to the east half of the whooping crane migration corridor (Figure 12). The western terminus of the Project Corridor is located within the center (50^{th} percentile band) of the whooping crane migration corridor. Migrating cranes are most vulnerable to collisions with structures in the early morning or late evening when light levels are diminished, as they fly at very low altitudes between roost and foraging sites, or when flying at low altitude when starting or ending a migration flight, especially when thermal currents are minimal.

Short-term direct impacts could occur in the event that a whooping crane is displaced from available stopover habitat during Project construction. Long-term direct impact could occur in

the event that installation of a new transmission line causes displacement of local stopover habitat.

Stehn and Wassenich (2007) stated that whooping cranes responded to marked lines and tried to avoid the lines. Minnkota proposes to mark both of the new transmission line shield wires in an alternating pattern within 1 mile of suitable habitat in the 95-percent sighting corridor of the whooping crane migration corridor. Minnkota would work with the USFWS to identify marker device spacing. Minnkota would provide the USFWS with a written confirmation that the shield wires were marked and the location of markers from Minnkota.

The primary indirect effect is the potential for complete avoidance by whooping cranes of the stopover habitat located near the proposed transmission line. Loss of migration habitat is a growing concern regarding the Aransas-Wood Buffalo population. Searching for suitable stopover habitat may cause increased exposure to hazards as birds are required to fly low for longer distances. The increased disturbance could also place the cranes at greater risk of exposure to other hazards encountered during migration such as structures, hunters, disease, and predation.

Piping Plover

The Project Corridor spans the Missouri over an historic nesting grounds sandbar. Aerial photography from 2009 indicates that sandbars are still present at these locations.

A direct impact to piping plover could occur in the event of a collision with the transmission line. While typical flight height information is not readily available, piping plovers do spend much of their time walking or running rather than flying, because their inconspicuous sand-colored plumage makes them more difficult to see on the ground than if they flew and exposed their bright white underbody (Elliott-Smith et al. 2004). However, trading flights between nesting and foraging locations along the Missouri River do occur. Little information is available that establish flight heights during local movements or migration for the piping plover. Generalized information on flight heights of shorebirds during migration suggest that the piping plover would migrate between 1,000 and 13,000 feet in elevation (Smithsonian 1998) that is well above the transmission line height. Several generalizations about avian migration flight characteristics can be inferred from published literature and may aid in assessing collision risk for migratory piping plovers. Most birds migrate during periods of good weather and geographic features such as rivers or mountain ranges are used by birds to orient themselves during migration. Flight heights tend to be higher for migrating birds at night or with tailwinds than during daylight hours or with a headwind (Curry and Kerlinger 2004,Scanlon et al. 2010, Dolbeer 2006). Given these generalizations about avian migration, there may be an increased risk to piping plovers during migration when the prevailing winds are from the south/southeast and during night-time hours. Static wires on the new transmission line would be marked with avian flight diverters in an alternating pattern near suitable habitat. Minnkota will work with the USFWS and RUS to identify marker device spacing to avoid collision impacts to piping plovers engaged in local movements and migration. Transmission conductor wires are generally constructed of a diameter (outside diameter of 1.382 inches) thick enough for birds to see during daylight movements. Helicopters will be employed to string transmission lines across Missouri River after breeding season.

Structure locations will be designed to avoid direct impacts to nesting habitat. Minnkota proposes to cross the Missouri River in one span; therefore, no structures will be placed within the Missouri River or its sandbars. In addition, Minnkota proposes to cross the Missouri River

near existing transmission lines. The Project will not cause a loss, fragmentation, or modification of sandbar habitat.

Fiber optic and regeneration stations will be located in upland habitats away from the Missouri River and will not impact or modify sandbar habitat.

Another direct impact could occur in the event that the installation of a new transmission line causes displacement of local nesting populations. The timing of construction at the Missouri River would be restricted such that construction activities will not be allowed during the nesting season from mid-April through August. Minnkota proposes to construct at the Missouri River after August, from November to the following March. Since piping plovers may use alkali wetland habitats for nesting, Minnkota proposes to conduct pre-construction surveys for active nesting piping plovers within the ROW. If active nesting areas are identified during the surveys that are outside the Missouri River designated critical habitat, Minnkota proposes to maintain a 0.5-mile buffer around the active piping plover nesting areas. Structure locations will be designed to avoid direct impacts to nesting sandbar habitat.

The primary indirect effect is the potential for complete avoidance by piping plovers of the nesting habitat located near the area of transmission line construction.

Pallid Sturgeon

The Project Corridor crosses the Missouri River, which is habitat for the pallid sturgeon. Minnkota proposes to span the Missouri River and not install structures within the river channel. Additionally, Minnkota proposes to place structures about 100 feet away from the river's existing bank to account for river flows that have the potential to erode the river's bank. Helicopters will be employed to string transmission lines across Missouri River to avoid potential impacts due to boat propellers striking sturgeon. No direct impacts are anticipated to the pallid sturgeon due to construction or operation of a transmission line.

The Project will utilize BMPs that will limit indirect impacts from sedimentation and erosion during construction, such as silt fence, straw bales, and revegetation. The Project will not change water temperature of the river. Minnkota will not refuel vehicles within 100 feet of the river's edge to minimize the potential for hazardous-materials spills reaching the river. No indirect impacts are anticipated to the pallid sturgeon due to construction or operation of the transmission line.

Gray Wolf

The gray wolf may pass through the Project Corridor, but viable gray wolf habitat does not occur in the Project Corridor. It is unlikely that gray wolves would be present during construction and operation, with the possible exception of an occasional transient animal. If gray wolves entered during Project construction they could be struck by vehicles, but the chance of collisions is considered negligible, particularly since posted speed limits would be very low.

The Project will not have indirect effects on the gray wolf. In general, the Project Corridor and North Dakota do not provide suitable habitat for establishment of a viable wolf population. Any wolves that have occurred or may occur in the Project Corridor are rare, dispersing individuals from a core population in Minnesota, well to the east of the Project Corridor.

Black-Footed Ferret

Potential direct effects to black-footed ferrets include: permanent loss of habitat, eradication of prairie dog towns (food source), and predation from raptors. Potential black-footed ferret

reintroduction habitat could be found in portions of Oliver County. No records of occurrence within the Project Corridor have been documented in recent years and there are no reintroduced populations near the Project Corridor. Minnkota will not eradicate a prairie dog town that may be a potential food source for the black-footed ferret. In addition, Minnkota will design their structures per APLIC guidelines that may reduce the ability of raptors to perch on the structures. This may reduce the opportunities for raptors to perch on the structures to prey on the black-footed ferret, if a population was reintroduced to the Project Corridor. No direct or indirect impacts are anticipated due to construction or operation of a transmission line within the Project Corridor.

Piping Plover Critical Habitat

The Project Corridor crosses the Missouri River, which is designated critical habitat. No direct impacts to critical habitat are expected as the transmission line will span the Missouri River.

5.16.3 Mitigation

Mitigation and minimization measures are expected to include:

- Designing and siting the transmission line route according to APLIC guidelines for minimization of electrocution and collision.
- Marking both shield wires of the transmission line in an alternating pattern with visual marking devices within 1 mile of suitable whooping crane habitat in the whooping crane migration corridor. Minnkota will work with the USFWS to identify marker device spacing.
- Avoiding the Lake Williams area, which is designated critical habitat for the piping plover.
- Constructing the Missouri River crossing after August, from November to the following March, which is outside of the breeding and fledgling season for the interior least tern and piping plover. The USFWS reports that the breeding season for the interior least tern lasts from April through August. The USFWS states that the breeding season for the piping plover in North Dakota extends from mid-April through August.
- Conducting pre-construction surveys for active piping plover nesting areas within the ROW. If active nesting areas are identified during the surveys that are outside the Missouri River designated critical habitat, Minnkota proposes to maintain a 0.5-mile buffer around the active piping plover nesting areas.
- Avoiding placing structures within the Missouri River channel or on sandbars of the Missouri River where interior least tern and piping plover nesting could occur.
- Maintaining a distance of at least 330 feet from active eagle nests, or 660 feet if the activity will be visible from the nest. Raptor nest surveys were completed in March 2010.
- Avoiding direct impacts to wetlands, native prairie, wooded draws or other sensitive habitat areas whenever feasible.
- Conducting ground clearing in the fall and winter prior to the nesting season. If ground clearing is not completed in the fall or winter, conducting ground surveys for nesting birds prior to construction.

- Replacing trees at a 2:1 mitigation ratio, per the Commission's requirements and subject to landowner approval.
- Avoid refueling vehicles within 100 feet of a waterway's edge to minimize the potential for hazardous materials spills reaching the waterway.
- Throughout the Project, Minnkota will utilize BMPs that will limit indirect impacts from sedimentation and erosion during construction, such as silt fence, straw bales, and revegetation.

6.0 Public and Agency Coordination

Minnkota pursued a public outreach effort that provided opportunities for landowners and other stakeholders to be involved in the routing process. Minnkota engaged landowners, interested members of the public, federal and state agencies, and local government units. Initial meetings with federal and state permitting authorities started in April 2009. Meetings with the counties were held in April and May 2009. Minnkota began hosting a series of public open house meetings in May 2009 to discuss the Project and identify potential issues and concerns.

The public and agency coordination efforts described in this section addressed a much larger area than the Project Corridor depicted in this application. The public and agency coordination efforts that began over a year ago assisted Minnkota with identifying the Project Corridor described in this application as the best possible corridor for a transmission line.

6.1 Public Participation

Minnkota engaged the public from the initial stages of Project development and continued public involvement throughout each stage of the Project by using a variety of outreach tools. Minnkota hosted three rounds of public open house meetings. Table 6.1-1 below identifies the Project phase, meeting dates, and meeting locations for each round of meetings. Minnkota hosted pre-scoping and post-scoping public open house meetings, while the RUS hosted the scoping meetings held in November 2009 and the EA public comment period from November 15 to December 17, 2010 as part of the federal scoping process. No public meetings were a part of the EA public comment period, however mailings were sent notifying the public of the comment period and how to make a comment.

In order to notify landowners of each round of public open house meetings, Minnkota used the following type of mail and media outreach:

- Direct mail notice to landowners.
- Press release to television stations and radio stations.
- Newspaper advertisements in the local newspapers.

Table 6.1-1. Public Open House Meetings

Project Phase	Meeting Dates	Meeting Locations	Meeting Materials
Project Introduction (Hosted by Minnkota)	May 6-7, 12-14, 2009	Washburn, Wing, Carrington, Cooperstown, Grand Forks	Informational boards, meeting handout, project video, aerial maps of potential project corridors
Project Introduction (Hosted by Minnkota)	August 20, 2009	Center	Informational boards, meeting handout, project video, aerial maps of potential project corridors
Federal Scoping Process (Hosted by RUS)	November 2009	Grand Forks, Cooperstown, Carrington, McClusky, Wilton, Center	Informational boards, meeting handouts/resource factsheets, aerials maps of macro-corridors
1,000-foot-wide Corridor Presentation (Hosted by Minnkota)	April 12-15, 2010	Grand Forks, Finley, Carrington, McClusky, Wilton, Center	Information boards, meeting handout/resource factsheets, mapping station, aerial maps of proposed routes, 30 minute presentation

In addition to public open house meetings, Minnkota used a project-specific Web site (www.minnkotacgf.com) and project-specific information phone line (800-473-5679) to reach interested members of the public. Minnkota collected comments from the public to identify concerns about the Project or routing suggestions. Minnkota will continue to notify the public of Project milestones through Project completion.

6.2 Federal, State, and Local Agencies

In April 2009, Minnkota sent correspondence to federal agencies, state agencies, and county commissioners within the vicinity of the Project Corridor. Table 6.2-1 lists all agency mailings for the Project. A list of organizations contacted regarding this Project is included in Appendix H.

Table 6.2-1. Agency Mailings

Agency Type	Purpose	From	Mailing Date
Federal and state agencies	Project introduction	Minnkota	4/27/2009
County Commissioners	Project introduction	Minnkota	4/22/2009
Federal and state agencies	River crossing site visit	RUS	9/16/2009
Federal and state agencies	Alternative Evaluation Study and Macro Corridor Study review and invitation to Scoping Meeting	RUS	11/2/2009
USFWS	Letter to initiate Section 7 Consultation	RUS	6/4/2010
Federal and state agencies	EA mailed for review and comment	RUS	11/15/2010

Minnkota held meetings with federal, state, and local agencies to provide general Project information and provide updates as the Project progressed. Table 6.2-2 provides a list of agency consultation meetings from April 2009 to May 2010. At the agency meetings, Minnkota provided an opportunity for the agencies to identify and discuss any specific concerns related to the Project.

In September 2009, a meeting was held for federal and state agencies to review the Missouri River and Sheyenne River crossings. Minnkota and RUS received comments from the agencies during these site reviews to assist in the determination of crossing options with minimal impacts.

USACE hosts bi-weekly interagency meetings in Bismarck, North Dakota for other federal and state agencies. Minnkota attended two meetings (April 30, 2009, and April 15, 2010) to provide a status update of the Project to the state and federal agencies in attendance. As necessary or requested by agencies, Minnkota will continue to meet with federal, state, and local agencies regarding the Project.

Table 6.2-2. Agency Meetings

Agency	Meeting Date
North Dakota Commission Meeting	4/13/2009
McLean County Commissioners	4/20/2009
Eddy County Commissioners	4/21/2009
Foster County Commissioners	4/21/2009
Grand Forks County Commissioners	4/21/2009

Agency	Meeting Date
Traill County Commissioners	4/21/2009
Nelson County Commissioners	4/29/2009
Burleigh County Commissioners	4/29/2009
North Dakota Inter-Agency Meeting (NDGF, USACE, Bureau of Reclamation (BOR), USFWS, Federal Highway Administration (FHWA), NRCS, North Dakota Department of Transportation (DOT), North Dakota Office of State Engineer)	4/30/2009
Griggs County Commissioners	5/5/2009
Kidder County Commissioners	5/5/2009
Sheridan County Commissioners	5/5/2009
Steele County Commissioners	5/5/2009
Wells County Commissioners	5/5/2009
USFWS	5/6/2009
Oliver County Commissioners	5/7/2009
Federal and State Agency Boat Tour – NDGF, USACE, ND State Water Commission (SWC), NDPR	9/23/2009
USFWS	9/24/2009
Agency Scoping Meeting (BOR, NDPR, ND SWC, USACE, USFWS, SHPO, FHWA)	11/19/2009
North Dakota Inter-Agency Meeting (SHPO, USFWS, DOT, USACE, FHWA, SWC, FAA)	4/15/2010
USFWS – Section 7 Consultation	4/21/2010

During October and November 2010, Minnkota met with County Commissioners from all 11 counties. In January 2011, Minnkota will meet with self-permitting townships.

6.3 Native American Tribes and Communities

As part of the federal permitting process for the Project, RUS is required under Section 106 of the National Historic Preservation Act, 16 U.S.C. §§ 470f, and its implementing regulations, 36 C.F.R. §§ 800.3-800.7, to enter into consultation with agencies and other parties, including Indian tribes, that may have an interest in the Project's effects on historic properties. RUS is coordinating consultation with tribal governments, listed below.

To initiate consultation, RUS sent a letter on September 10, 2009, providing general information on the Project. In addition, this letter invited tribal representatives to field meetings in September 2009 at the Missouri and Sheyenne rivers. Both river crossings have a high potential for cultural resources, and tribes are being consulted during the preparation of a PA.

Table 6.3-1. Initial Project Tribal Contact

Nation	Nation
Assiniboine & Sioux Tribes of the Fort Peck Reservation	Oglala Sioux
Bois Forte Ojibwe	Red Lake Band of Chippewa
Crow Creek Sioux	Rosebud Sioux
Flandreau Santee Sioux	Santee Sioux
Fond du Lac Band of Lake Superior Chippewa	Cheyenne River Sioux
Grand Portage Band of Ojibwe	Sisseton Wahpeton Oyate
Leech Lake Band of Ojibwe	Spirit Lake Tribe
Lower Brule Sioux	Standing Rock Sioux
Lower Sioux Community	Three Affiliated Tribes
Mille Lacs Band of Ojibwe	Turtle Mountain Band of Chippewa
Minnesota Chippewa Tribe	Upper Sioux Community
Northern Cheyenne nations	White Earth Band of Ojibwe

No tribal invitees participated in the Scoping Meetings or attended the September 2009 river meetings. Following these meetings, Minnkota contacted each tribe directly to determine its interest in the Project. This effort identified other tribes that may have an interest in consulting. These additional tribes were contacted and are included in the list in Table 6.3-2. RUS received letters and oral communication from several tribal governments that have expressed interest to participate in the Section 106 process for this Project. RUS will continue to consult with the tribal governments as listed in Table 6.3-2.

Table 6.3-2. Tribal Consultation List

Nation	Date Mailed	Response	Consultation Status
Leech Lake Band of Ojibwe Indians	5/8/2009	5/14/2009 - Letter	Declined participation
Assiniboine and Sioux Tribes of the Fort Peck Indian Reservation	5/8/2009	12/15/09 - Phone	Consulting party
Bois Forte Band of Chippewa Indians	5/8/2009	6/10/2009 – Letter	Declined participation
Cheyenne River Sioux Tribe of the Cheyenne River Reservation	5/8/2009	12/01/09 – Phone	Consulting party
Crow Tribe (Apsaalooke Nation)	5/8/2009	No response to date	Consulting party
Crow Creek Sioux Tribe of the Crow Creek Reservation	5/8/2009	No Response to Date	Consulting party
Flandreau Santee Sioux Tribe	5/8/2009	12/03/09 – Phone	Declined participation
Fond du Lac Band of Lake Superior Chippewa	5/8/2009	No response to date	Consulting party
Grand Portage Band of lake Superior Chippewa	5/8/2009	09/21/09 – email	Consulting party
Lower Brule Sioux Tribe of the Lower Brule Reservation	5/8/2009	3/22/109 – phone	Consulting party
Lower Sioux Indian Community	5/8/2009	No response to date	Consulting party

Nation	Date Mailed	Response	Consultation Status
Minnesota Chippewa Tribe	5/8/2009	No response to date	Individual bands consulted
Mille Lacs Band of Ojibwe Indians	5/8/2009	5/15/2009 – Letter	Consulting party
Oglala Sioux Tribe of the Pine Ridge Reservation	5/8/2009	4/7/10 – email	Declined participation
Northern Cheyenne	3/22/10	12/02/09 – phone	Consulting party
Prairie Island Indian Community	5/8/2009	No response to date	Consulting party
Red Lake Band of Chippewa Indians	5/8/2009	12/17/09 – phone	Declined participation
Rosebud Sioux Tribe of the Rosebud Indian Reservation	5/8/2009	12/02/09 – phone	Consulting party
Santee Sioux Nation	5/8/2009	12/08/08 – email	Consulting party
Spirit Lake Tribe	5/8/2009	3/30/10 - phone	Consulting party
Sisseton-Wahpeton Oyate of the Lake Traverse Reservation	5/8/2009	12/01/09 – phone	Consulting party
Standing Rock Sioux Tribe	5/8/2009	Y6/11/2009 – Email	Consulting party
Three Affiliated Tribes of the Fort Berthold Reservation	5/8/2009	12/02/09 – phone	Consulting party
Turtle Mountain Band of Chippewa Indians	5/8/2009	12/03/09 – phone	Consulting party
Upper Sioux Community	5/8/2009	3/15/10 – phone	Consulting party
White Earth Band of Minnesota Chippewa Tribe	5/8/2009	12/02/09 – phone	Consulting party

To continue Section 106 Consultation for the Project, RUS hosted a meeting on April 22, 2010 in Bismarck, North Dakota. RUS hosted a meeting for tribal representatives and agencies to review the river crossings and continue preparation of the PA on June 8-10, 2010. A meeting was hosted by RUS on August 17, 2010, for tribal representatives interested in participating and gathering more information on the Project.

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7.0 Identification of Required Permits/Approvals

Minnkota will be required to obtain approvals from a variety of federal, state, and local agencies prior to constructing the Project. Agencies with primary approval/permitting authority include RUS and the Commission. Table 7.0-1 identifies permits, approvals, and other project coordination that may be needed by federal agencies, tribal governments, state of North Dakota, counties, and townships. This preliminary listing of regulatory requirements is subject to change as Project development continues.

Table 7.0-1. Potential Required Permits and Approvals

Agency	Type of Permit, Regulatory Compliance, or Coordination	Need
Federal		
Rural Utilities Service	Approval of Financial Assistance	Approval of Financial Assistance
	NEPA Compliance, Section 7 of the Endangered Species Act	Section 7 Consultation under NEPA
	NEPA Compliance, Section 106 of the National Historic Preservation Act Coordination	Section 106 Consultation under NEPA
	NEPA Compliance, Native American Consultation	Section 106 Consultation under NEPA
U.S. Fish and Wildlife Service	Section 7 of the Endangered Species Act, Migratory Bird Treaty Act of 1918, and Bald and Golden Eagle Protection Act of 1972	Section 7 Consultation under NEPA
	Right-of-Way (ROW) Permit and Compatibility Determination	If constructed in wetlands within wetland easements or in grassland easements, then compatibility analysis is required. ROW Permit needed if permanent disturbance to land under a Grassland Easement or wetland under a Wetland Easement.
	Special Use Permit (SUP) and Compatibility Determination	If constructed in wetlands within wetland easements or in grassland easements, then compatibility analysis is required. SUP needed if temporary disturbance to land under a Grassland Easement or wetland under a Wetland Easement.
U.S. Army Corps of Engineers	Section 404 of the Clean Water Act	Permit required for dredging or fill in jurisdictional waters of the United States
	Section 10 of the Rivers and Harbors Act of 1899	Section 10 permit if the Project requires structures or work in or affecting navigable waters
	Construction Plan Approval	Construction plan and permit will be required for construction in or adjacent to jurisdictional waters
Federal Aviation Administration	FAA Form 7460-1, Notice of Proposed Construction or Alteration	The FAA must confirm that construction of the Project does not constitute a hazard to air navigation
	FAA Form 7460-2 - Notice of Actual Construction or Alteration	Notifies FAA of actual constructed or altered structures

Agency	Type of Permit, Regulatory Compliance, or Coordination	Need
	FAA Form 7461-1, Notice of Proposed Construction Hazard Determination	Notifies FAA of structures that might affect navigable airspace. Form requires proposed markings and lighting. FAA must review possible impacts to air safety and navigation, as well as the potential for adverse effects on radar systems.
Department of Agriculture – Natural Resources Conservation Service	Farmland Conversion Form - Form AD-1006	Farmland conversion impact rating
Environmental Protection Agency	Spill Prevention Control and Countermeasure (SPCC) Plan	Required if the substation facility has greater than 1,320 gallons of oil. Current SPCC Plans will be revised as necessary. A copy of the plan will be maintained on file with the substation's owner/operator and will be reviewed by the certifying engineer every five years.
State		
Public Service Commission	Certificate of Corridor Compatibility	Required prior to construction of a transmission facility; designates corridor within which a route may be located
	Route Permit	Required prior to construction of a transmission facility; designates route location within approved corridor
Department of Health	401 Water Quality Certification	Required for fill in jurisdictional waters of the United States
	NPDES Permit: General Construction Storm Water	Required for disturbance of over 1 acre of land. Must prepare a SWPPP
Division of Emergency Management	Emergency Planning and Community Right-to-Know Act (EPCRA) Tier II report	Required for owner/operators of facilities containing hazardous materials. A copy of the report must be filed annually by March 1st
Parks and Recreation	Natural Heritage Inventory	Compliance with NDCC 20.1-02-05 – Management programs have been established for protection of threatened and endangered species in North Dakota. North Dakota does not have a list of threatened and endangered species
State Water Commission – Office of State Engineer	State Sovereign Lands Permit	If a project's proposed construction activities could impact an island or bed of a navigable water or stream, a Sovereign Lands Permit must be obtained from the North Dakota State Water Commission, Office of the State Engineer
	Conditional Water Permit	Water appropriation

Agency	Type of Permit, Regulatory Compliance, or Coordination	Need
State Historical Society	Section 106 of the National Historic Preservation Act Coordination	Compliance with NDCC 55-03-01 and 55-03-01.1 and Coordination with Section 106 of the NHPA is required for projects considered a federal undertaking (i.e., federal funding, USACE)
	Permit to Investigate Effects on Cultural Resources	Compliance with NDCC 55-03 to assess the potential project effects to cultural resources
North Dakota Highway Patrol	Overheight/Overweight Permit	Permit required for hauling construction equipment and materials on state highways. Contractors will obtain as necessary
State Land Department	Right-of-Way Permit	Permit to obtain an easement on a state surface tract
Department of Transportation	Road Approach/Access Permit	Permit required for construction of access roads from state highways
	Utility Permit/Risk Management Documents	Permit required for utility crossings on state highway ROW
Local		
Counties – Burleigh, Eddy (some townships with permit), Foster (one township with permit), Griggs, McLean, Oliver, Sheridan (one township with permit), Steele, Nelson	Conditional Use Permits	Permit may be required for project construction depending on zoning regulations
	Building Permit	Permit may be required for substation construction and generation outlet line
	Haul Road Agreement	Permit may be required for hauling construction equipment and materials on county roads
	Utility Permit	Permit required for utility crossings on county road ROW
Townships –Eddy Co. (some townships retain permitting), Foster Co. (Bordelach Township), Grand Forks Co. (all townships), Sheridan Co. (Berlin Twsp), Wells Co. (all townships) , Burleigh Co. (all townships)	Conditional Use Permits	Permit may required for project construction depending on zoning regulations
Cities	Building Permit	Permit required if construction within city municipal boundary
Miscellaneous		
Railway Companies	Temporary Occupancy Permit	Required for any work within railroad ROW

Agency	Type of Permit, Regulatory Compliance, or Coordination	Need
	Wire Line Crossing or Longitudinal Communication and Electric Permit	Required for locations where Project crosses or is within railroad ROW
Pipeline Companies	Utility Crossing Permit	Permit required to cross existing pipeline facilities
Transmission Line Utility Companies	Utility Crossing Permit	Permit required to cross existing transmission facilities

8.0 Factors Considered

The North Dakota Energy Conversion and Transmission Facility Siting Act lists 11 factors to guide the Commission in evaluation of a corridor.

8.1 Public Health and Welfare, Natural Resources, and the Environment

Section 5.0 discuss the research and investigations relating the effects of the proposed facility on public health and welfare, natural resources, and the environment. The effects and mitigation in relation to the corridor are discussed under the impacts and mitigation subheadings within Section 5.0. Minnkota selected the Project Corridor by addressing public, agency, and tribal input and concerns raised by the public. Minnkota will minimize impacts to landowners, agricultural practices, the Missouri River crossing, and environmental features.

8.2 Technologies to Minimize Adverse Environmental Effects

Minnkota will utilize the most current technologies that minimize impacts to the environment. The structures proposed for the Project are the most appropriate technologies to minimize adverse environmental effects.

8.3 Potential for Beneficial Uses of Waste Energy

This factor is not applicable to this Project.

8.4 Unavoidable Adverse Environmental Effects

Unavoidable adverse environmental effects include the visual impacts and physical impacts to the land (primarily agricultural land) associated with the Project. Minnkota will implement measures as described in Section 5.0 and as identified by regulatory agencies to minimize these unavoidable adverse environmental effects.

8.5 Alternatives to the Proposed Corridor

As previously discussed, several alternatives to the Project were identified by Minnkota and reviewed during the federal scoping process carried out by RUS. The AES discussed system and project alternatives. The MCS and EA analyzed routing alternatives. The Project Corridor depicted in this application is the best location from an economic and environmental standpoint for a 345 kV line from Center to Grand Forks, North Dakota.

8.6 Irreversible and Irretrievable Commitment of Natural Resources for the Corridor

Irreversible and irretrievable resource commitments are related to the use of nonrenewable resources and the effects that the use of these resources have on future generations. Irreversible effects primarily result from use or destruction of a specific resource that cannot be replaced within a reasonable time frame. Irretrievable resource commitments involve the loss in value of an affected resource that cannot be restored as a result of the action. There are few commitments of resources associated with this Project that are irreversible and irretrievable, but include those resources primarily related to construction. Construction resources that will be used include aggregate resources, concrete, steel, and hydrocarbon fuel. These resources will be utilized to construct the Project. During construction, vehicles will be traveling to and from the site, utilizing hydrocarbon fuels.

8.7 Direct and Indirect Economic Impacts of the Proposed Facility

Direct economic impacts include the impacts associated with removing agricultural land from production due to the construction and operation of the Project. In general, agricultural areas surrounding each structure can still be farmed, and landowners will be compensated for the land occupied by the Project.

The remaining direct and indirect economic impacts are primarily positive. To the extent that local sub-contractors are used for portions of the construction, total wages and salaries paid to contractors and workers will contribute to the total personal income of the region. Additional personal income will be generated for residents in the county and the state by circulation and recirculation of dollars paid out by Minnkota as business expenditures and state and local taxes. Expenditures made for equipment, energy, fuel, operating supplies, and other products and services benefit businesses in the county and the state.

8.8 Existing Development Plans of the State, Local Government, and Private Entities at or in the Vicinity of the Corridor

No conflicts are anticipated with existing state and local government and private entities' development plans. Minnkota will work with the Grand Forks International Airport and the FAA to minimize and avoid impacts associated with the airport expansion. Minnkota will obtain the necessary permits from local governmental units for the Project.

8.9 Effect on Cultural Resources

No impacts to previously identified cultural resources are anticipated. Minnkota has completed a Class I Literature Search for the Project Corridor. With consultation from SHPO and RUS, Minnkota developed a model that identified areas that may have a high, moderate, or low probability of containing cultural resource sties. Minnkota will conduct a Class III cultural resources inventory of the high probability areas along the route. The construction contractor will be required to comply with environmental, cultural, archaeological, or historical guidelines as will be set forth through Section 106 requirements and the PA, which are currently in negotiations. It is anticipated that the route will avoid all cultural resource sites and cultural resource sites will be treated in accordance with the PA. Action would include notification and working with the proper and applicable authorities.

8.10 Effect on Biological Resources

Minnkota has implemented measures to avoid and minimize effects to biological resources in the vicinity of the Project Corridor. The impact of the Project on vegetation, wildlife and sensitive species is expected to be minimal. The Project will include measures to minimize impacts to avian species.

8.11 Problems Raised by Agencies

At the Commission's request, Minnkota will provide electronic copies of agency mailings. Appendix H includes a list of the federal agencies, tribes, state agencies, and county commissioners that have been notified about the Project. For those agencies that responded, their concerns are summarized below and a copy of their response letter is included in Appendix I.

Federal Aviation Administration

In addition to outlining permitting requirements, the FAA recommended in their June 4, 2009 response letter that the design, construction, operation, and any wetland and/or wildlife mitigation associated with the Project not create a hazardous wildlife attractant to surrounding airports.

The Project will not create hazardous wildlife attractants for nearby airports. As noted in Section 7.0, Minnkota will obtain the appropriate permits from the FAA.

North Dakota Game and Fish Department

On May 26, 2009, NDGF commented that its primary concern is the possible disturbance of native prairie and wetland areas during construction. They asked that wetlands be avoided to the extent possible, above-ground appurtenances not be placed in wetland areas, and disturbed areas be reclaimed to pre-project conditions. NDGF also recommended that overhead lines be marked when placed over perennial streams or sited in proximity to large wetland complexes to minimize possible avian impacts. NDGF noted that a Special Use Permit will be required to cross WMA land.

Minnkota will not impact WMA land so a permit from NDGF will not be necessary. Minnkota will minimize native prairie impacts and span wetlands to the extent possible and reclaim disturbed areas (Section 4.2.2). As described in Section 3.5, the shield wires will be marked, as appropriate, for sections of the Project within the whooping crane migration corridor.

North Dakota Department of Transportation

North Dakota Department of Transportation (DOT) noted on May 13, 2009 that if construction work is necessary in highway ROWs, appropriate permits and risk management documents will need to be obtained from DOT.

As described in Section 7.0, Minnkota will obtain the appropriate permits and risk management documents from DOT.

Office of the State Engineer

On May 1, 2009, the Office of the State Engineer noted several bodies of water spanned by the Project contain Sovereign Lands of the State. Any construction work that crosses or is below the Ordinary High Water Mark for the Missouri River, Sheyenne River, and the James River will require a Sovereign Lands Permit.

As noted in Section 7.0, Minnkota will obtain these permits from the Office of the State Engineer.

North Dakota Parks and Recreation Department

NDPR noted on May 26, 2009 that the Project through Oliver and McLean counties includes properties containing significant natural, historic, scenic, and cultural resources. NDPR stated its North Dakota Natural Heritage Inventory biological conservation database information is not based on a comprehensive inventory so there may be species of concern or otherwise significant ecological communities in the area that are not represented in the database. The Project should be accomplished with minimal impacts and efforts will be made to ensure critical habitats are not disturbed in order to help secure rare species conservation in North Dakota. Any disturbed areas will be reclaimed using native species.

Sections 5.15.3 and 5.16.3 discuss numerous mitigation measures for wildlife and habitat conservation. Minnkota will reseed non-cultivated areas disturbed by construction activities with vegetation similar to that which was removed.

Natural Resources Conservation Service

NRCS noted on May 5, 2009 that the Project may be subject to the FPPA. They recommended that impacts to wetlands be avoided.

Minnkota will span wetlands to the extent possible and obtain permits from appropriate agencies for wetland impacts.

U.S. Army Corps of Engineers

USACE responded on May 11, 2009, that permits should be requested if work will be done in navigable waters (under Section 10 of the Rivers and Harbors Act) or Waters of the United States (under Section 404 of the Clean Water Act).

Minnkota will span wetlands to the extent possible and obtain permits from appropriate agencies for wetland impacts.

U.S. Fish and Wildlife Service

USFWS concerns were expressed in its June 2, 2009 letter and at agency meetings with Minnkota. The letter (Appendix I) noted USFWS concerns related to potential impacts to USFWS trust resources, including migratory birds, federally listed threatened and endangered species of plants and animals and their habitats, bald and golden eagles, and units of the National Wildlife Refuge system. USFWS also recommended numerous conservation measures.

Sections 5.15 and 5.16 discuss Minnkota's mitigation measures for wildlife and habitat conservation.

9.0 Qualifications of Contributors

Name/Project Role	Education and Professional Experience
Michelle Bissonnette Energy Environmental Practice Leader HDR Engineering, Inc.	Michelle Bissonnette, is a Senior Project Manager, Vice President of the Environmental Power and Energy Practice and on HDR's National Power and Energy leadership team. The majority of Michelle's consulting career has been spent in the power and energy field. Her experience includes environmental assessment, public involvement, siting, and permitting work on a variety of utility projects from power generation to transmission and distribution as well as wind, pipeline and combustion turbine projects. In her current position, she manages teams that conduct environmental assessments and permitting for transmission line, wind power, and energy projects. She also coordinates national power and energy projects for HDR's environmental groups. B.S., Landscape Architecture, University of Minnesota, 1982 Foreign Studies/French Minor, University of Grenoble, France, 1977
Brian Hunker Project Manager/Environmental Scientist HDR Engineering, Inc.	Mr. Hunker is an Environmental Scientist with a diverse project background in environmental documentation and permitting. He has been involved in the preparation of Environmental Assessments, Environmental Impact Statements, and other NEPA-related and environmental permitting documents for local, state, and federal power and energy projects across the United States. B.S., Environmental Sciences/Studies (Zoology and Biological Aspects of Conservation), University of Wisconsin-Madison, 1999
Lydia Nelson Senior Environmental Scientist HDR Engineering, Inc.	Ms. Nelson has more that 25 years of experience as an environmental project manager and project scientist. Ms. Nelson has managed or helped to develop NEPA documents for numerous federal agencies, including the RUS, NPS, USFS, FTA and FHWA. She routinely works with federal, state, and local agencies in the development of permit applications such as Section 404, Section 10, Section 7, state route and siting applications, NPDES, and local conditional use permits. Ms. Nelson has extensive experience in wetland delineation, functional assessment, wetland mitigation design, water resource evaluation, prime farmlands, hydric soils, wildlife habitat, and endangered species. Ms. Nelson performs quality control/quality assurance review for large NEPA documents and permit applications. B.S., Environmental Sciences/Studies (Soil Science), Oregon State University, 1983 B.S., Biology, Central Michigan University, 1981

Name/Project Role	Education and Professional Experience
Patricia Terhaar, PG, CPG Senior Project Manager HDR Engineering, Inc.	Ms. Terhaar has 24 years of environmental consulting and project management experience. She has managed or worked as part of multi-disciplinary teams in the preparation of documents supporting NEPA compliance for energy projects across the United States. Ms. Terhaar has also managed and performed phase I/II site assessments, hydrogeologic investigations, and remedial investigations/feasibility studies associated with landfills, hazardous waste sites, chemical and petroleum spills, asbestos, and brownfields. M.S., Geology, Texas A&M University, 1985 B.S., Earth Science, Montana State University, 1983
Emily Siedschlag Environmental Scientist/Public Involvement Specialist HDR Engineering, Inc.	Ms. Siedschlag has four years of experience in environmental consulting including wetland delineations, biological surveys, and data analysis. She has experience developing survey protocols, coordinating field surveys and discussing mitigation and monitoring prior to project construction. Ms. Siedschlag has experience working with federal, state, and local agencies in the development of NEPA documents and permit applications. B.A., Environmental Studies (Geography), Gustavus Adolphus College, 2006
Ann Fossum GIS Specialist HDR Engineering, Inc.	Ms. Fossum has eight years of experience with GIS and more than five years of experience as a GIS specialist, including experience with spatial analysis, editing, data creation, conversion, map production, modeling, and GPS data collection and processing. For the last two years, she has applied her GIS knowledge to assist in the development of power transmission and wind farm projects throughout the United States, including NEPA and permit application document support. She has experience with ArcGIS, MapInfo, MicroStation and various other GIS software and utilities. B.A., Geography, Gustavus Adolphus College, 2004
Ingrid Schwingler Environmental Scientist HDR Engineering, Inc.	Ms. Schwingler has more than two years of experience in environmental consulting including data collection, fieldwork, and data analysis. She has worked as part of multi-disciplinary teams in the preparation of Environmental Impact Statements, Environmental Assessments and other NEPA-related and environmental permitting documents for local, state, and federal power and energy projects across the United States. B.A., Environmental Studies, Political Science, Gustavus Adolphus College, St. Peter, MN, 2007

Name/Project Role	Education and Professional Experience
Tim Ahrens Document Production Specialist HDR Engineering, Inc.	Mr. Ahrens has six years of editing and writing experience. After time spent working as a writer and copy editor for newspapers in the Midwest, he has been a part of HDR's document production team for three years. Projects he has worked on include the Monticello to St. Cloud (Minnesota) 345 kV Transmission Line DEIS and FEIS and the PPM Dry Lake (Arizona) Environmental Assessment. B.A., Communication and Journalism, University of Wisconsin-Eau Claire, 2004.
Mollie M. Smith Attorney Fredrikson & Byron, P.A.	Ms. Smith is a senior associate in Fredrikson & Byron's Litigation, Oil & Gas, Transmission, Renewable Energy and Condemnation & Eminent Domain Groups. Ms. Smith assists clients with oil and gas litigation matters; wind farm, transmission line and pipeline permitting matters; and condemnation/eminent domain matters. University of Minnesota Law School, J.D., 2004 Colorado State University, M.A., 2000 Northern State University, B.A., 1997
Mike Hennes System Projects Manager Minnkota Power Cooperative, Inc.	Mr. Hennes has more than twenty years of utility engineering and project management experience. Mr. Hennes has also served as an electrical engineer, project engineer and Substation Engineering Manager while working for Minnkota. B.S., Electrical Engineering. University of North Dakota, 1993 B.S., Engineering Management. University of North Dakota, 1993 A.A.S., Electronics Technology, North Dakota College of Science, 1975
John T. Graves, P.E. Environmental Manager Minnkota Power Cooperative, Inc.	Registered Professional Engineer with over 30 years experience in the environmental area in the utility sector and in Environmental Manager government. Mr. Graves has served on multi-company permitting teams for projects while employed with Minnkota, and Minnkota Power Cooperative Inc. as a project manager. B.S. Mechanical Engineering, University of North Dakota, 1972

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10.0 References

Air Quality Standard (Federal). *40 CFR Part 50, Subpart 15.* http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&sid=9754e31d9f03145d116e63115ff36dea&rgn=div8&view=text&node=40:2.0.1.1.1.0.1.17&idno=40.

American Cancer Society (ACS). Electromagnetic field exposure and cancer: a review of epidemiologic evidence. 1996. Report of the American Cancer Society, by Heath, C.W., CA Cancer Journal for Clinicians 46: 29-44. http://caonline.amcancersoc.org/cgi/content/abstract/46/1/29

American Council of Governmental Industrial Hygienists (ACGIH). http://www.acgih.org/home.htm

American Medical Association (AMA). Effects of Electric and Magnetic Fields. 1994. Report of the American Medical Association (AMA), Council on Scientific Affairs. Chicago: AMA (December 1994). http://www.ama-assn.org/ama/pub/category/13682.html

American Physical Society (APS). Electric and Magnetic Fields and Public Health. 2005. American Physical Society. National Policy 05.3, Adopted April 15, 2005). http://www.aps.org/policy/statements/05_3.cfm

American Transmission Company. 2005. Property Values. http://www.atcllc.com/PropertyValues.shtml.

Avian Power Line Interaction Committee (APLIC). 2006. *Suggested Practices for Avian Protection On Power Lines: The State of the Art in 2006.* Edison Electric Institute, APLIC, and the California Energy Commission. Washington, D.C. and Sacramento, CA.

Bluemle, John P., 2006. Surface Geology, Grace City Quadrangle, North Dakota, 1:24,000. North Dakota Geological Survey.

CapX2020. Electric and Magenetic Fields (EMF): the Basics. http://capx2020.com/images/emf_01.13.09.pdf

Curry, R., and P. Kerlinger. 2004. The Altamont Avian Plan. Proceedings of the National Avian Wind Power Interaction Workshop III, May, 1998, San Diego, CA. National Wind Coordinating Committee/RESOLVE, Inc.

Dolbeer, R. A. 2006. Height distribution of birds recorded by collisions with civil aircraft. Journal of Wildlife Management 70 95):1345-1350

Dirk, C.N.G. 2006a. North Dakota Animal Species of Concern. [Unpublished list]. North Dakota Natural Heritage Program, Bismarck. 11 pp.

Dirk, C.N.G. 2006b. North Dakota Plant Species of Concern. [Unpublished list]. North Dakota Natural Heritage Program, Bismarck. 7 pp.

Dyrda, K. and P. Khairy. Expert Review of Cardiovascular Therapy. Power Lines and Implantable Rhythm Devices: A Reply. March 2009 v7 i3 p223(1).

Elliott-Smith, Elise and Susan M. Haig. 2004. Piping Plover (Charadrius melodus), *The Birds of North America Online (A. Poole, Ed.).* Ithaca: Cornell Lab of Ornithology; Retrieved from

the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/002. Accessed March 23, 2010.

Electric Power Research Institute (EPRI). Report No. 1005570, 2004. *Electromagnetic Interference With Implanted Medical Devices: 1997-2003*. A summary is available at http://my.epri.com/portal/server.pt?space=CommunityPage&cached=true&parentname=ObjMgr&parentid=2&control=SetCommunity&CommunityID=404&RaiseDocID=000000000001005570&RaiseDocType=Abstract_id. Accessed April 20, 2010

Environmental Protection Agency (EPA). Ambient Air Quality Standards. http://www.epa.gov/air/criteria.html. Accessed April 20, 2010.

Federal Aviation Administration (FAA). Federal Aviation Regulation (FAR) Part 77 - Objections Affecting Navigable Airspace. https://oeaaa.faa.gov/oeaaa/external/content/FAR_Part77.pdf.

Federal Aviation Administration 2008. *Airports*. http://www.bts.gov/programs/geographic_information_services/.

Federal Aviation Administration. 2007. *Runways*. http://www.bts.gov/programs/geographic_information_services/.

FCC Wireless Telecommunications Bureau. 2-22-2009. *Communication Towers*. http://wireless.fcc.gov/geographic/index.htm?job=licensing_database_extracts.

Grand Forks Regional Airport Authority. 2006. *Land Use Compatibility Plan for Grand Forks International Airport*. http://www.gfkairport.com/authority/pdf/land_use.pdf. Accessed April 21, 2010.

HDR, GRE, MPC. 2003-2009. *Transmission lines*.

HDR Engineering, Inc. 2009. *Wind Turbine or Groups of Turbines, Center Pivot Irrigation*. Data collected from field surveys, aerial photography interpretation and public open houses.

HydroQuebec. 1999. *Effects of Electric and Magnetic Fields on Livestock Health and Productivity*. Published for TransEnergie by the Vice-presidence Affaires corporatives et secretariat general. http://www.hydroquebec.com/sustainable-development/documentation/pdf/cem/pop_24_01.pdf.

International Commission on Non-Ionizing Radiation Protection (ICNIRP). http://www.icnirp.de/

International Commission on Non-Ionizing Radiation Protection (ICNIRP). 2010. Fact Sheet on the Guidelines for Limiting Exposure to Time-Varying Electric and Magnetic Fields (1Hz-100 kHz). Published in Health Phys 99(6): 818-836: 2010.

Jackson, Thomas. Ph.D., AICP, MAI, CRE, FRICS. *Electric Transmission Lines: Is There an Impact on Rural Land Values*? Right of Way. November/December 2010.

Licht, Daniel and Louis E. Huffman. *Gray Wolf Status in North Dakota*. U.S. Fish and Wildlife Service/University of Nebraska Lincoln. 1996. http://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1059&context=usfwspubs. Accessed May 10, 2010.

Minnesota Pollution Control Agency. *A Guide to Noise Control in Minnesota*. March 1999. http://www.nonoise.org/library/sndbasic/Sound.pdf. Accessed May 2010.

Minnkota Power Cooperative, Inc. 2010a. 2009 Electric Load Forecast. Prepared by Clearspring Energy Advisors, LLC. January 2010.

Minnkota Power Cooperative, Inc. 2010b. *Raptor Nest Survey Report for the Center to Grand Forks Project.* Unpublished report. HDR Engineering, Inc. May 2010.

Minnkota Power Cooperative, Inc. October 2009. *Macro-Corridor Study (MCS).* http://www.usda.gov/rus/water/ees/ea.htm#Minnkota_Power_Cooperative,_Inc._.

Minnkota Power Cooperative, Inc. October 2009. *Alternative Evaluation Study (AES).* http://www.usda.gov/rus/water/ees/ea.htm#Minnkota_Power_Cooperative,_Inc._.

Minnkota Power Cooperative, Inc. Center to Grand Forks Project. Electric and Magnetic Fields (EMF) Facts. http://www.minnkotacgf.com/Documents/PostScoping/EMFFactSheet.pdf

Minnkota Power Cooperative, Inc. Center to Grand Forks Project. Stray and Induced Voltage Facts. http://www.minnkotacgf.com/Documents/PostScoping/StrayVoltage.pdf

National Academy of Sciences (NAS). Possible Health Effects of Exposure to Residential Electric and Magnetic Fields. 1997. Report of the National Research Council, Committee on the Possible Effects of Electromagnetic Fields on Biologic Systems. Washington: National Academy Press. http://www.nap.edu/openbook.php?isbn=0309054478

National Electric Safety Code (NESC). IEEE Standards Association. http://standards.ieee.org/nesc/ Accessed April 24, 2010.

National Environmental Policy Act (NEPA).7 Code of Federal Regulations (CFR) Part 1794. http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?sid=35800979288dae9318221183ff0a8f05&c=ecfr&tpl=/ecfrbrowse/Title07/7cfrv11_02.tpl#1700.

National Institute of Environmental Health Services (NIEHS). 1999. *Heath Effects from Exposure to Power-Line Frequency Electric and Magnetic Fields*. Washington, DC. NIH Publication No. 99-4493. http://www.niehs.nih.gov/health/topics/agents/emf. Accessed April 20, 2010.

National Institute of Environmental Health Services (NIEHS). 2002. *EMF: Electric and Magnetic Fields Associated with the Use of Electric Power. Questions and Answers.* http://www.niehs.nih.gov/health/docs/emf-02.pdf. Accessed April 23, 2010.

National Park Service. North Country National Scenic Trail information. http://www.nps.gov/noco/index.htm.

National Park Service. Lewis and Clark National Scenic Trail information. http://www.nps.gov/lecl/index.htm.

National Park Service. *North Country Scenic Trail line.* Shapefile sent to Brian Hunker at HDR from Ken Howell, North Country National Scenic Trail Land Protection Coordinator, on 2009-May-20.

National Park Service. 1-1-2007. *NRHP Sites.* Data collect from: http://nrhp.focus.nps.gov/natreghome.do?searchtype=natreghome on 6-26-2009.

Natural Resources Conservation Service. Prime and Unique Farmlands – Identification of important farmlands. 7 CFR, 657.5 (a) (1). http://cfr.vlex.com/vid/657-identification-important-farmlands-19905813. Accessed April 2010.

Natural Resources Conservation Service - National Cartography and Geospatial Center. State Soil Geographic (STATSGO) Database. Soils Data Mart. http://soildatamart.nrcs.usda.gov/USDGSM.aspx.

NatureServe. 2010. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. Accessed: April 12, 2010.

North Country Trail Association. North Country National Scenic Trail information. http://www.northcountrytrail.org/.

North Dakota Century Code. North Dakota Energy Conversion Facility Siting Overview. NDCC Rules 69-06-08-02. http://www.legis.nd.gov/

North Dakota Department of Transportation. Traffic Count Cycles. State of North Dakota. http://www.dot.nd.gov/road-map/pdf/traffic/trafficstate_2009.pdf .

North Dakota Department of Transportation. 6-27-2003. *Tribal Lands*. http://www.nd.gov/gis/.

North Dakota Department of Transportation. 3-24-2008. *Incorporated areas*. http://www.nd.gov/gis/.

North Dakota Department of Transportation. 10-10-2008. *State and federal roads*. http://www.nd.gov/gis/.

North Dakota Department of Transportation. 4-17-2008. *County and local roads*. http://www.nd.gov/gis/.

North Dakota Department of Transportation. 3-9-2009. *Railroads*. http://www.nd.gov/gis/.

North Dakota Department of Transportation., KLJ, HDR. 2001-2009. *Pipelines*.

North Dakota Department of Transportation., HDR. 2008-2009. *Electrical substations*. Downloaded from http://www.nd.gov/gis/. Updated with aerial photography and field surveys.

North Dakota Game and Fish Department Wildlife Management Area Guide - http://gf.nd.gov/hunting/wildlife.html.

North Dakota Game and Fish. PLOTs information http://web.apps.state.nd.us/imf/imf.jsp?site=NDGFPLOTSGuide. Accessed on February 9, 2010.

North Dakota Game and Fish. 2009. Maps/Data Resources. Online: http://gf.nd.gov/maps/. Accessed 2009.

North Dakota Game and Fish. Wildlife Action Plan. *100 Species of Conservation Priority*. 2009. Online: http://gf.nd.gov/conservation/levels-list.html. Accessed 2009.

North Dakota Game and Fish. 1-2003. *USBOR Land*. http://www.nd.gov/gis/.

North Dakota Game and Fish. 1-2003. *State Park or Recreation Areas*. http://www.nd.gov/gis/.

North Dakota Game and Fish. 2-2006. *State WMA*. http://www.nd.gov/gis/.

North Dakota Game and Fish. Data downloaded on: 2-9-2009. PLOTS Lands. http://web.apps.state.nd.us/imf/imf.jsp?site=NDGFPLOTSGuide.

North Dakota Game and Fish. 6-25-2009. *Threatened and Endangered Species data.* Provided by NDPRstaff.North Dakota Legislative Council for the Energy Development and Transmission Committee (Legislative Document #19041 "Allocation of Wind Rights-Background Memorandum" October 2009, http://www.legis.nd.gov/docs/pdf/19041.pdf).

North Dakota Parks and Recreation Department. Lewis and Clark National Historic Trail. http://www.parkrec.nd.gov/recreation/trails/lctrail.htm.

North Dakota Parks and Recreation Department. Sakakawea Scenic Byway. http://www.parkrec.nd.gov/byways/find/Sakakawea/index.html.

North Dakota Parks and Recreation Department. Natural Heritage Inventory (NHI). http://www.parkrec.nd.gov/Nature/Preserves.htm.

North Dakota Parks and Recreation Department. Natural Heritage Inventory. 2009. *Guide to North Dakota Biological and Conservation Data.* 8 pp. Received from North Dakota Park and Recreation Department July 11, 2009.

North Dakota Parks and Recreation Department. 6-11-2009. *Threatened and Endangered Species data.* Provided by NDPRstaff.

North Dakota Rules – Air Pollution Control, Article 33-15-02-04.1. http://www.legis.nd.gov/information/acdata/html/33-15.html.

NRHP (National Register of Historic Places). 20XX. Registered Historic and Cultural Sites in North Dakota Data.

North Dakota State Water Commission and US Geological Survey. February 2008. *Water 1:100,000 polygons and lines.* http://www.nd.gov/gis/.

Northern Plains Heritage Foundation (NPHF).2010. http://northernplainsheritage.org/.

Occupational Safety and Health Administration (OSHA). *Laws, Regulations and Interpretations.* http://www.osha.gov/comp-links.html Accessed April 23, 2010.

Old Fort Totten Trail. http://www.tottentrailinn.com/trail.htm and http://www.waymarking.com/waymarks/WM251D_Old_Fort_Totten_Trail Accessed October 19, 2010.

Public Service Commission (PSC) of Wisconsin. Environmental Impacts of Transmission Lines. 2008. http://psc.wi.gov/thelibrary/publications/electric/electric10.pdf

Public Service Commission (PSC) of Wisconsin. Electric and Magnetic Fields (EMF). 2009. http://psc.wi.gov/thelibrary/publications/electric/electric12.pdf

Research and Innovative Technology Administration's Bureau of Transportation Statistics (RITA/BTS). 2006. *U.S. Military Installations.* http://www.bts.gov/programs/geographic_information_services/.

Rumrill, J.N., and Canter, L.W., "Addressing Future Actions in Cumulative Effects Assessment," Project Appraisal, Vol. 12, No. 4, December, 1997, pp. 207-218.

Rural Utilities Service. Bulletin 1794A-603. *Scoping Guide for RUS Funded Projects Requiring Environmental Assessments with Scoping and Environmental Impact Statements.* http://www.usda.gov/rus/water/ees/bulletin.htm. Accessed 2010.

Rural Utilities Service. March 2010. *Scoping Report.* http://www.usda.gov/rus/water/ees/ea.htm#Minnkota_Power_Cooperative,_Inc._.

Scholten, A, Joosten, S. and Silney, J. March 2004. *Unipolar Cardiac Pacemakers in Electromagnetic Fields of High Voltage Overhead Lines*. FEMU, University Hospital, Aachen, Germany.

Smithsonian National Zoological Park. Optimal Migration, special issue of the Journal of Avian Biology, Vo. 29, No. 4, December 1998

Snowmobile North Dakota and North Dakota Parks and Recreation Department. January 2008. *Snowmobile trails*. http://www.nd.gov/gis/.

Stehn, Tom and Tom Wassenich. 2007. Whooping Crane Collisions with Power Lines: An Issue Paper. Tom Stehn, USFWS, Whooping Crane Coordinator. Tom Wassenich Texas State University – San Marcos, TX.

Strong, Laurence L., H. Thomas Sklebar, and Kevin E. Kermes. 2005. North Dakota GAP Analysis Project. Jamestown, ND: Northern Prairie Wildlife Research Center Online. http://www.npwrc.usgs.gov/projects/ndgap/ Version 12 JUN2006.

Thompson, Bruce C., Jerome A. Jackson, Joannna Burger, Laura A. Hill, Eileen M. Kirsch and Jonathan L. Atwood. 1997. Least Tern (*Sterna antillarum*), *The Birds of North America Online (A. Poole, Ed.)*. Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/290. Accessed March 23, 2010.

The Nature Conservancy. December 2007. *TNC Preserves*. GIS data. Provided by TNC regional staff.The Nature Conservancy. 2009. Cross Ranch Preserve. Online: http://www.nature.org/wherewework/northamerica/states/northdakota/preserves/art9055.html. Accessed July 2009.

Toivonen, L. Valjus, J. et al. 1991. *The Influence of Elevated 50Hz Electric and Magnetic Fields on Implanted Cardiac Pacemakers: the Role of the Lead Configuration and Programming Sensitivity.* Pacing & Clinical Electrophysiology. 14:2114-2122.

Tower Project. Biennial Transmission Projects Report. Certification of a High-Voltage Transmission Line. Public Document – Trade Secret Data Excised. November 2005. Minnesota Power. Great River Energy. http://www.greatriverenergy.com/deliveringelectricity/currentprojects/tow_con.pdf

United State Army Corps of Engineers. 1-2003. *USACE Land*. http://www.nd.gov/gis/.

United States Census Bureau. Top Occupations, Race and Ethnicity Populations, Census 2000 Summary File 3. http://factfinder.census.gov/servlet/DatasetMainPageServlet. Accessed April 15, 2010.

United States Census Bureau. 2000. United States Census 2000. www.census.gov. Accessed June 2009.

United States Census Bureau (BOC). 2000. *State boundary*. http://www.census.gov.

United States Department of Health and Human Services. National Institutes of Health. National Cancer Institute. President's Cancer Panel. 2009-2009 Annual Report. Reducing Environmental Cancer Risk. What We Can Do Now. April 2010.

United States Department of Transportation (US DOT), Federal Aviation Administration (FAA). 1963. *Federal Regulation 49 CFR Part 77*. http://www.faa.gov/regulations_policies/faa_regulations/ Accessed April 21, 2010.

United States Department of Agriculture. National Agriculture Statistics Service. 2007 Census of Agriculture. http://www.agcensus.usda.gov/. Accessed April 2010.

United States Department of Agriculture. NRCS SSURGO Statewide Soils Data North Dakota. http://soils.usda.gov/survey/geography/ssurgo/.

United States Department of Agriculture Rural Utility Service. 2002. "Scoping Guide for RUS Projects Requiring Environmental Assessments with Scoping and Environmental Impact Statements". RUS Bulletin 1794A-603. February 2002.

United States Department of Agriculture. FSA Aerial Photography Field Office. 2006. *Aerial photography*. http://datagateway.nrcs.usda.gov./

United States Department of Commerce, U.S. Census Bureau, Geography Division. 2008. *County Boundary*. http://www.nd.gov/gis/

United States Federal Register. September 11, 2002. http://www.fws.gov/mountain-prairie/species/birds/pipingplover/fedreg091102.pdf. Accessed May 18, 2010.

United States Fish and Wildlife Service. October 2009. *USFWS Easements*. Provided by USFWS regional staff July 2010.

United States Fish and Wildlife Service. Information on grassland easements. http://www.fws.gov/mountain-prairie/realty/Grassesmt.htm.

United States Fish and Wildlife Service. Information on wetland easements. http://www.fws.gov/mountain-prairie/realty/Wetesmt.htm.

United States Fish and Wildlife Service.Information on conservation easements. http://www.fws.gov/mountain-prairie/pfw/r6pfw8b.htm.

United States Fish and Wildlife Service. Endangered Species Program. http://www.fws.gov/endangered/. Accessed May 3, 2010.

United States Fish and Wildlife Service. *Gray Wolf (Canis lupus)*. http://www.fws.gov/midwest/wolf/aboutwolves/biologue.htm. Accessed May 5, 2010.

United States Fish and Wildlife Service. *Whooping Crane; Species Status and Fact Sheet*. http://www.fws.gov/northflorida/WhoopingCrane/whoopingcrane-fact-2001.htm. Accessed May 5, 2010.

United States Fish and Wildlife Service. *Critical Habitat for Piping Plover (Charadrius melodus)*. http://www.fws.gov/plover/. Accessed May 17, 2010.

United States Fish and Wildlife Service. *Least Tern (Interior Population)*. http://www.fws.gov/midwest/Endangered/birds/tern.html. Accessed May 7, 2010.

United States Fish and Wildlife Service. *Pallid Sturgeon* (*Scaphirhynchus albus)*. http://www.fws.gov/southdakotafieldoffice/STURGEON.HTM. Accessed May 5, 2010.

United States Fish and Wildlife Service. *Black-footed ferret.* http://www.fws.gov/mountainprairie/species/mammals/blackfootedferret/revfact.chy.pdf. Accessed May 5, 2010.

United States Fish and Wildlife Service. National Wetland Inventory. http://www.fws.gov/wetlands/.

United States Fish and Wildlife Service. America's National Wildlife Refuge System. http://mountain-prairie.fws.gov/nd.html.

United State Forest Service, Northern Prairie Wildlife Research Center. August 2004. *North Dakota Gap Analysis Land Cover Database.* http://www.nd.gov/gis/.

United States Fish and Wildlife Service. 01-2003. *USFWS WDA and WPA.* http://www.nd.gov/gis/.

United States Fish and Wildlife Service. Region 9. 12-2002. *National Wildlife Refuge Boundaries.* http://www.fws.gov/mountain-prairie/gis/index.html.

United States Geological Survey. 2006. *Ecoregions of North and South Dakota.* http://www.npwrc.usgs.gov/resource/habitat/ndsdeco/nodak.htm. Accessed March 19, 2010.

U.S. Geological Survey. National Land Cover Data Base. Online: www.mrlc.gov. Accessed 2009.

"Use of Global Positioning System (GPS) Receivers Under Power-Line Conductors" published in the IEEE Transactions On Power (October 2002).

Valberg, Peter A. 2009. Power-Line Electric and Magnetic Fields (EMF): Status of Scientific Research on Potential Health Effects, Gradient Corporation *for* CapX2020

Wemmer, L.C. 200. Conservation of the Piping plover (*Charadrius melodus*) in the Great Lakes region: A landscape-ecosystem approach. Dissertation, University of Minnesota, St. Paul, Minnesota, USA.

Western Area Power Administration. 2005. Electric and Magnetic Fields Facts, Department of Energy.

Witsch, William and James Gosselink. *Wetlands: 3rd Ed.* New York. 920 pp.

Figures

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Map Vicinity

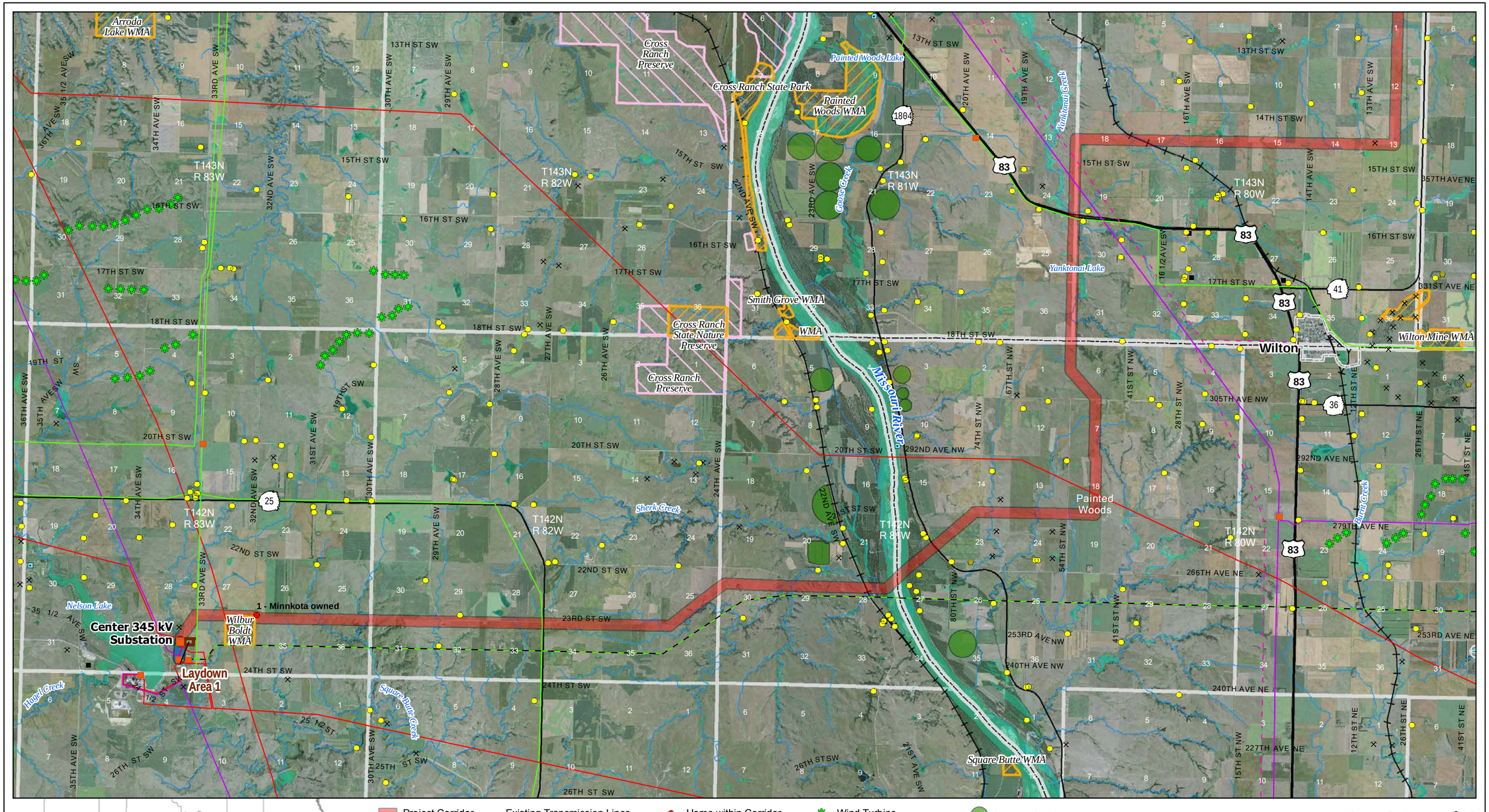
Project Corridor

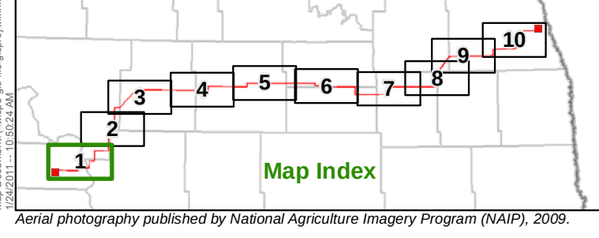
Project Substation

Figure 1
Project Vicinity
Center to Grand Forks Project
Minnkota Power Cooperative, Inc.

0 5 10 Miles

Scale 1:850,000





Project Corridor
230-kV Tie Line Corridor
Substation
Laydown Area

Existing Transmission Lines
400-kV DC
345-kV AC
250-kV DC
230-kV AC
115-kV or less AC
Gas or Oil Pipeline

Home within Corridor
Home
School
Business
Recreation
Gravel Pit or Mine
Dump or Landfill

Wind Turbine
State Park, Recreation Area or WMA
USFWS WPA or WDA
USFWS NWR
USBOR Land
TNC Preserve

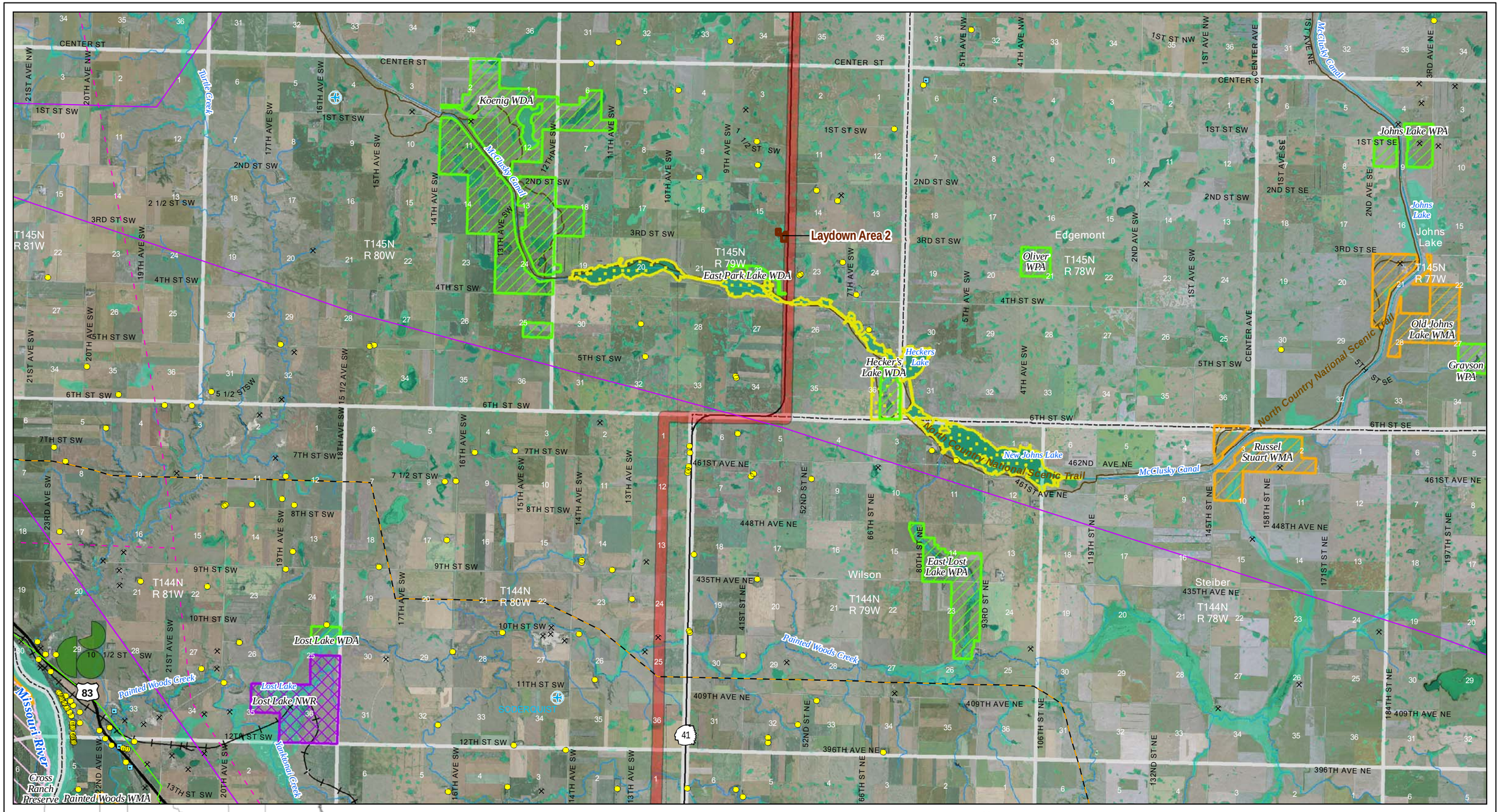
Irrigated Land
Incorporated Area
Public Airport
Private Airport
USGS River, Stream or Canal
NWI Wetland

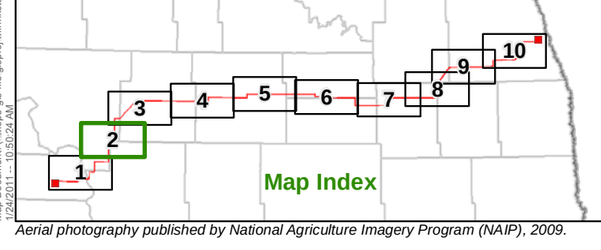
Figure 2: Page 1 of 10
Corridor Siting Criteria
Center to Grand Forks Project
Minnkota Power Cooperative, Inc.

0 1 2 Miles
Scale 1:100,000

Aerial photography published by National Agriculture Imagery Program (NAIP), 2009.

Map Document: (.\Maps-gis-file gis\pro\Minnkota 110900.mxd) 1/24/2011 - 10:50:24 AM





Project Corridor
230-kV Tie Line Corridor
Substation
Laydown Area

Existing Transmission Lines
400-kV DC
345-kV AC
250-kV DC
230-kV AC
115-kV or less AC
Gas or Oil Pipeline

Home within Corridor
Home
School
Business
Recreation
Gravel Pit or Mine
Dump or Landfill

Wind Turbine
State Park, Recreation Area or WMA
USFWS WPA or WDA
USFWS NWR
USBOR Land
TNC Preserve

Irrigated Land
Incorporated Area
Public Airport
Private Airport
USGS River, Stream or Canal
NWI Wetland

Figure 2: Page 2 of 10
Corridor Siting Criteria
Center to Grand Forks Project
Minnkota Power Cooperative, Inc.

0 1 2 Miles
Scale 1:100,000

Aerial photography published by National Agriculture Imagery Program (NAIP), 2009.

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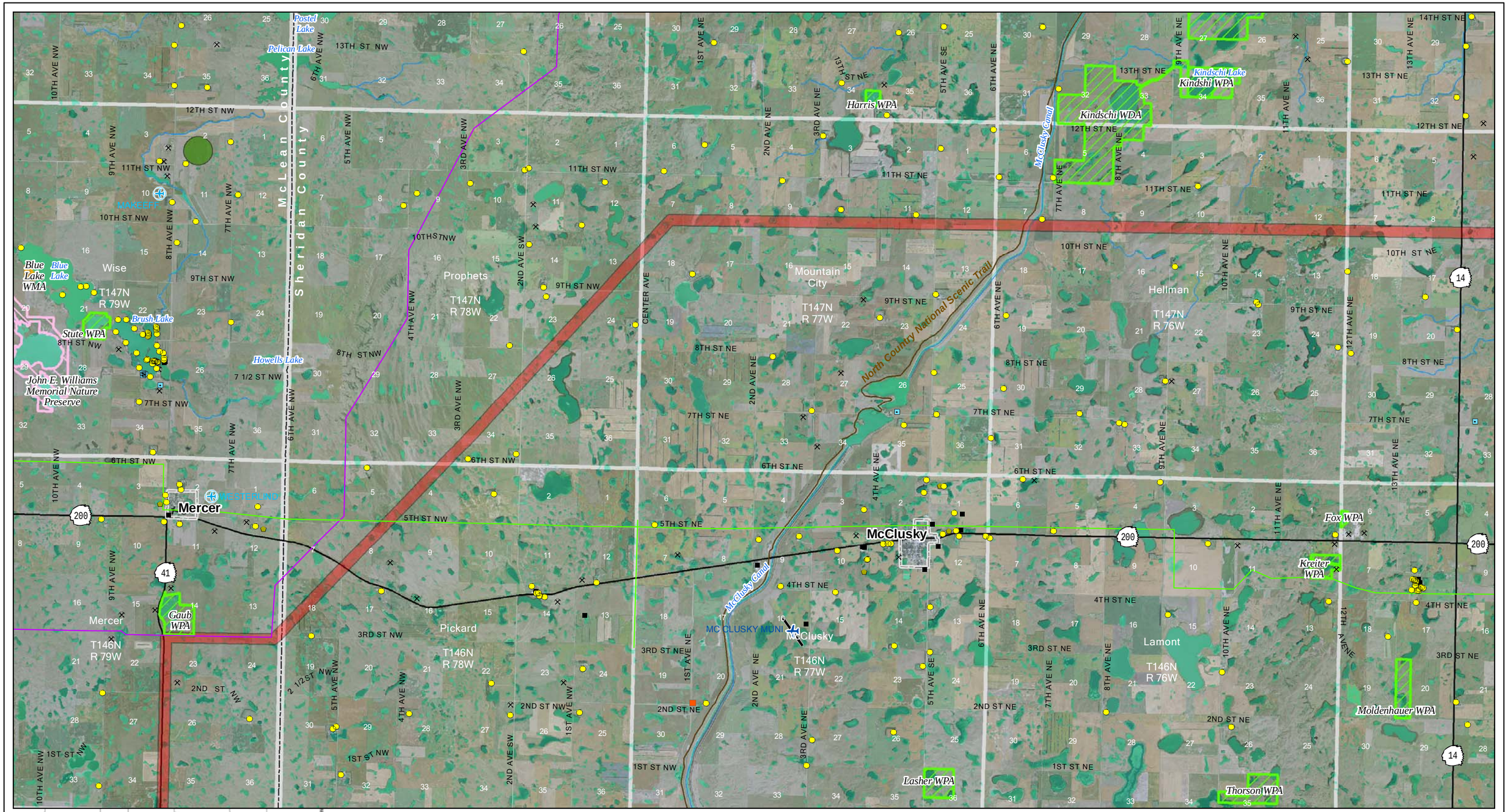

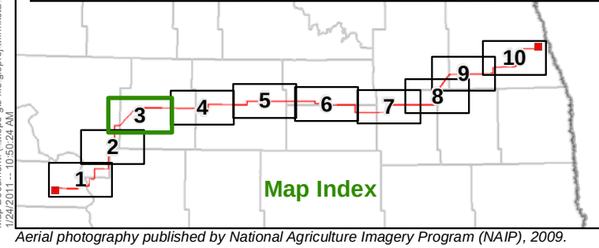

Project Corridor
230-kV Tie Line Corridor
Substation
Laydown Area

Existing Transmission Lines
400-kV DC
345-kV AC
250-kV DC
230-kV AC
115-kV or less AC
Gas or Oil Pipeline

Home within Corridor
Home
School
Business
Recreation
Gravel Pit or Mine
Dump or Landfill

Wind Turbine
State Park, Recreation Area or WMA
USFWS WPA or WDA
USFWS NWR
USBOR Land
TNC Preserve

Irrigated Land
Incorporated Area
Public Airport
Private Airport
USGS River, Stream or Canal
NWI Wetland

Figure 2: Page 3 of 10
Corridor Siting Criteria
Center to Grand Forks Project
Minnkota Power Cooperative, Inc.

0 1 2 Miles
Scale 1:100,000

Map Document: (Maps.gis-file.gisproj Minnkota 110900 map: docs PSC CorridorApp.CGFCCC 02::11x17L 10p: CorridorSitingCriteria.mxd)
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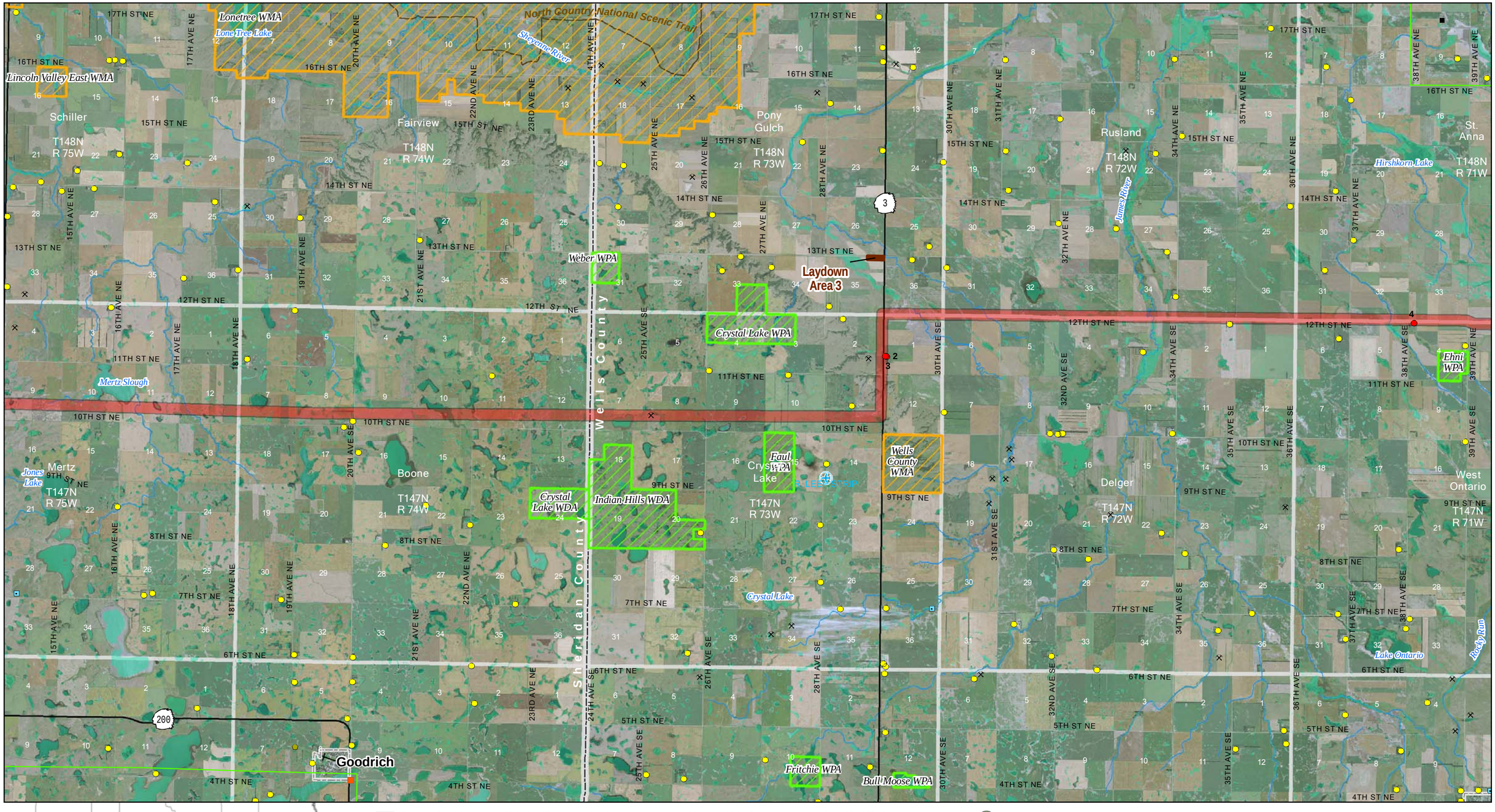

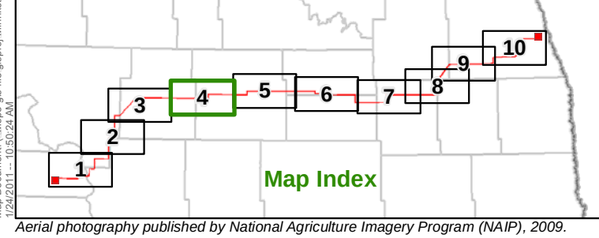

Project Corridor
230-kV Tie Line Corridor
Substation
Laydown Area

Existing Transmission Lines
400-kV DC
345-kV AC
250-kV DC
230-kV AC
115-kV or less AC
Gas or Oil Pipeline

Home within Corridor
Home
School
Business
Recreation
Gravel Pit or Mine
Dump or Landfill

Wind Turbine
State Park, Recreation Area or WMA
USFWS WPA or WDA
USFWS NWR
USBOR Land
TNC Preserve

Irrigated Land
Incorporated Area
Public Airport
Private Airport
USGS River, Stream or Canal
NWI Wetland

Figure 2: Page 4 of 10
Corridor Siting Criteria
Center to Grand Forks Project
Minnkota Power Cooperative, Inc.

0 1 2 Miles
Scale 1:100,000

Aerial photography published by National Agriculture Imagery Program (NAIP), 2009.

Map Document: (Maps.gis-file:gisproj Minnkota 110900 map: docs PSC CorridorApp.CGFCCC 02 : 11x17L 10p CorridorSitingCriteria.mxd)
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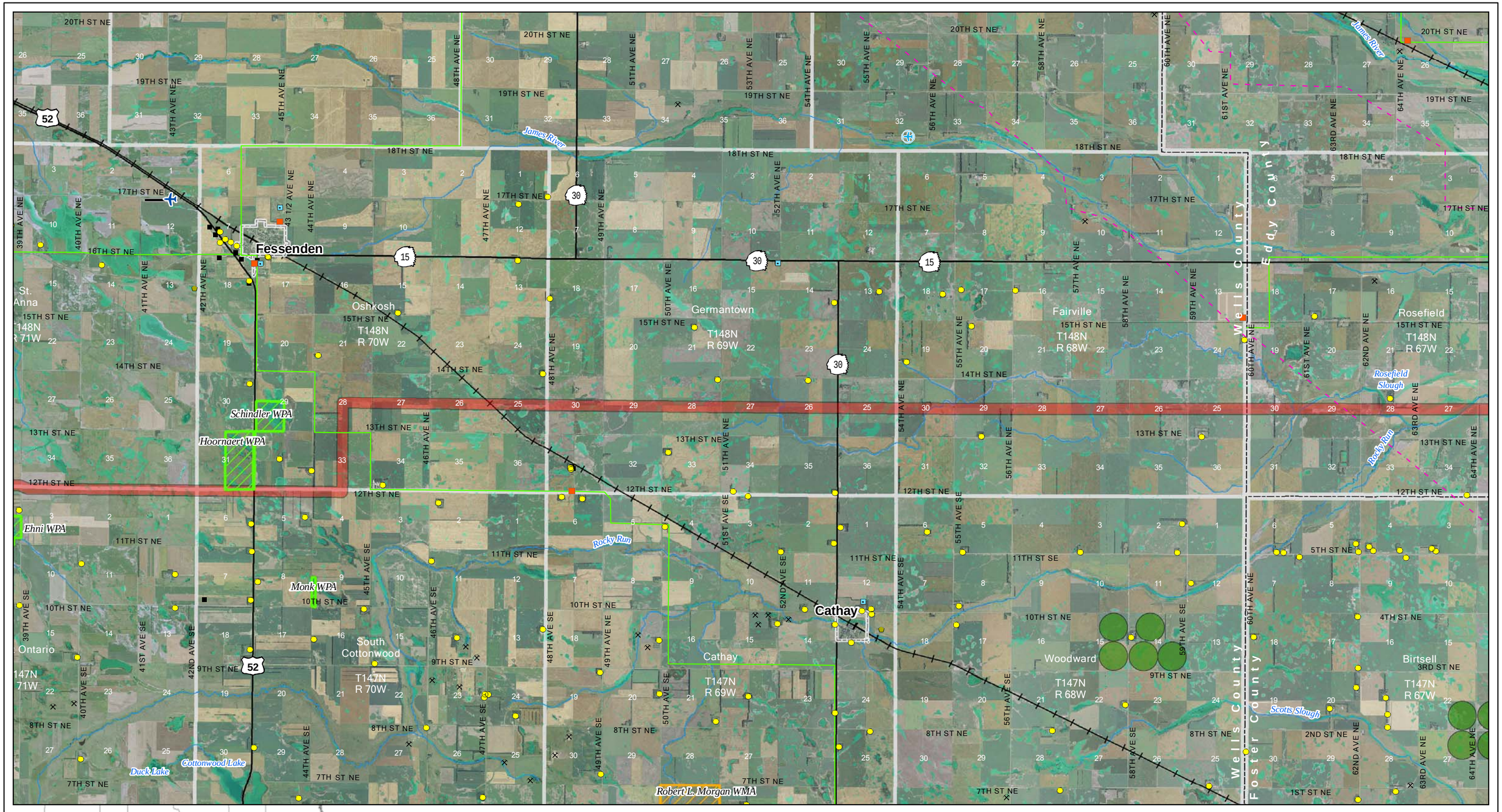

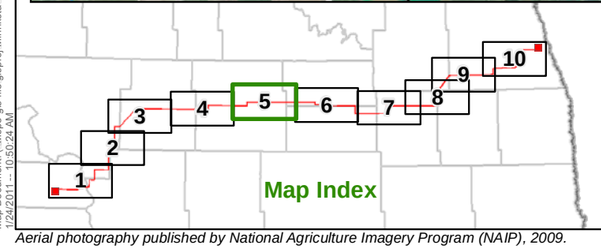

Project Corridor
230-kV Tie Line Corridor
Substation
Laydown Area

Existing Transmission Lines
400-kV DC
345-kV AC
250-kV DC
230-kV AC
115-kV or less AC
Gas or Oil Pipeline

Home within Corridor
Home
School
Business
Recreation
Gravel Pit or Mine
Dump or Landfill

Wind Turbine
State Park, Recreation Area or WMA
USFWS WPA or WDA
USFWS NWR
USBOR Land
TNC Preserve

Irrigated Land
Incorporated Area
Public Airport
Private Airport
USGS River, Stream or Canal
NWI Wetland

Figure 2: Page 5 of 10
Corridor Siting Criteria
Center to Grand Forks Project
Minnkota Power Cooperative, Inc.

0 1 2 Miles
Scale 1:100,000

Aerial photography published by National Agriculture Imagery Program (NAIP), 2009.

Map Document: (.\Mxds-gis-file gis\proj Minnkota 11090\ map .docs PSC CorridorApp CGFCCC 02 11x17L 10p: CorridorSlingCriteria.mxd)
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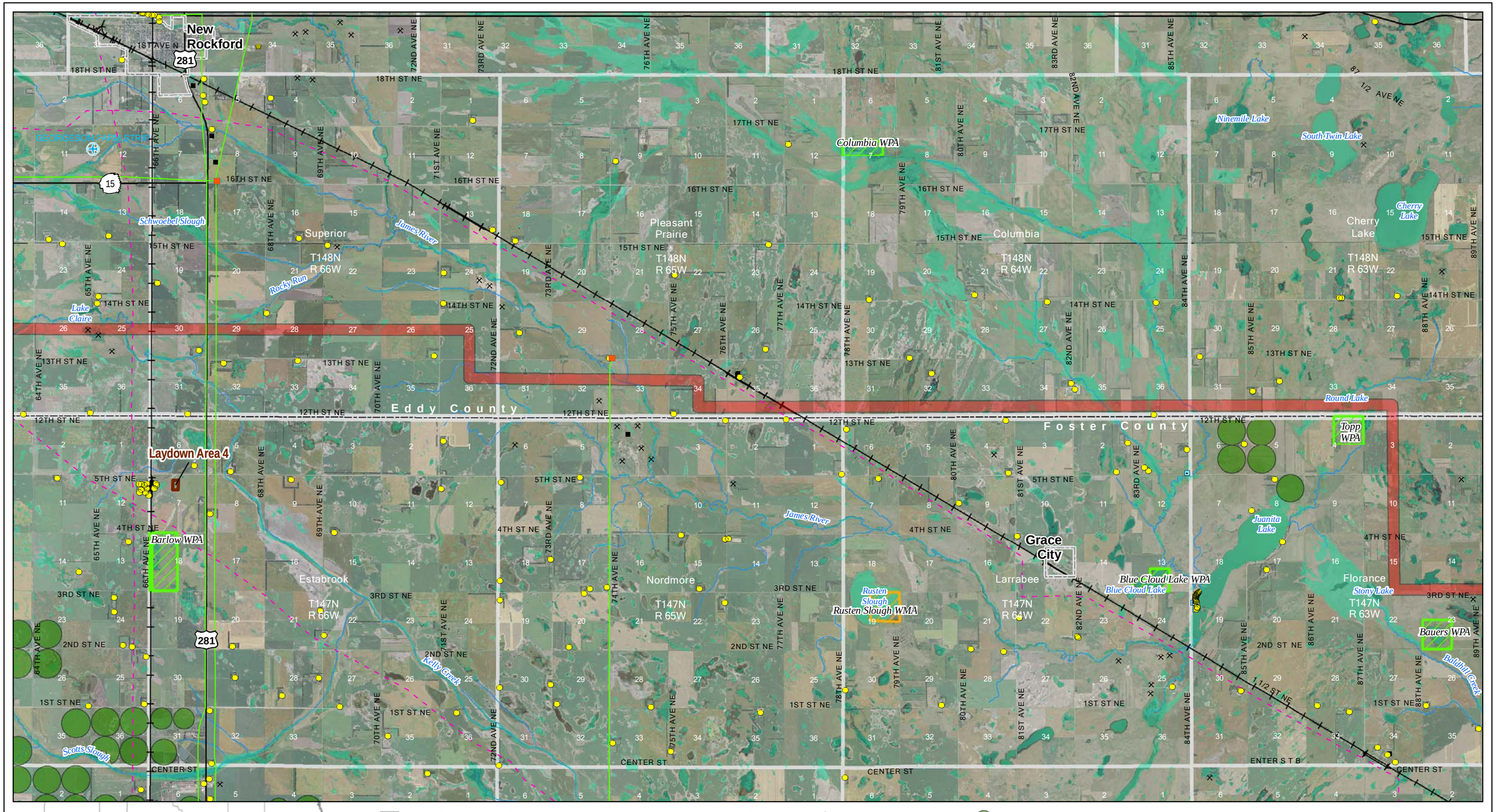
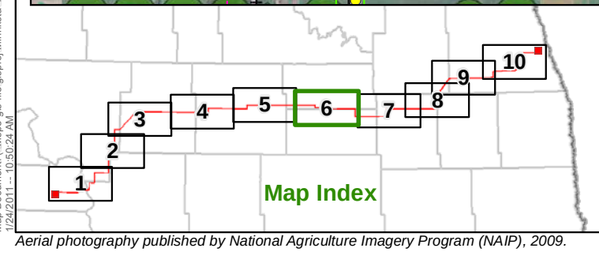




Project Corridor
230-kV Tie Line Corridor
Substation
Laydown Area

Existing Transmission Lines
400-kV DC
345-kV AC
250-kV DC
230-kV AC
115-kV or less AC
Gas or Oil Pipeline

Home within Corridor
Home
School
Business
Recreation
Gravel Pit or Mine
Dump or Landfill

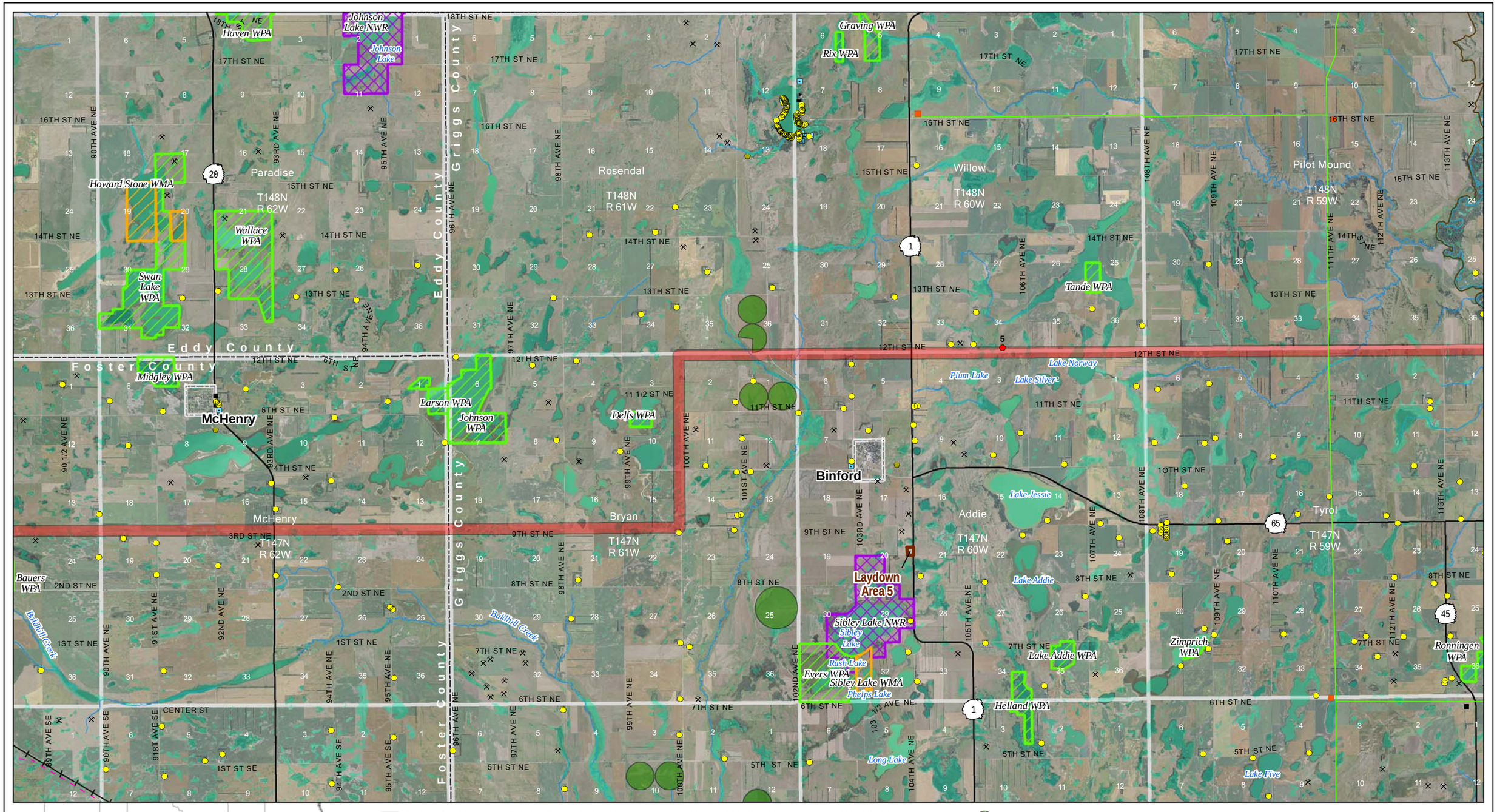
Wind Turbine
State Park, Recreation Area or WMA
USFWS WPA or WDA
USFWS NWR
USBOR Land
TNC Preserve

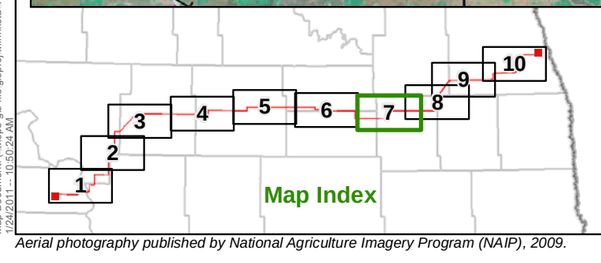
Irrigated Land
Incorporated Area
Public Airport
Private Airport
USGS River, Stream or Canal
NWI Wetland

Figure 2: Page 6 of 10
Corridor Siting Criteria
Center to Grand Forks Project
Minnkota Power Cooperative, Inc.

0 1 2 Miles
Scale 1:100,000

Aerial photography published by National Agriculture Imagery Program (NAIP), 2009.





Project Corridor
230-kV Tie Line Corridor
Substation
Laydown Area

Existing Transmission Lines
400-kV DC
345-kV AC
250-kV DC
230-kV AC
115-kV or less AC
Gas or Oil Pipeline

Home within Corridor
Home
School
Business
Recreation
Gravel Pit or Mine
Dump or Landfill

Wind Turbine
State Park, Recreation Area or WMA
USFWS WPA or WDA
USFWS NWR
USBOR Land
TNC Preserve

Irrigated Land
Incorporated Area
Public Airport
Private Airport
USGS River, Stream or Canal
NWI Wetland

Figure 2: Page 7 of 10
Corridor Siting Criteria
Center to Grand Forks Project
Minnkota Power Cooperative, Inc.

0 1 2 Miles
Scale 1:100,000

Aerial photography published by National Agriculture Imagery Program (NAIP), 2009.

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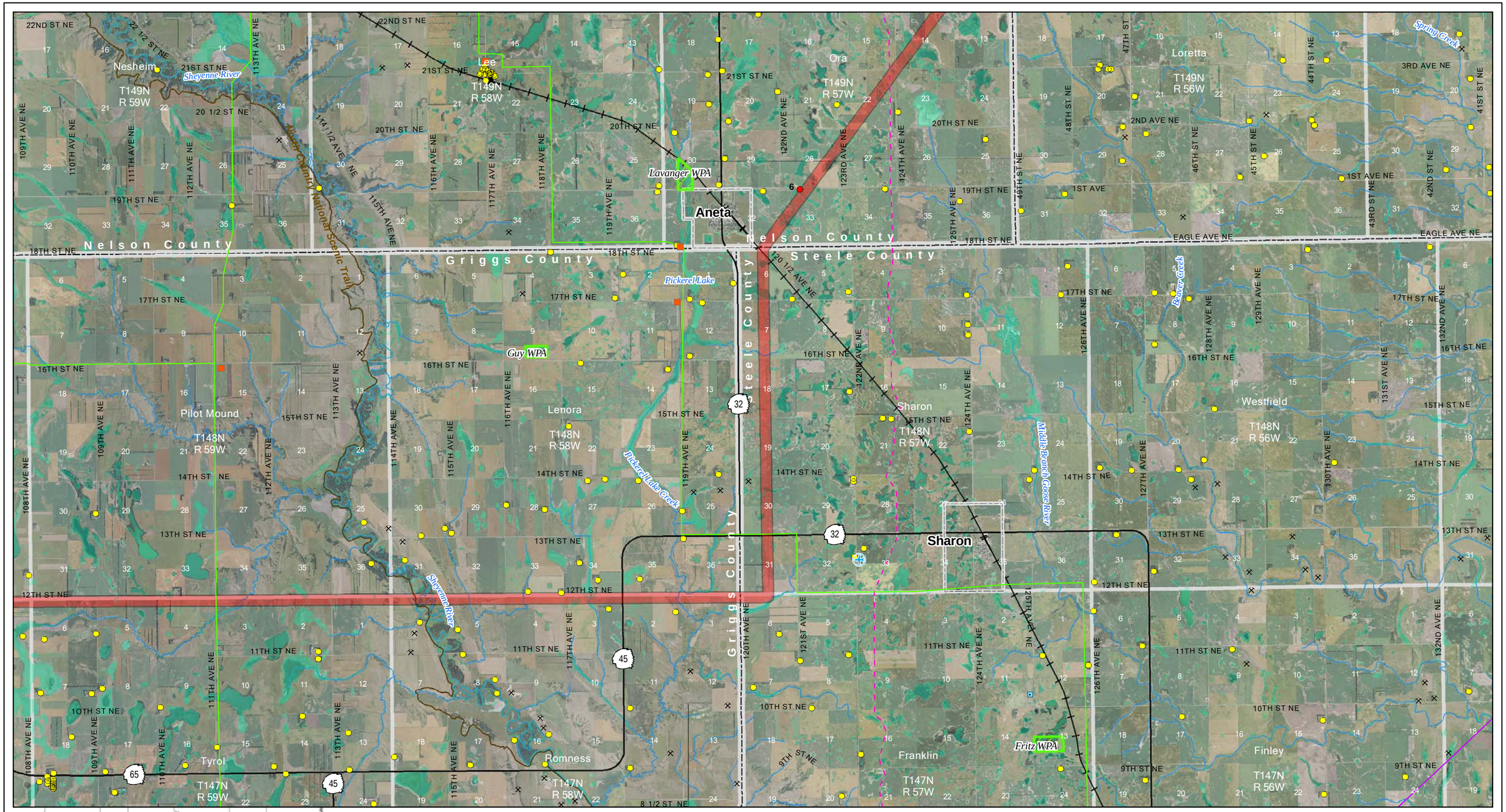
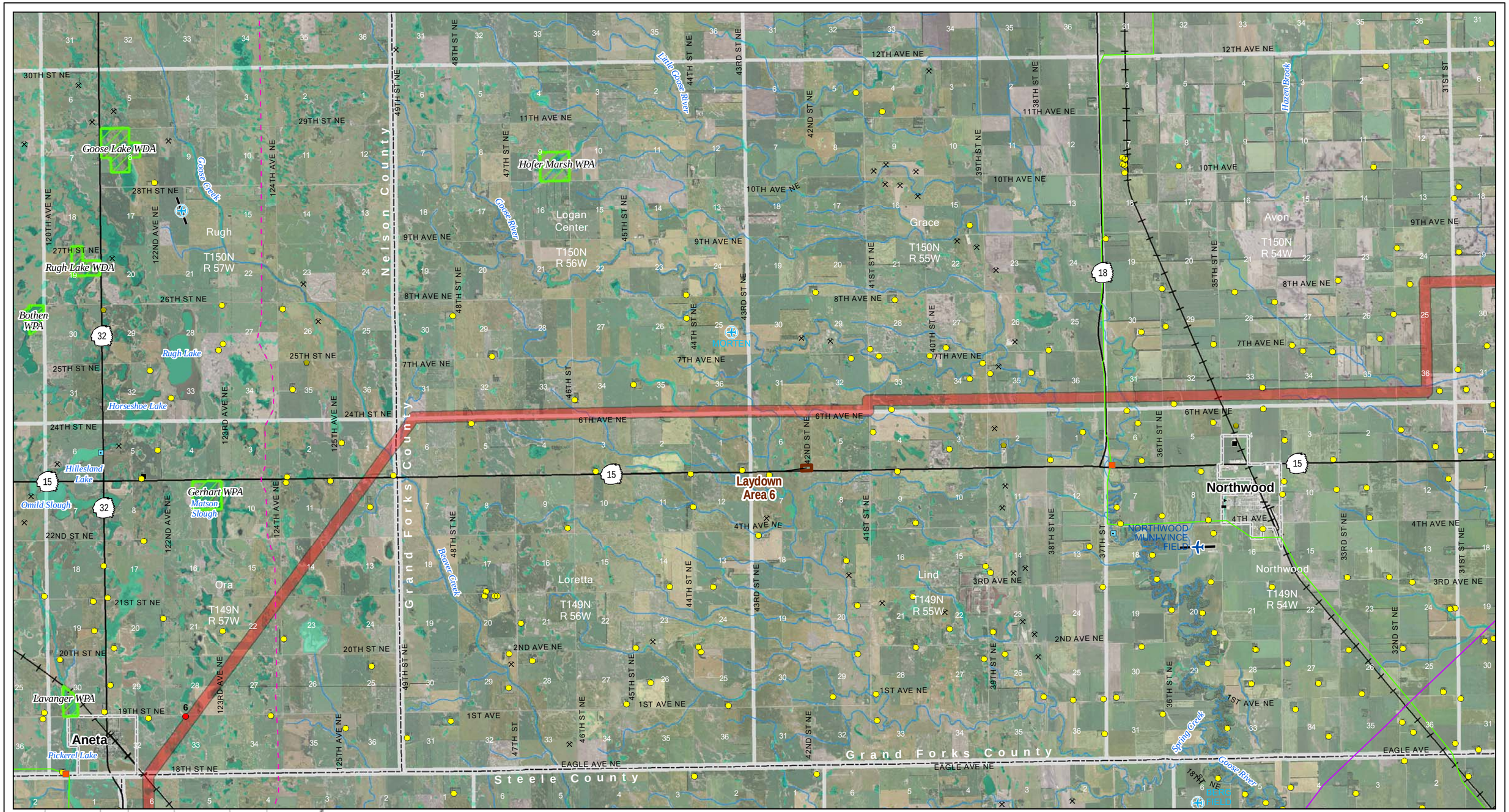


Figure 2: Page 8 of 10
Corridor Siting Criteria
Center to Grand Forks Project
Minnkota Power Cooperative, Inc.

Aerial photography published by National Agriculture Imagery Program (NAIP), 2009.



Project Corridor
230-kV Tie Line Corridor
Substation
Laydown Area

Existing Transmission Lines
400-kV DC
345-kV AC
250-kV DC
230-kV AC
115-kV or less AC
Gas or Oil Pipeline

Home within Corridor
Home
School
Business
Recreation
Gravel Pit or Mine
Dump or Landfill

Wind Turbine
State Park, Recreation Area or WMA
USFWS WPA or WDA
USFWS NWR
USBOR Land
TNC Preserve

Irrigated Land
Incorporated Area
Public Airport
Private Airport
USGS River, Stream or Canal
NWI Wetland

Figure 2: Page 9 of 10
Corridor Siting Criteria
Center to Grand Forks Project
Minnkota Power Cooperative, Inc.

0 1 2 Miles
Scale 1:100,000

Aerial photography published by National Agriculture Imagery Program (NAIP), 2009.

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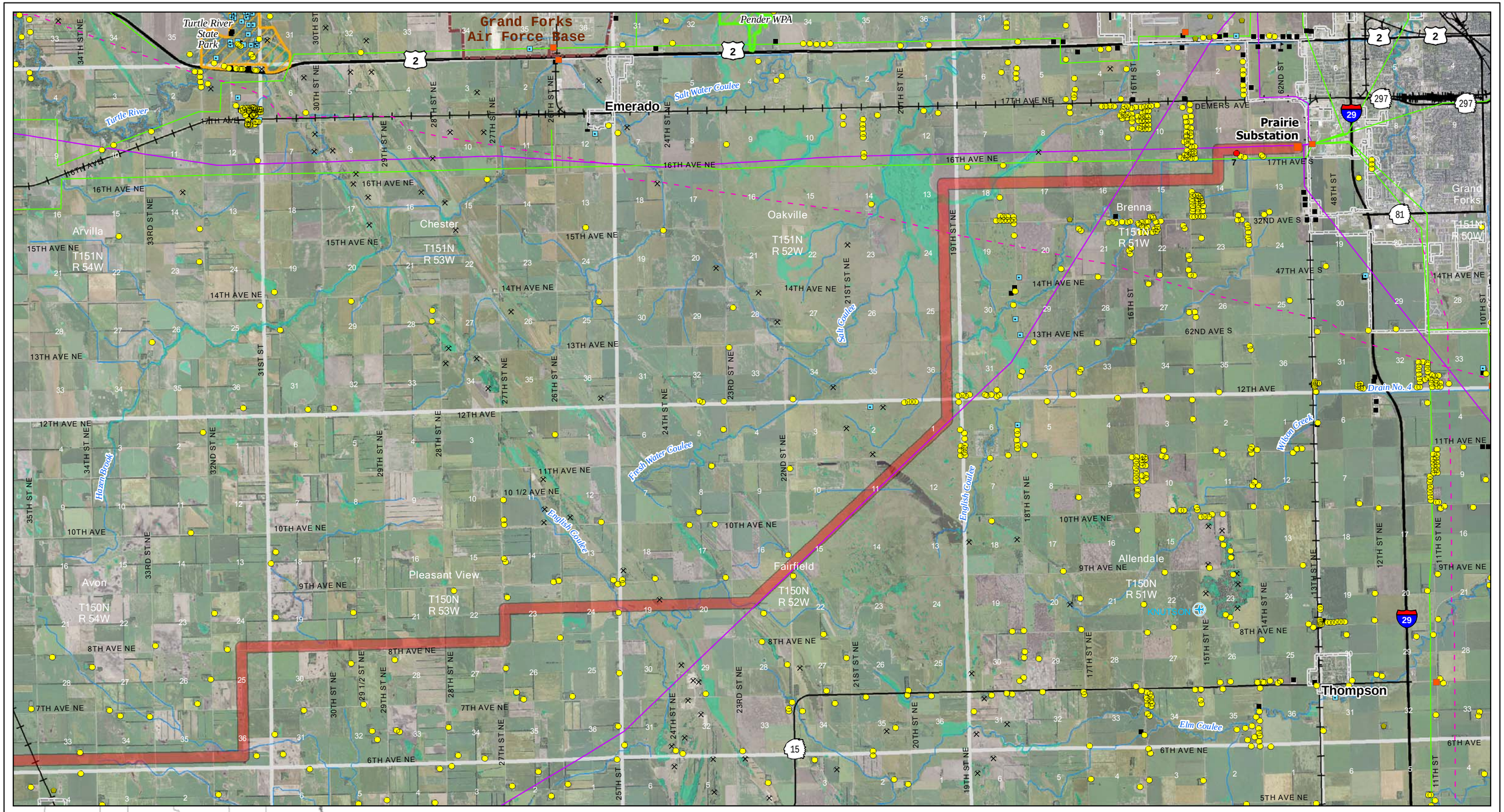

Figure 2: Page 10 of 10
Corridor Siting Criteria
Center to Grand Forks Project
Minnkota Power Cooperative, Inc.

Aerial photography published by National Agriculture Imagery Program (NAIP), 2009.

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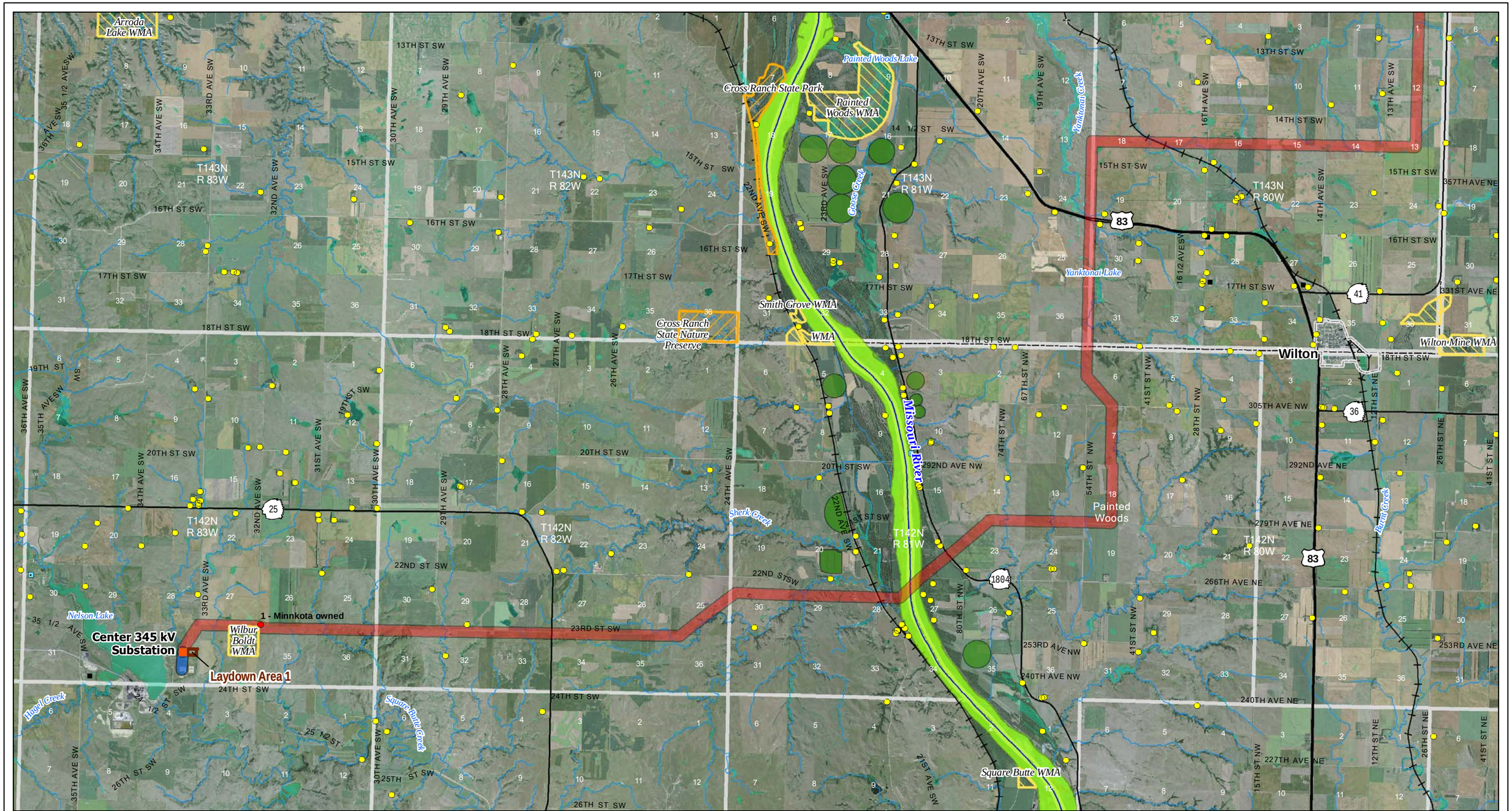

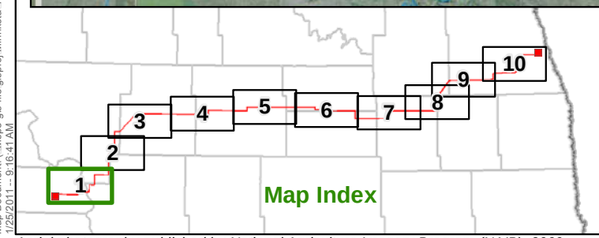

Sensitive location information has been redacted from this Figure.

Project Areas
- Project Corridor
- 230-kV Tie Line Corridor
- Project Substation
- Laydown Area

Exclusion Areas
- State Park, Recreation Area or Nature Preserve
- Piping Plover Critical Habitat

Avoidance Areas
- Home within Corridor
- Home
- School
- Business
- Recreation
- Irrigated Land
- USFWS NWR
- USFWS WPA or WDA
- State WMA
- Chain of Lake Recreation Area
- USBR McClusky Canal - fenceline
- North Country National Scenic Trail

Figure 3: Page 1 of 10
Corridor Exclusion and Avoidance Areas
Center to Grand Forks Project
Minnkota Power Cooperative, Inc.

0 1 2 Miles
Scale 1:100,000

Aerial photography published by National Agriculture Imagery Program (NAIP), 2009.

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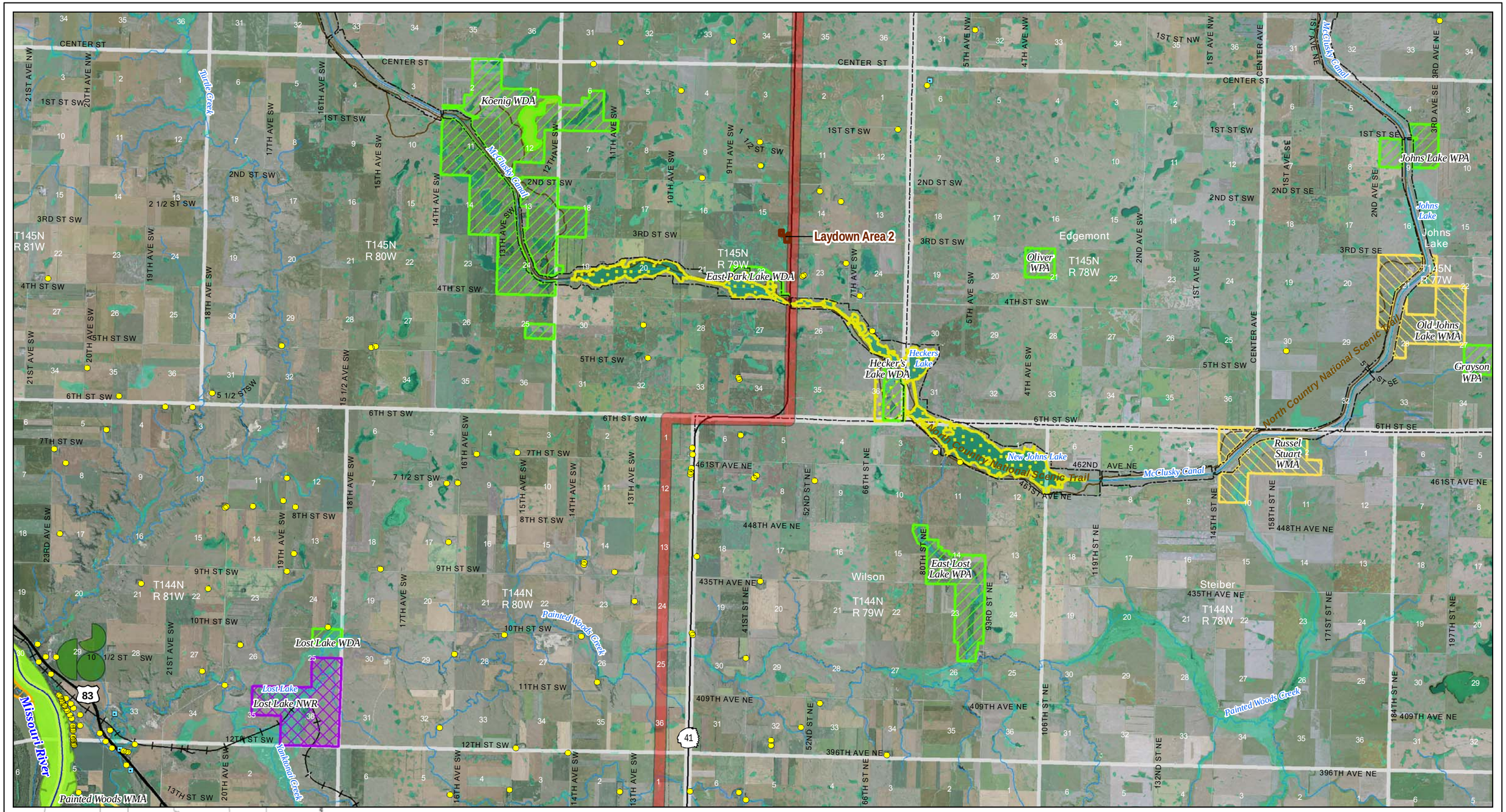

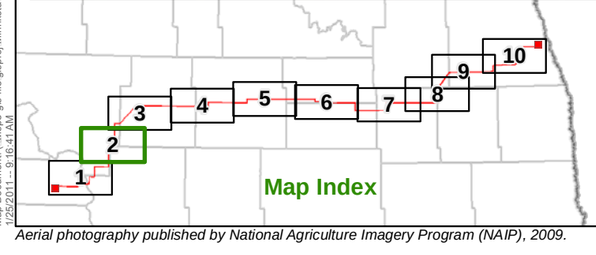

Sensitive location information has been redacted from this Figure.

Project Areas
- Project Corridor
- 230-kV Tie Line Corridor
- Project Substation
- Laydown Area

Exclusion Areas
- State Park, Recreation Area or Nature Preserve
- Piping Plover Critical Habitat

Avoidance Areas
- Home within Corridor
- Home
- School
- Business
- Recreation
- Irrigated Land
- USFWS NWR
- USFWS WPA or WDA
- State WMA
- Chain of Lake Recreation Area
- USBR McClusky Canal - fenceline
- North Country National Scenic Trail

Figure 3: Page 2 of 10
Corridor Exclusion and Avoidance Areas
Center to Grand Forks Project
Minnkota Power Cooperative, Inc.

0 1 2 Miles
Scale 1:100,000

Aerial photography published by National Agriculture Imagery Program (NAIP), 2009.

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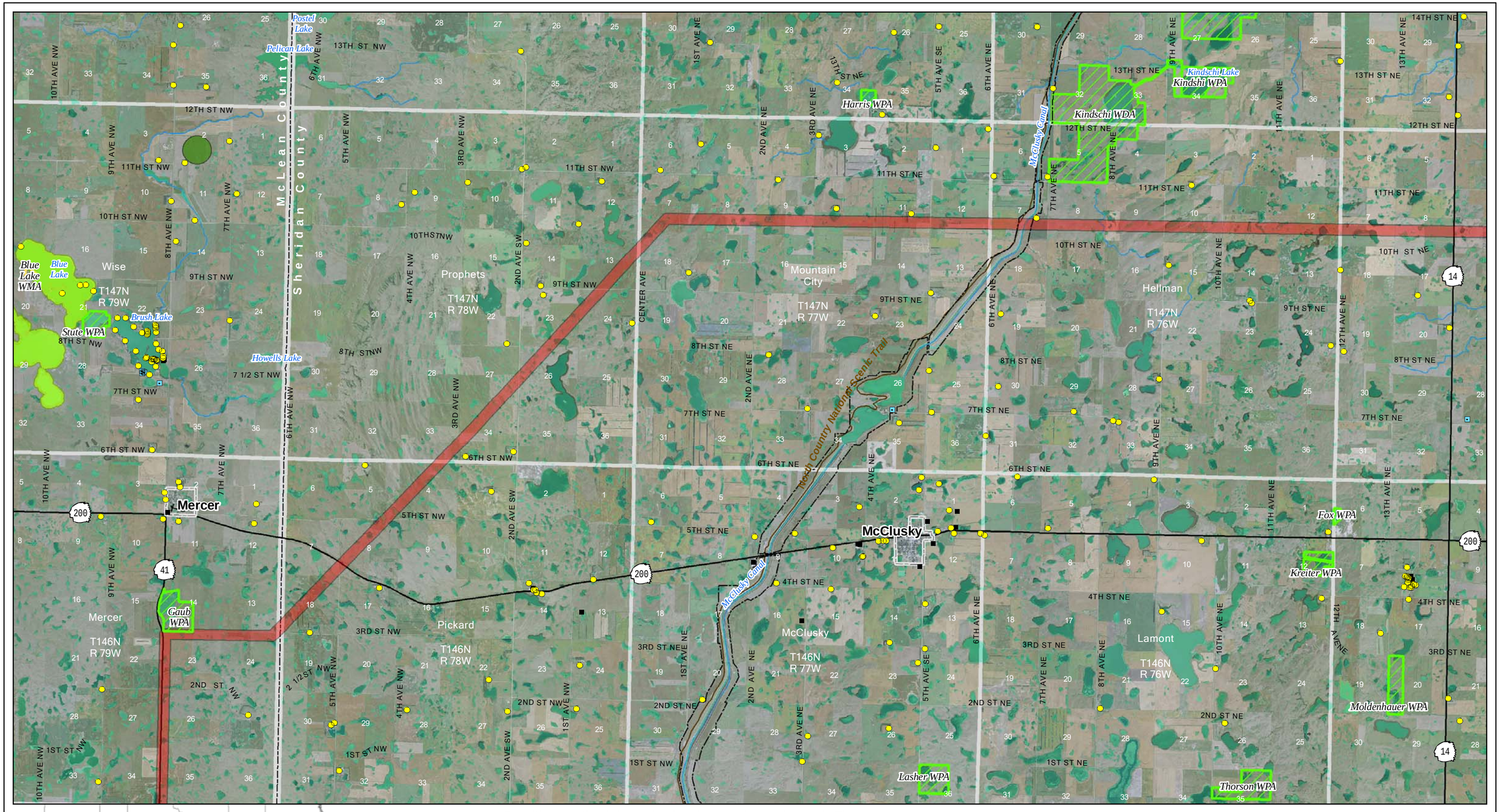

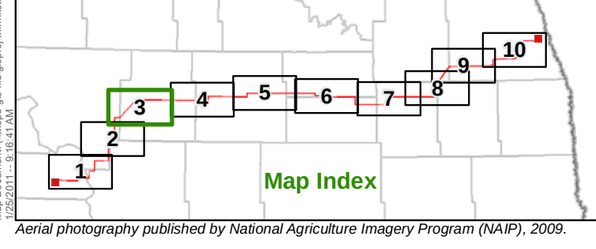

Sensitive location information has been redacted from this Figure.

Project Areas
- Project Corridor
- 230-kV Tie Line Corridor
- Project Substation
- Laydown Area

Exclusion Areas
- State Park, Recreation Area or Nature Preserve
- Piping Plover Critical Habitat

Avoidance Areas
- Home within Corridor
- Home
- School
- Business
- Recreation
- Irrigated Land
- USFWS NWR
- USFWS WPA or WDA
- State WMA
- Chain of Lake Recreation Area
- USBR McClusky Canal - fenceline
- North Country National Scenic Trail

Figure 3: Page 3 of 10
Corridor Exclusion and Avoidance Areas
Center to Grand Forks Project
Minnkota Power Cooperative, Inc.

0 1 2 Miles
Scale 1:100,000

Aerial photography published by National Agriculture Imagery Program (NAIP), 2009.

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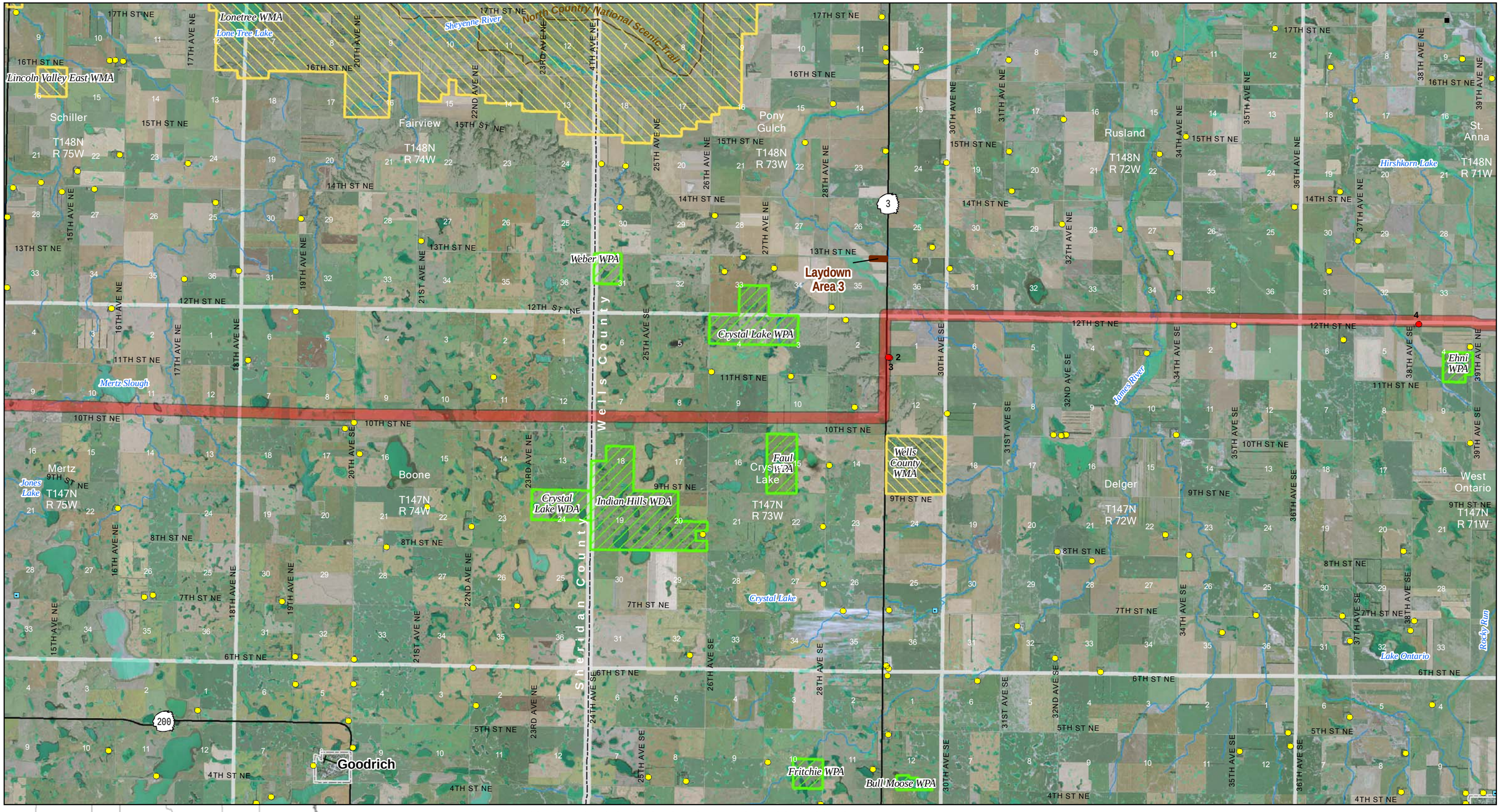

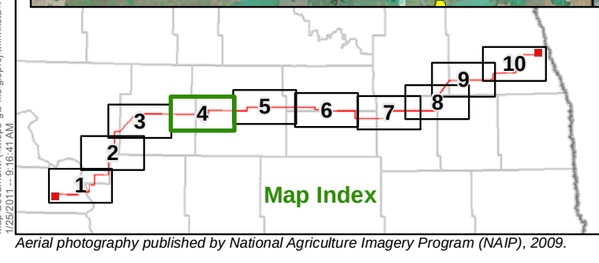

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Project Areas
- Project Corridor
- 230-kV Tie Line Corridor
- Project Substation
- Laydown Area

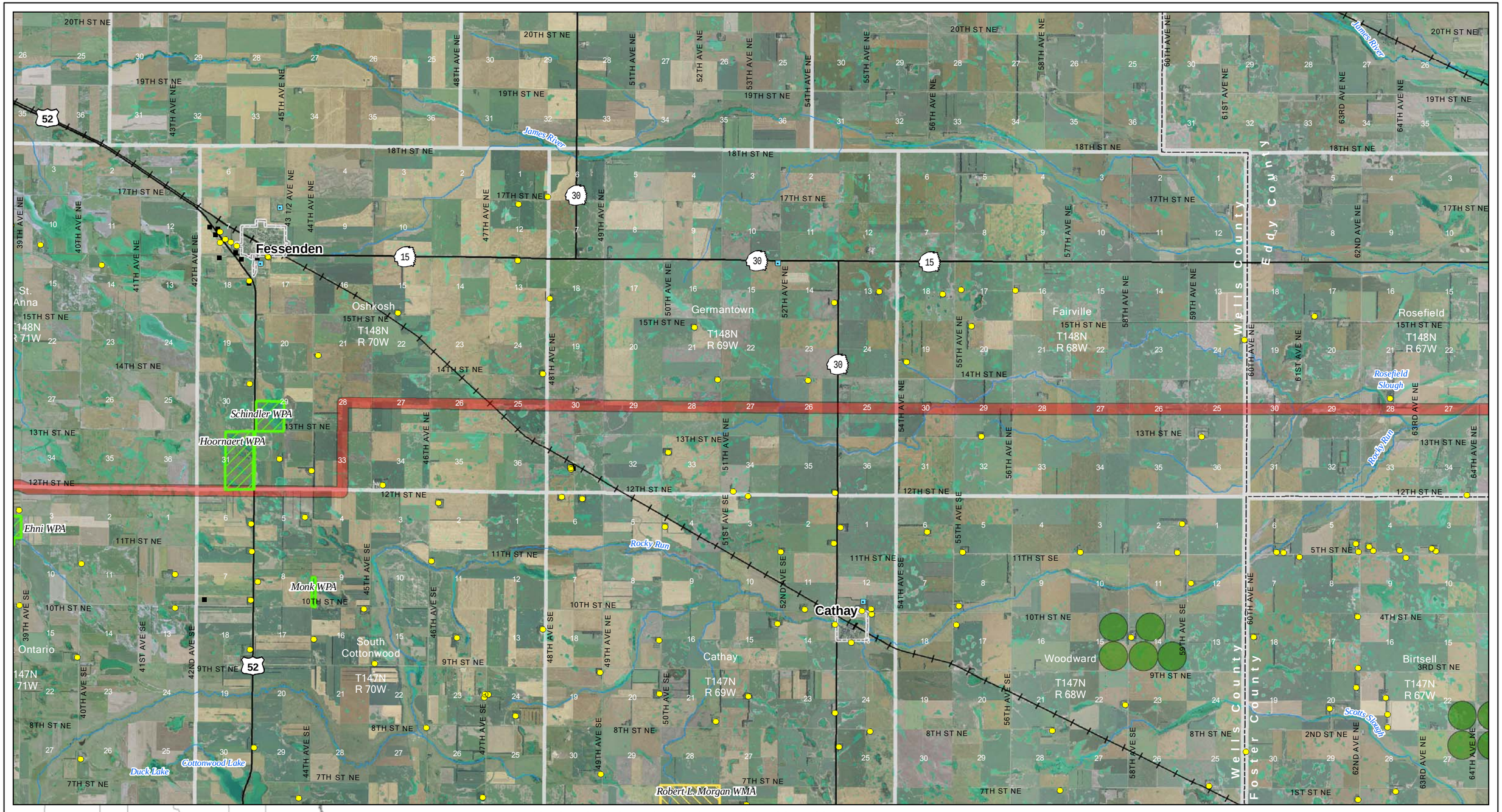
Exclusion Areas
- State Park, Recreation Area or Nature Preserve
- Piping Plover Critical Habitat

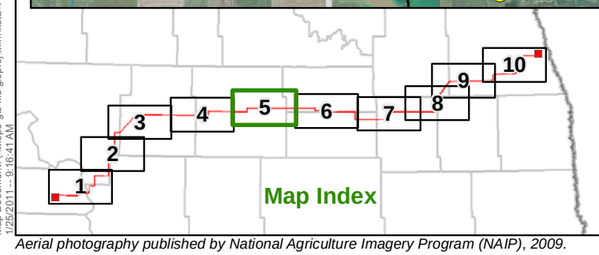
Avoidance Areas
- Home within Corridor
- Home
- School
- Business
- Recreation
- Irrigated Land
- USFWS NWR
- USFWS WPA or WDA
- State WMA
- Chain of Lake Recreation Area
- USBR McClusky Canal - fenceline
- North Country National Scenic Trail

Aerial photography published by National Agriculture Imagery Program (NAIP), 2009.

Figure 3: Page 4 of 10
Corridor Exclusion and Avoidance Areas
Center to Grand Forks Project
Minnkota Power Cooperative, Inc.

0 1 2 Miles
Scale 1:100,000





Project Areas
- Project Corridor
- 230-kV Tie Line Corridor
- Project Substation
- Laydown Area

Exclusion Areas
- State Park, Recreation Area or Nature Preserve
- Piping Plover Critical Habitat

Avoidance Areas
- Home within Corridor
- Home
- School
- Business
- Recreation
- Irrigated Land
- USFWS NWR
- USFWS WPA or WDA
- State WMA
- Chain of Lake Recreation Area
- USBR McClusky Canal - fenceline
- North Country National Scenic Trail

Sensitive location information has been redacted from this Figure.

Figure 3: Page 5 of 10
Corridor Exclusion and Avoidance Areas
Center to Grand Forks Project
Minnkota Power Cooperative, Inc.

0 1 2 Miles
Scale 1:100,000

Aerial photography published by National Agriculture Imagery Program (NAIP), 2009.

Map Document: (.\mxds\gis-file gis\proj Minnkota 11090\ map .docs PSC Corridor\App CGF\CCC 03 .11x17L 10p. ExclAvoid.mxd)
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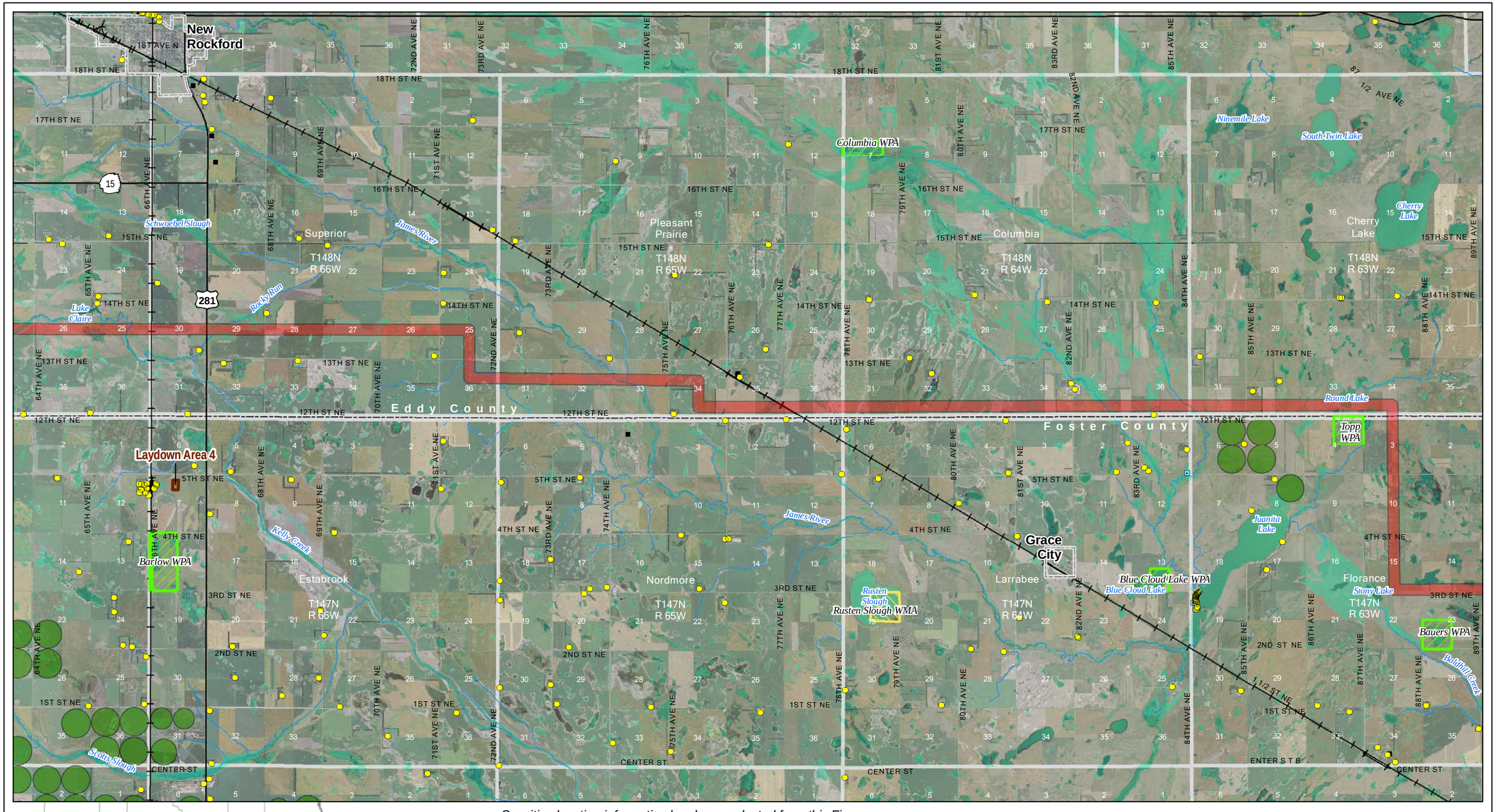
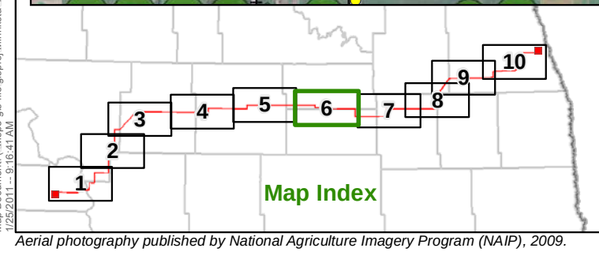




Sensitive location information has been redacted from this Figure.

Project Areas
- Project Corridor
- 230-kV Tie Line Corridor
- Project Substation
- Laydown Area

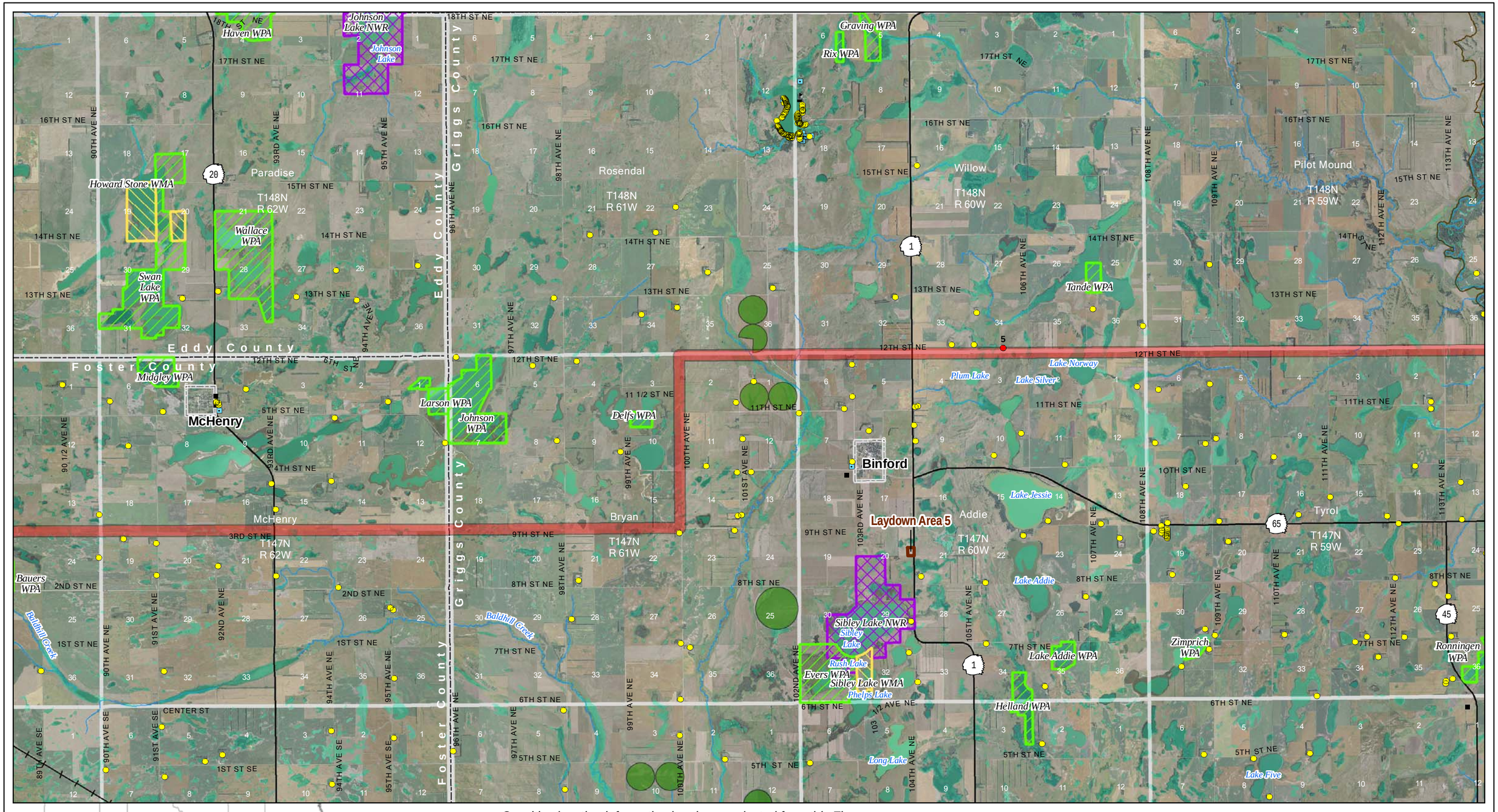
Exclusion Areas
- State Park, Recreation Area or Nature Preserve
- Piping Plover Critical Habitat

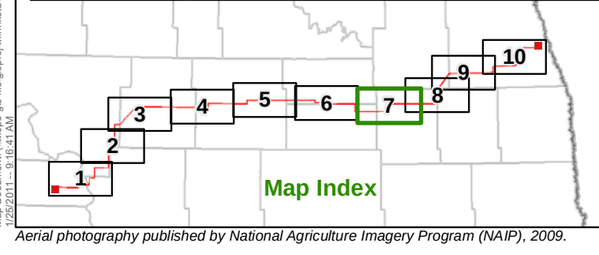
Avoidance Areas
- Home within Corridor
- Home
- School
- Business
- Recreation
- Irrigated Land
- USFWS NWR
- USFWS WPA or WDA
- State WMA
- Chain of Lake Recreation Area
- USBR McClusky Canal - fenceline
- North Country National Scenic Trail

Aerial photography published by National Agriculture Imagery Program (NAIP), 2009.

Figure 3: Page 6 of 10
Corridor Exclusion and Avoidance Areas
Center to Grand Forks Project
Minnkota Power Cooperative, Inc.

0 1 2 Miles
Scale 1:100,000





Sensitive location information has been redacted from this Figure.

Project Areas
- Project Corridor
- 230-kV Tie Line Corridor
- Project Substation
- Laydown Area

Exclusion Areas
- State Park, Recreation Area or Nature Preserve
- Piping Plover Critical Habitat

Avoidance Areas
- Home within Corridor
- Home
- School
- Business
- Recreation
- Irrigated Land
- USFWS NWR
- USFWS WPA or WDA
- State WMA
- Chain of Lake Recreation Area
- USBR McClusky Canal - fenceline
- North Country National Scenic Trail

Figure 3: Page 7 of 10
Corridor Exclusion and Avoidance Areas
Center to Grand Forks Project
Minnkota Power Cooperative, Inc.

0 1 2 Miles
Scale 1:100,000

Aerial photography published by National Agriculture Imagery Program (NAIP), 2009.

Map Document: (.\mxp-gis-file\gisproj\Minnkota 110900.mxp: docs:PSC CorridorApp CGFCCC: 03: 11x17L: 10p: ExclAvoid.mxd)
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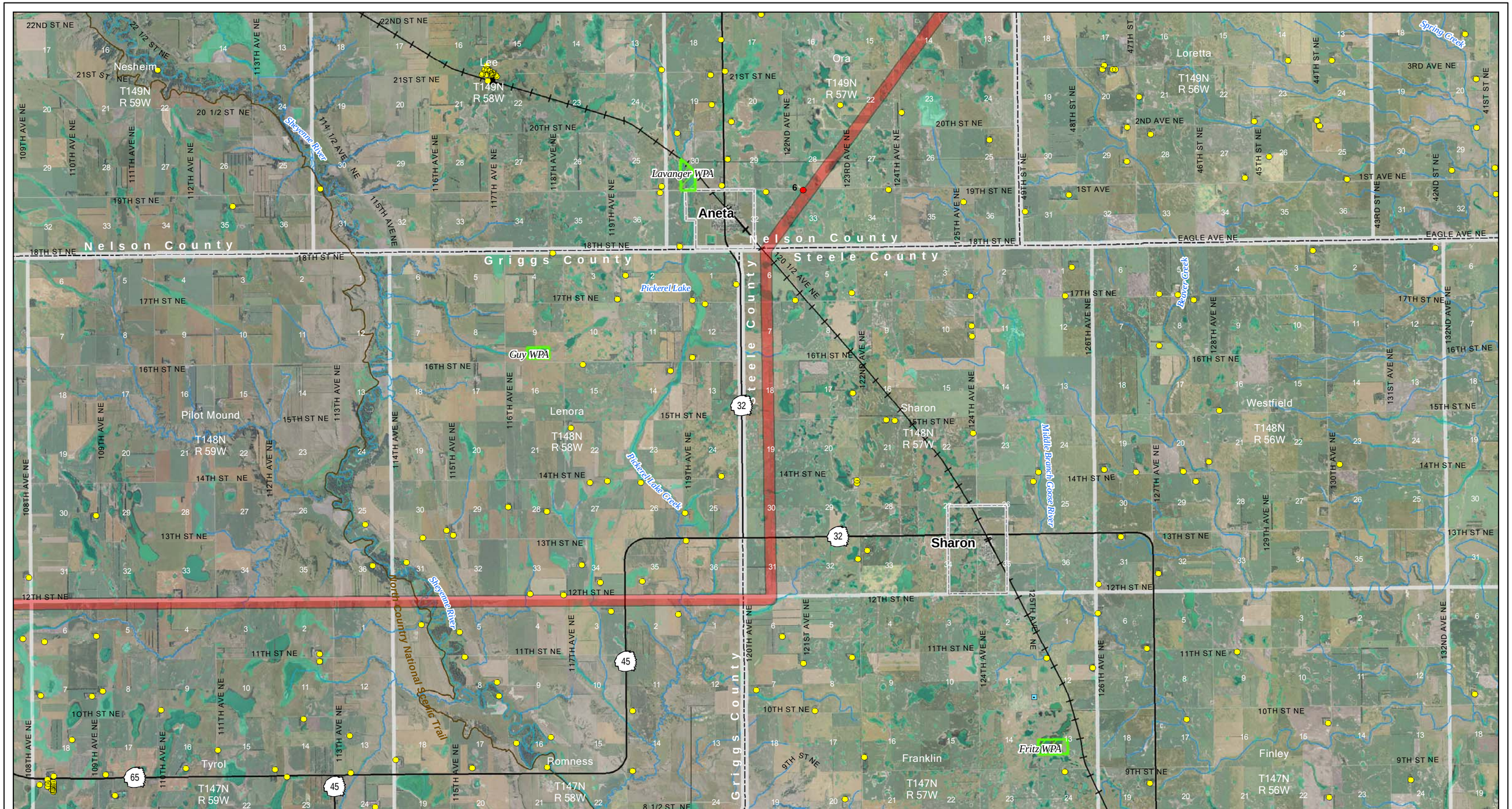

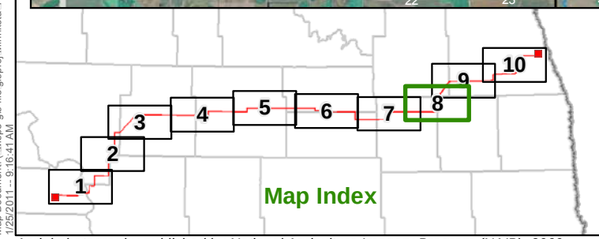

Sensitive location information has been redacted from this Figure.

Project Areas
- Project Corridor
- 230-kV Tie Line Corridor
- Project Substation
- Laydown Area

Exclusion Areas
- State Park, Recreation Area or Nature Preserve
- Piping Plover Critical Habitat

Avoidance Areas
- Home within Corridor
- Home
- School
- Business
- Recreation
- Irrigated Land
- USFWS NWR
- USFWS WPA or WDA
- State WMA
- Chain of Lake Recreation Area
- USBR McClusky Canal - fenceline
- North Country National Scenic Trail

Aerial photography published by National Agriculture Imagery Program (NAIP), 2009.

Figure 3: Page 8 of 10
Corridor Exclusion and Avoidance Areas
Center to Grand Forks Project
Minnkota Power Cooperative, Inc.

0 1 2 Miles
Scale 1:100,000

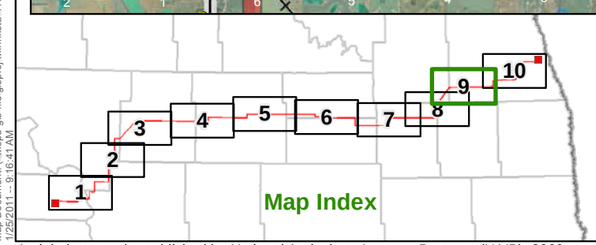

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Figure 3: Page 9 of 10
Corridor Exclusion and Avoidance Areas
Center to Grand Forks Project
Minnkota Power Cooperative, Inc.

0 1 2 Miles
Scale 1:100,000

Aerial photography published by National Agriculture Imagery Program (NAIP), 2009.

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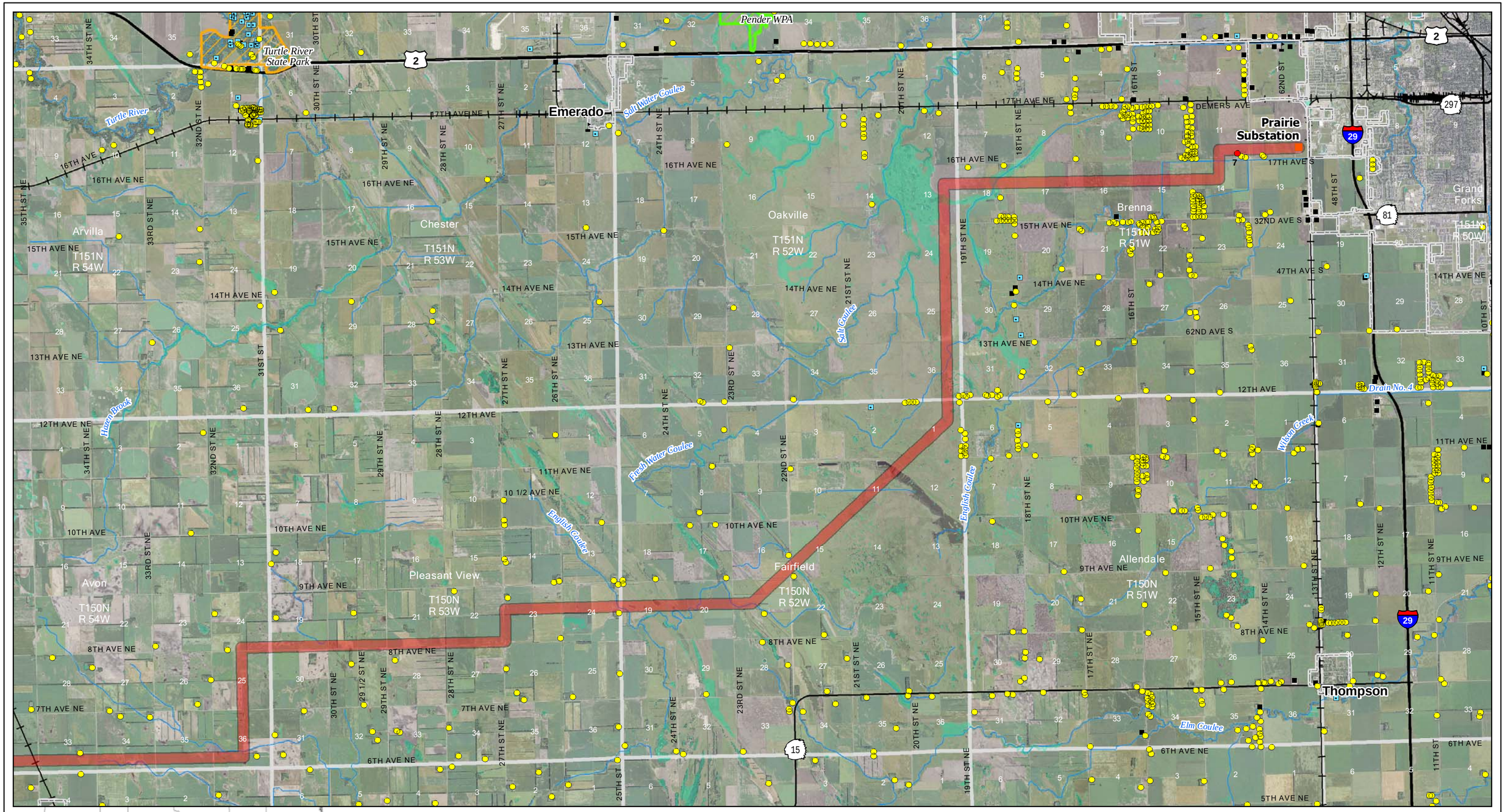

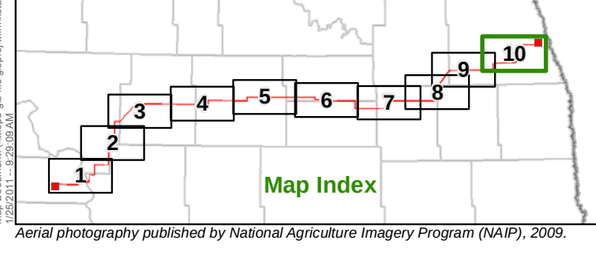

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Figure 3: Page 10 of 10
Corridor Exclusion and Avoidance Areas
Center to Grand Forks Project
Minnkota Power Cooperative, Inc.

0 1 2 Miles
Scale 1:100,000

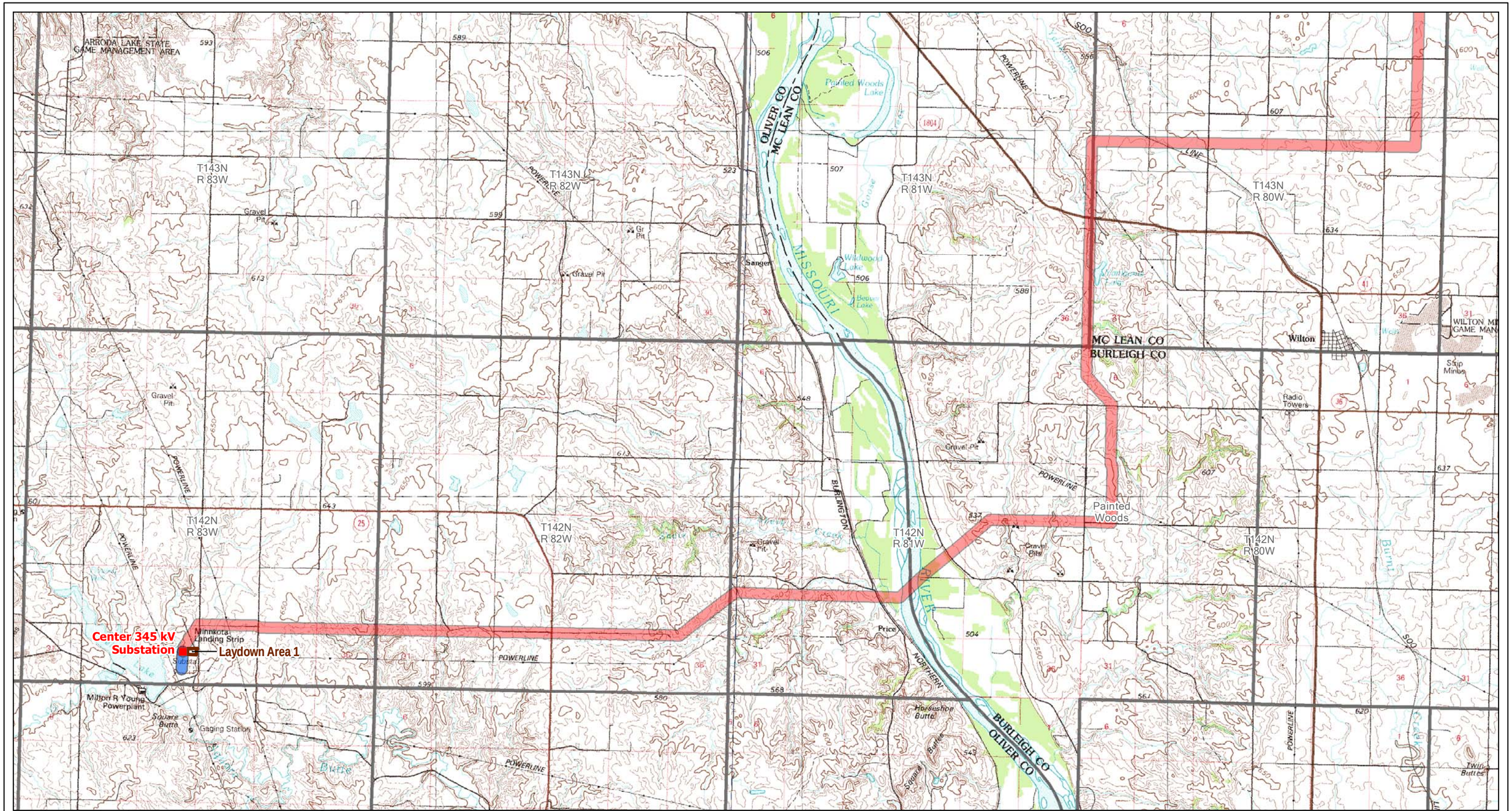

Figure 4: Page 1 of 10
USGS 1:100,000 Topographic Map
Center to Grand Forks Project
Minnkota Power Cooperative, Inc.

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Laydown Area 2

T145N R 81W

T145N R 80W

T145N R 79W

Edgemont

T145N R 78W

Johns Lake

T145N R 77W

BURLEIGH CO

MC LEAN CO

T144N R 81W

T144N R 80W

Wilson

T144N R 79W

Steiber

T144N R 78W

LOST LAKE NATIONAL WILDLIFE REFUGE

Merida

POWERLINE

Gravel Pit

Gaging Station

Map Index

1 2 3 4 5 6 7 8 9 10

Project Corridor

230 kV Tie Line Corridor

Project Substation

Laydown Area

Figure 4: Page 2 of 10
USGS 1:100,000 Topographic Map
Center to Grand Forks Project
Minnkota Power Cooperative, Inc.

0 1 2 Miles

Scale 1:100,000

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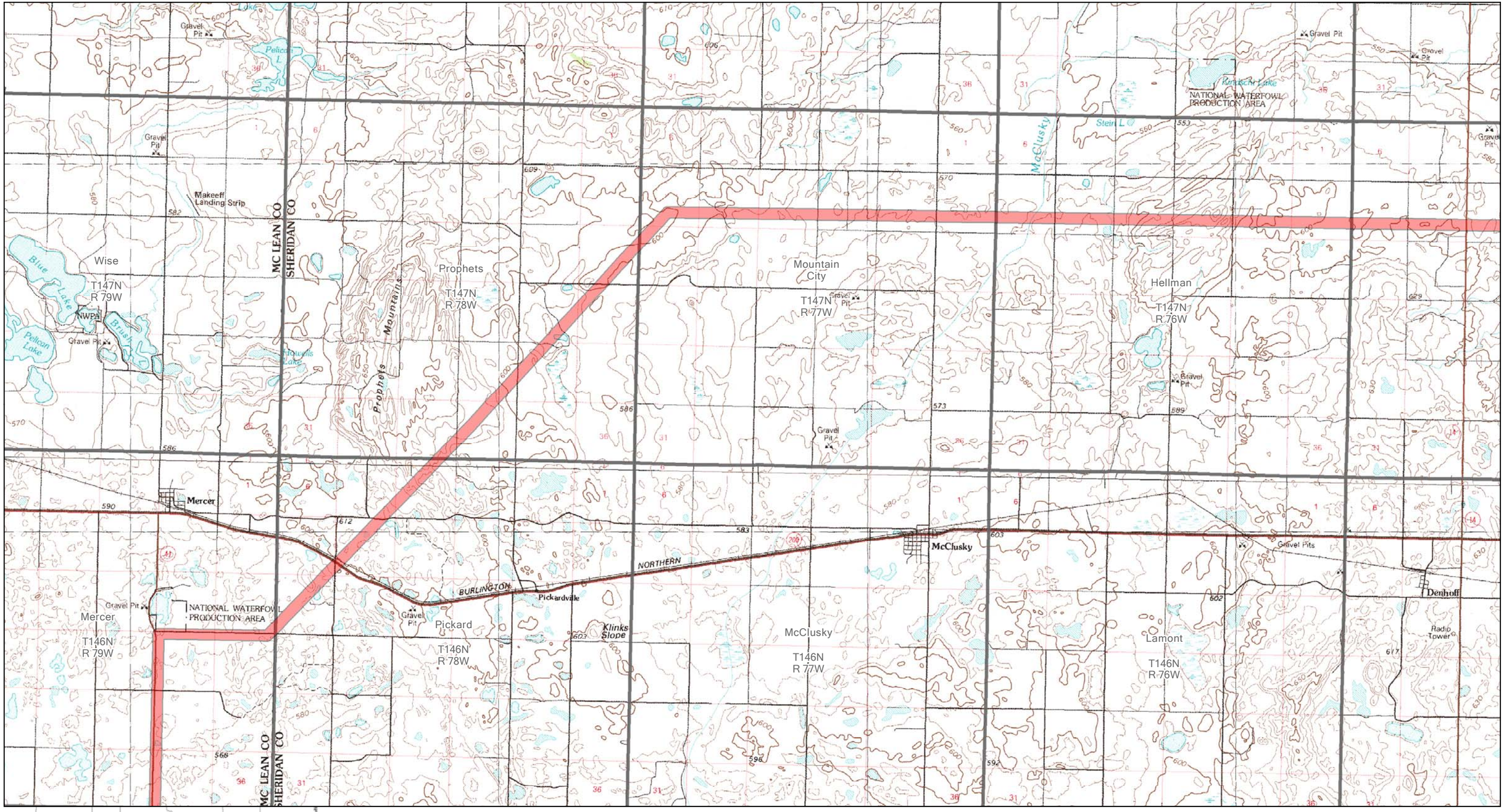

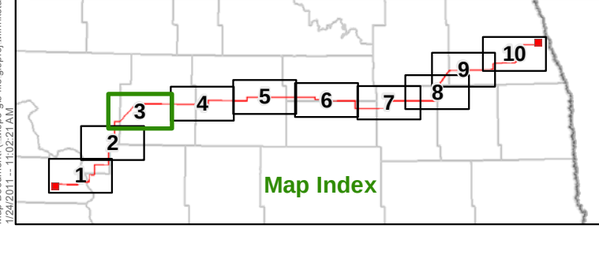

Project Corridor
230 kV Tie Line Corridor
Project Substation
Laydown Area

Figure 4: Page 3 of 10
USGS 1:100,000 Topographic Map
Center to Grand Forks Project
Minnkota Power Cooperative, Inc.

0 1 2 Miles
Scale 1:100,000

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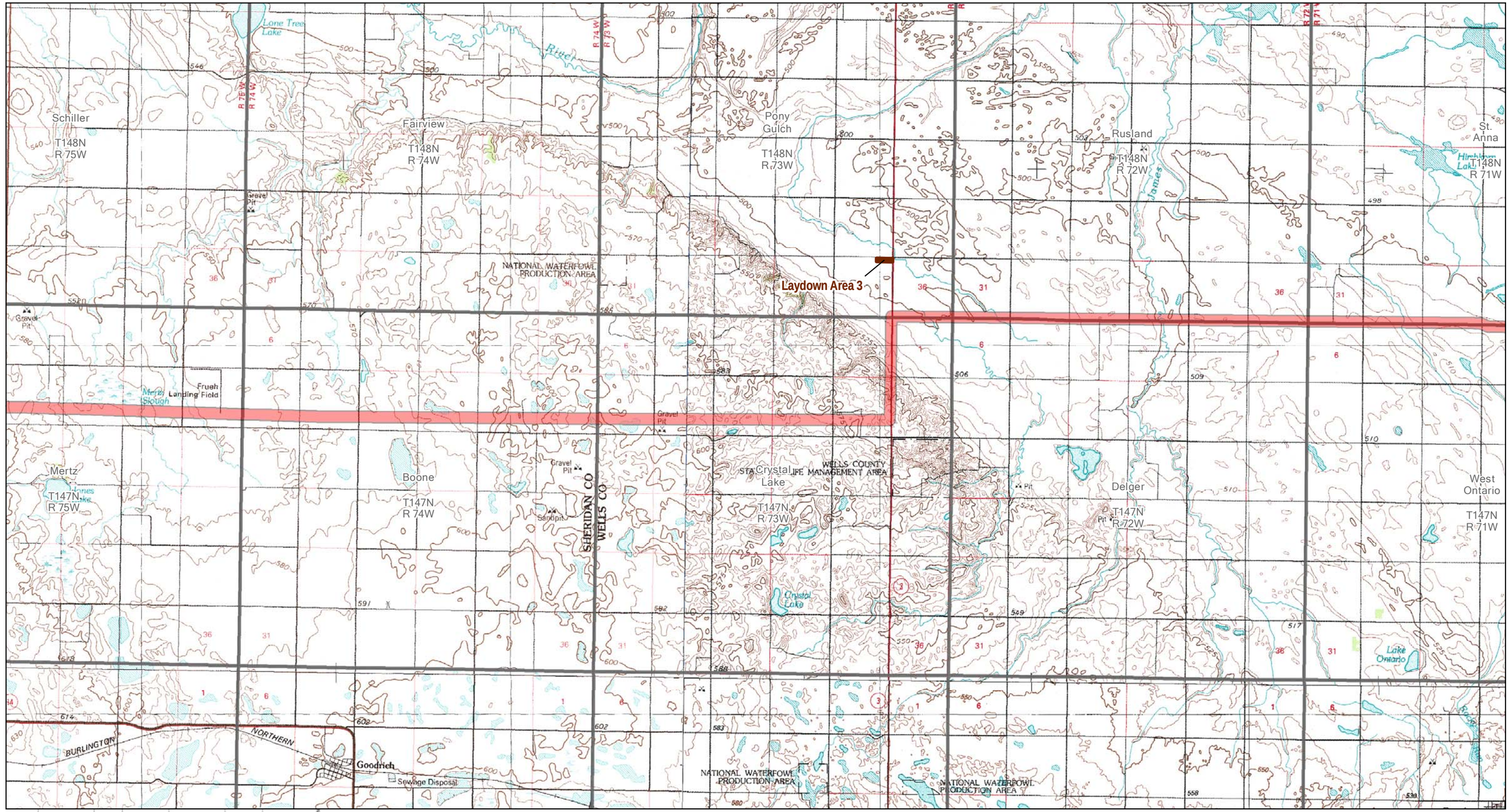

Figure 4: Page 4 of 10
USGS 1:100,000 Topographic Map
Center to Grand Forks Project
Minnkota Power Cooperative, Inc.

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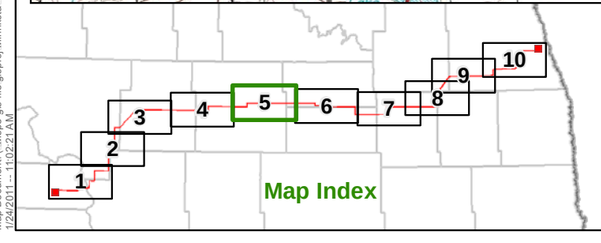
Fessenden
St. Anna
Oshkosh
Germantown
Fairville
Rosefield
Emrick
South Cottonwood
Cathay
Woodward
Birtsell
Gravel Pit
Sew Disp
Pit
Rosefield Slough
PIPELINE
BURLINGTON
WELLS CO
FOSTER CO
James River
Sou Run
Rocky
Duck L
Cottonwood Lake
Scotts
T148N R 71W
T148N R 70W
T148N R 69W
T148N R 68W
T148N R 67W
T147N R 71W
T147N R 70W
T147N R 69W
T147N R 68W
T147N R 67W



Project Corridor
230 kV Tie Line Corridor
Project Substation
Laydown Area

Figure 4: Page 5 of 10
USGS 1:100,000 Topographic Map
Center to Grand Forks Project
Minnkota Power Cooperative, Inc.

0 1 2 Miles
Scale 1:100,000

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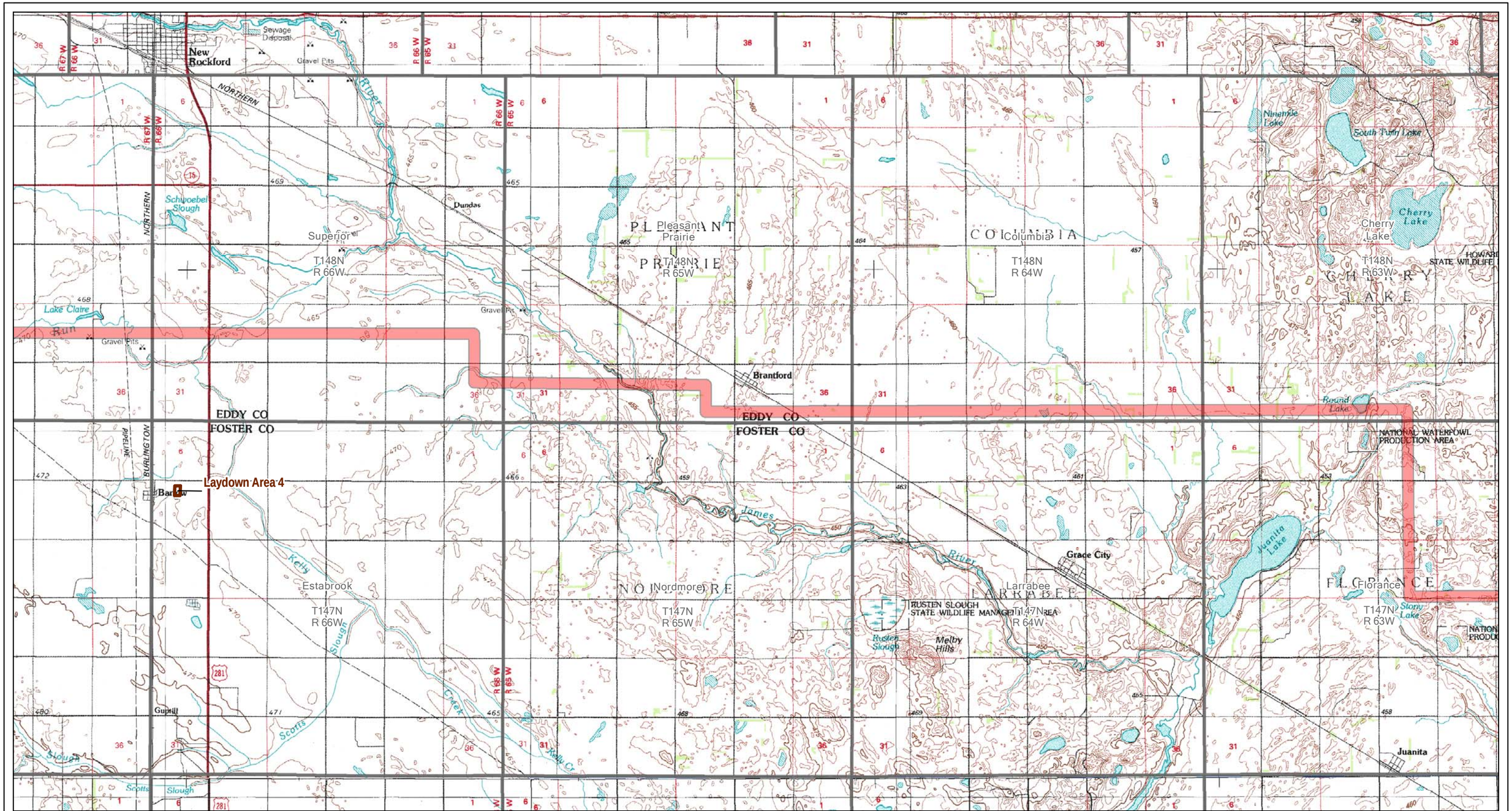

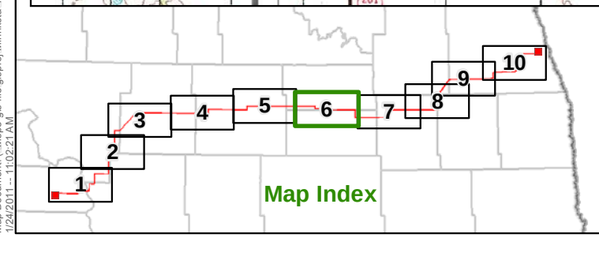

Project Corridor
230 kV Tie Line Corridor
Project Substation
Laydown Area

Figure 4: Page 6 of 10
USGS 1:100,000 Topographic Map
Center to Grand Forks Project
Minnkota Power Cooperative, Inc.

0 1 2 Miles
Scale 1:100,000

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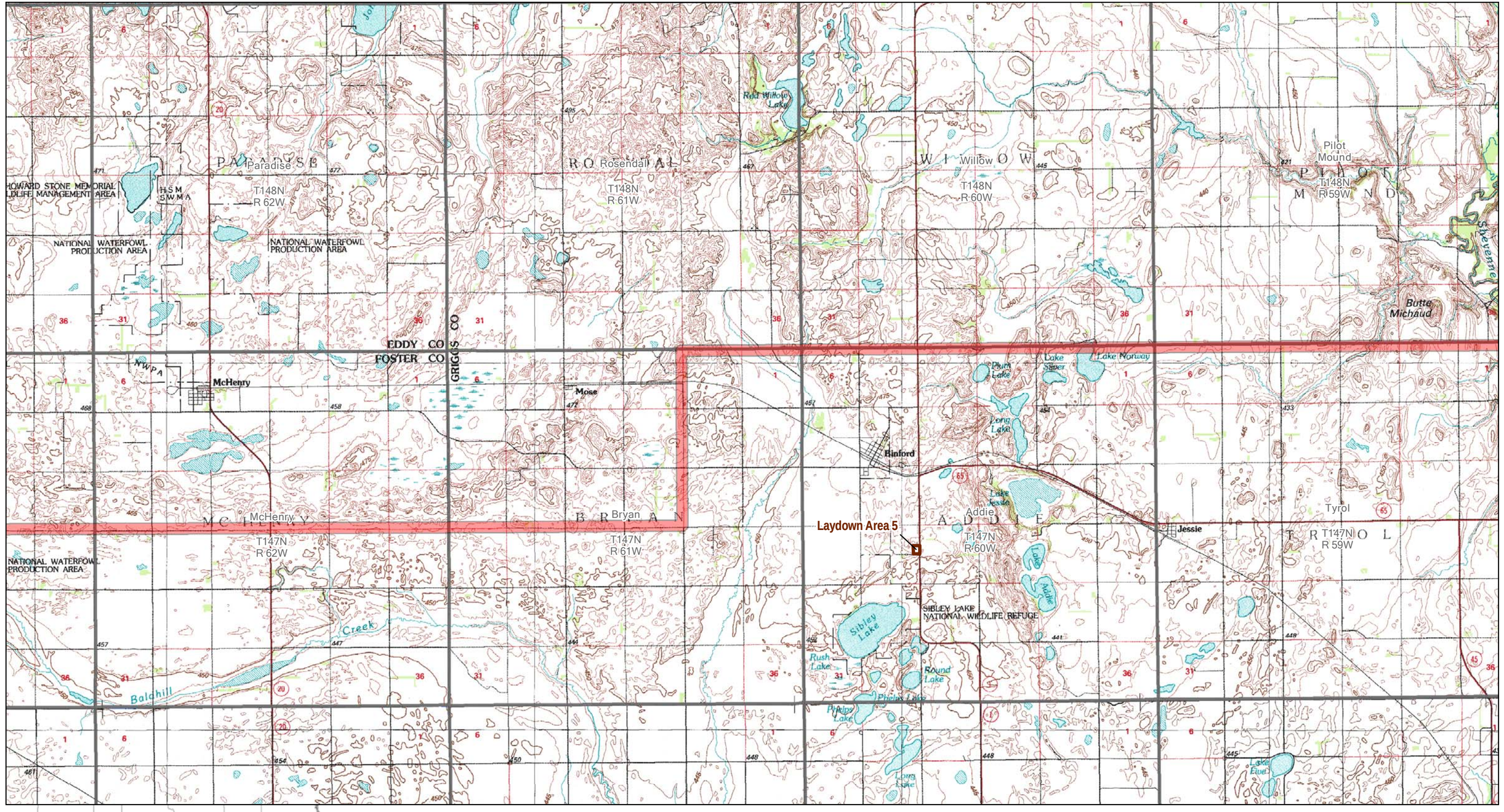

Figure 4: Page 7 of 10
USGS 1:100,000 Topographic Map
Center to Grand Forks Project
Minnkota Power Cooperative, Inc.

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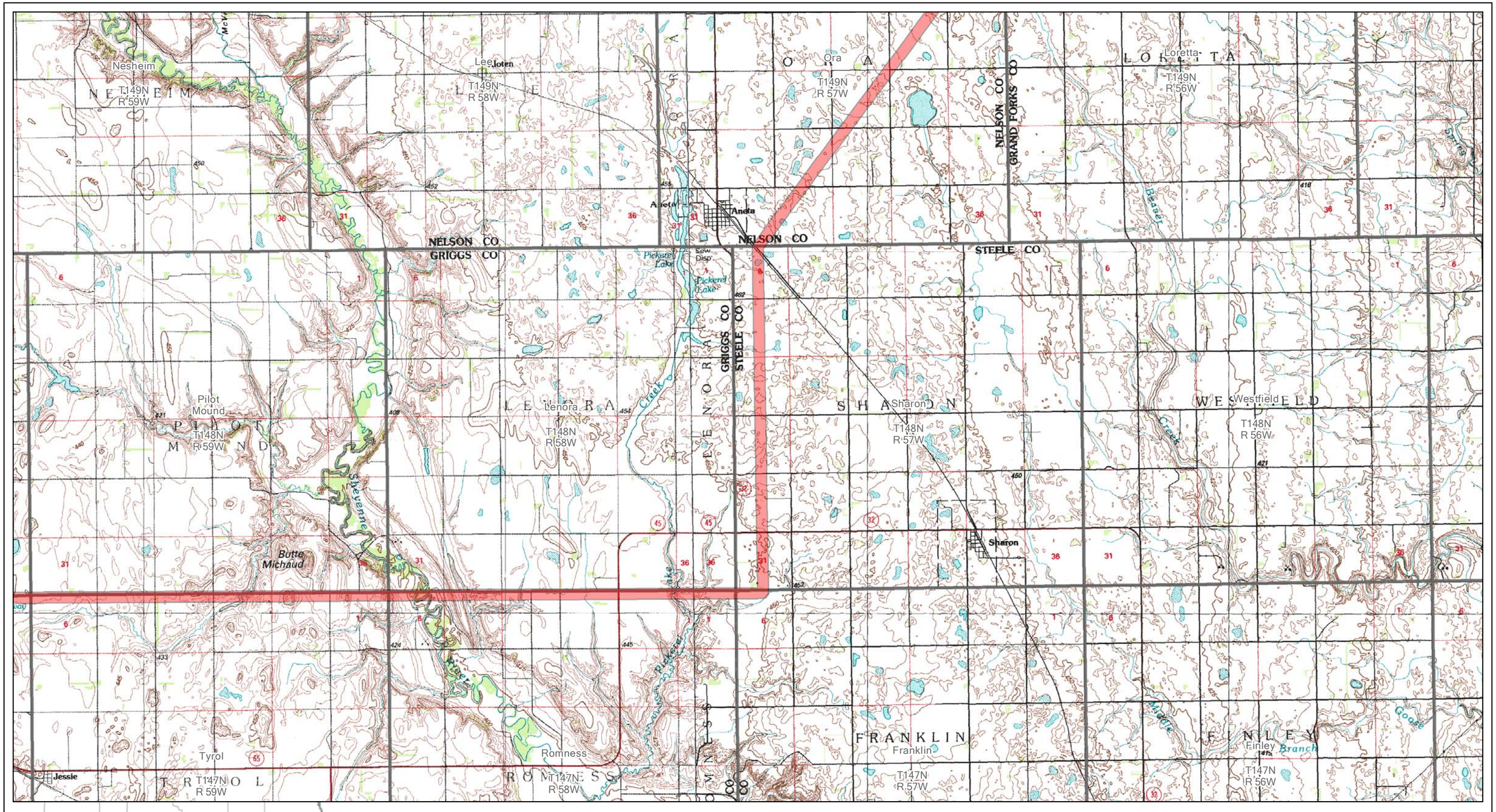

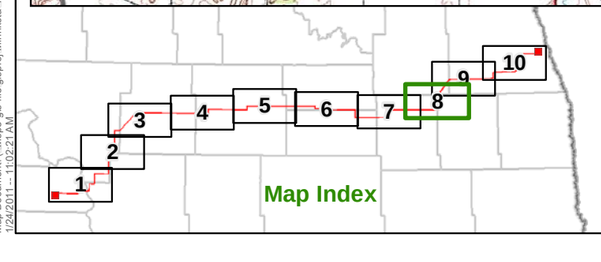

Project Corridor
230 kV Tie Line Corridor
Project Substation
Laydown Area

Figure 4: Page 8 of 10
USGS 1:100,000 Topographic Map
Center to Grand Forks Project
Minnkota Power Cooperative, Inc.

0 1 2 Miles
Scale 1:100,000

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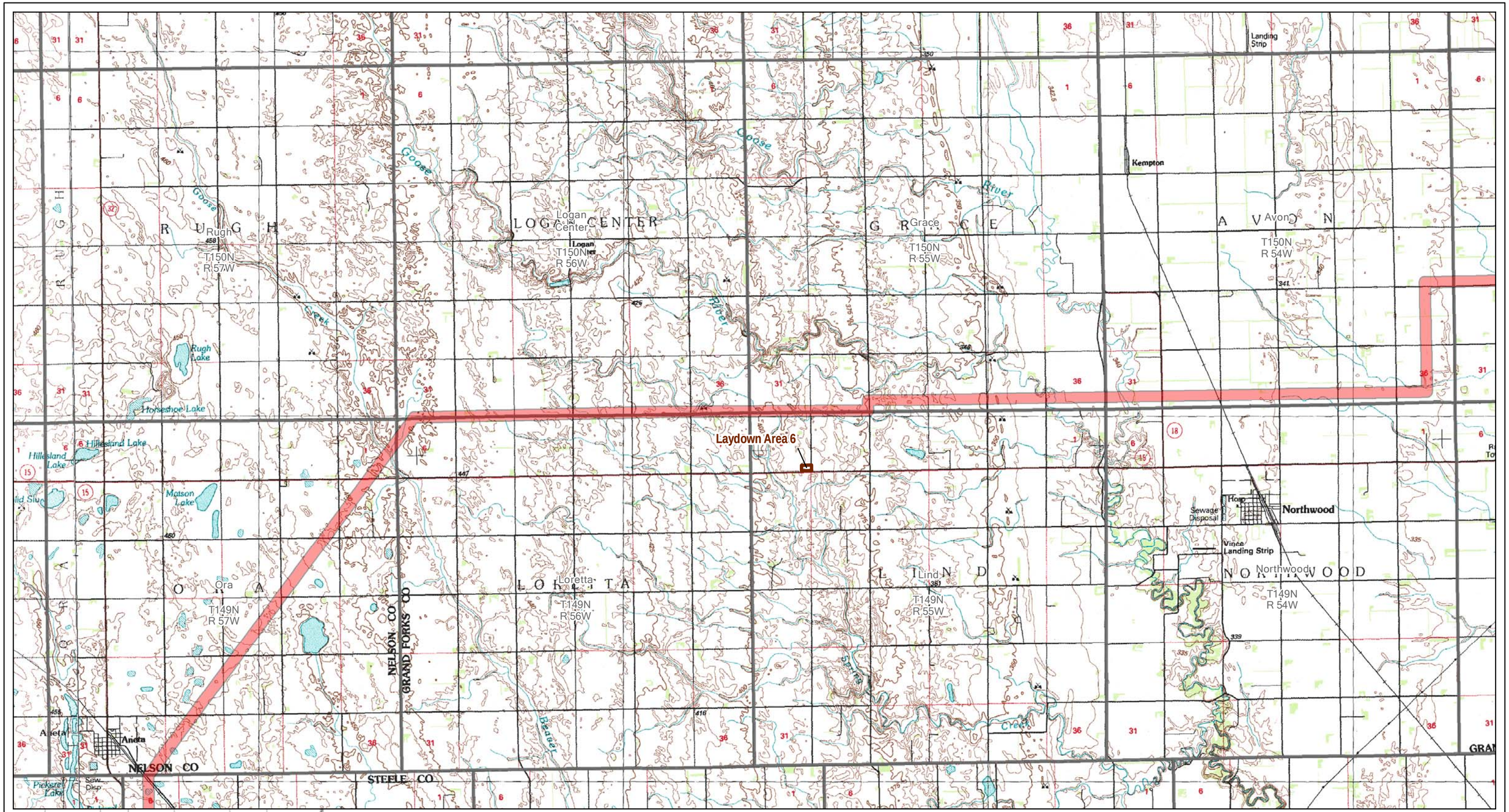

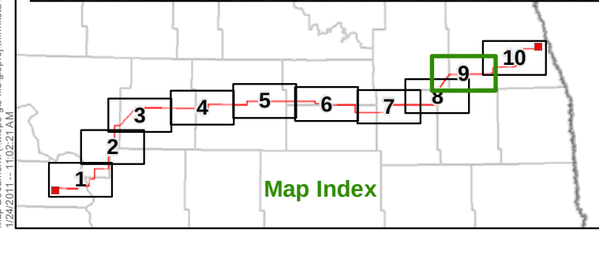

Project Corridor
230 kV Tie Line Corridor
Project Substation
Laydown Area

Figure 4: Page 9 of 10
USGS 1:100,000 Topographic Map
Center to Grand Forks Project
Minnkota Power Cooperative, Inc.

0 1 2 Miles
Scale 1:100,000

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Prairie Substation

ARVILLA
Arvilla
T151N R 54W

CHESTER
Chester
T151N R 53W

OAKVILLE
Oakville
T151N R 52W

BRENNA
Brenna
T151N R 51W

GRAND FORKS
T151N R 50W

PLEASANT VIEW
Pleasant View
T150N R 53W

FAIRFIELD
Fairfield
T150N R 52W

ALLENDALE
Allendale
T150N R 51W

AVON
Avon
T150N R 54W

Project Corridor
230 kV Tie Line Corridor
Project Substation
Laydown Area

Map Index

Figure 4: Page 10 of 10
USGS 1:100,000 Topographic Map
Center to Grand Forks Project
Minnkota Power Cooperative, Inc.

0 1 2 Miles
Scale 1:100,000

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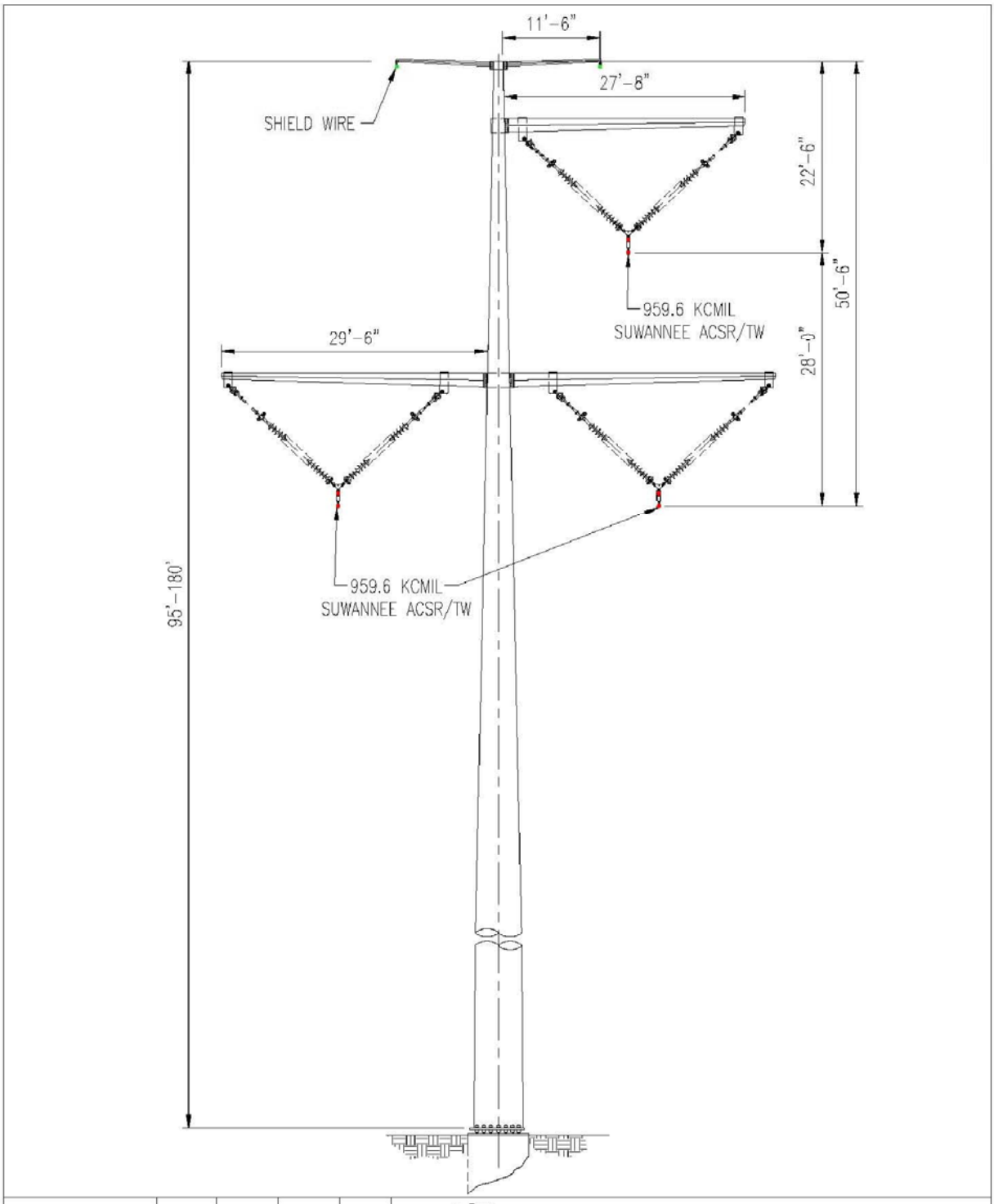

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CADD A1-R4 © STANLEY CONSULTANTS

REVISIONS	DSGN	CHKD	APVD	DATE

Stanley Consultants INC.

8000 South Chester Street, Suite 500
Centennial, Colorado 80112
www.stanleyconsultants.com

DESIGNED T. STREICH
DRAWN B. CAMPBELL
CHECKED
APPROVED
APPROVED
DATE

MINNKOTA POWER COOPERATIVE, INC.
GRAND FORKS, N.D.

CGF TRANSMISSION LINE
345kV, SINGLE CIRCUIT,
TANGENT (PRELIMINARY)

SCALE: NTS

NO. 21906 TAN2_A

REV. A

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Figure 5
345 kV Structure
Center to Grand Forks Project
Minnkota Power Cooperative, Inc.

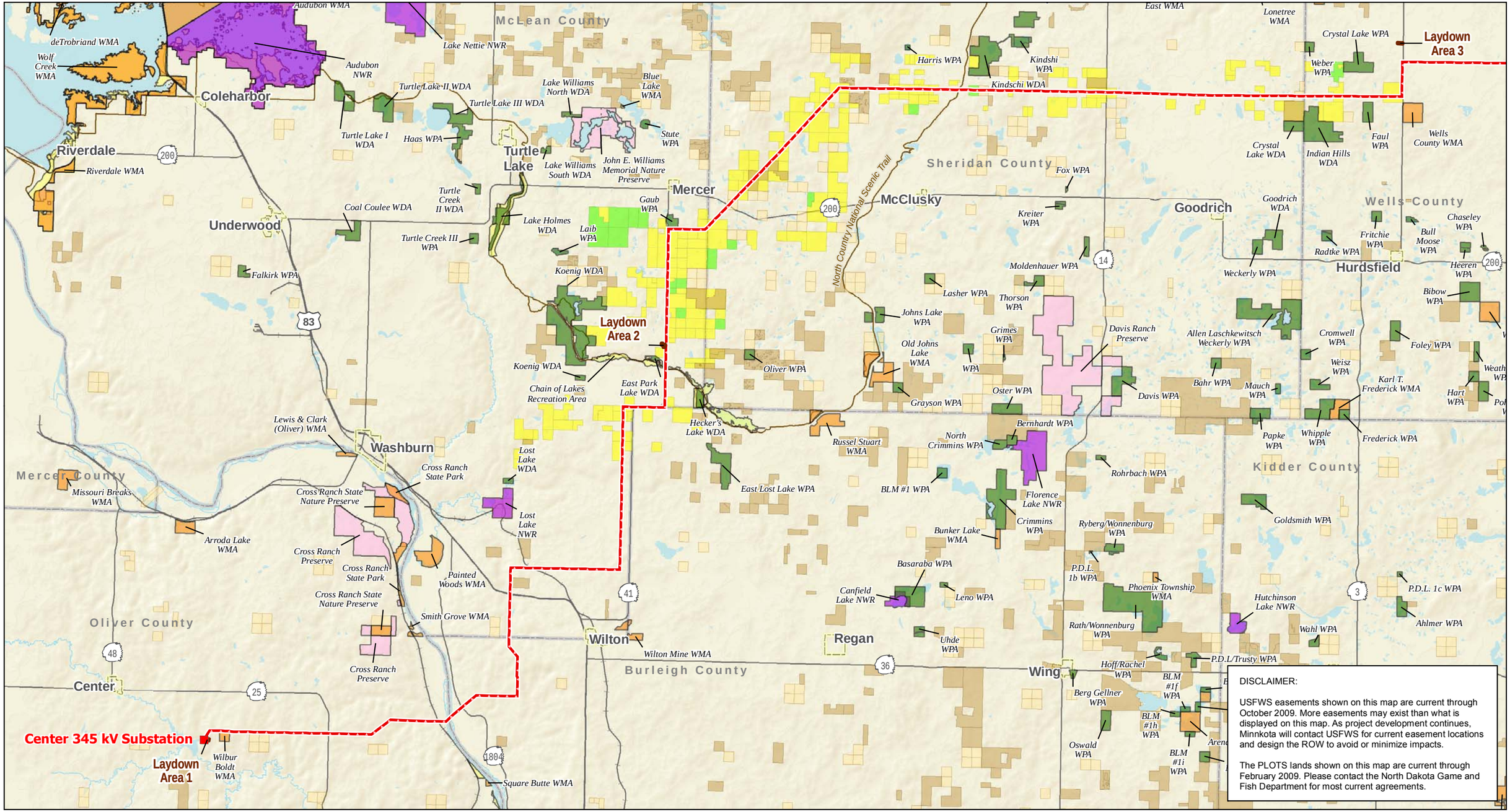

Figure 6: Page 1 of 4
Managed Resource Lands
Center to Grand Forks Project
Minnkota Power Cooperative, Inc.

Data Sources: NCTA, NDGF, TNC, USACE, USFWS.

Map Document: (.\Maps-gis-file gisproj Minnkota 110900 map docs PSC CorridorApp CGFCCC 06 11x17L 4pg ResourceLands.mxd)
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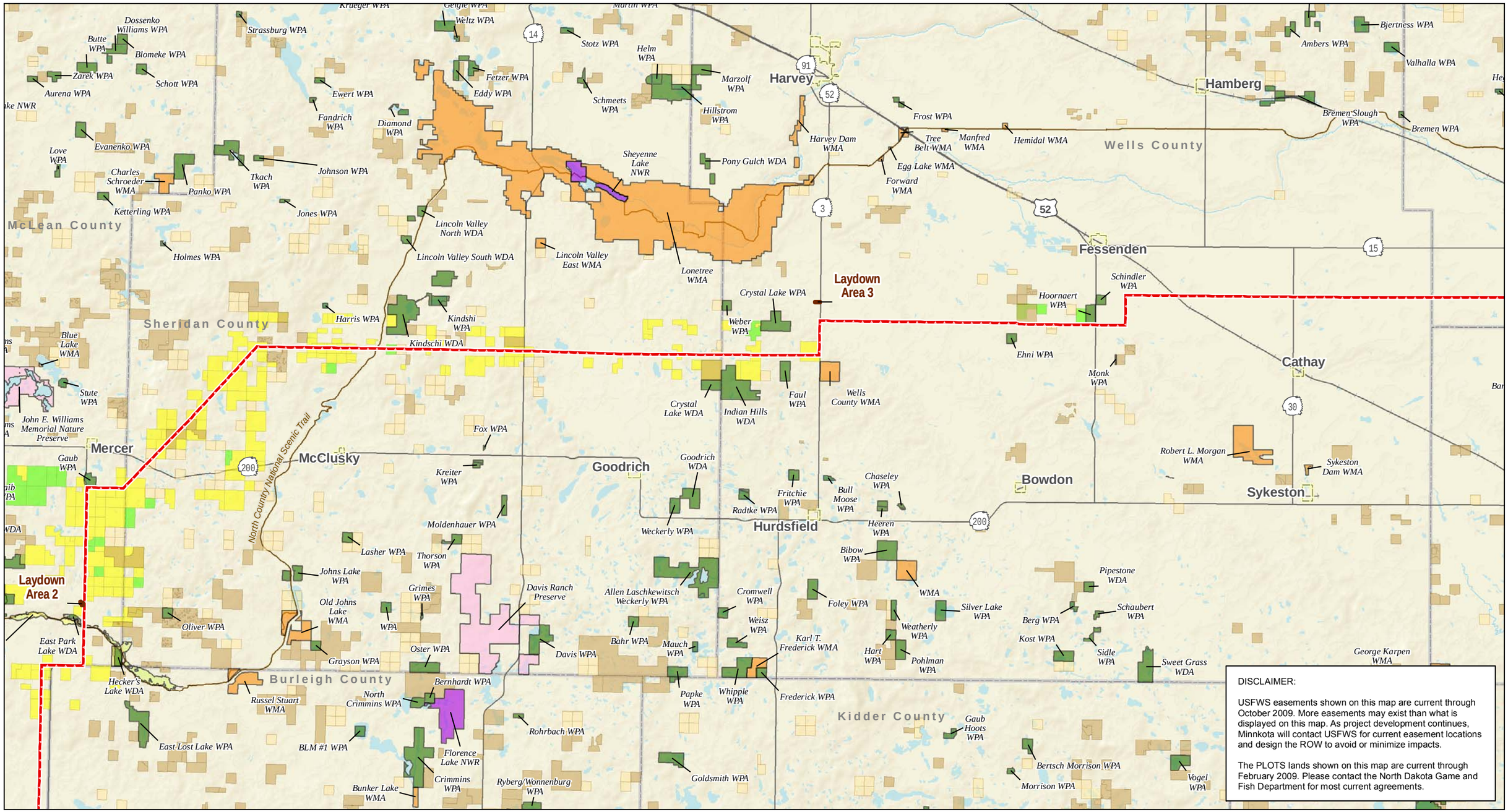

DISCLAIMER:

USFWS easements shown on this map are current through October 2009. More easements may exist than what is displayed on this map. As project development continues, Minnkota will contact USFWS for current easement locations and design the ROW to avoid or minimize impacts.

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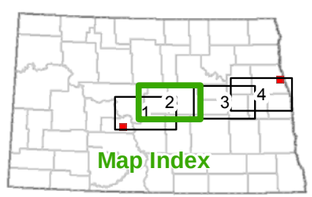

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- Project Substation
- Laydown Area
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- USFWS National Wildlife Refuge
- USFWS Waterfowl Production Area or Wildlife Development Area
- State Park, Recreation Area or Wildlife Management Area
- Bureau of Reclamation or Army Corps of Engineers Land
- The Nature Conservancy Preserve
- State Surface Tract
- PLOTS Land
- USFWS Wetland Eastment
- USFWS Grassland Easement

Figure 6: Page 2 of 4
Managed Resource Lands
Center to Grand Forks Project
Minnkota Power Cooperative, Inc.

0 2 4 Miles
Scale 1:300,000

Data Sources: NCTA, NDGF, TNC, USACE, USFWS.

Map Document: (Maps gis-file gisproj Minnkota 110900 map .docx PSC CorridorApp CGFCCC .06 .11x17L .4pg ResourceLands.mxd)
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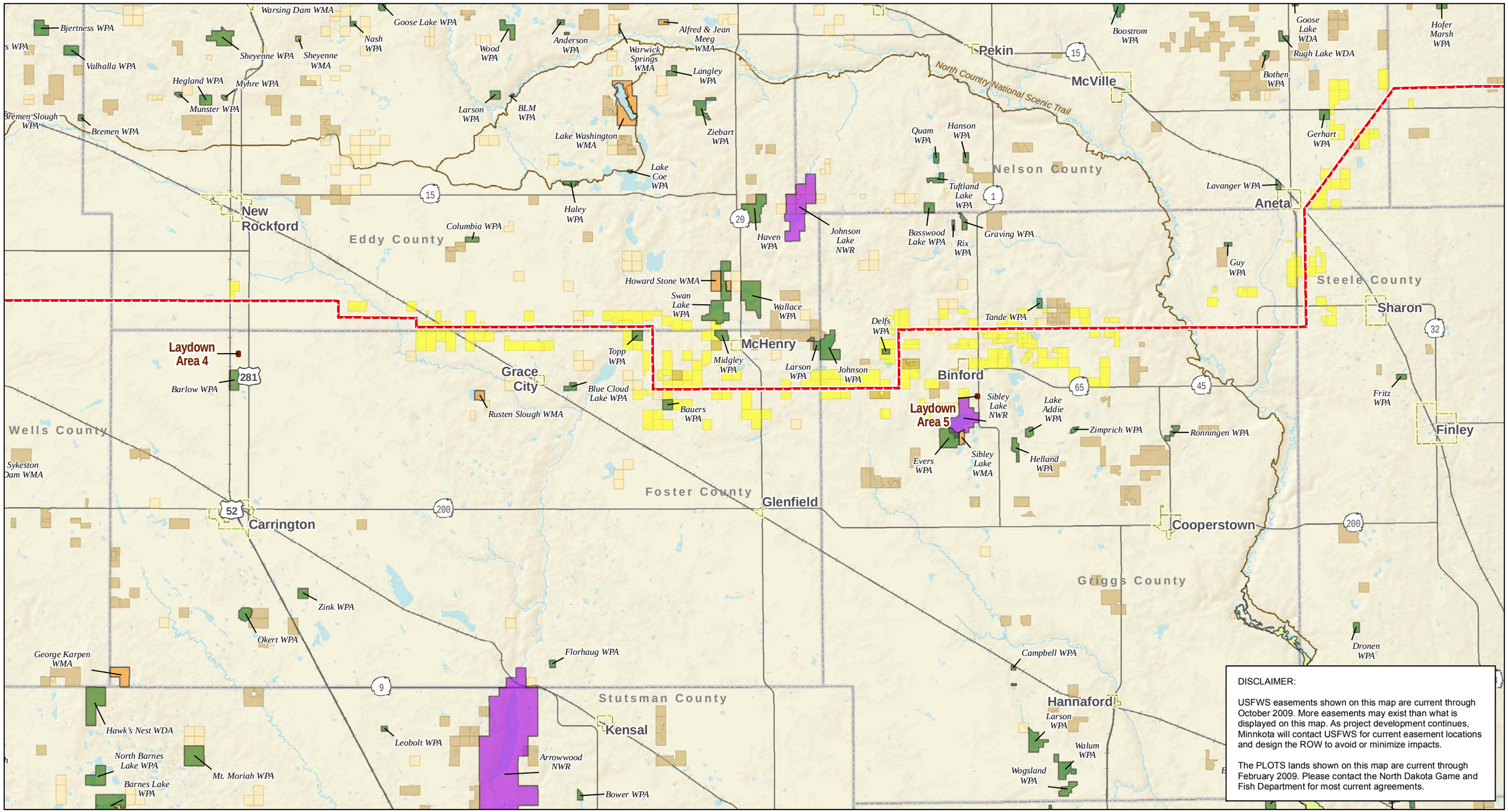

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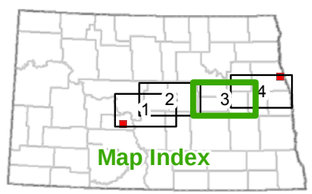

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Figure 6: Page 3 of 4
Managed Resource Lands
Center to Grand Forks Project
Minnkota Power Cooperative, Inc.

0 2 4 Miles
Scale 1:300,000

Data Sources: NCTA, NDGF, TNC, USACE, USFWS.

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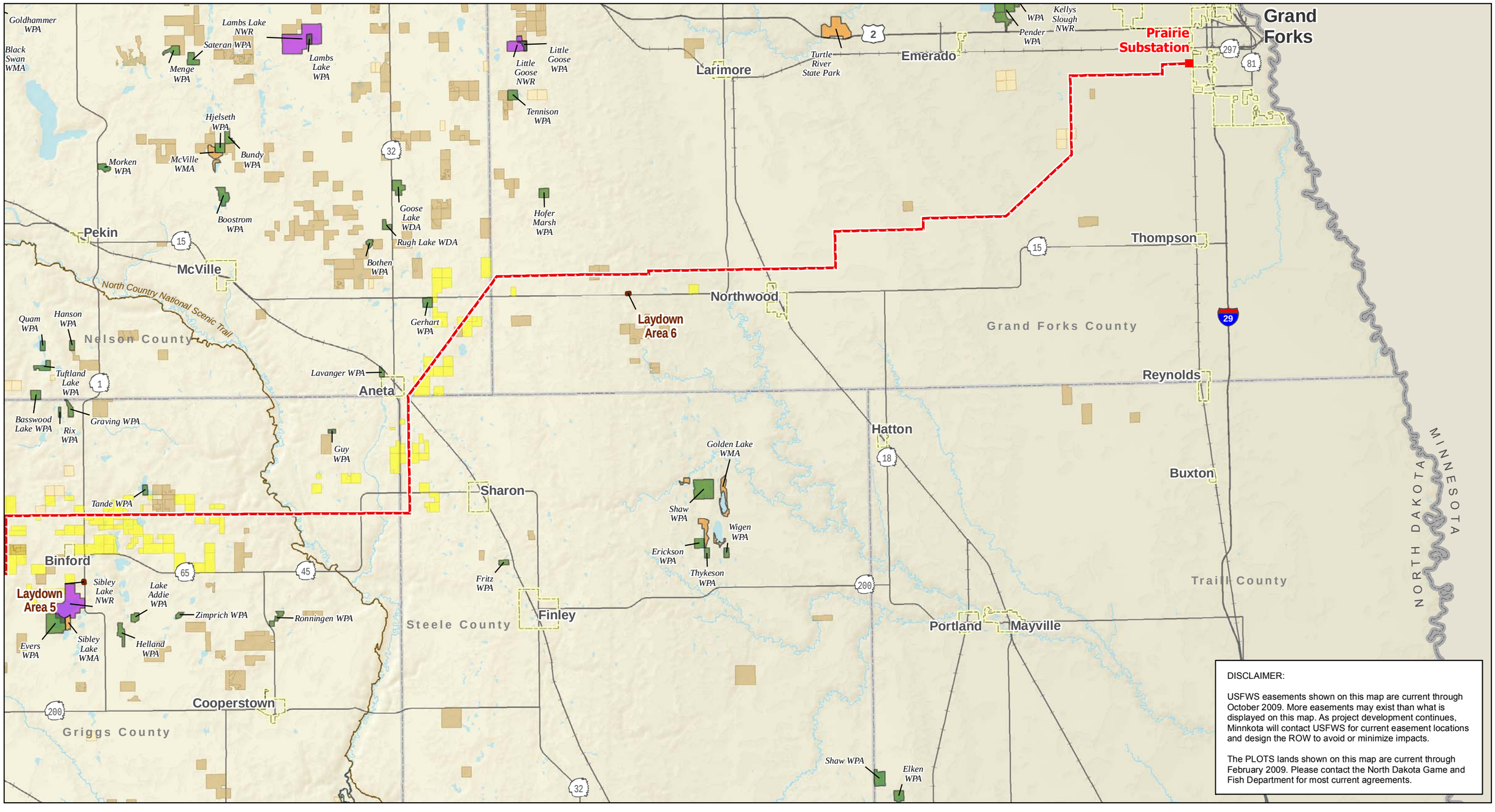

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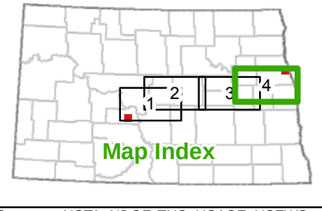

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Figure 6: Page 4 of 4
Managed Resource Lands
Center to Grand Forks Project
Minnkota Power Cooperative, Inc.

0 2 4 Miles
Scale 1:300,000

Data Sources: NCTA, NDGF, TNC, USACE, USFWS.

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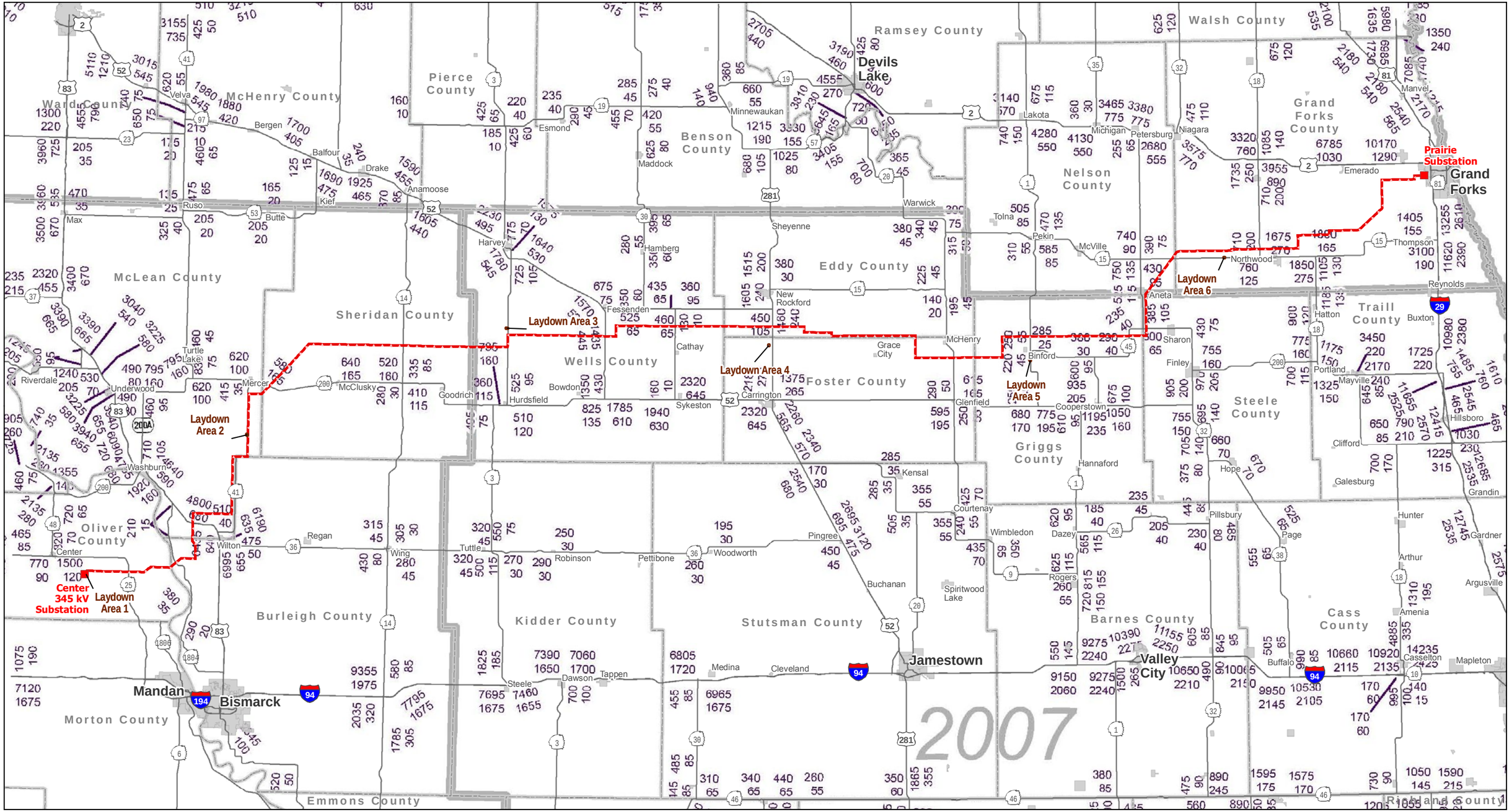

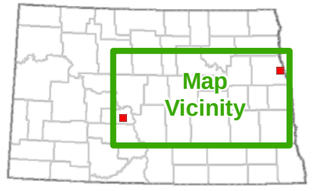

Project Corridor

Project Substation

Laydown Area

AADT (Average Annual Daily Traffic) - 2500

COMMERCIAL TRUCK TRAFFIC - 150

THE TRAFFIC FIGURES ARE THE TOTAL AT THE CLOSEST HIGHWAY INTERSECTION OR TOWN.

TRAFFIC COUNT CYCLES

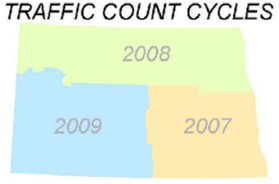

Figure 7
Average Annual Daily Traffic
Center to Grand Forks Project
Minnkota Power Cooperative, Inc.

0 5 10 Miles

Scale 1:850,000

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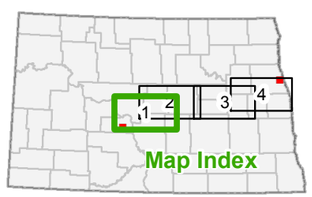
Base Map Source: NDDOT, 2009.

Coleharbor
Riverdale
Turtle Lake
Mercer
McClusky
Goodrich
Hurdsfield
Laydown Area 3
McLean County
Underwood
Sheridan County
Wells County
83
200
Laydown Area 2
14
3
Washburn
Mercer County
48
41
Burleigh County
Kidder County
Oliver County
Wilton
Regan
36
Wing
Tuttle
Center
25
1804
Center 345 kV Substation
Laydown Area 1



Project Corridor
Project Substation
Laydown Area

SSURGO Prime Farmland
Prime Farmland
Prime Farmland if Drained
Farmland of Statewide Importance
Not Prime Farmland

Figure 8: Page 1 of 4
Prime Farmland and Soil Distribution (SSURGO)
Center to Grand Forks Project
Minnkota Power Cooperative, Inc.

N
0 2 4 Miles
Scale 1:300,000

Map Document: (\\Mspe-gis-file\gispro)\Minnkota\110900\map_docs\PSC\CorridorApp\CGFCCC_08_11x17L_4pg_PrimeFarmland.mxd)
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McLean County

Sheridan County

Wells County

Burleigh County

Kidder County

Stutsman County

Harvey

Hamberg

Fessenden

Cathay

Sykeston

Bowdon

Hurdsfield

Goodrich

McClusky

Mercer

Laydown Area 3

Laydown Area 2

52

14

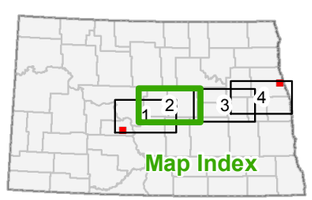
3

15

30

200

41



Project Corridor

Project Substation

Laydown Area

SSURGO Prime Farmland

Prime Farmland

Prime Farmland if Drained

Farmland of Statewide Importance

Not Prime Farmland

Figure 8: Page 2 of 4
Prime Farmland and Soil Distribution (SSURGO)
Center to Grand Forks Project
Minnkota Power Cooperative, Inc.

N

0 2 4 Miles

Scale 1:300,000

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Pekin
McVille
Nelson County
Eddy County
New Rockford
15
1
Aneta
Sharon
32
Wells County
Laydown Area 4
281
McHenry
20
Grace City
Binford
65
45
Laydown Area 5
Finley
Foster County
Griggs County
52
Carrington
200
Glenfield
Cooperstown
Steele County
9
Kensal
Hannaford
38
Stutsman County
Luverne

Map Index
1
2
3
4

Project Corridor
Project Substation
Laydown Area

SSURGO Prime Farmland
Prime Farmland
Prime Farmland if Drained
Farmland of Statewide Importance
Not Prime Farmland

Figure 8: Page 3 of 4
Prime Farmland and Soil Distribution (SSURGO)
Center to Grand Forks Project
Minnkota Power Cooperative, Inc.

0 2 4 Miles
Scale 1:300,000

Map Document: (\\Mspe-gis-file\gispro\Minnkota\110900\mxd\PSC\CorridorApp\CGFCCC_08_11x17L_4pg_PrimeFarmland.mxd)
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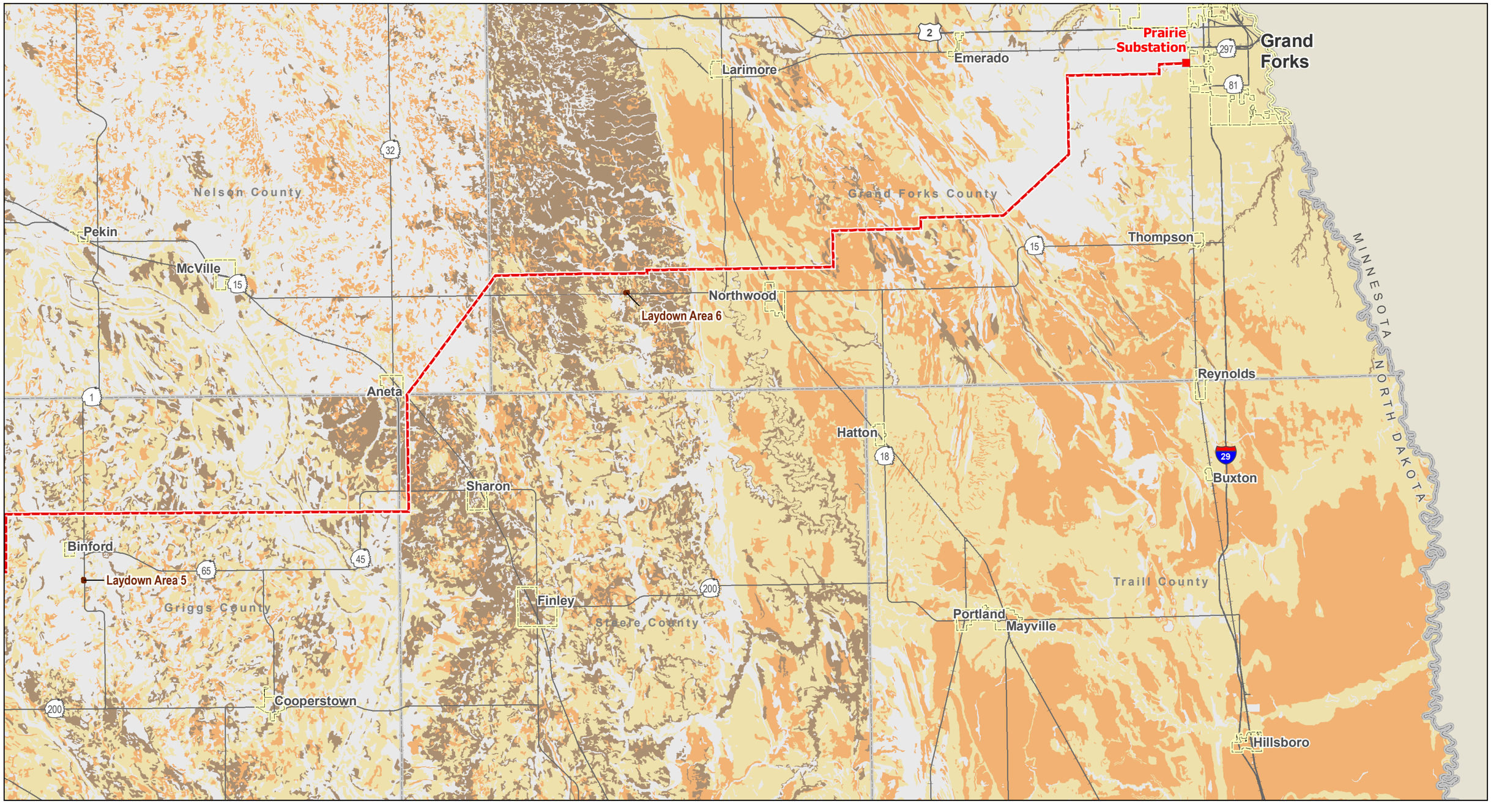

Figure 8: Page 4 of 4
Prime Farmland and Soil Distribution (SSURGO)
Center to Grand Forks Project
Minnkota Power Cooperative, Inc.

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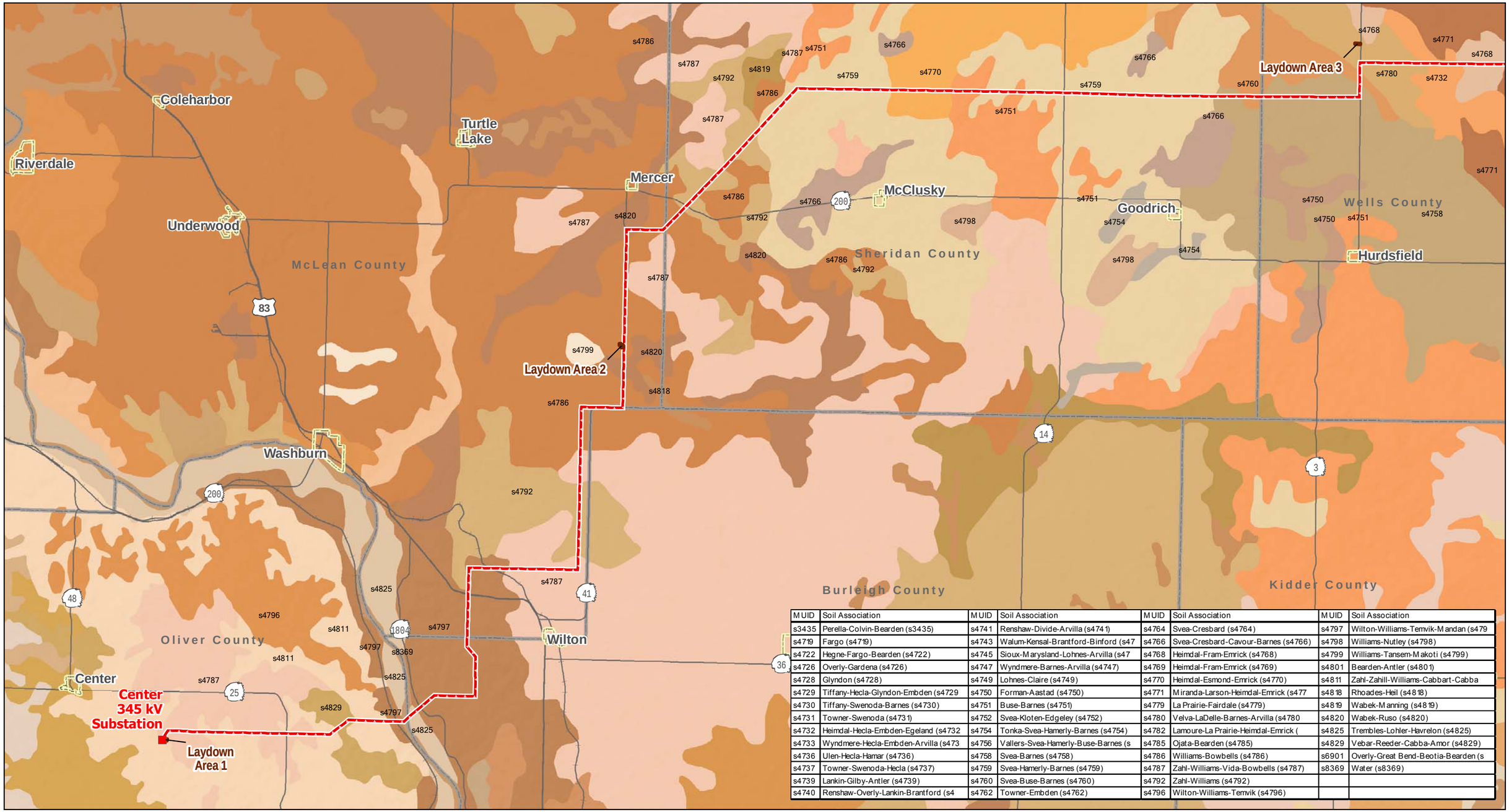

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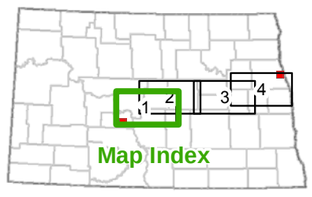
s4719	Fargo (s4719)	s4743	Walum-Kensal-Brantford-Binford (s47	s4766	Svea-Cresbard-Cavour-Barnes (s4766)	s4798	Williams-Nutley (s4798)
s4722	Hegne-Fargo-Bearden (s4722)	s4745	Sioux-Marysland-Lohnes-Arvilla (s47	s4768	Heimdal-Fram-Emrick (s4768)	s4799	Williams-Tansem-Makoti (s4799)
s4726	Overly-Gardena (s4726)	s4747	Wyndmere-Barnes-Arvilla (s4747)	s4769	Heimdal-Fram-Emrick (s4769)	s4801	Bearden-Antler (s4801)
s4728	Glyndon (s4728)	s4749	Lohnes-Claire (s4749)	s4770	Heimdal-Esmond-Emrick (s4770)	s4811	Zahl-Zahill-Williams-Cabbart-Cabba
s4729	Tiffany-Hecla-Glyndon-Embden (s4729	s4750	Forman-Aastad (s4750)	s4771	Miranda-Larson-Heimdal-Emrick (s477	s4818	Rhoades-Heil (s4818)
s4730	Tiffany-Swenoda-Barnes (s4730)	s4751	Buse-Barnes (s4751)	s4779	La Prairie-Fairdale (s4779)	s4819	Wabek-Manning (s4819)
s4731	Towner-Swenoda (s4731)	s4752	Svea-Kloten-Edgeley (s4752)	s4780	Velva-LaDelle-Barnes-Arvilla (s4780	s4820	Wabek-Ruso (s4820)
s4732	Heimdal-Hecla-Embden-Egeland (s4732	s4754	Tonka-Svea-Hamerly-Barnes (s4754)	s4782	Lamoure-La Prairie-Heimdal-Emrick (	s4825	Trembles-Lohler-Havrelon (s4825)
s4733	Wyndmere-Hecla-Embden-Arvilla (s473	s4756	Vallers-Svea-Hamerly-Buse-Barnes (s	s4785	Ojata-Bearden (s4785)	s4829	Vebar-Reeder-Cabba-Amor (s4829)
s4736	Ulen-Hecla-Hamar (s4736)	s4758	Svea-Barnes (s4758)	s4786	Williams-Bowbells (s4786)	s6901	Overly-Great Bend-Beotia-Bearden (s
s4737	Towner-Swenoda-Hecla (s4737)	s4759	Svea-Hamerly-Barnes (s4759)	s4787	Zahl-Williams-Vida-Bowbells (s4787)	s8369	Water (s8369)
s4739	Lankin-Gilby-Antler (s4739)	s4760	Svea-Buse-Barnes (s4760)	s4792	Zahl-Williams (s4792)		
s4740	Renshaw-Overly-Lankin-Brantford (s4	s4762	Towner-Embden (s4762)	s4796	Wilton-Williams-Temvik (s4796)		



Project Corridor
Project Substation
Laydown Area

Figure 9: Page 1 of 4
State Soils Association (STATSGO)
Center to Grand Forks Project
Minnkota Power Cooperative, Inc.

0 2 4 Miles
Scale 1:300,000

Map Document: (Maps-gis-file.gisproj Minnkota 110900 map docs PSC CorridorApp CGFCCC 09 11x17L 4pg STATSGO.mxd)
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McLean County

Sheridan County

Wells County

Burleigh County

Harvey

Hamberg

Fessenden

Cathay

Laydown Area 3

Laydown Area 2

Mercer

McClusky

Goodrich

Hurdsfield

Bowdon

Sykeston

MUID	Soil Association	MUID	Soil Association	MUID	Soil Association	MUID	Soil Association
s3435	Perella-Colvin-Bearden (s3435)	s4741	Renshaw-Divide-Arvilla (s4741)	s4764	Svea-Cresbard (s4764)	s4797	Wilton-Williams-Temvik-Mandan (s479
s4719	Fargo (s4719)	s4743	Walum-Kensal-Brantford-Binford (s47	s4766	Svea-Cresbard-Cavour-Barnes (s4766)	s4798	Williams-Nutley (s4798)
s4722	Hegne-Fargo-Bearden (s4722)	s4745	Sioux-Marysland-Lohnes-Arvilla (s47	s4768	Heimdal-Fram-Emrick (s4768)	s4799	Williams-Tansem-Makoti (s4799)
s4726	Overly-Gardena (s4726)	s4747	Wyndmere-Barnes-Arvilla (s4747)	s4769	Heimdal-Fram-Emrick (s4769)	s4801	Bearden-Antler (s4801)
s4728	Glyndon (s4728)	s4749	Lohnes-Claire (s4749)	s4770	Heimdal-Esmond-Emrick (s4770)	s4811	Zahl-Zahill-Williams-Cabbart-Cabba
s4729	Tiffany-Hecla-Glyndon-Embden (s4729	s4750	Forman-Aastad (s4750)	s4771	Miranda-Larson-Heimdal-Emrick (s477	s4818	Rhoades-Heil (s4818)
s4730	Tiffany-Swenoda-Barnes (s4730)	s4751	Buse-Barnes (s4751)	s4779	La Prairie-Fairdale (s4779)	s4819	Wabek-Manning (s4819)
s4731	Towner-Swenoda (s4731)	s4752	Svea-Kloten-Edgeley (s4752)	s4780	Velva-LaDelle-Barnes-Arvilla (s4780	s4820	Wabek-Ruso (s4820)
s4732	Heimdal-Hecla-Embden-Egeland (s4732	s4754	Tonka-Svea-Hamerly-Barnes (s4754)	s4782	Lamoure-La Prairie-Heimdal-Emrick (	s4825	Trembles-Lohler-Havrelon (s4825)
s4733	Wyndmere-Hecla-Embden-Arvilla (s473	s4756	Vallers-Svea-Hamerly-Buse-Barnes (s	s4785	Ojata-Bearden (s4785)	s4829	Vebar-Reeder-Cabba-Amor (s4829)
s4736	Ulen-Hecla-Hamar (s4736)	s4758	Svea-Barnes (s4758)	s4786	Williams-Bowbells (s4786)	s6901	Overly-Great Bend-Beotia-Bearden (s
s4737	Towner-Swenoda-Hecla (s4737)	s4759	Svea-Hamerly-Barnes (s4759)	s4787	Zahl-Williams-Vida-Bowbells (s4787)	s8369	Water (s8369)
s4739	Lankin-Gilby-Antler (s4739)	s4760	Svea-Buse-Barnes (s4760)	s4792	Zahl-Williams (s4792)		
s4740	Renshaw-Overly-Lankin-Brantford (s4	s4762	Towner-Embden (s4762)	s4796	Wilton-Williams-Temvik (s4796)		

Map Index

Project Corridor

Project Substation

Laydown Area

Figure 9: Page 2 of 4
State Soils Association (STATSGO)
Center to Grand Forks Project
Minnkota Power Cooperative, Inc.

0 2 4 Miles

Scale 1:300,000

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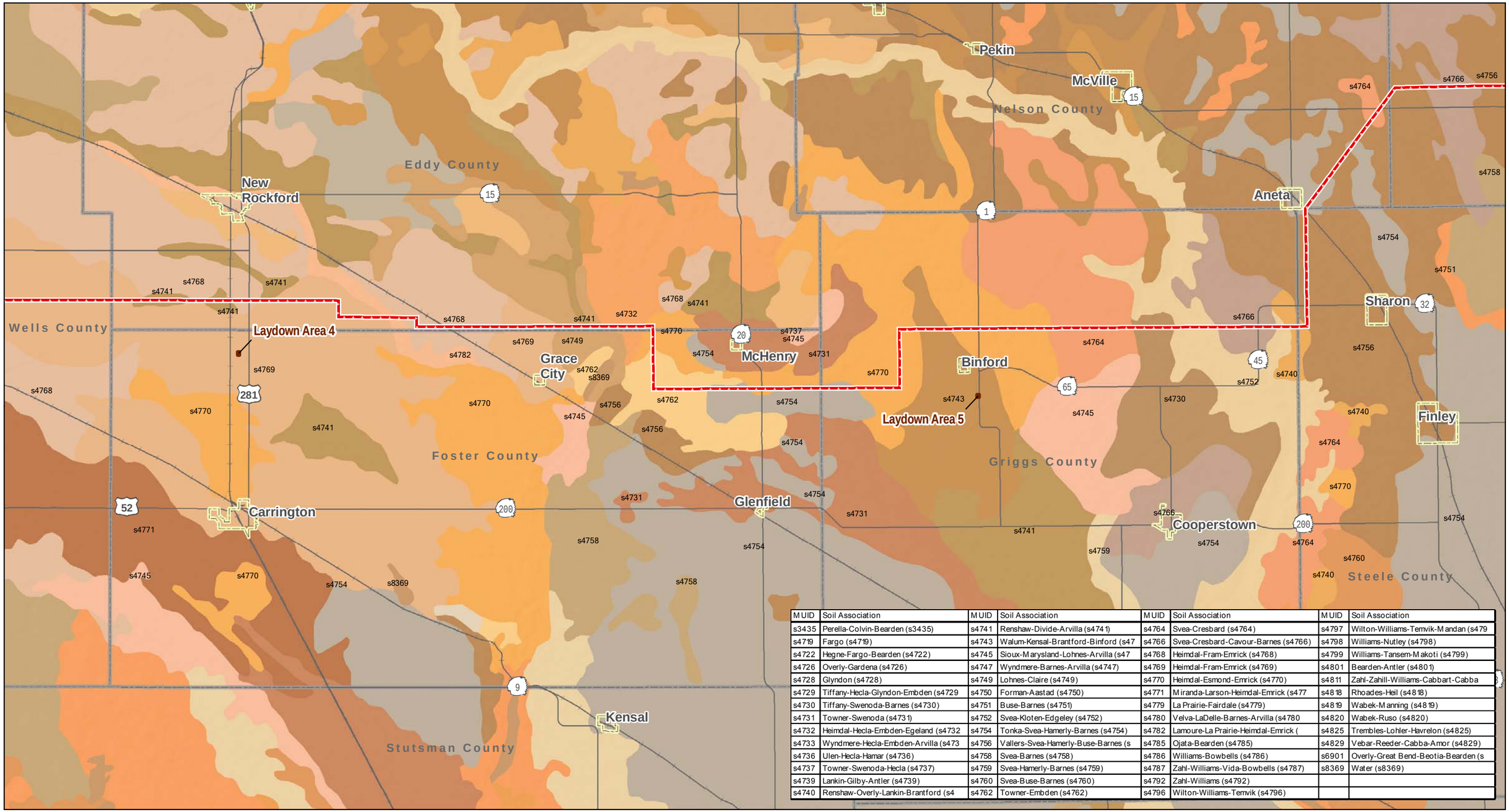

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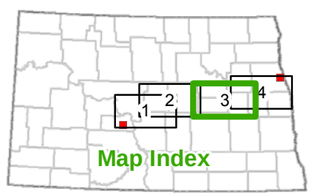
s4719	Fargo (s4719)	s4743	Walum-Kensal-Brantford-Binford (s47	s4766	Svea-Cresbard-Cavour-Barnes (s4766)	s4798	Williams-Nutley (s4798)
s4722	Hegne-Fargo-Bearden (s4722)	s4745	Sioux-Marysland-Lohnes-Arvilla (s47	s4768	Heimdal-Fram-Emrick (s4768)	s4799	Williams-Tansem-Makoti (s4799)
s4726	Overly-Gardena (s4726)	s4747	Wyndmere-Barnes-Arvilla (s4747)	s4769	Heimdal-Fram-Emrick (s4769)	s4801	Bearden-Antler (s4801)
s4728	Glyndon (s4728)	s4749	Lohnes-Claire (s4749)	s4770	Heimdal-Esmond-Emrick (s4770)	s4811	Zahl-Zahill-Williams-Cabbart-Cabba
s4729	Tiffany-Hecla-Glyndon-Embden (s4729	s4750	Forman-Aastad (s4750)	s4771	Miranda-Larson-Heimdal-Emrick (s477	s4818	Rhoades-Heil (s4818)
s4730	Tiffany-Swenoda-Barnes (s4730)	s4751	Buse-Barnes (s4751)	s4779	La Prairie-Fairdale (s4779)	s4819	Wabek-Manning (s4819)
s4731	Towner-Swenoda (s4731)	s4752	Svea-Kloten-Edgeley (s4752)	s4780	Velva-LaDelle-Barnes-Arvilla (s4780	s4820	Wabek-Ruso (s4820)
s4732	Heimdal-Hecla-Embden-Egeland (s4732	s4754	Tonka-Svea-Hamerly-Barnes (s4754)	s4782	Lamoure-La Prairie-Heimdal-Emrick (	s4825	Trembles-Lohler-Havrelon (s4825)
s4733	Wyndmere-Hecla-Embden-Arvilla (s473	s4756	Vallers-Svea-Hamerly-Buse-Barnes (s	s4785	Ojata-Bearden (s4785)	s4829	Vebar-Reeder-Cabba-Amor (s4829)
s4736	Ulen-Hecla-Hamar (s4736)	s4758	Svea-Barnes (s4758)	s4786	Williams-Bowbells (s4786)	s6901	Overly-Great Bend-Beotia-Bearden (s
s4737	Towner-Swenoda-Hecla (s4737)	s4759	Svea-Hamerly-Barnes (s4759)	s4787	Zahl-Williams-Vida-Bowbells (s4787)	s8369	Water (s8369)
s4739	Lankin-Gilby-Antler (s4739)	s4760	Svea-Buse-Barnes (s4760)	s4792	Zahl-Williams (s4792)		
s4740	Renshaw-Overly-Lankin-Brantford (s4	s4762	Towner-Embden (s4762)	s4796	Wilton-Williams-Temvik (s4796)		



Project Corridor
Project Substation
Laydown Area

Figure 9: Page 3 of 4
State Soils Association (STATSGO)
Center to Grand Forks Project
Minnkota Power Cooperative, Inc.

0 2 4 Miles
Scale 1:300,000

Prairie Substation
Grand Forks
Larimore
Emerado
Nelson County
Grand Forks County
Pekin
McVille
Thompson
Northwood
Laydown Area 6
Aneta
Reynolds
Hatton
Buxton
Sharon
Binford
Laydown Area 5
Griggs County
Finley
Steele County
Traill County
Cooperstown
MINNESOTA
NORTH DAKOTA

MUID	Soil Association	MUID	Soil Association	MUID	Soil Association	MUID	Soil Association
s3435	Perella-Colvin-Bearden (s3435)	s4741	Renshaw-Divide-Arvilla (s4741)	s4764	Svea-Cresbard (s4764)	s4797	Wilton-Williams-Temvik-Mandan (s479
s4719	Fargo (s4719)	s4743	Walum-Kensal-Brantford-Binford (s47	s4766	Svea-Cresbard-Cavour-Barnes (s4766)	s4798	Williams-Nutley (s4798)
s4722	Hegne-Fargo-Bearden (s4722)	s4745	Sioux-Marysland-Lohnes-Arvilla (s47	s4768	Heimdal-Fram-Emrick (s4768)	s4799	Williams-Tansem-Makoti (s4799)
s4726	Overly-Gardena (s4726)	s4747	Wyndmere-Barnes-Arvilla (s4747)	s4769	Heimdal-Fram-Emrick (s4769)	s4801	Bearden-Antler (s4801)
s4728	Glyndon (s4728)	s4749	Lohnes-Claire (s4749)	s4770	Heimdal-Esmond-Emrick (s4770)	s4811	Zahl-Zahill-Williams-Cabbart-Cabba
s4729	Tiffany-Hecla-Glyndon-Embden (s4729	s4750	Forman-Aastad (s4750)	s4771	Miranda-Larson-Heimdal-Emrick (s477	s4818	Rhoades-Heil (s4818)
s4730	Tiffany-Swenoda-Barnes (s4730)	s4751	Buse-Barnes (s4751)	s4779	La Prairie-Fairdale (s4779)	s4819	Wabek-Manning (s4819)
s4731	Towner-Swenoda (s4731)	s4752	Svea-Kloten-Edgeley (s4752)	s4780	Velva-LaDelle-Barnes-Arvilla (s4780	s4820	Wabek-Ruso (s4820)
s4732	Heimdal-Hecla-Embden-Egeland (s4732	s4754	Tonka-Svea-Hamerly-Barnes (s4754)	s4782	Lamoure-La Prairie-Heimdal-Emrick (	s4825	Trembles-Lohler-Havrelon (s4825
s4733	Wyndmere-Hecla-Embden-Arvilla (s473	s4756	Vallers-Svea-Hamerly-Buse-Barnes (s	s4785	Ojata-Bearden (s4785)	s4829	Vebar-Reeder-Cabba-Amor (s4829)
s4736	Ulen-Hecla-Hamar (s4736)	s4758	Svea-Barnes (s4758)	s4786	Williams-Bowbells (s4786)	s6901	Overly-Great Bend-Beotia-Bearden (s
s4737	Towner-Swenoda-Hecla (s4737)	s4759	Svea-Hamerly-Barnes (s4759)	s4787	Zahl-Williams-Vida-Bowbells (s4787)	s8369	Water (s8369)
s4739	Lankin-Gilby-Antler (s4739)	s4760	Svea-Buse-Barnes (s4760)	s4792	Zahl-Williams (s4792)		
s4740	Renshaw-Overly-Lankin-Brantford (s4	s4762	Towner-Embden (s4762)	s4796	Wilton-Williams-Temvik (s4796)		

Map Index

Project Corridor
Project Substation
Laydown Area

Figure 9: Page 4 of 4
State Soils Association (STATSGO)
Center to Grand Forks Project
Minnkota Power Cooperative, Inc.

0 2 4 Miles
Scale 1:300,000

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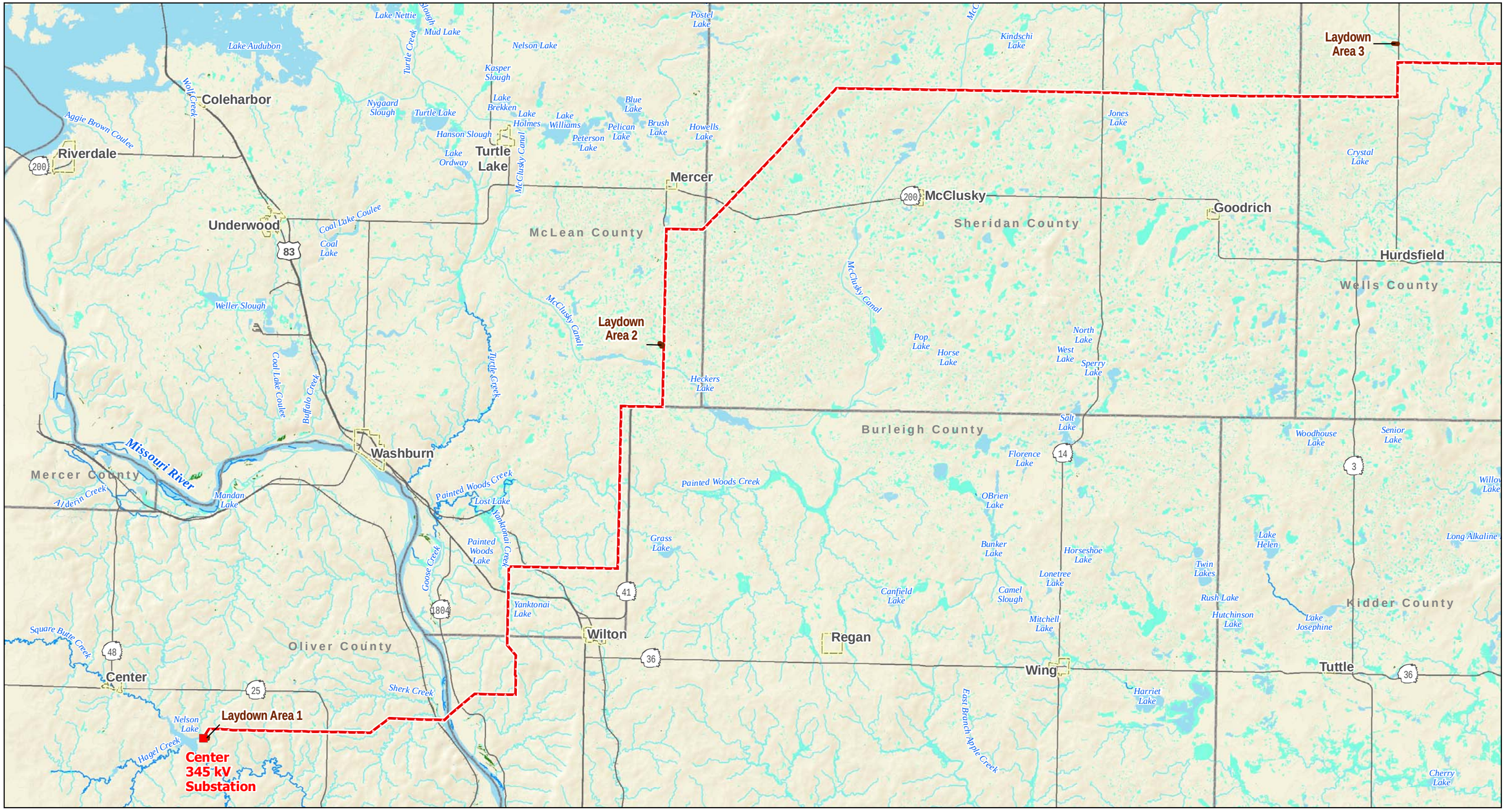

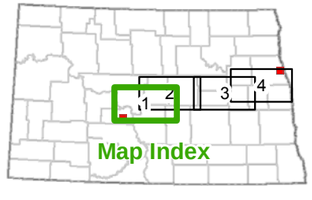

Project Corridor
Project Substation
Laydown Area

USGS Streams
Perennial River or Stream
Intermittent Stream, Ditch or Canal

NWI Wetlands
Lake, Pond or River
Freshwater Emergent Wetland
Freshwater Forested/Shrub Wetland

Figure 10: Page 1 of 4
National Wetlands Inventory and Surface Waters
Center to Grand Forks Project
Minnkota Power Cooperative, Inc.

0 2 4 Miles
Scale 1:300,000

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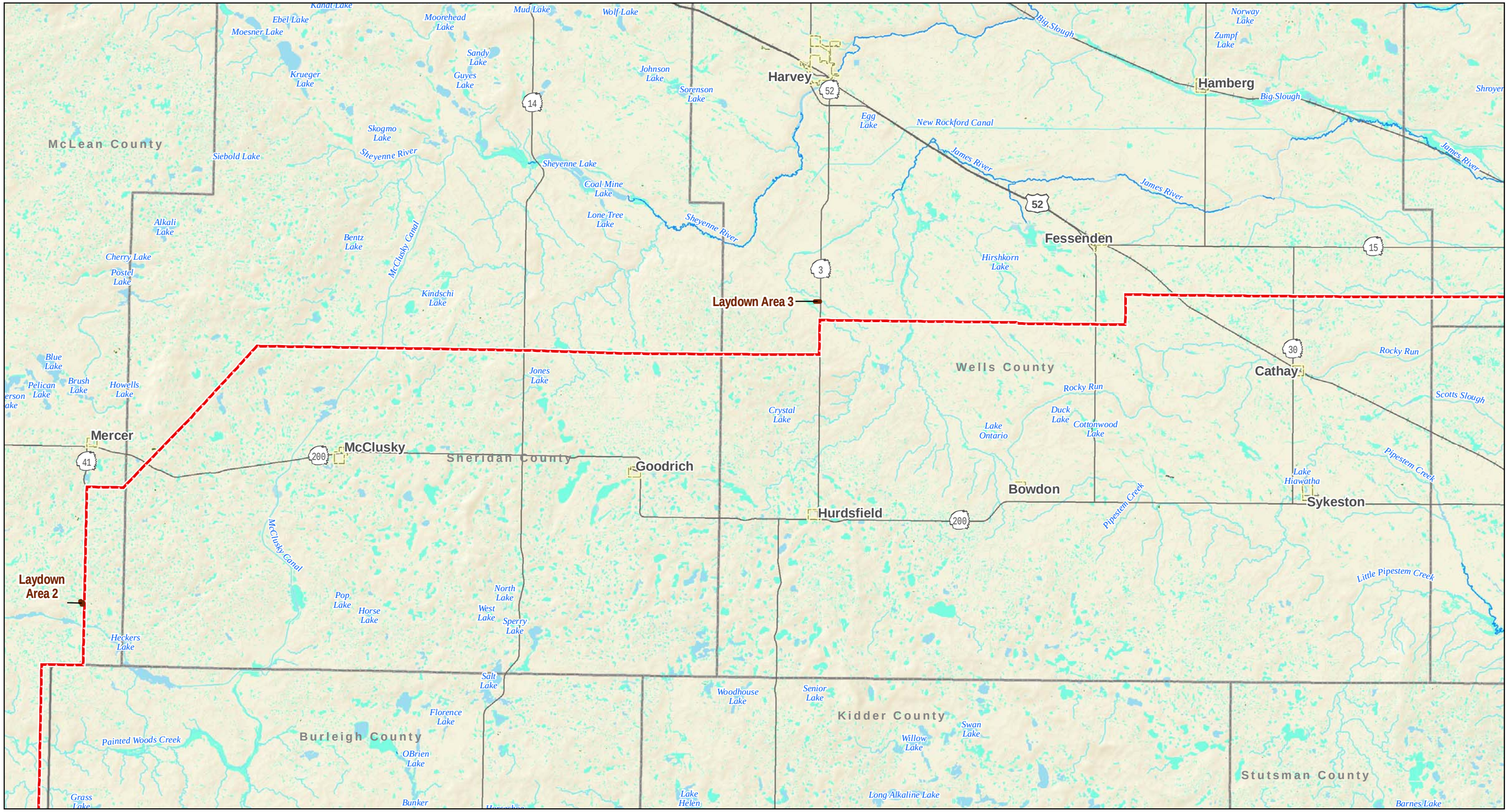

Figure 10: Page 2 of 4
National Wetlands Inventory and Surface Waters
Center to Grand Forks Project
Minnkota Power Cooperative, Inc.

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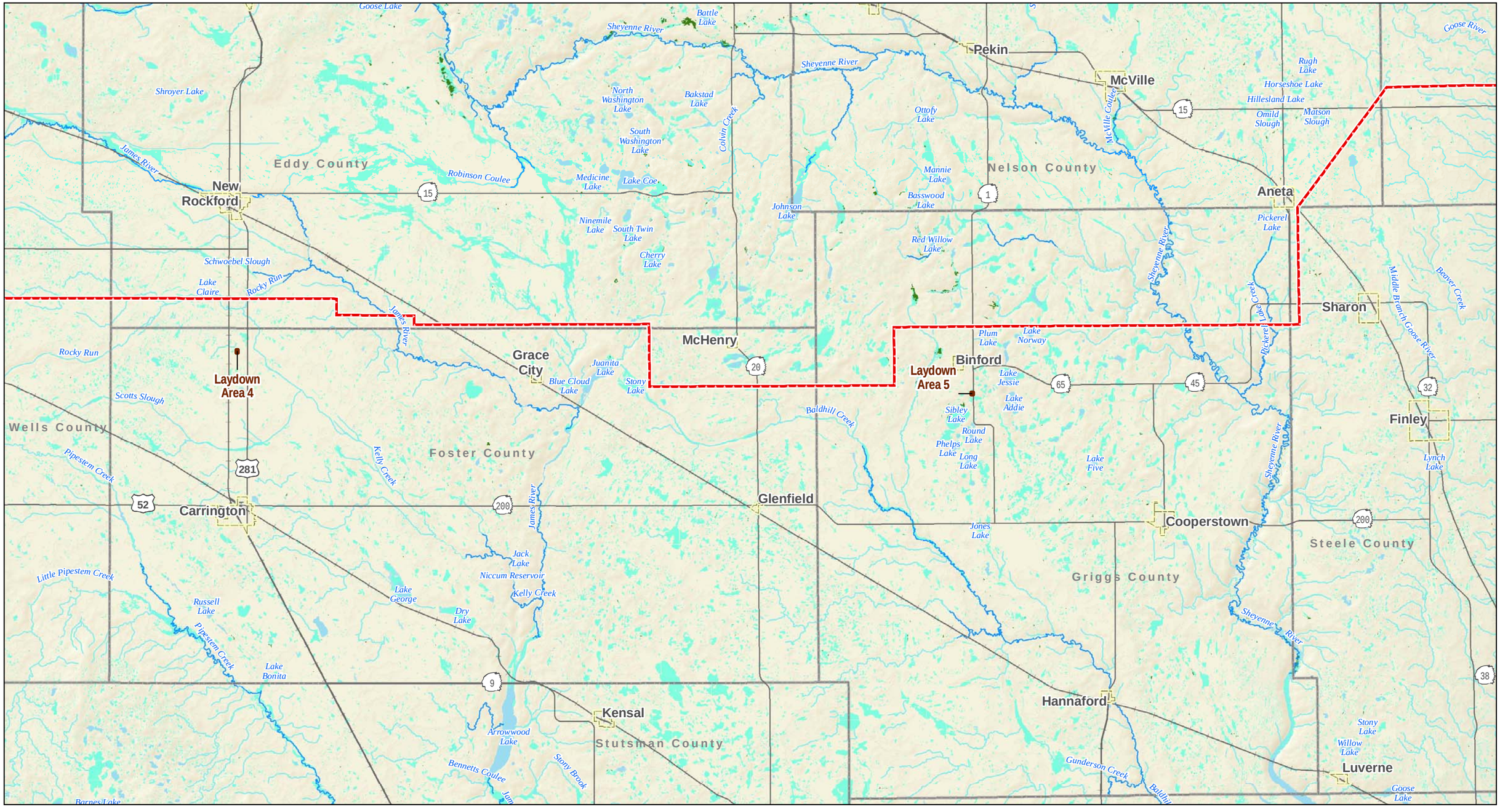

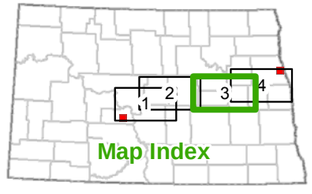

Project Corridor
Project Substation
Laydown Area

USGS Streams
Perennial River or Stream
Intermittent Stream, Ditch or Canal

NWI Wetlands
Lake, Pond or River
Freshwater Emergent Wetland
Freshwater Forested/Shrub Wetland

Figure 10: Page 3 of 4
National Wetlands Inventory and Surface Waters
Center to Grand Forks Project
Minnkota Power Cooperative, Inc.

0 2 4 Miles
Scale 1:300,000

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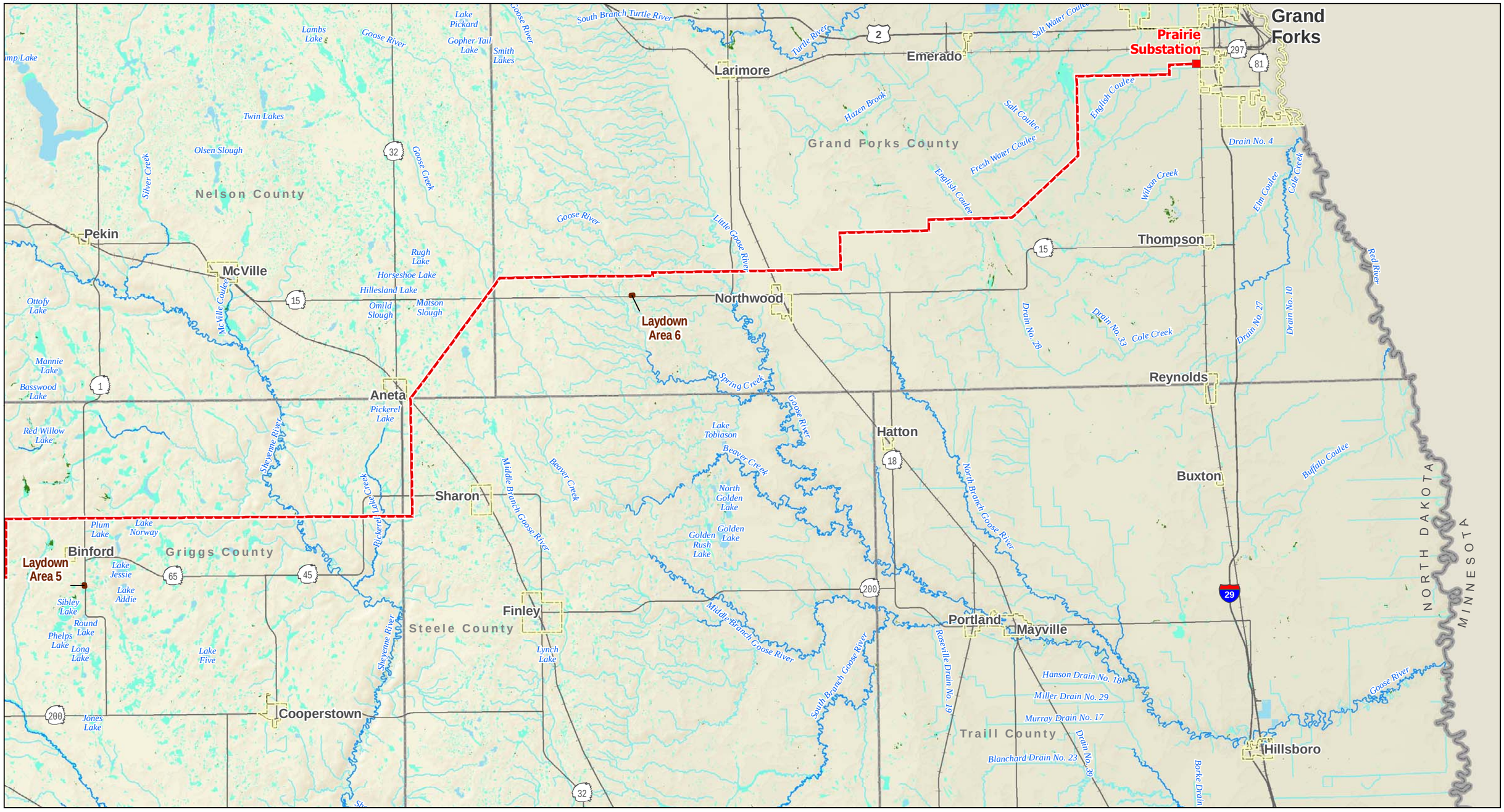

Figure 10: Page 4 of 4
National Wetlands Inventory and Surface Waters
Center to Grand Forks Project
Minnkota Power Cooperative, Inc.

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Coleharbor
Turtle Lake
Mercer
McClusky
Goodrich
Laydown Area 3
Underwood
McLean County
Sheridan County
Wells County
Hurdsfield
83
200
Laydown Area 2
14
Washburn
3
48
41
Burleigh County
Kidder County
Oliver County
Wilton
Regan
36
Wing
Tuttle
Robinson
Center
1804
25
Center 345 kV Substation
Laydown Area 1

Map Index
1 2 3 4

Project Corridor
Project Substation
Laydown Area

2004 GAP Land Cover
Barren/Sparse Vegetation
Cropland
Developed
Pasture
Prairie
Shrubland
Wetland
Woodland

Figure 11: Page 1 of 4
Land Cover
Center to Grand Forks Project
Minnkota Power Cooperative, Inc.

0 2 4 Miles
Scale 1:300,000

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McLean County

Sheridan County

Wells County

Burleigh County

Kidder County

Stutsman County

Harvey

Hamberg

Fessenden

Cathay

Laydown Area 3

Laydown Area 2

Mercer

McClusky

Goodrich

Hurdsfield

Bowdon

Sykeston

14

52

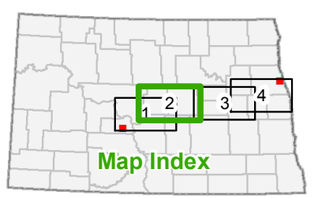
3

15

30

41

200



Project Corridor

Project Substation

Laydown Area

2004 GAP Land Cover

Barren/Sparse Vegetation

Cropland

Developed

Pasture

Prairie

Shrubland

Wetland

Woodland

Figure 11: Page 2 of 4
Land Cover
Center to Grand Forks Project
Minnkota Power Cooperative, Inc.

0 2 4 Miles

Scale 1:300,000

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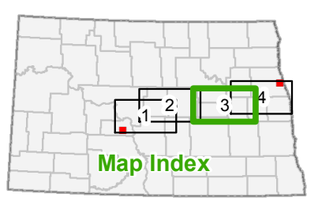
Pekin
McVille
Nelson County
Eddy County
New Rockford
15
1
Aneta
Sharon
32
Wells County
McHenry
20
Grace City
Laydown Area 4
281
Binford
65
45
Laydown Area 5
Finley
Griggs County
Foster County
52
Carrington
200
Glenfield
Cooperstown
Steele County
200
9
Kensal
Hannaford
38
Stutsman County
Luverne



Project Corridor
Project Substation
Laydown Area

2004 GAP Land Cover
Barren/Sparse Vegetation
Cropland
Developed
Pasture
Prairie
Shrubland
Wetland
Woodland

Figure 11: Page 3 of 4
Land Cover
Center to Grand Forks Project
Minnkota Power Cooperative, Inc.

0 2 4 Miles
Scale 1:300,000

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Prairie Substation
Grand Forks
Larimore
Emerado
Nelson County
Grand Forks County
Pekin
McVille
Thompson
Northwood
Laydown Area 6
Reynolds
Aneta
Hatton
MINNESOTA NORTH DAKOTA
Sharon
Buxton
Binford
Laydown Area 5
Griggs County
Finley
Steele County
Traill County
Portland
Mayville
Cooperstown
Hillsboro

Map Index

Project Corridor
Project Substation
Laydown Area

2004 GAP Land Cover
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Shrubland
Wetland
Woodland

Figure 11: Page 4 of 4
Land Cover
Center to Grand Forks Project
Minnkota Power Cooperative, Inc.

0 2 4 Miles
Scale 1:300,000

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McLean County
Coleharbor
Riverdale
Turtle Lake
Mercer
Underwood
83
Laydown Area 2
Sheridan County
McClusky
200
Goodrich
Laydown Area 3
Approx. 75□
Hurdsfield
Wells County
Kidder County
Mercer County
Washburn
200
1804
Approx. 50□
Burleigh County
14
3
Oliver County
41
Wilton
Regan
48
Center
25
36
Wing
Tuttle
36
Center 345 kV Substation
Laydown Area 1

Map Index
1 2 3 4

Project Corridor
Project Substation
Laydown Area

Federally Threatened or Endangered Species
NHI Species of Concern
Impaired or Vulnerable Terrestrial Community
Piping Plover Critical Habitat

Whooping Crane Sighting Corridor
Approx. 50□
Approx. 75□
Approx. 85□
Approx. 95□

Figure 12: Page 1 of 4
Sensitive Natural Resources
Center to Grand Forks Project
Minnkota Power Cooperative, Inc.

N
0 2 4 Miles
Scale 1:300,000

Map Document: (.\Maps_gis-file-gis\proj Minnkota 110900 map .docs PSC Corridor\App C\GFCCC -12 -11x17L -4pg -SensitiveNatRes.mxd)
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McLean County

Sheridan County

Wells County

Burleigh County

Kidder County

Stutsman County

Harvey

Hamberg

Fessenden

Cathay

Sykeston

Bowdon

Hurdsfield

Goodrich

McClusky

Mercer

Laydown Area 3

Laydown Area 2

Approx. 75□

Approx. 50□

Approx. 85□

14 91 52 3 15 30 41 200

Map Index

1 2 3 4

Project Corridor

Project Substation

Laydown Area

Federally Threatened or Endangered Species

NHI Species of Concern

Impaired or Vulnerable Terrestrial Community

Piping Plover Critical Habitat

Whooping Crane Sighting Corridor

Approx. 50□

Approx. 75□

Approx. 85□

Approx. 95□

Figure 12: Page 2 of 4
Sensitive Natural Resources
Center to Grand Forks Project
Minnkota Power Cooperative, Inc.

N

0 2 4 Miles

Scale 1:300,000

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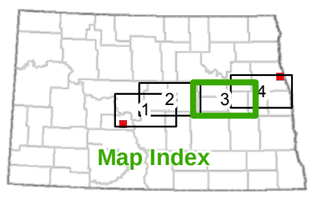
Pekin
McVille
Nelson County
Eddy County
New Rockford
Aneta
Laydown Area 4
McHenry
Steele County
Sharon
Binford
Grace City
Laydown Area 5
Wells County
Finley
Carrington
Glenfield
Cooperstown
Approx. 95
Foster County
Griggs County
Stutsman County
Hannaford
Kensal
Approx. 85
Luverne



- Project Corridor
- Project Substation
- Laydown Area
- Federally Threatened or Endangered Species
- NHI Species of Concern
- Impaired or Vulnerable Terrestrial Community
- Piping Plover Critical Habitat

Whooping Crane Sighting Corridor
- Approx. 50
- Approx. 75
- Approx. 85
- Approx. 95

Figure 12: Page 3 of 4
Sensitive Natural Resources
Center to Grand Forks Project
Minnkota Power Cooperative, Inc.

0 2 4 Miles
Scale 1:300,000

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Grand Forks
Prairie Substation
Larimore
Emerado
Pekin
McVille
Nelson County
Laydown Area 6
Northwood
Thompson
Grand Forks County
Reynolds
Aneta
Hatton
Buxton
Sharon
Binford
Laydown Area 5
Griggs County
Steele County
Finley
Portland
Mayville
Traill County
Cooperstown
Hillsboro
NORTH DAKOTA MINNESOTA

Map Index

- Project Corridor
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- Approx. 50
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Figure 12: Page 4 of 4
Sensitive Natural Resources
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Minnkota Power Cooperative, Inc.

0 2 4 Miles
Scale 1:300,000

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