Applications to the North Dakota Public Service Commission for Waiver of Procedures and Time Schedules and a Consolidated Certificate of Corridor Compatibility and Route Permit

Volume III

Case No: PU-11-696

for the

AVS-Neset 345-kV Transmission Project

BASIN ELECTRIC POWER COOPERATIVE

A Touchstone Energy® Cooperative

March 2013

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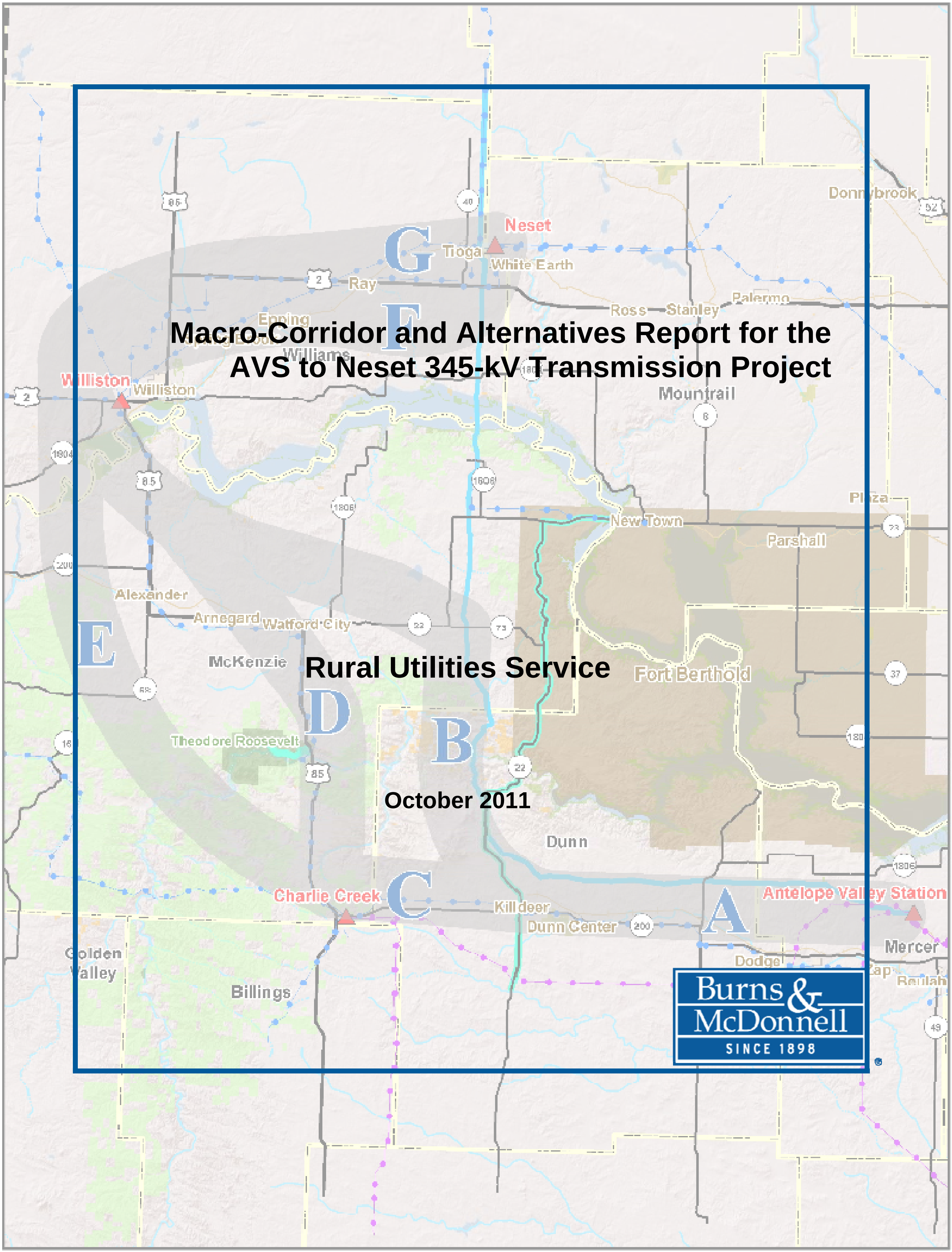
APPENDIX A - MACRO-CORRIDOR AND ALTERNATIVES REPORT

Macro-Corridor and Alternatives Report for the AVS to Neset 345-kV Transmission Project

Rural Utilities Service

October 2011



Burns & McDonnell
SINCE 1898

Macro-Corridor and Alternatives Report for the AVS to Neset 345-kV Transmission Project

prepared for

Rural Utilities Service

October 2011

Project No. 61495

prepared by

Burns & McDonnell Engineering Company, Inc.
Kansas City, Missouri

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1.0 INTRODUCTION

1.1 BACKGROUND

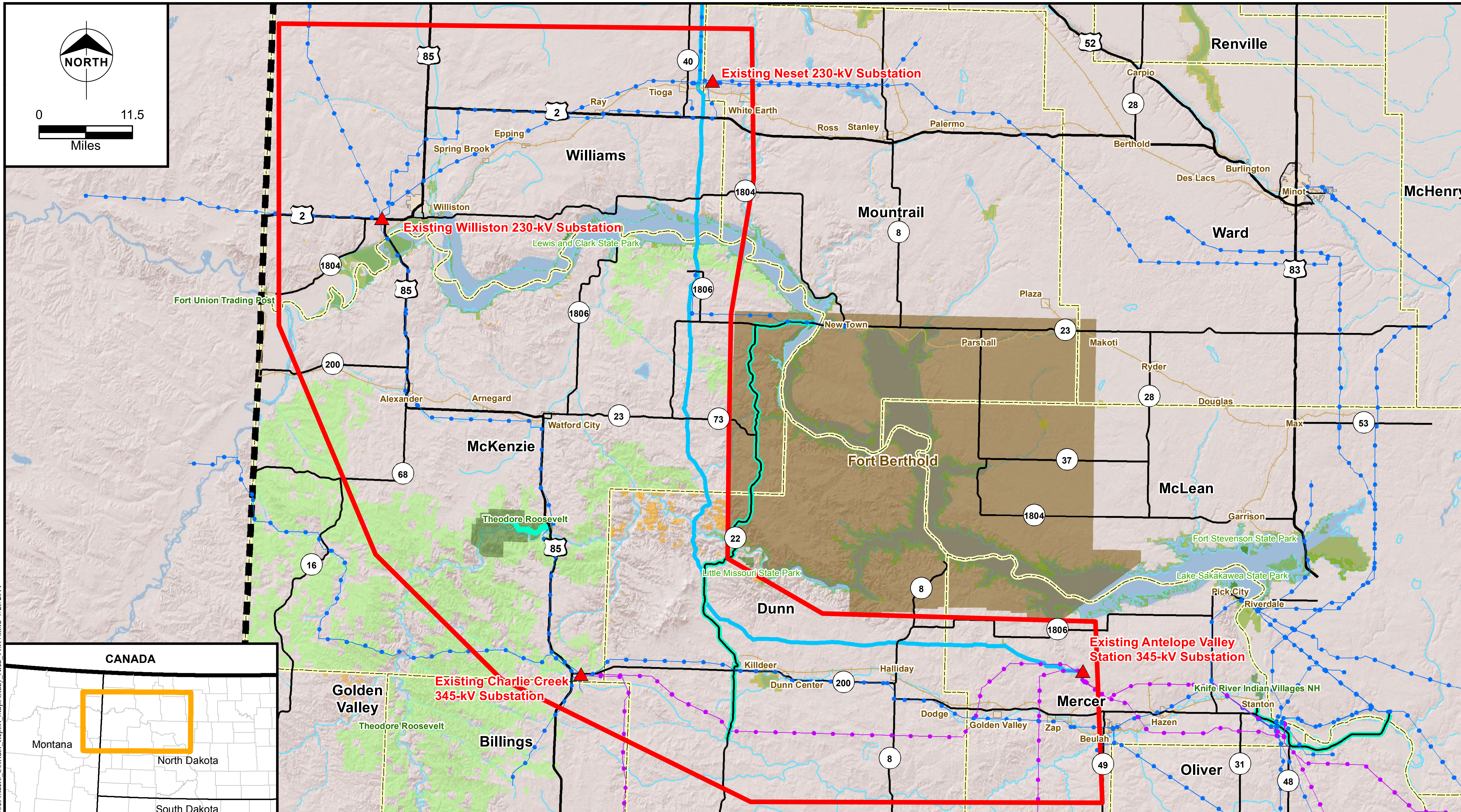
Northwestern North Dakota is experiencing a rapid increase in development as a result of the activities associated with the extraction of oil from the Bakken shale. In North Dakota, Bakken shale development is currently concentrated in McKenzie, Mountrail and Williams Counties. The level of development that has occurred and is planned for the future will require an increase in electrical transmission capacity and reliability. Through studies of power supply for the region and the upper Midwest, it has been determined that a new 345-kilovolt (kV) transmission line is needed to serve the long-term needs of northwestern North Dakota.

Basin Electric Power Cooperative (Basin Electric) is the wholesale power supplier to transmission and distribution cooperatives in the region. Mountrail Williams Electric Cooperative (MWEC) is one of Basin Electric's distribution members located in northwestern North Dakota north of the Missouri River. McKenzie Electric Cooperative (MEC) is the distribution member serving McKenzie County. These two distribution members are the primary members that will be involved with this 345-kV project.

1.2 PROJECT DESCRIPTION AND STUDY AREA

To serve the region, Basin Electric has determined that approximately 190 miles of new 345-kV transmission line would need to be constructed, starting from the Antelope Valley Station electric generation facility located near Beulah with final termination at Basin Electric's existing Neset Substation near Tioga. Along the route, the proposed line will connect with Basin Electric's existing Charlie Creek Substation near Grassy Butte and Western Area Power Administration's Williston Substation. Two new substations are also proposed, one near Williston and one near the existing Neset Substation at Tioga. The study area developed for this Project encompasses parts of Mercer, Dunn, Billings, McKenzie, Williams, and Mountrail Counties in North Dakota. The overall project elements and study area are shown on Figure 1-1 and are described in more detail in Section 4.0.

The project will require upgrades to Basin Electric's existing facilities at the Antelope Valley Station 345-kV Substation, Charlie Creek 345-kV Substation, Neset 230-kV Substation and Western Area Power Administration's (Western) Williston 230-kV Substation. The proposed overall project may require the following elements.



LEGEND

Study Area
Existing Substation
Army Corps of Engineers
National or State Park
National Wildlife Refuge
National Grassland
Tribal Lands
BLM Lands
State Boundary
County Boundary
Municipal Areas
Railroad
DGC Pipeline
Scenic Byway

Existing Transmission Lines
345-kV
230-kV and Below

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BASIN ELECTRIC POWER COOPERATIVE A Touchstone Energy Cooperative

Figure 1-1
Basin Electric Power Cooperative
Antelope Valley Station to Neset
345-kV Transmission Project
Overall Proposed Project
and Study Area

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Source: North Dakota GIS; Esri; Basin Electric; Burns & McDonnell.

Revised September 23, 2011

- **Transmission Lines.** Approximately 130 miles of single-circuit 345-kilovolt (kV) transmission line is proposed to connect Basin Electric's Antelope Valley Station (AVS) 345-kV Substation to the existing Charlie Creek 345-kV Substation and then on to the proposed Judson 345-kV Substation. A two-mile 230-kV transmission line will connect the proposed Judson 345-kV Substation to the existing Western 230-kVSubstation near Williston. An additional 60 miles of new 345-kV transmission line is proposed to connect Basin Electric's proposed Judson 345-kV Substation to a proposed Neset 345-kV Substation. A two-mile 230-kV transmission line will connect the proposed Neset 345-kV Substation to the existing 230-kV Neset Substation.

- **AVS 345-kV Substation.** The existing AVS Substation's 345-kV switchyard would require the installation of one 345-kV power circuit breaker and associated transmission bay bus expansion, including disconnect switches, grounding switches, potential transformers, and protection and control equipment. No new land or grading is required at this Substation.

- **Charlie Creek 345-kV Substation.** Upgrades to the existing Charlie Creek 345-kV Substation would require the installation of the necessary bus, circuit breakers, disconnect switches, grounding switches, and protection and control equipment to support the addition of a 345-kV interconnection. No expansion of the substation fence is anticipated.

- **Judson 345-kV Substation.** The proposed Judson 345-kV Substation near Williston would be approximately 12 acres in size and would require the installation of a 345-kV/230-kV transformer, and the necessary bus, circuit breakers, disconnect switches, grounding switches, and protection and control equipment to support the 345-kV interconnection and the addition of the 230-kV interconnect to Western's nearby Williston 230-kV Substation.

- **Williston 230-kV Substation.** Western's existing Williston 230-kV Substation would require the installation of an additional 230-kV power circuit breaker and associated transmission bay bus expansion, including disconnect switches, grounding switches, potential transformers, and protection and control equipment all within the existing substation boundary.

- **Neset 345-kV Substation.** The proposed 12-acre Neset 345-kV Substation would require the installation of a 345-kV/230-kV transformer, and the necessary bus, disconnect switches, circuit breakers, grounding switches, and protection and control equipment to support the 345-kV connection and the connection to the nearby existing Neset 230-kV Substation.

- **Neset 230-kV Substation.** The existing Neset 230-kV Substation would require the expansion of transmission bus bay and the necessary circuit breakers, disconnect switches, grounding switches, and protection and control equipment to support the addition of the 230-kV connection. No expansion of the substation fence is anticipated.

- **Killdeer 345-kV Switchyard.** Dependent on the final corridor selection, there is a potential need for a proposed 345-kV switchyard near the town of Killdeer. The proposed 12-acre Killdeer 345-kV Switchyard would require the installation of the necessary bus, circuit breakers, disconnect switches, grounding switches, and protection and control equipment to support a 345-kV connection.

1.2.1 Other Basin Electric Transmission Line Projects in the Area

The proposed 345-kV transmission line and associated facilities transects MWEC's service territory in Mountrail and Williams Counties. MWEC currently has several distribution/transmission projects in various stages of development. Where there are opportunities to double-circuit Basin Electric's 345-kV project with MWEC's 115-kV projects, efforts will be undertaken to co-locate the lines in double circuit arrangements. These opportunities have the potential to reduce the environmental, socio-economic and land use impacts to the area.

For example, MWEC has proposed a 115-kV transmission line in the eastern portion of the project area (between Williston and Tioga). The final route and interconnection points are still in the project development stage. Approximately 30 miles of the 60-mile length of the proposed 345-kV line from Williston to Tioga could be double-circuited with MWEC's 115-kV line. Additionally, MWEC's current State Line Project interconnects with Western's Williston 115-kV Substation. This project potentially transects approximately three to four miles of its16-mile length with Basin Electric's 345-kV project and the two could be co-located for some portion of the alignment.

1.2.2 Right-of-Way Considerations

The new transmission line is proposed to be constructed within a 150-foot-wide right-of-way (ROW). Basin Electric representatives would work with the landowners along the selected route to obtain the necessary easements to allow for access, construction, operation, and maintenance of the transmission line. Landowners would retain ownership of the land with limitations on building new structures within the right-of-way. Agricultural activities would be permitted to continue within the right-of-way. Property for the proposed Judson 345-kV Substation and proposed Neset 345-kV Substation would be purchased in fee and owned by Basin Electric. Lands for substations would be converted to utility use.

1.2.3 Proposed Transmission Line Characteristics

Several structure types would be necessary to address the various voltage, terrain and connector scenarios included as part of this project. These structures are shown in Figures 1-2 through 1-6. A summary of structure characteristics is provided in Table 1-1.

Project construction and design would meet the requirements of the National Electrical Safety Code (NESC) for the Heavy Loading District, Basin Electric and USDA-RUS design criteria, and other applicable local or national building codes. The Heavy Loading District refers to those areas (including North Dakota) that are subject to severe ice and wind loading. Minimum conductor clearance is measured at the point where conductor sag is closest proximity to the ground. The proposed transmission line would be constructed with clearances that exceed standards set by NESC. Minimum conductor height would be 30 feet over agricultural land, rural roads, and paved highways. Clearance will be based on a conductor temperature of 100 degrees Celsius.

Table 1-1: Typical Transmission Structure Design Characteristics

Description of Design Component	345-kV (Fig 1-2)	230/115-kV (Fig 1-3)	345/115-kV (Fig 1-4)	230-kV (Fig 1-5)	345-kV H-Frame (Fig 1-6)
Conductor Size(inches)	1.8	1.345/1.108	1.8/1.108	1.345	1.800
Right-of-way Width (feet)	150	100	150	100	150
Typical minimum and maximum Span Distance between Structures (feet) *	650-1100	700-900	650-1000	650-950	900-1000
Average Span (feet)	900	800	800	800	1000
Minimum and Maximum Structure Height (feet)	100-130	97-127	115-145	70-110	80-100
Average Height of Structures (feet)	115	112	130	95	90
Average Number of Structures per mile	6	6.5	6.5	6.5	5.5
Temporary disturbance per Structure (acre) **	0.0003	0.0002	0.0003	0.0002	0.0004
Minimum Conductor-to-Ground Clearance to agricultural lands, rural roads and paved highways @100 deg C (feet)	30	26	30	26	30
Minimum Conductor-to-Ground Clearance to Railroads @100 deg C (feet)	As required by specific Railroad				

Description of Design Component	345-kV (Fig 1-2)	230/115-kV (Fig 1-3)	345/115-kV (Fig 1-4)	230-kV (Fig 1-5)	345-kV H-Frame (Fig 1-6)
Circuit Configuration* **	See Figure 1-2	See Figure 1-3	See Figure 1-4	See Figure 1-5	See Figure 1-6
*** Actual span distance will vary depending on topography.** ** Angle and dead-end structures (for longitudinal stability) would be constructed with concrete foundations. Guy wires would not typically be required.** *** Single pole tangent structures would be freestanding on concrete foundations. H-frame tangent structures would likely be directly embedded into the ground.**					

1.3 PURPOSE OF THE MACRO-CORRIDOR STUDY

The U.S. Department of Agriculture's Rural Utilities Service (RUS) electric program provides capital loans to electric cooperatives for the upgrade, expansion, maintenance, and replacement of the electric infrastructure in rural areas. Basin Electric is pursuing financing from RUS for the proposed 345-kV transmission line in Mercer, Dunn, Billings, McKenzie, Williams, and Mountrail counties. As a requirement of 7 CFR Part 1794.51(c), RUS requires Basin Electric to submit a Macro-Corridor Study before formal scoping is initiated. Basin will also connect to Western's existing Williston 230-kV Substation in Williams County. RUS is the lead agency in the NEPA process. Western is serving as a cooperating agency in the review process.

* * * * *

Figure 1-2: Typical Single-Circuit 345-kV Single Pole Structure

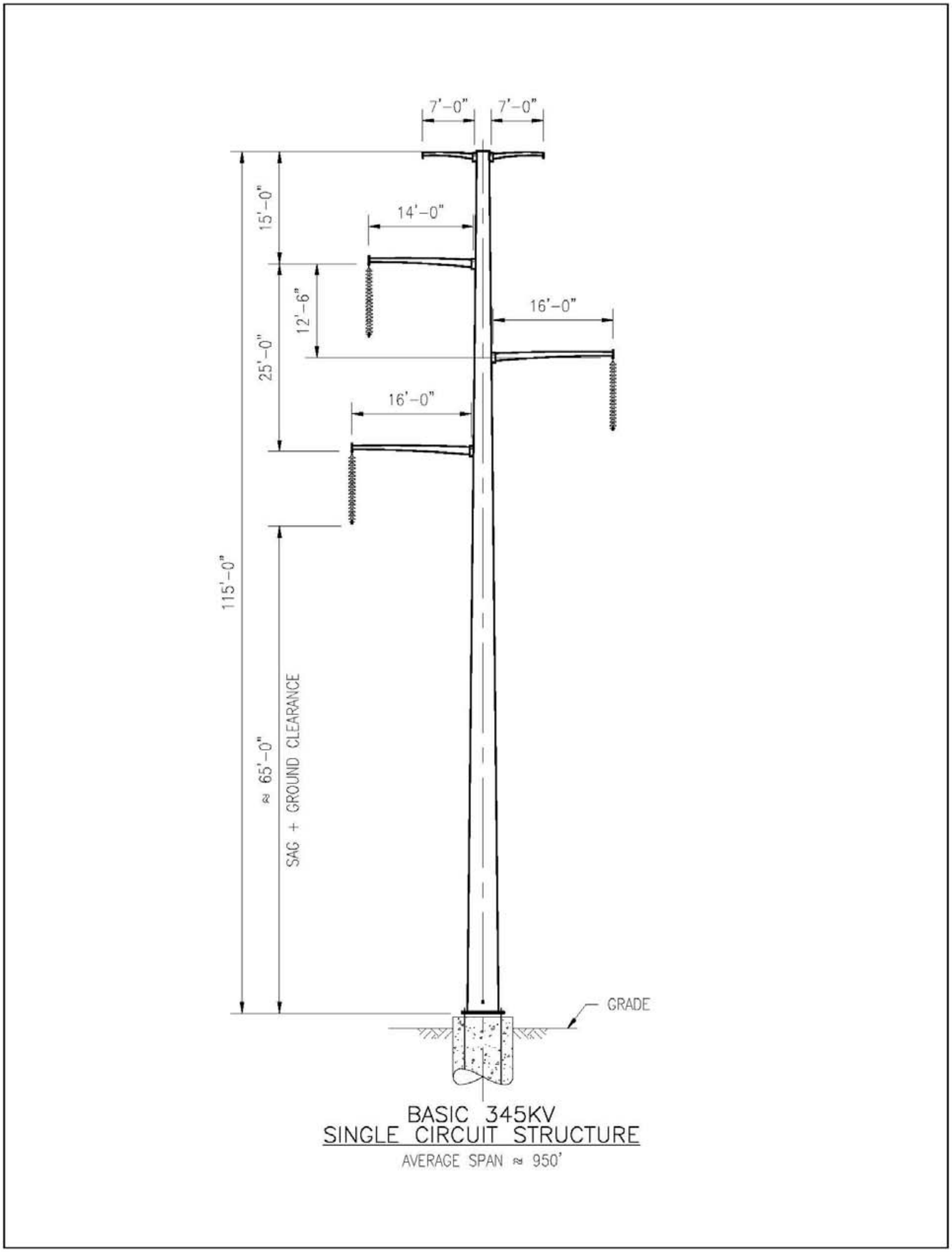


Figure 1-3: Typical Double-Circuit 230/115-kV Single Pole Structure

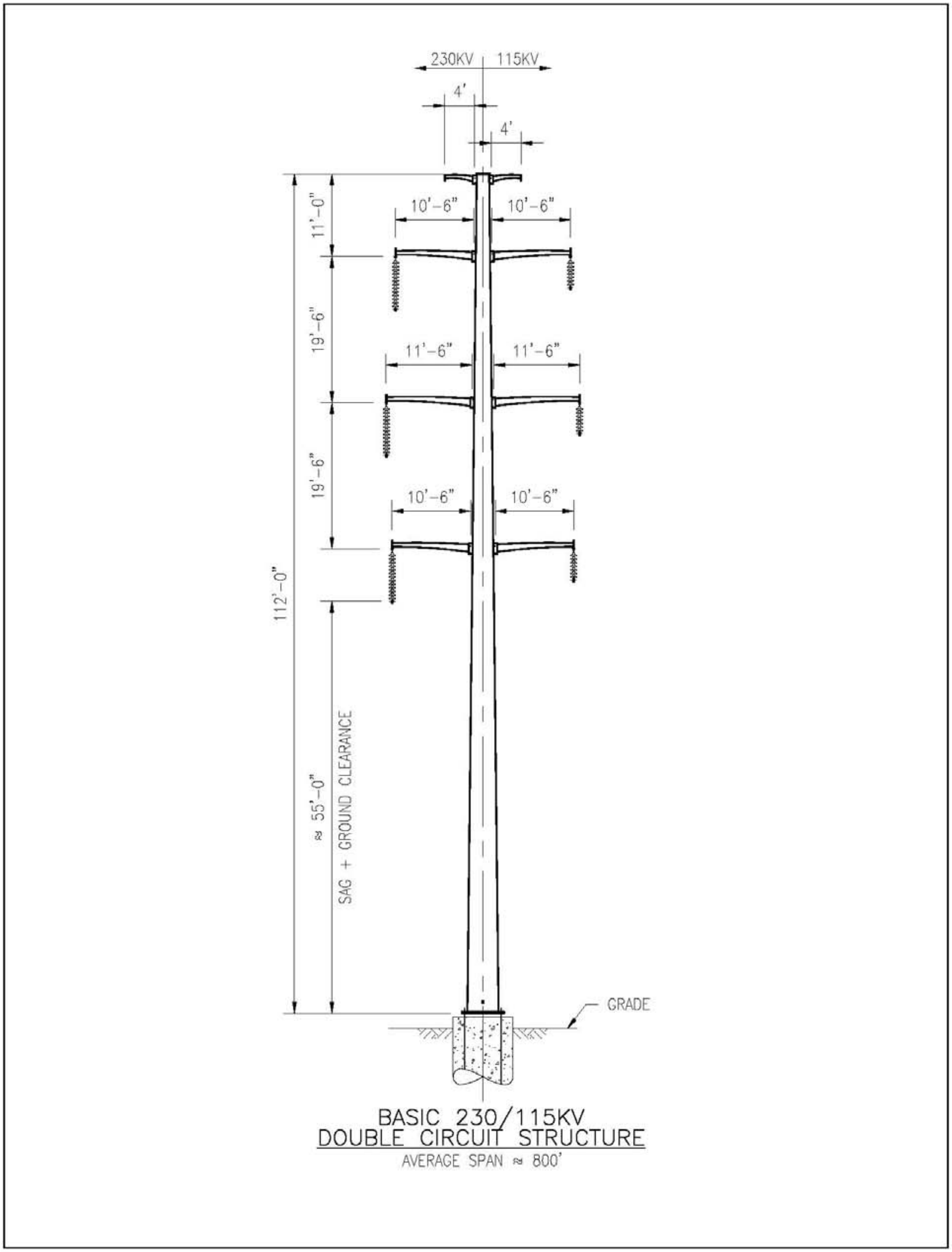


Figure 1-4: Typical Double-Circuit 345/115-kV Single Pole Structure

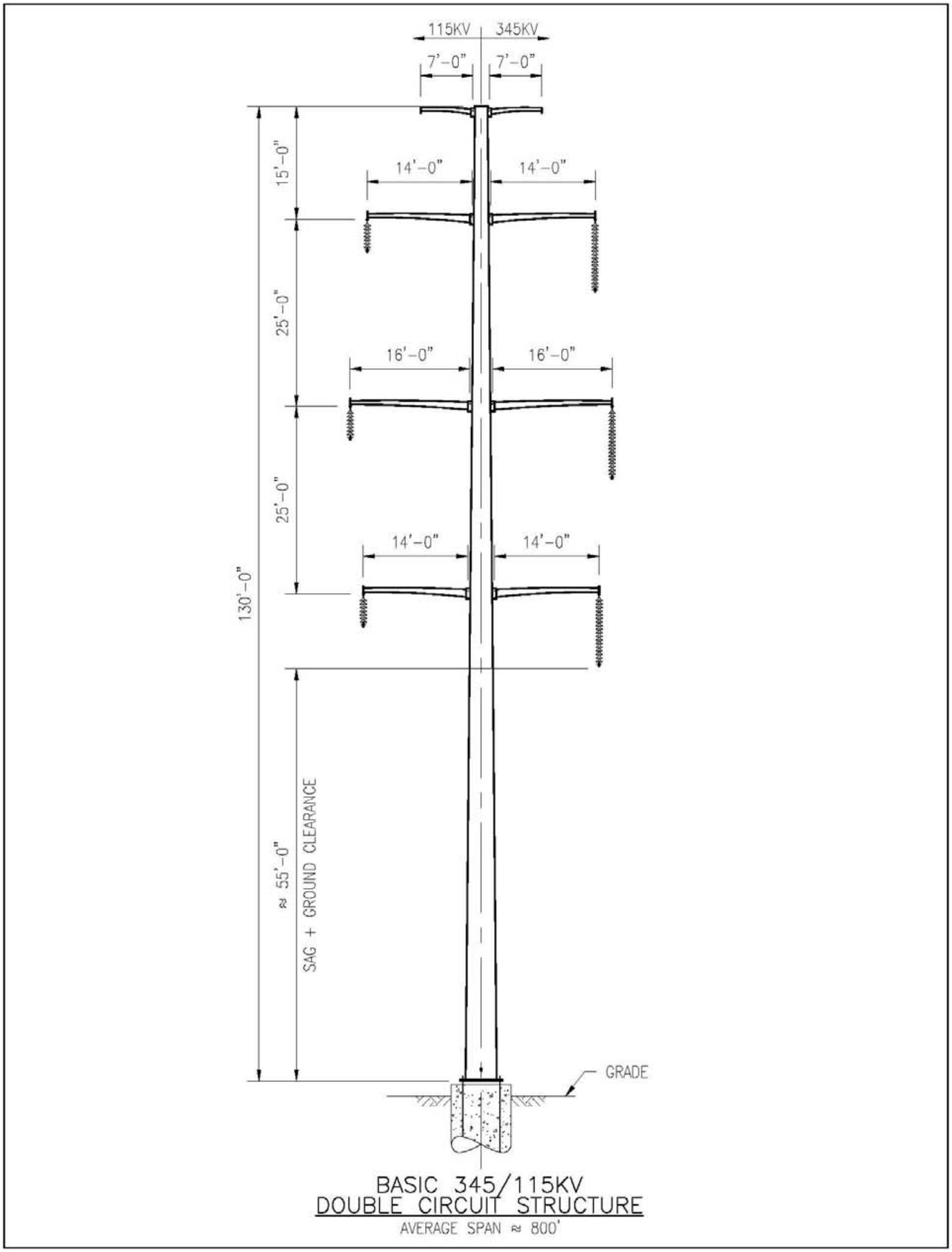


Figure 1-5: Typical Single-Circuit 230-kV Single Pole Structure

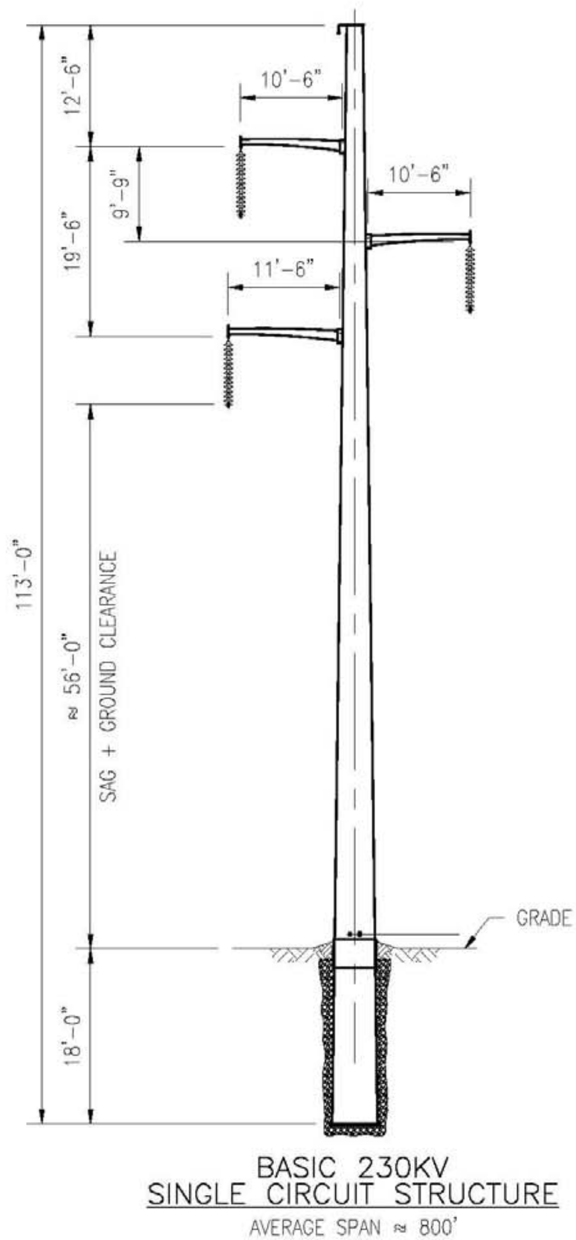
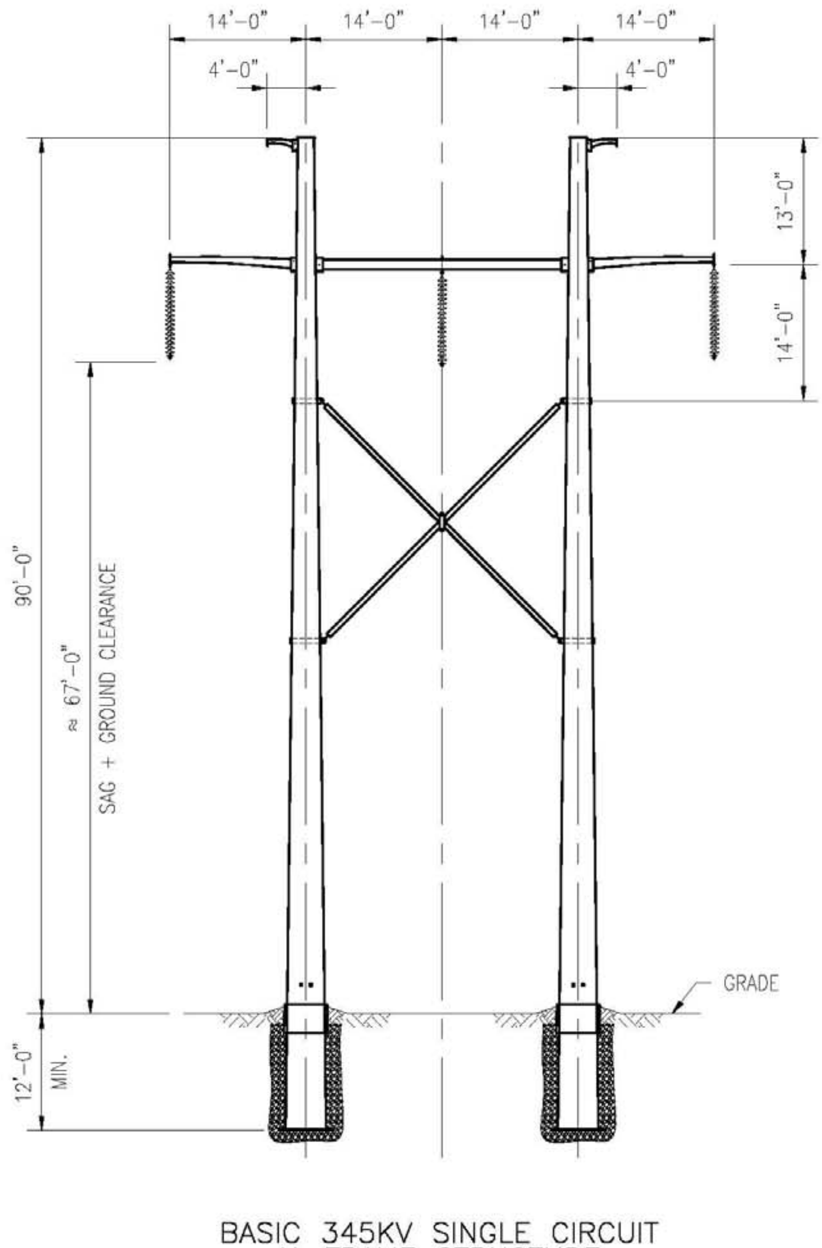


Figure 1-6: Typical Single-Circuit 345-kV H-Frame Structure



BASIC 345KV SINGLE CIRCUIT
H-FRAME STRUCTURE
AVERAGE SPAN ≈ 1000'

2.0 PURPOSE AND NEED

2.1 NEED FOR THE PROJECT

Load Forecast. The demand for electricity creates a stress on existing generation and transmission facilities. The August 2011 Basin Electric load forecast indicates an acceleration of growth in the northwestern North Dakota area that is mainly a result of the development related to the Bakken oil field. Much of the short-term load growth in this area is associated with provision of electrical service to support the rapid expansion of the number of facilities for oil and natural gas production as well as the supporting infrastructure and services. This relatively rapid upswing in development activity in recent years is due to new exploration and extraction technology and the potential for oil recovery from the Bakken Formation.

The Bakken Formation is a thin, widespread geologic formation consisting of oil-generating shale and sandstone layers that extends through portions of Montana, North Dakota, and the Canadian Provinces of Saskatchewan and Manitoba (USGS, 2008). While there are 17 oil-producing counties in North Dakota, all of which are located in the western third of the state, the top-producing counties in 2010 included Mountrail, McKenzie, Dunn, and Williams in northwestern North Dakota (NDPC, 2011). Oil production in North Dakota increased from 62.8 million barrels of oil in 2008 to 79.7 million barrels in 2009 (27% increase) and 113 million barrels in 2010 (40% increase) (NDPC, 2011). Production is expected to continue to increase with an estimated 1,100 to 2,700 new wells per year in western North Dakota and 26,000 new wells over the next 10 to 20 years (NDDMR, 2011).

Infrastructure development related to the expanding oil and gas industry activity in the region includes pipelines, rail, natural gas plants, homes, businesses, roads, and transmission/distribution line development. Pipeline infrastructure is being developed to transport crude oil out of the Bakken to refinery and marketing hubs, such as the U.S. Gulf Coast, as well as to transport natural gas, fracking water, and salt water. Crude oil is being transported by rail out of the Bakken oil field, and expansion of rail infrastructure and associated loading and unloading facilities is under development. Natural gas plants are expanding to process natural gas for consumer use. Local transmission lines for distribution have recently been constructed or are in development in western North Dakota to support the expanding drilling activity and supporting infrastructure.

In the Williston/Tioga region, the preliminary load forecast for northwestern North Dakota is noted in Table 2-1. It is projected that the load is increasing in the regions adjacent to Williston/Tioga in a similar manner.

Table 2-1: Load Forecast for Transmission Lines in the Williston/Tioga Region

Year	Load (MW*)	% Increase
2011	280	--
2012	390	39
2013	454	16
2014	481	6
2015	509	6
2016	538	6

*MW = mega watts

An analysis of transmission line capacity indicates by the year 2016 the load will have increased beyond the load serving capacity of the existing system for the Williston/Tioga region and a new transmission line is required to provide additional capacity. The closest strong transmission system support is associated with the electrical power generation at the Antelope Valley Station, located near Beulah. This system is operated at 345-kV and extends west, south and east from Beulah. A new 345-kV transmission line from the Beulah area to the northwest that connects directly to the 230-kV system in the Williston/Tioga area would provide an increase in the load serving capacity to accommodate the projected load growth and maintain acceptable reliability of the regional transmission system. If this new 345-kV transmission line is not added, then the load growth will be capped at the projected 2015 load level and no new load growth could be accommodated. This would limit the future potential development activities in the Bakken oil field and any other load requirements in this service region.

Reliability Issues. The existing high voltage system in the Williston/Tioga region consists of 230-kV and 115-kV systems that connect to: Saskatchewan, Canada; eastern Montana; central North Dakota; and western North Dakota. Outage of any of these paths could cause low voltage criteria violations and overload adjacent transmission lines in the Williston/Tioga region.

2.1.1 Integrated System Transmission Studies

The Integrated System (IS) is operated and administered by Western. The common use transmission system is in the eastern interconnection of the IS service area. The IS transmission reliability study group performed an evaluation study titled *Eastern Montana/Western North Dakota Load Serving Study Facility Additions Justification-August 2011*(IS Study, 2011). The recommendation of the study is the basis for this project. Project alternatives, based on the study, are discussed in the following section.

* * * * *

3.0 PROJECT ALTERNATIVES

3.1 OVERVIEW

The IS transmission reliability study group performed a study (IS Study, 2011) to assess the electrical system in the IS territory and its capacity to serve the electricity load projections within the service territory. The study investigated a number of system operation scenarios including various system facility upgrades and additions. These scenarios were evaluated based on standard system contingency considerations to determine system capacity, response, and reliability under projected load requirements. The following summarizes the study findings and recommendations.

3.2 ALTERNATIVES CONSIDERED

The IS evaluation considered a number of alternatives to address system capacity and reliability under projected load requirements. These alternatives included various system upgrades to existing facilities, the addition of new 115-kV lines, and the addition of new 345-kV lines. The results of the evaluation for each of these alternatives are summarized below.

3.2.1 System Upgrades

Numerous operating scenarios were developed and evaluated for the IS system as well as system facility upgrades which did not include new line construction. These operating scenarios were modeled with different line ratings, line carrying capacities, and system contingencies. Modeling of the facility upgrades included replacement of existing transformers with higher-capacity units and the installation of capacitors at various locations throughout the system. Under all scenarios investigated, system reliability on some lines would be only temporarily improved. However, even with implementation of all investigated upgrades, significant system failures, including considerable voltage drops or even voltage collapse, would result in numerous lines throughout the system exceeding their emergency ratings. These considerable system limitations could occur as early as 2014.

3.2.2 Additional 115-kV Lines

In order to mitigate the system limitations identified under the various system upgrade operating scenarios, construction of several new alternatives for 115-kV lines were investigated. It was anticipated by the study that these lines could be constructed and made operational by 2014 by the Basin Electric member distribution cooperatives. Generally, these lines have been identified by Basin Electric member cooperatives to serve specific loads and would not be operated as part of the overall electricity transmission network. Additional 115-kV lines considered included:

- MWEC 115-kV lines to serve the Tioga and Blaisdell areas
- Central Power 115-kV line between the Minot and Roseglen areas
- MWEC 115-kV line between Watford City and Swenson
- 115-kV line connection between Snake Creek Pumping Station and Parshall with an interconnection at Roseglen

Construction and operation by the member cooperatives of these 115-kV facilities was found to mitigate many of the system limitations identified through 2014. However, as early as 2015 many of the same system limitations would again result even with the proposed upgrades and 115-kV line constructions. Potentially as early as 2016, load forecasts for the IS territory could not be met with the evaluated system improvements.

3.2.3 Additional 345-kV Lines

The IS study included further long-term analysis to identify potential solutions to address the inability of the system to meet projected load forecasts beyond the 2014 to 2016 time period. These alternatives included construction of various 345-kV lines in addition to the 115-kV lines previously noted. Two 345-kV transmission line alternatives were considered:

- **AVS to Charlie Creek Substation to Judson to Neset alternative (Project Alternative 1)**. This alternative would include a 65-mile 345-kV line from the AVS to the existing Charlie Creek 345-kV Substation. The existing Charlie Creek 345-kV Substation would be connected by a 70-mile segment to the proposed Judson 345-kV Substation. The proposed Judson 345-kV Substation would then interconnect with the proposed Neset 345-kV Substation by a 56-mile line segment and a two-mile 230-kV transmission line would interconnect the proposed Judson 345-kV Substation to Western's existing Williston 230-kV Substation. Finally, the proposed Neset 345-kV Substation would interconnect with the existing Neset 230-kV Substation by a two-mile 230-kV line segment (Figure 3-1).

  AVS to Killdeer to Judson to Neset 345-kV line with a Charlie Creek Substation interconnection (Project Alternative 2). This alternative would include construction of approximately 40 miles of 345-kV line from AVS to a proposed 345-kV switchyard near Killdeer. An additional 85-mile 345-kV transmission line would extend from the proposed Killdeer 345-kV Switchyard to the proposed Judson 345-kV Substation and a 25-mile 345-kV line segment would extend from the proposed Killdeer 345-kV Switchyard to the existing Charlie Creek 345-kV Substation, located near Grassy Butte. The proposed Judson 345-kV Substation would then interconnect with the proposed Neset 345-kV Substation by a 56-mile line segment and a two-mile 230-kV transmission line would interconnect the proposed Judson 345-kV Substation to Western's nearby existing Williston 230-kV Substation. Finally, the proposed Neset 345-kV Substation would interconnect with the existing Neset 230-kV Substation by a two-mile 230-kV line segment (Figure 3-2).

3.2.4 Recommended System Alternative

Based on the IS study, construction of new 345-kV transmission line facilities will be required to meet the projected load for the eastern Montana and western/central North Dakota areas, including the identified Williston Load Pocket. Construction of a 345-kV line from AVS to the Williston and Tioga areas is the only alternative identified to meet the system load capacity and reliability criteria. There was initial discussion of delivering power to the Judson/Williston/Neset Substations without a Charlie Creek 345-kV Substation connection. Future conditions evaluated with and without a Charlie Creek 345-kV Substation connection were found to maintain system reliability requirements and serve projected load forecasted through 2020. However, the condition including the Charlie Creek 345-kV Substation connection provided a more robust support of the western IS system and better supports future planning for growth in western North Dakota. Therefore, it is determined that the construction and operation of the AVS -to-Charlie Creek –to-Judson-to-Neset by a 345-kV transmission line, with associated substation interconnections, will better satisfy the Project's Purpose and Need. The IS study therefore recommends construction and operation of this 345-kV line, and associated connection to the Charlie Creek 345-kV Substation. Two system alternatives that include a connection to the existing Charlie Creek 345-kV Substation have been retained for further study and evaluation as part of the macro-corridor alternatives considered in this report.

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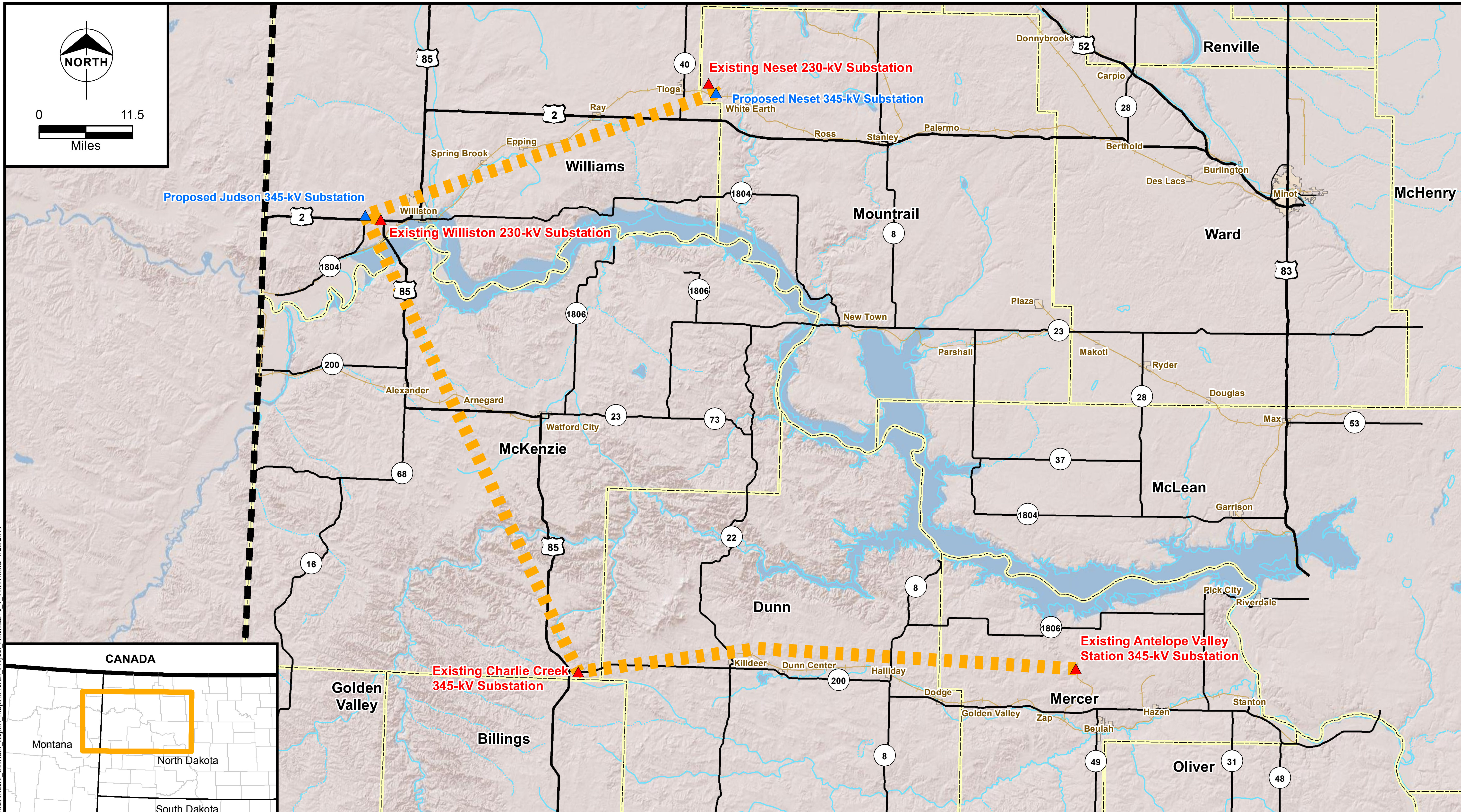

LEGEND

- Existing Substation
- Proposed Substations and Switchyard
- Alternative Transmission Line Connection
- State Boundary
- County Boundary
- Municipal Areas
- Railroad

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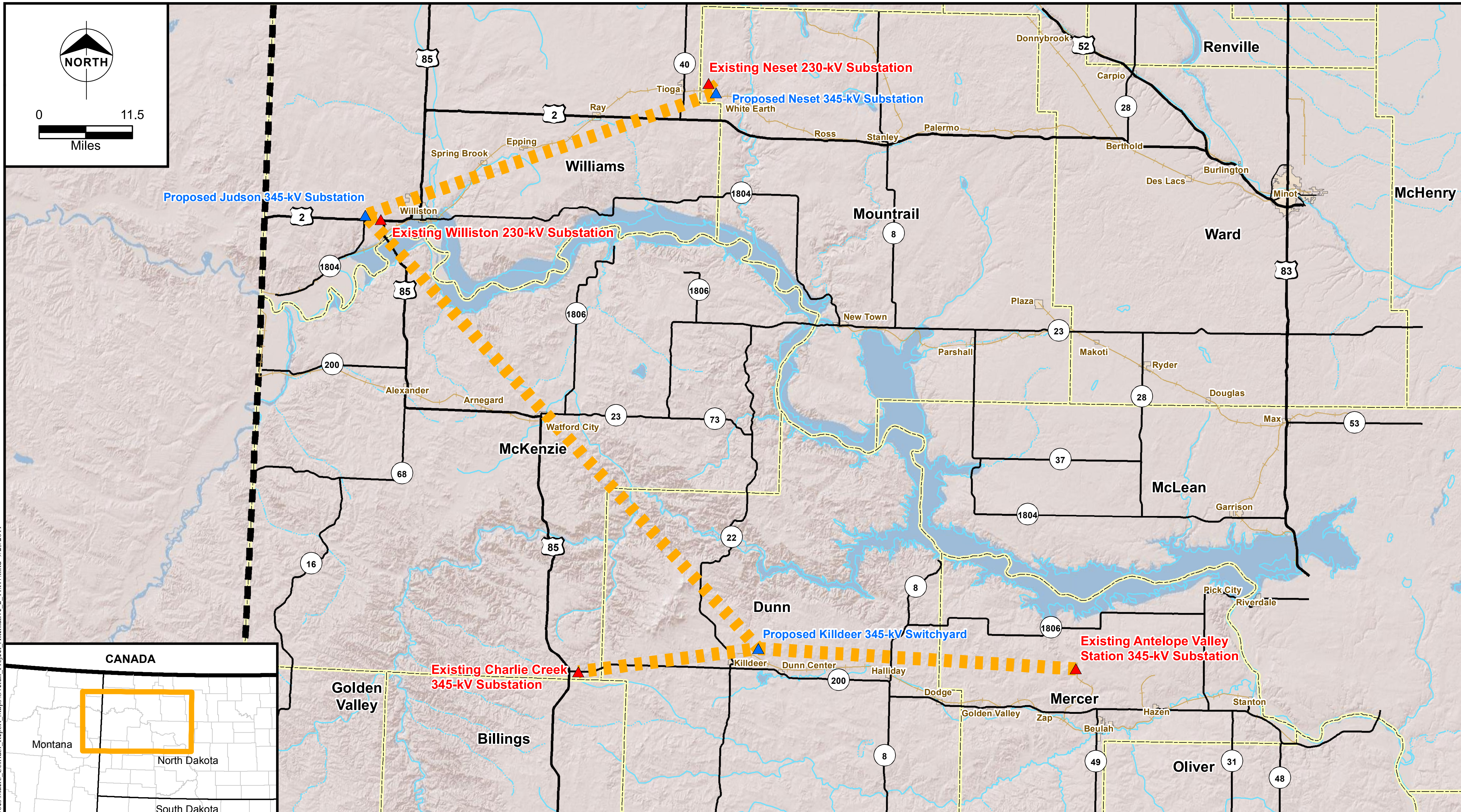
Figure 3-1
Basin Electric Power Cooperative
Antelope Valley Station to Neset
345-kV Transmission Project
Project Alternative 1

Source: North Dakota GIS; Esri; Basin Electric; Burns & McDonnell.

Revised September 23, 2011



LEGEND

- Existing Substation
- Proposed Substations and Switchyard
- Alternative Transmission Line Connections
- State Boundary
- County Boundary
- Municipal Areas
- Railroad

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BASIN ELECTRIC POWER COOPERATIVE
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Figure 3-2
Basin Electric Power Cooperative
Antelope Valley Station to Neset
345-kV Transmission Project
Project Alternative 2

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Source: North Dakota GIS; Esri; Basin Electric; Burns & McDonnell.

Revised September 23, 2011

4.0 STUDY AREA IDENTIFICATION AND MACRO-CORRIDOR COMPARISON

4.1 BASIN ELECTRIC SERVICE AREA

Basin Electric Power Cooperative (Basin Electric), established in 1961 and headquartered in Bismarck, North Dakota, is one of the largest electric generation and transmission cooperatives in the United States. Basin Electric's core business is generating and transmitting wholesale bulk electric power to customers, which primarily consist of 135 member cooperatives located in nine states. Basin Electric's service territory spans 540,000 square miles in the central United States from the Canadian border to Mexico, including parts of Colorado, Iowa, Minnesota, Montana, Nebraska, New Mexico, North Dakota, South Dakota, and Wyoming. Basin Electric's member cooperatives distribute electricity to about 2.8 million consumers. Basin Electric owns 2,093 miles and maintains 2,178 miles of high-voltage transmission lines and owns and maintains equipment in 66 switchyards and 116 telecommunications sites.

4.2 STUDY AREA IDENTIFICATION

Prior to the development of a defined study area, the large constraints in the region north of the existing Antelope Valley Station (AVS) 345-kV Substation that are located in the path towards a connection to the existing Neset 230-kV Substation near Tioga were reviewed. The two big impediments to developing a new transmission line from AVS to Tioga are the Fort Berthold Reservation and Lake Sakakawea, both north of the existing AVS 345-kV Substation. Crossing Fort Berthold was not considered a viable alternative because it would involve tribal lands, which could complicate the approval process. Crossing Lake Sakakawea was investigated at a conceptual level and it was determined that the logistics and costs associated with trying to place a submarine cable in the lake made the project infeasible. At this time, additional studies determined that a new substation and associated transmission line are needed at Williston to support the increased electrical needs in the northwestern North Dakota area. Therefore the study area was expanded to include AVS, Williston and Tioga.

A study area capable of providing geographic coverage that could include several macro-corridor options that did not include areas directly north of the existing AVS 345-kV Substation and would connect the proposed Judson 345-kV Substation, existing Charlie Creek 345-kV Substation and Neset 230-kV Substation endpoints was established. The study area consists of parts of six counties in North Dakota. The following sections provide a description of the Project study area and identify the macro-corridors developed within the study area for further investigation.

4.3 GENERAL DESCRIPTION OF STUDY AREA

The AVS to Neset study area encompasses the existing AVS 345-kV Substation, Basin Electric's existing Charlie Creek 345-kV Substation, Western's existing Williston 230-kV Substation and vicinity for construction of Basin Electric's proposed Judson 345-kV Substation, and Basin Electric's existing Neset 230-kV Substation and vicinity for Basin Electric's proposed Neset 345-kV Substation . The configuration of the study area to include these substation locations generally extends to the west from the existing AVS 345-kV Substation for approximately 50 miles before extending approximately 80 miles to the north (see Figure 1-1). The study area extends along the south side of the Fort Berthold Reservation before turning north to the west of the reservation. The western boundary of the study area extends to approximately 13 miles west of Williston, providing sufficient routing opportunities around the west side of the existing Charlie Creek 345-kV Substation and the City of Williston. The northern border of the study area is located approximately 6.5 miles north of the existing Neset 230-kV Substation, which again provides routing opportunities up to, and around, the existing Neset 230-kV Substation. Extending the study area further in any direction would unnecessarily include lands and resources not likely to be affected by the Project. The study area provides a balance between providing sufficient area for development of numerous macro-corridor options and not being so large as to encumber the analysis.

The study area includes portions of Mercer, Dunn, Billings, McKenzie, Williams, and Mountrail counties in North Dakota. The existing AVS 345-kV Substation is located in Mercer County, approximately six miles northwest of the community of Beulah. Charlie Creek Substation is located in the southern portion of McKenzie County near the intersection of U.S Highway 85 and N.D. Highway 200. The proposed Judson 345-kV Substation to be constructed in Williams County would be located in the vicinity of Western's existing Williston 230-kV Substation, west of the City of Williston north of the intersection of U.S. Highway2 and U.S. Highway 85. The proposed Neset 345-kV Substation will be located near the existing Neset 230-kV Substation which is located in Mountrail County, approximately three miles east of the community of Tioga. Dominant features in the study area are Theodore Roosevelt National Park, Lake Sakakawea, the Missouri River, Little Missouri River, and the Little Missouri National Grasslands. Larger towns within the study area include Beulah, Dodge, Killdeer, Watford City, Williston, Epping, and Tioga, along with numerous smaller towns and communities.

Burns & McDonnell conducted an investigation of the human and natural resources within the study area to identify those resources that would present issues or concerns for the routing of a transmission line. The investigation also sought to identify opportunities within the study area that could provide a corridor for a new transmission line. The goal of the analysis was to identify and define a macro-corridor, an area up to several miles in width that extends between the Project endpoints, within which the proposed transmission line could be constructed. The substantial width of the macro-corridor will provide flexibility to identify several route corridors for the transmission line for comparison to select a corridor that minimizes impacts to important natural and human resources identified within the macro-corridor.

4.3.1 Human Resources

The AVS to Neset study area contains large expanses of rural, undeveloped area with scattered residential development and small towns and communities. General population and employment data for the counties within the Project study area are included in Tables 4-1 and 4-2. Land use within the study area consists of a mixture of grassland, cropland, and rangeland, with smaller areas of woodland and cropland around river drainages and lakes. Lake Sakakawea is a large impoundment of the Missouri River that is located through the northern portion of the study area.

Table 4-1: Study Area Population

	2000	2010	% Change
North Dakota	642,200	672,591	4.7
Billings County	888	783	-11.8
Dunn County	3,600	3,536	-1.8
McKenzie County	5,737	6,360	10.9
Mercer County	8,644	8,424	-2.5
Mountrail County	6,631	7,673	15.7
Williams County	19,761	22,398	13.3

Source: U.S. Census Bureau (2010a). 2000 and 2010 Census Data

Table 4-2: Percent Employment by County

Industry	North Dakota	Billings	Dunn	McKenzie	Mercer	Mountrail	Williams
Agriculture, forestry, fishing and hunting, and mining	8.6	35.1	30.3	27.2	21.6	16.2	22.1
Construction	7.0	6.5	8.1	5.9	7.3	4.8	3.9
Manufacturing	7.9	0.9	9.7	1.9	7.1	6.7	3.8
Wholesale trade	3.4	3.3	2.8	2.3	0.4	1.5	5.6
Retail trade	12.3	11.2	10.2	6.4	9.3	10.4	11.6
Transportation and warehousing, and utilities	5.3	3.3	4.4	3.1	17.5	3.2	6.0
Information	1.8	0.9	0.5	1.5	2.3	2.9	1.3
Finance, insurance, and real estate, and rental and leasing	6.0	1.5	2.0	3.0	1.8	4.5	4.8

Industry	North Dakota	Billings	Dunn	McKenzie	Mercer	Mountrail	Williams
Professional, scientific, management, administrative and waste management services	6.4	1.1	1.2	8.4	7.2	1.9	4.5
Educational, health, and social services	23.9	13.0	22.4	22.1	14.7	26.3	21.6
Arts, entertainment, recreation, accommodation and food services	8.0	10.0	2.9	8.6	4.6	9.9	6.9
Other services, except public administration	4.4	6.5	2.1	1.8	3.0	3.1	4.9
Public administration	5.1	6.5	3.3	7.7	3.2	8.6	3.0

Source: U.S. Census Bureau (2010b). 2005-2009 American Community Survey Data

There are numerous small towns and communities throughout the study area, with scattered rural residences and homesteads interspersed throughout. Communities located within the study area include Alexander, Arnegard, Beulah, Dodge, Dunn Center, Epping, Golden Valley, Grassy Butte, Halliday, Killdeer, Ray, Springbrook, Tioga, Watford City, White Earth, Williston, and Zap. Populations in 2010 for these communities are included in Table 4-3.

Table 4-3: Populations of Communities in the Study Area

Community	2010 Population
Alexander	223
Arnegard	115
Beulah	3,121
Dodge	87
Dunn Center	146
Epping	100
Golden Valley	182
Halliday	188
Grassy Butte	252
Killdeer	751
Ray	592
Springbrook	27
Tioga	1,230
Watford City	1,744
White Earth	80
Williston	14,716
Zap	237

Source: U.S. Census Bureau (2010a). 2010 Census Population Data

Theodore Roosevelt National Park and portions of the Little Missouri National Grasslands are located within the study area, along with two state parks (see Figure 1-1). These state parks include Lewis and Clark State Park located along Lake Sakakawea in Williams County and Little Missouri State Park located north of Dunn Center in Dunn County. North Tobacco Garden, Tobacco Garden, and Hofflund State Game Management Areas are located near Lake Sakakawea, and Killdeer Mountain State Game Management Area is located northwest of the town of Killdeer. Lake Ilo National Wildlife Refuge is located near Dunn Center in the southern part of the study area.

Primary roadways in the study area include U.S. Highway 2, U.S. Highway 85 and North Dakota State Highway 200. U.S. Highway 2 runs generally east to west through the northern portion of the study area, passing through the towns of Williston and Ray. The proposed Judson 345-kV Substation will be constructed adjacent to, or very near, U.S. Highway 2 just west of Williston and just north of U.S. Highway 85, and the existing Neset 230-kV Substation is located approximately five miles north of U.S. Highway 2 on the eastern edge of the study area. U.S. Highway 85 extends generally north to south through the western portion of the study area, and also passes through the town of Williston, as well as the towns of Alexander, Watford City and Grassy Butte. The Killdeer Mountain Four Bears Scenic Byway (North Dakota State Route 22) and the Theodore Roosevelt National Park North Unit Scenic Byway are located in the central portion of the study area. Several other paved state routes exist within the study area, along with numerous smaller paved and unpaved state and county roads. North Dakota State Highway 200 runs east to west across North Dakota and through the southern portion of the study area.

There are two active BNSF Railway Company (BNSF) rail lines providing service to customers within the Project study area. One of these lines runs generally southwest to northeast across the northern portion of the study area, passing through the towns of Williston and Tioga. Another BNSF line extends from the eastern edge of the study area and terminates at the Antelope Valley Station northwest of the town of Beulah. Several other abandoned rail lines occur within the study area.

Several transmission lines (115-kV or greater) are present within the Project study area. Basin Electric’s existing Charlie Creek to Antelope Valley Station 345-kV transmission line is located in the southern portion of the study area. Basin Electric’s Williston to Tioga 230-kV transmission line is located in the northern portion of the study area north and east of Williston. Western’s Indian Hills to Williston, Culbertson to Williston and Charlie Creek to Williston 115-kV transmission lines also occur within the study area. Western’s 115-kV line from Charlie Creek to Williston is being upgraded to 230-kV. The line is planned to be energized to 230-kV in the fall of 2011. Montana-Dakota Utilities’ Williston to Genora and Williston to Tioga 115-kV lines are present within the study area as well. Numerous smaller transmission and distribution lines occur throughout the study area to provide electrical service to residences and businesses. Distribution lines occur throughout the area, generally located along area roadways. Transmission lines more commonly extend cross-country following section, quarter-section, or fence lines.

4.3.2 Natural Resources

The Project study area includes portions of four physiographic provinces: the Missouri Coteau, the Coteau Slope, the Little Missouri Badlands, and the Missouri Plateau (USGS, 2006). Topography of the area ranges from a hummocky, glacially-modified landscape to rolling, hilly plains to rugged, deep canyons. Drainage flows are generally north and west towards the Missouri River, which flows from west to east. Much of the portion of the Missouri River in the study area contains Lake Sakakawea, which was formed by the construction of the Garrison Dam on the Missouri River near Pick City. Smaller rivers that drain into the Missouri include the Little Missouri, Little Muddy, Spring and Knife rivers (USGS, 2011b). Numerous intermittent and ephemeral stream channels are contained within the study area, with sharply defined stream channels in steeper areas, and broader, less-eroded features in areas with shallow slopes.

Vegetation within the study area consists of many different community types. These types include sparsely-to-heavily timbered canyons and draws, wooded riparian corridors, row crop agriculture, pasture/rangeland, and native mixed and short grass grasslands. Much of the study area contains thin or rocky soils, limiting the amount of row crop agriculture. In the areas with extensive grasslands, livestock grazing and hay production are common practices. Wetland communities occur in high densities within the Missouri Coteau and less so in the other regions. Wetlands in the glaciated regions tend to be more isolated with less connection to drainageways and streams.

The abundance and variety of vegetative communities provides habitat for numerous species of wildlife. Wildlife include both game species such as eagles, ringneck pheasant, mourning dove, fox squirrel, mule deer, white-tailed deer, sharp-tailed grouse, coyote, red fox, and waterfowl as well as numerous non-game species including prairie dogs, rodents, songbirds, shorebirds, and reptiles.

Preliminary investigation identified several Federally-listed species as potentially occurring in the counties included in the study area. Species associated with the Missouri River include the interior least tern, the pallid sturgeon, and the piping plover. Since the transmission line will span the river, these species are not expected to be impacted. No Federally-listed species are known to occur within the Little

Missouri River. Table 4-4 provides a complete list of the Federally-listed species potentially occurring in the Project study area.

The study area has a long history of habitation, both by prehistoric Native American groups and Euro-American settlers. In addition to several National Register of Historic Places (NRHP) sites, there are likely many prehistoric archaeological sites occurring throughout the area. There are 31 historic places registered on the NRHP in the study area. Table 4-5 summarizes the types and locations of the historical places in the study area listed on the NRHP.

Table 4-4: Threatened and Endangered Species by County

Common Name	Scientific Name	Federal Status*	Counties				
			Billings	Dunn	Mercer	McKenzie	Mountrail
Black-footed ferret	*Mustela nigripes*	E	E	E	E	E	
Dakota skipper	*Hesperia dacotae*	C		C		C	C
Gray wolf	*Canis lupus*	E	E	E	E	E	E
Greater sage-grouse	*Centrocercus urophasianus*	C					
Interior least tern	*Sterna antillarum*	E		E	E	E	E
Pallid sturgeon	*Scaphirhyncus albus*	E		E	E	E	E
Piping plover	*Charadrius melodus*	T		T, CH	T, CH	T, CH	T, CH
Spragues pipit	*Anthus spragueii*	C	C	C	C	C	C
Western prairie fringed orchid	*Platanthera paraeclara*	C					
Whooping crane	*Grus americana*	E	E	E	E	E	E

*E – Endangered; T – Threatened; C – Candidate; CH – Critical Habitat
Source: USFWS (2010).

Table 4-5: National Register of Historic Places (NRHP) by County

Category	Billings	Dunn	Mercer	McKenzie	Mountrail
Farm/Ranch	1	1	0	0	0
Building/Structure	2	0	3	2	1
Roadway	0	0	0	0	0
Cemetery	0	0	0	0	0
Church	1	1	1	0	0
Battlefield	0	0	0	0	0
Bridge	0	0	1	1	0
Courthouse	1	1	0	0	1
Site	0	0	0	0	0
Museum	1	0	0	1	0
Conservation/Archeological	2	0	1	0	0
Village	0	0	2	0	0
Park	3	0	1	0	1
Total	**11**	**3**	**9**	**4**	**3**

Source: NRHP (2011).

4.4 IDENTIFICATION OF ALTERNATIVE MACRO-CORRIDORS

Following the establishment and investigation of the Project study area attributes, several general areas that could contain macro-corridor alternatives were evaluated to determine if they were suitable for the development of transmission line route corridor alternatives. The initial macro-corridors were evaluated with consideration of the following constraints present within the study area that were used as a high level screening tool for areas to avoid placing transmission lines and substations:

- Communities and other developed areas within the study area
- Lake Sakakawea
- Missouri River
- Theodore Roosevelt National Park
- Little Missouri National Grasslands
- Little Missouri River
- Areas of rough and steep terrain around the Missouri River and Little Missouri River

Table 4-6 summarizes the considerations for macro-corridor development.

Table 4-6: Macro-Corridor Development Considerations

Resource	Opportunity Area (Optimize Use for Routing)	Avoidance Area (Minimize Use for Routing)	Exclusion Area (Exclude When Possible)
Communities and Developed Areas	--	--	Incorporated and unincorporated municipal boundaries, residential developments
Lake Sakakawea	--	Within flood inundation zone for lake	Crossing of lake inundation area
Missouri River	Existing linear facilities crossings	Narrow adjacent areas of rough terrain and associated floodplains	Wide adjacent areas of rough terrain, extensive floodplains, and wide river crossings
Theodore Roosevelt National park	--	--	Within the park boundary
Little Missouri National Grasslands	Paralleling existing linear facilities across grassland properties	Narrow or isolated grassland parcels	Large contiguous tracts of grassland property
Little Missouri River	Existing linear facilities crossings	Narrow adjacent areas of rough terrain and associated floodplains	Wide adjacent areas of rough terrain, extensive floodplains, and wide river crossings
Rough and steep terrain	Existing linear facilities crossings	Narrow areas adjacent to area drainages	Wide areas adjacent to area drainages and associated steep draws and canyons

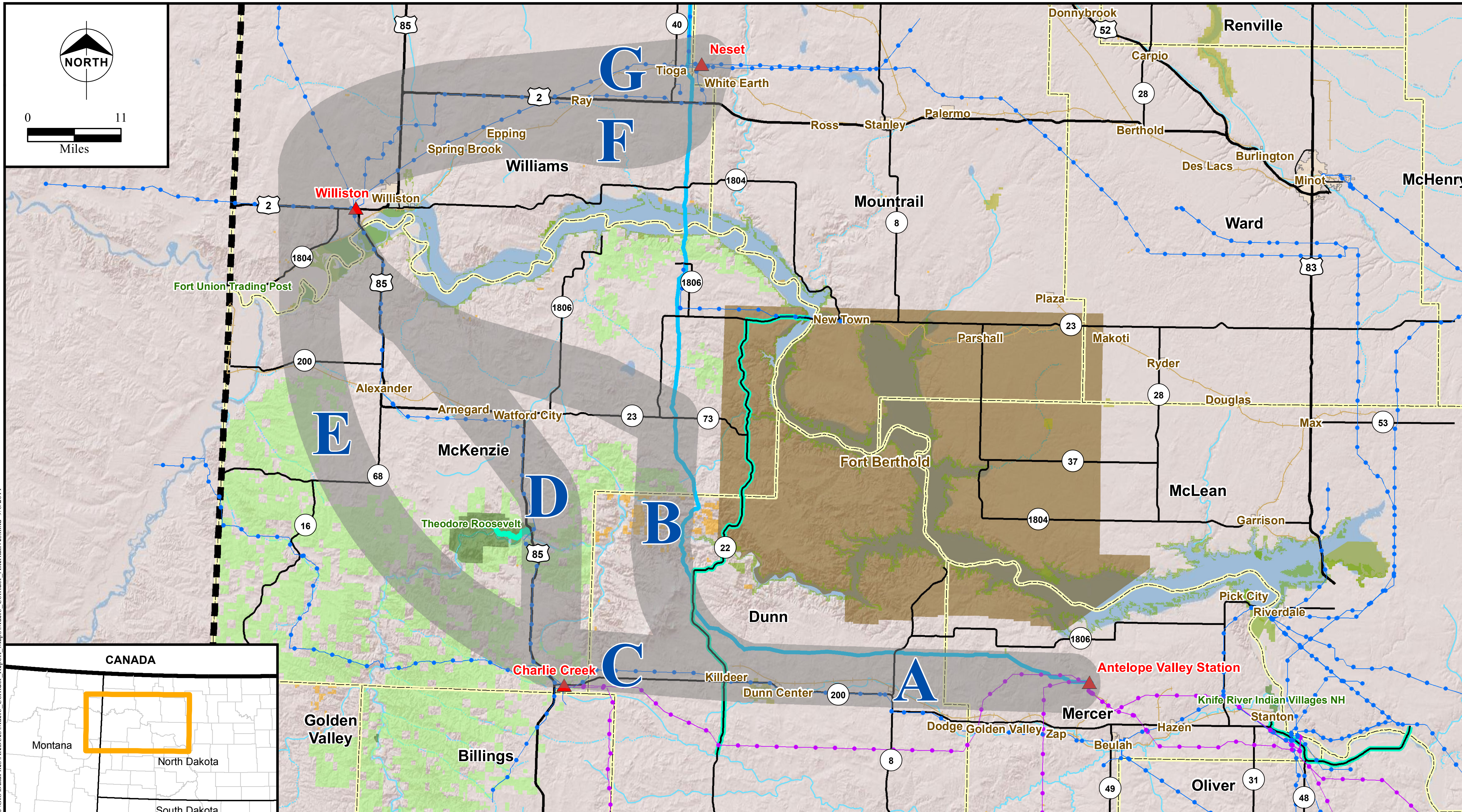
Communities occurring within the study area are generally small and can be avoided by a transmission line corridor. Theodore Roosevelt National Park is located west of U.S. Highway 85 in McKenzie County. The Little Missouri National Grasslands is comprised of many tracts spread throughout the study area; the primary area is located in the western portion of McKenzie County, which is in the western portion of the study area. Protected Federal properties such as national parks, grasslands, and historic areas are generally considered as areas to avoid when developing corridors for transmission lines. Due to the vast extent of the Federal Grasslands in certain areas of the study area it may be unavoidable in some instances. Areas of steep and rough terrain, as found near the Missouri and Little Missouri rivers, can pose engineering and construction complexities. Lake crossings also present engineering and construction challenges, as well as adding cost to the project. In a similar manner the macro-corridors considered the locations of natural and human resources within the study area and potential opportunities available for the compatible location of a new transmission line such as roadways, pipeline routes and existing transmission line corridors. A more detailed discussion and comparison of these macro-corridors is found in the following section.

4.5 ALTERNATIVE MACRO-CORRIDORS

Figure 4-1 illustrates the alternative macro-corridors and identifies individual corridor segments by letter designation A-G. Starting from the existing AVS 345-kV Substation, a corridor was developed (corridor segment A) that extends to the west across relatively undeveloped areas with favorable terrain for transmission line construction, while providing an adequate area for multiple alternative route corridors.

This corridor segment also contains within its boundaries the existing Dakota Gasification Company (DGC) CO_2 pipeline right-of-way. This corridor segment extends from the existing AVS 345-kV Substation approximately 40 miles to near the towns of Killdeer and Dunn Center, where it then splits.

Corridor segment B continues to the north, generally following the DGC pipeline right-of-way while crossing the Little Missouri River, and then turns in a northwest direction upon reaching North Dakota Highway 23. Corridor segment B then extends in a northwest direction while crossing the Missouri River at Williston using the U.S. Highway 85 corridor and terminating at the proposed Judson 345-kV Substation. Corridor segment C continues to head west from corridor segment A and terminates at the existing Charlie Creek 345-kV Substation. Corridor segment D extends north from the existing Charlie Creek 345-kV Substation and passes to the east of the Theodore Roosevelt National Park paralleling U.S. Highway 85. This corridor segment minimizes areas of rough terrain to be crossed but encounters considerable natural grasslands under Federal ownership. This corridor segment then continues to the north, eventually utilizing the same area as corridor segment B as it crosses the Missouri River near Williston, where it terminates at the proposed Judson 345-kV Substation.



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LEGEND

- Substation
- Army Corps of Engineers
- National or State Park
- National Wildlife Refuge
- National Grassland
- Tribal Lands
- BLM Lands
- State Boundary
- County Boundary
- Municipal Areas
- Railroad
- DGC Pipeline
- Scenic Byway
- Existing Transmission Lines
  - 345-kV
  - 230-kV and Below
- Macro-Corridor Alternatives

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BASIN ELECTRIC POWER COOPERATIVE A Touchstone Energy Cooperative

Figure 4-1
Basin Electric Power Cooperative
Antelope Valley Station to Neset
345-kV Transmission Project
Macro-Corridor Alternatives

Source: North Dakota GIS; Esri; Basin Electric; Burns & McDonnell.

Revised September 08, 2011

Corridor segment E extends westward from the existing Charlie Creek 345-kV Substation and turns northwest, passing to the west of Theodore Roosevelt National Park, crossing extensive areas of Federal grasslands as it turns to the northwest. This corridor segment continues to the northwest and crosses the Missouri River west of corridor segments B and D.

Extending from the proposed Judson 345-kV Substation to the proposed Neset 345-kV Substation, two corridor segments were considered, one north of U.S. Highway 2 and one south of U.S. Highway 2. Corridor segment F extends northeastward toward the proposed Neset 345-kV Substation. This corridor segment is generally located south of U.S. Highway 2 east of Williston. The other corridor segment (corridor segment G) takes a more northerly track, generally extending north from Williston and turning east toward the proposed Neset 345-kV Substation while remaining on the north side of U.S. Highway 2. Both of these corridor segments traverse primarily agricultural areas criss-crossed by section roads, providing good access throughout the area.

4.6 EVALUATION OF MACRO-CORRIDORS

The preliminary macro-corridors discussed in the previous section reveal three distinct macro-corridors from the existing AVS 345-kV Substation to the proposed Judson 345-kV Substation near Williston. Corridor segment combinations forming these macro-corridors are corridor segments AB, corridor segments ACD and corridor segments ACE (see Figure 4-1). Additionally, there are two distinct macro-corridors from the proposed Judson 345-kV Substation to Neset. These macro-corridors are designated as corridor segment F and corridor segment G. A discussion of these macro-corridors is included below. Corridor segments AB avoid a majority of the Little Missouri National Grassland area. This macro-corridor crosses mostly rangeland with generally good access roads throughout the area with the exception of the Little Missouri Crossing north of Killdeer, North Dakota. The total length of corridor segments AB is approximately 130 miles. Corridor segment C (extending to the existing Charlie Creek 345-kV Substation) could also be used in combination with corridor segments AB if it is determined that a switchyard at Killdeer would be needed to facilitate an additional 345-kV connection to the existing Charlie Creek 345-kV Substation.

Corridor segments ACD cross extensive areas of the Little Missouri National Grassland and cross areas of rough terrain with limited access. This macro-corridor also passes in proximity to Theodore Roosevelt National Park. This macro-corridor follows a former corridor that was investigated in the 1980's by Basin Electric and Montana-Dakota Utilities Company to construct a 230-kV transmission line from existing Charlie Creek 345-kV Substation to Williston, North Dakota. The 230-kV project received input from the required Federal and State agencies and was issued Corridor and Route Certificates by the North

Dakota Public Service Commission but was never constructed. The total length of corridor segments ACD is approximately 136 miles.

Corridor segments ACE cross a substantial amount of Federally-controlled natural grasslands, pass in proximity to Theodore Roosevelt National Park without containing any major existing road or pipeline alignments to follow such as corridor segments ACD, and are located almost entirely within areas of rough terrain with limited access. Rough terrain and limited access could increase project impacts and construction costs significantly, and since this macro-corridor is approximately 136 miles in length, the use of corridor segments ACE provides no real advantages over the other corridor segment combinations under consideration. Because of the above factors, the combination of corridor segments ACE was eliminated from further evaluation for potential transmission line alternative routes.

The Little Missouri River crossing using either corridor segments AB or corridor segments ACD represents an area of rough terrain and limited access; however, the expanse of this rough terrain is generally limited to areas near the river, and special structure types and design features would be able to allow the construction of a transmission line through these unique areas. Using corridor segments ACD does have the additional layer of complexity in that it is closer to the National Park and crosses Federal grasslands. This macro-corridor also requires minimal clearing, and provides the flexibility and opportunities for development of route corridors that also minimize resource impacts. Therefore, the combination of corridor segments AB and corridor segments ACD have been retained for further evaluation for potential transmission line alternative routes from the existing AVS 345-kV Substation to the proposed Judson 345-kV Substation (Figure 4-2).

From the proposed Judson 345-kV Substation to the proposed Neset 345-kV Substation there are two distinct macro-corridors, both of which are approximately 60 miles in length. Corridor segment F extends generally south of U.S. Highway 2 and avoids rough terrain, provides good access, and provides more opportunities for the placement of a transmission line (i.e. roads, existing transmission lines) than does corridor segment G, which is located generally north of U.S. Highway 2. Therefore, corridor segment F was selected to continue as the macro-corridor to be considered for further evaluation for potential transmission line alternative routes from the proposed Judson 345-kV Substation to proposed Neset 345-kV Substation (see Figure 4-2).

After the selection of the corridor segments to be retained, more defined, six-mile-wide corridors were developed within the retained corridor segments (Figure 4-3). These selected macro-corridors generally avoid major constraints within the study area, and take advantage of opportunities present within the study area. Table 4-7 summarizes the opportunities and constraints within each macro-corridor. A more detailed discussion of opportunities and constraints within the retained macro-corridors is presented in the following chapter.

Table 4-7: Summary of Macro-Corridor Opportunities and Constraints

Macro-Corridor Segments	Opportunity Area (Optimize Use for Routing)	Avoidance Area (Minimize Use for Routing)	Exclusion Area (Exclude When Possible)
AVS to Judson			
AB	Undeveloped cropland and rangeland, existing utility corridors	Minimal areas of steep terrain adjacent to Little Missouri River and Missouri River, residential development along Missouri River, minimal national grassland area	Incorporated and unincorporated communities (Killdeer, Dunn Center)
AB+C	Undeveloped cropland and rangeland, existing utility corridors	Minimal areas of steep terrain adjacent to Little Missouri River and tributaries, Missouri River, residential development along Missouri River, minimal national grassland area	Incorporated and unincorporated communities (Killdeer, Dunn Center)
ACD	Undeveloped cropland and rangeland, existing utility corridors, Hwy 85 corridor	Minimal areas of steep terrain adjacent to Little Missouri River and tributaries, Missouri River, residential development along Missouri River, minimal national grassland area	Incorporated and unincorporated communities (Killdeer, Dunn Center, Watford City, Arnegard), proximity to Theodore Roosevelt National Park, more contiguous national grassland properties
ACE	Undeveloped cropland and rangeland, minimal existing utility corridors	Minimal areas of steep terrain adjacent to Little Missouri River and tributaries, Missouri River	Incorporated and unincorporated communities (Killdeer, Dunn Center), proximity to Theodore Roosevelt National Park, large contiguous national grassland properties, extensive areas of rough terrain and limited access
Judson to Neset			

Macro-Corridor Segments	Opportunity Area (Optimize Use for Routing)	Avoidance Area (Minimize Use for Routing)	Exclusion Area (Exclude When Possible)
F	Existing linear facilities and roadways	--	Incorporated and unincorporated communities (Spring Brook, Epping, Ray, Tioga, Williston), irrigated lands
G	Limited existing linear facilities	--	Incorporated and unincorporated communities (Spring Brook, Epping, Ray, Tioga, Williston), irrigated lands

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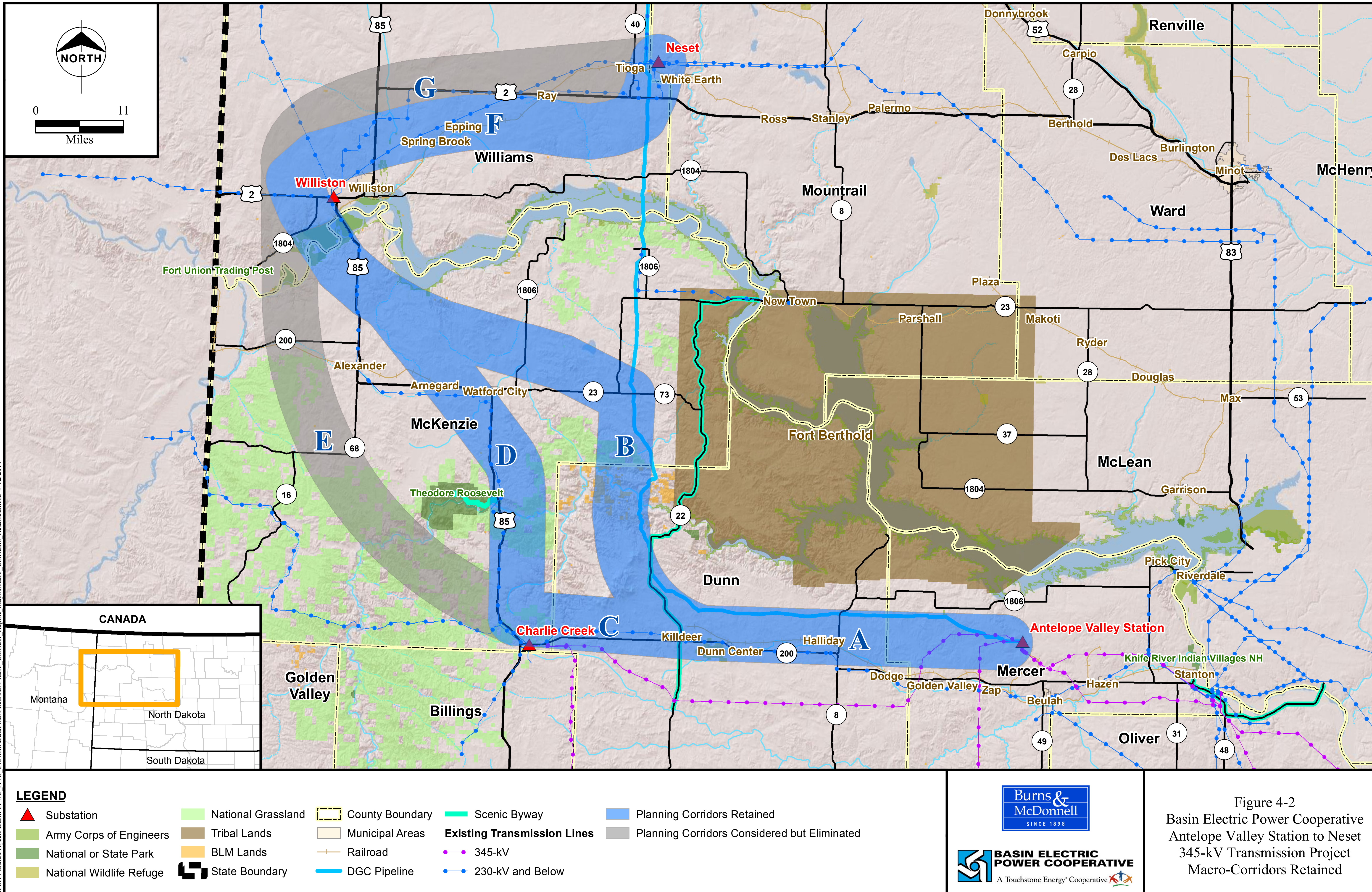

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Figure 4-2
Basin Electric Power Cooperative
Antelope Valley Station to Neset
345-kV Transmission Project
Macro-Corridors Retained

Source: North Dakota GIS; Esri; Basin Electric; Burns & McDonnell.

Revised September 12, 2011

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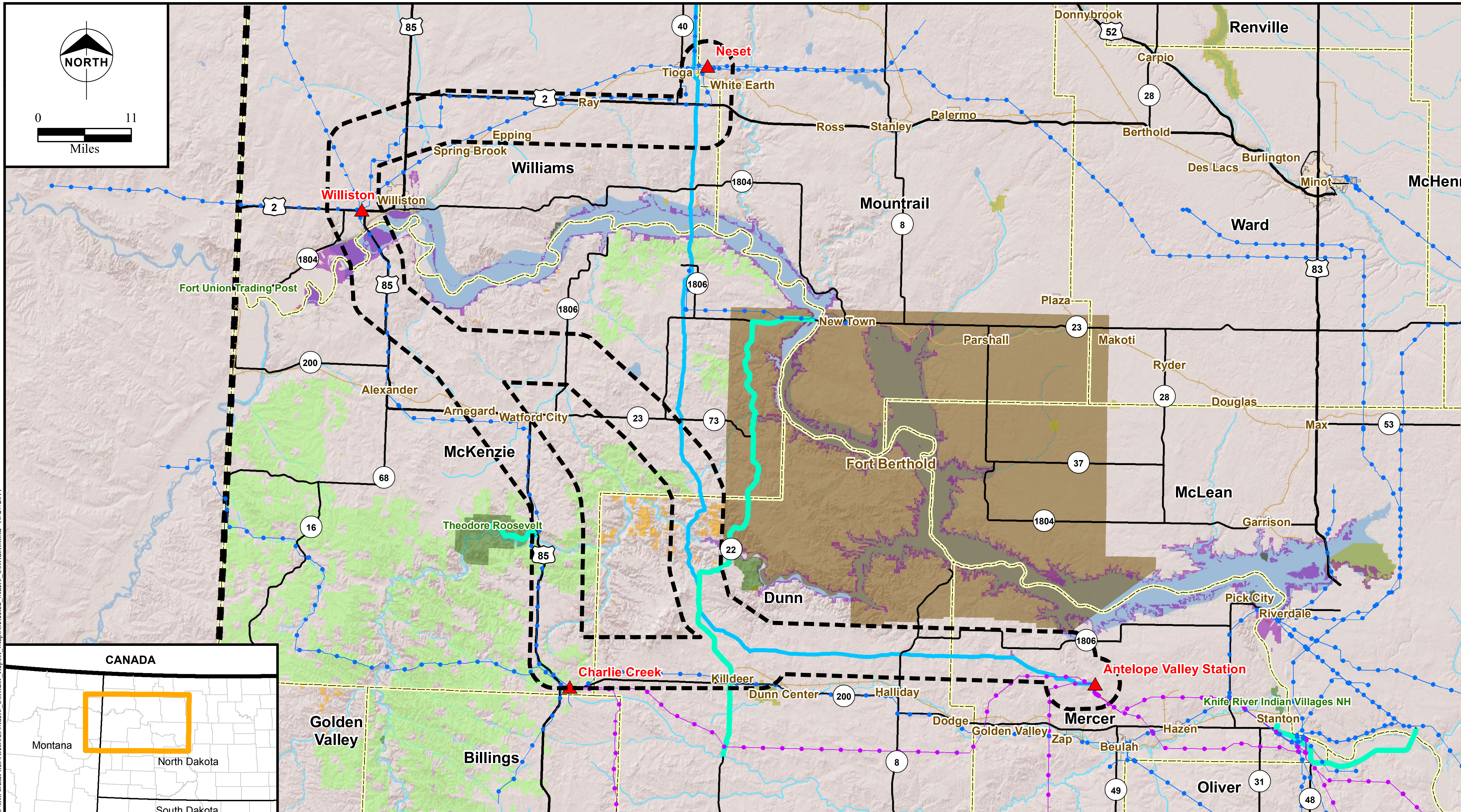

LEGEND

- Selected Macro Corridors
- Substation
- Army Corps of Engineers
- National or State Park
- National Wildlife Refuge
- National Grassland
- Tribal Lands
- BLM Lands
- State Boundary
- County Boundary
- Municipal Areas
- Railroad
- DGC Pipeline
- Scenic Byway

Existing Transmission Lines

- 345-kV
- 230-kV and Below

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BASIN ELECTRIC POWER COOPERATIVE
A Touchstone Energy® Cooperative

Figure 4-3
Basin Electric Power Cooperative
Antelope Valley Station to Neset
345-kV Transmission Project
Selected Macro Corridors

Source: North Dakota GIS; Esri; Basin Electric; Burns & McDonnell.

Revised October 27, 2011

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5.0 MACRO-CORRIDOR ANALYSIS

5.1 OVERVIEW

The purpose of identifying opportunities and constraints within the macro-corridors between the existing Antelope Valley Station (AVS) 345-kV Substation, existing Charlie Creek 345-kV Substation, proposed Judson 345-kV Substation, and proposed Neset 345-kV Substation is to identify potential constraints (natural or human resources that may not be compatible with the location of new transmission line facilities) and opportunities (locations or areas well-suited for the location of new transmission line facilities) within the identified macro-corridor alternatives to consider when developing route corridors. Resource data was collected and areas of opportunity, avoidance, and exclusion were identified within the macro-corridors. A detailed discussion of identified resource data, and the opportunities and constraints they present, is provided in the following sections.

5.2 RESOURCE DATA COLLECTION

Readily-available resource data within the study area was collected from resource management agencies, state and local governments, utility companies, and other publicly available sources. This data was used to prepare Geographic Information System (GIS) resource maps and included the following resource categories:

- Land Use and Jurisdiction;
- Existing Transportation and Utility Corridors;
- Geology and Soils;
- Water Resources;
- Cultural Resources; and
- Biological Resources

The resource data was mapped in GIS format and combined with aerial photography to validate resources within the identified macro-corridors. As described below, each environmental resource was categorized as an opportunity (suitable area), an avoidance area, or an exclusion area in the GIS opportunities and constraints inventory. The following sections describe in more detail each set of resource data that was collected as part of this inventory.

5.3 OPPORTUNITIES AND CONSTRAINTS

An opportunities and constraints inventory was developed based on resources and characteristics found within the macro-corridors that would provide desirable or undesirable attributes for the development of route corridors within the macro-corridors. The opportunities and constraints inventory used criteria developed for resources found within the macro-corridors that provided either favorable or unfavorable attributes for the location of a proposed transmission line. The criteria classifications include opportunity, avoidance, and exclusion areas associated with each selected resource. Table 5-1 lists the opportunity and constraint criteria that were developed for the Project.

Table 5-1: Project Opportunity and Constraint Criteria

Resource	Opportunity Area (Optimize Use for Routing)	Avoidance Area (Minimize Use for Routing)	Exclusion Area (Exclude When Possible)
Land Use and Jurisdiction			
Zoning/Land Use	Rangeland or agriculture; industrial or commercial	Designated prime and unique farmlands	Incorporated and unincorporated municipal boundaries, pivot irrigation
Residential Areas	--	Within 500 feet of occupied residence or other occupied building, subdivisions	Within 100 feet of occupied buildings/residences, subdivisions
Airports	--	--	Within 5,000 feet of a public airport and 2,500 feet of a private airport
Jurisdiction	--	Corps of Engineers property, state lands	Within boundary of formally designated state lands (conservation areas, state parks, SWAs, etc.) and federal conservation areas, wilderness areas, national parks/landmarks/monuments
Communication Towers/Radio Towers	--	Within 150 feet of FCC-registered structure	transmission line 150-foot right-of-way
Oil and gas wells	--	--	transmission line 150-foot right-of-way
Public Schools, Cemeteries, Churches, Parks and Recreation Areas	--	Within ¼ mile	transmission line 150-foot right-of-way
Existing Transportation and Utility Corridors			
Roads (interstate, state, county)	Within 500 feet	--	--
Railroads	--	--	right-of-way of railroad
Transmission Lines	Within 0.50-mile of existing transmission line (230-kV, 115-kV)	--	right-of-way of existing transmission line
Natural Gas Pipelines	--	Within 500 feet	Pipeline right-of-way

Resource	Opportunity Area (Optimize Use for Routing)	Avoidance Area (Minimize Use for Routing)	Exclusion Area (Exclude When Possible)
Geology and Soils			
Slope	Less than 10%	--	--
Geological Hazards	--	Moderate	Severe hazards/Undermined areas
Buried mineral resources	--	Areas of concentrated mineral resources	--
Soils	--	soil types characterized as highly erodible	--
Water Resources			
Wetlands	--	Within wetland boundary (structure only)	--
100-year Floodplain	--	Within floodplain boundary	--
Cultural Resources			
National Registered Historic Places, Landmarks and Monuments, archaeological sites	--	Within boundary of known archaeological site	Within 1/8 mile of NRHP site (structure only)
Biological Resources			
Big Game (elk, mule deer, bighorn sheep, mountain goat, and pronghorn)	--	Within concentration and winter concentration areas, severe winter range, production areas	--
Sensitive Vegetation Communities	--	Riparian Communities or designated sensitive plant communities	Federally threatened or endangered plants-designated critical habitat
Waterfowl/wading birds	--	Concentration areas, wintering habitat	--
Threatened and Endangered Species	--	--	Within areas of documented occurrences (including active nesting, denning, burrow, or lek sites). Exclusion area will vary depending on the species.

Opportunity areas are those areas that are conducive to, or compatible with, transmission lines. Opportunity areas are generally associated with undeveloped areas, areas containing existing utility or transmission corridors, other linear infrastructure (roads, railroads, non-natural gas pipelines), or industrial areas.

Avoidance areas are sensitive areas that are likely to incur adverse environmental impacts or result in land use conflicts if directly affected by a transmission line or associated right-of-way. Avoiding these areas is preferable if there are opportunities available elsewhere for the location of a transmission line. If such an area cannot be completely avoided, impacts can be minimized through route adjustments, careful placement of the transmission structures and access roads, spanning of the sensitive resource, seasonal restrictions on construction activities, and other mitigation measures.

Exclusion areas include highly-sensitive locations, including those with regulatory or legislative designations or extreme physical constraints resulting in limited compatibility with transmission line construction and/or operation. Locating a transmission line in these areas is not recommended and could result in increased environmental impacts, significantly higher costs, and/or additional regulatory approvals.

Figure 5-1 illustrates those areas identified as opportunities, avoidance areas, and exclusion areas based on the opportunities and constraints criteria and resource data gathered. Although avoidance and exclusion areas do appear within all of the macro-corridors, it appears that sufficient space is available for the development of several alternative route corridors within the macro-corridors. The following sections describe each of the opportunities and constraints criteria in greater detail.

5.3.1 Land Use and Jurisdiction

5.3.1.1 Land Use and Land Cover

Land use and land cover data were obtained from the U.S. Geological Survey (USGS) National Land Cover Dataset (2001). Land cover describes the general categories and distribution of land uses and land cover types within the macro-corridors (Figure 5-2). Cropland and pasture, grassland, and shrub/scrub constitute the majority of the land cover within the macro-corridors. These cover types typically provide good routing opportunities for transmission lines. Several smaller areas of woodland and irrigated land also occur within the macro-corridors.

5.3.1.2 Jurisdiction

Jurisdiction and land ownership within the macro-corridors is shown in Figure 5-4. Killdeer, Watford City, Arnegard, Epping and Ray are the only communities whose municipal boundaries are located within the macro-corridors, although the communities of Williston and Tioga are just outside the macro-corridor boundaries. Data on land ownership were obtained from the North Dakota Geographic Information System (GIS) (2011). Land ownership and jurisdiction within the macro-corridors include the Bureau of Land Management (BLM), State of North Dakota, U.S. Army Corps of Engineers (USACE), United

States Forest Service (USFS), U.S. Fish & Wildlife Service (USFWS), U.S. National Park Service (NPS) and private land. Many of these private lands contain easements under the Conservation Reserve Program (CRP), Wetland Reserve Program (WRP), or other conservation-type easements administered through the USFWS or the U.S. Department of Agriculture (USDA). Additionally, these lands may contain oil or gas wells, and these have been designated as exclusion areas, meaning that these wells should not be within the transmission line right-of-way. Areas within town boundaries, BLM lands, and the boundaries of state or Federally-owned parks or areas were designated as exclusion areas. Boundaries of pivot-irrigation systems were also designated as exclusion areas.

5.3.1.3 Residences and Residential Areas

Individual residences and farmsteads have been identified using photo-interpretation to show residential development patterns within the macro-corridors. Residences and farmsteads are located throughout the macro-corridors, as shown in Figure 5-5. These residences have not been field-verified; they have been preliminarily identified through a desktop survey with the use of aerial mapping of the study area. For the opportunities and constraints inventory, areas within 100 feet of a residence or farmstead were designated as exclusion areas and areas within 500 feet of a residence or farmstead are considered avoidance areas whenever possible.

5.3.1.4 Census Landmarks

Data on the locations of schools, parks, recreation areas, cemeteries, and other census-identified landmarks were obtained from the U.S. Census Bureau (2010c). There are few census landmarks within the macro-corridors, and these are widely-scattered (Figure 5-6). For the opportunities and constraints inventory, areas within 75 feet of census landmarks were designated as exclusion areas and areas within 1/4-mile of these features were designated as avoidance areas.

5.3.1.5 Communication and Radio Towers

The locations of communication facilities within the macro-corridors were obtained from the Federal Communications Commission (2010). Communication facilities include television transmission towers, microwave towers, AM and FM towers, and cellular telephone towers. These facilities are generally scattered throughout the macro-corridors and are also shown in Figure 5-6. For the opportunities and constraints inventory, areas within 150 feet of a tower’s guy wire ground anchors were designated as avoidance areas, and exclusion areas were designated as being within 75 feet of the tower, or within the transmission right-of-way.

5.3.1.6 Airports

Data on airports within the macro-corridors were obtained from the National Flight Data Center (FAA, 2011) and North Dakota GIS (2011). There are five private airstrips and two public airports located within the boundary of the macro-corridors. The Tioga Municipal Airport is located in the town of Tioga in the northeast corner of macro-corridor segment G. Weydahl Field is located northwest of the community of Killdeer in macro-corridor segment C. The Sloulin Field International Airport is located in the community of Williston, which lies just outside of the macro-corridors. Watford City Municipal Airport is located very near, but outside of, the macro-corridor boundary within the community of Watford City. For the opportunities and constraints analysis, areas within 2,500 feet of a private airport and 5,000 feet of a public airport were designated as exclusion areas. Public and private airports within the macro-corridors are shown on Figure 5-7.

5.3.2 Existing Transportation and Utility Corridors

Existing linear facilities and associated rights-of-way often provide good opportunities for routing transmission lines. For the Project, roads, railroads, transmission lines, and non-natural gas pipelines were identified and mapped as potential opportunities (Figure 5-7). This data was obtained from the North Dakota GIS and Basin Electric (2011).

Locating a transmission line along linear features may result in fewer environmental impacts because of the previous disturbance from construction and relatively easy access to the existing right-of-way. However, locating along these facilities can be difficult due to development around and adjacent to these lines. Following existing infrastructure can also limit flexibility to avoid resources along the existing infrastructure. A general description of these linear features is presented in the following sections.

5.3.2.1 Major Roads and Scenic Byways

Several opportunities are available for using existing roadways within the macro-corridors (Figure 5-7). U.S. Highway 85 south and north of Williston, along with U.S. Highway 2 from Williston to near the existing Neset 230-kV Substation, provide opportunities for transmission line location. Areas within 500 feet of a roadway were designated as opportunity areas.

The Killdeer Mountain Four Bears Scenic Byway is designated as a state scenic byway. This byway is part of State Highway 22 that traverses north and south through the town of Killdeer in Dunn County (macro-corridor segments A and B). Theodore Roosevelt National Park North Unit Scenic Byway is also designated as a state scenic byway located within macro-corridor segment D within Theodore Roosevelt National Park in McKenzie County, adjacent to U.S. Highway 85 as it passes through the park. These sections of roadway were not considered as opportunities for routing due to their special designation in these areas. Instead, they were considered as avoidance areas.

5.3.2.2 Railroad Rights-of-Way

There are two active Burlington Northern Santa Fe (BNSF) rail lines occurring within the macro-corridors (see Figure 5-7). One of these lines runs generally southwest to northeast across macro-corridor segment F, passing through the towns of Williston and Tioga. Another BNSF line extends from the eastern edge of macro-corridor segment A and terminates a short distance away at the Antelope Valley Station northwest of the town of Beulah. There is also a section of abandoned railroad northeast of the community of Killdeer, just inside macro-corridor segment A. For the purpose of the opportunities and constraints inventory, exclusion areas were determined to include the right-of-way of an active railroad.

5.3.3 Transmission Lines

Existing transmission lines may provide opportunities for routing the proposed transmission line adjacent to an existing right-of-way. Paralleling the rights-of-way of existing transmission lines could potentially reduce environmental impacts associated with construction, operation, and maintenance of the proposed transmission line and is considered good routing practice by confining linear facilities to common corridors. However, it is not practicable for this Project to parallel existing high-voltage transmission lines (above 230-kV) for reasons of system reliability unless where multiple lines greater than 230-kV merge at common points such as the AVS and Charlie Creek substations. For the Project, Basin has indicated opportunities for placing the proposed transmission line adjacent to an existing line are limited to within 0.50 mile of existing 230-kV or lower voltage transmission lines to preserve system reliability.

Existing transmission lines within the macro-corridors are shown in Figure 5-7. Large areas within the macro-corridors are void of any high-voltage transmission lines, although distribution lines are found throughout the macro-corridors. There are two Basin Electric 345-kV transmission lines extending from the AVS Substation in the extreme eastern part of macro-corridor segment A. A Western 115-kV line, which is to be upgraded in 2012 to 230-kV, enters macro-corridor segments B and D south of Williston and generally parallels U.S. Highway 85 to the south until terminating at the existing Charlie Creek 345-kV Substation. An MDU 115-kV and Basin Electric 230-kV line extend from the existing Williston 230-kV Substation through a portion of macro-corridor segment F before connecting at the existing Neset 230-kV Substation. These lines provide some opportunities to be paralleled by the proposed project, but they do not extend in the direction necessary for this project for long distances.

5.3.4 Geology and Soils

Primary geologic hazards identified within the macro-corridors are landslide hazards. Areas along the Little Missouri River, Missouri River, and Lake Sakakawea all contain areas of steep terrain that could pose problems during the construction of a transmission line. For the opportunities and constraints inventory, areas of moderate landslide hazard have been classified as avoidance areas, while areas of high landslide hazard have been classified as exclusion areas. Areas with little or no slope are ideal for the routing of transmission lines, and areas where the slope is less than 10 percent are considered as areas of opportunity (Figure 5-8). Percent-slope was gathered using the USGS National Elevation Dataset 30-meter Digital Elevation Model (2011a).

Areas of prime farmland and farmland of statewide importance are also found throughout the macro-corridors (Figure 5-9). These prime and unique farmlands have been determined as avoidance areas for the opportunities and constraints analysis. Farmland soil data was obtained through the Natural Resource Conservation Service (NRCS) Soil Survey Geographic Database (SSURGO) database (2011). Additionally, areas within the macro-corridors containing concentrated mineral resources, or with soil types characterized as highly-erodible, have been designated as avoidance areas.

5.3.5 Water Resources

Wetlands and surface water features within the macro-corridors are shown in Figure 5-8. National Wetlands Inventory (NWI) data was used to determine locations of wetland areas within the macro-corridors (USFWS, 2011). Wetland areas not associated with the Little Missouri River or Missouri River are widely scattered within the macro-corridors, and generally consist of small pothole-type wetland areas.

For the opportunities and constraints inventory, wetland boundaries were designated as avoidance areas, meaning that transmission structures would not be placed within any wetland boundary if possible. Designated floodplain areas are also designated as avoidance areas for the Project, although these areas are generally small and occur immediately adjacent to rivers and streams. In most cases, wetlands, streams and floodplains could be easily spanned by the Project. Although these resources may occur within the right-of-way, structures could be located outside these areas.

5.3.6 Cultural Resources

There are two known National Register of Historic Places (NRHP) sites within the macro-corridors (see Figure 5-5). The Ray Opera House is located within the community of Ray in the northern portion of macro-corridor segment F. The Grassy Butte Post Office is located in Grassy Butte in the western portion of macro-corridor segment C. These protected structures have a designated exclusion area of 1/8-mile for the opportunities and constraints inventory. The Killdeer Mountain Battlefield State Historic Site is located within macro-corridor segment C, approximately eight miles northwest of the community of Killdeer in Dunn County. Avoidance areas have also been designated to include the boundaries of any known or encountered archaeological sites. Data was obtained from the NPS NRHP database (2011).

5.3.7 Biological Resources

The macro-corridors contain areas of suitable habitat for many different species of wildlife and vegetation, including Federally-listed threatened and endangered species. The land cover types present within the macro-corridors are shown in Figure 5-2. Figure 5-3 shows important habitat areas for Federally-listed threatened and endangered species, including piping plover critical habitat, least tern and pallid sturgeon habitat, and whooping crane migration corridor. For the opportunities and constraints inventory, those areas suitable as winter concentration areas and production areas for big game species such as elk, mule deer, and bighorn sheep are designated as avoidance areas, where possible. Breeding habitat and other concentration areas for waterfowl and wading birds are also designated as avoidance areas within the macro-corridors. Riparian communities and areas designated as sensitive plant communities are designated as avoidance areas as well. Exclusion areas have been designated for Federally-threatened or endangered plant and animal species critical habitat or documented occurrences, or for nesting, denning, or lek sites. Specific areas of avoidance and exclusion will be determined after further field studies within the macro-corridors.

5.4 PUBLIC SCOPING AND STAKEHOLDER INVOLVEMENT

Involvement with the general public and stakeholders within the Project area will be integral to the evaluation of the alternative route corridors within the macro-corridors, and ultimately the selection of a preferred route corridor to be carried forward for a more detailed environmental analysis.

The public involvement process will include public scoping meetings that will occur at the beginning of the formal NEPA process. At these meetings, the macro-corridors and alternative route corridors will be presented to the public for solicitation of input regarding the route corridors. Public input received will help in refining the alternative route corridors as well as determine the appropriate levels of study necessary to address issues of concern.

Stakeholders are those people and organizations that may be affected or have some interest in the Project. Potential stakeholders for this Project include the following:

- Property owners, business owners, or residents within the macro-corridors or route corridors;

- Towns or small communities located within or near the macro-corridors
- State and local elected officials;
- North Dakota Game & Fish Department;
- North Dakota Department of Transportation;
- Native American tribes with interests in the area;
- Bureau of Indian Affairs;
- Bureau of Land Management;
- U.S. Army Corps of Engineers;
- U.S. Forest Service;
- U.S. Fish & Wildlife Service; and
- National Park Service.

Two public scoping meetings are planned within the macro-corridors, one meeting in Williston and the other meeting in Killdeer. Notices advertising the scoping meetings will be published in local newspapers and broadcast on local radio stations prior to the meetings, anticipated to be in mid-November, 2011.

5.5 FIELD RECONNAISSANCE AND IDENTIFICATION OF CORRIDOR-SPECIFIC CONSTRAINTS

Initial field reconnaissance of the study area occurred during the spring and summer of 2011, as part of developing the macro-corridors. Field reconnaissance will be used to ground-truth collected data, and will also be used to identify additional corridor-specific constraints not previously discovered. Field observations may include determining the extent of floodplains and wetlands, verification of threatened or endangered species habitat, verification of occupied residences within the route corridors, and identifying other visible constraints that could influence routing decisions. The results of the field reconnaissance will be used to further develop the route corridors and to provide relevant data for comparison between corridors.

5.6 ROUTE CORRIDOR DEVELOPMENT AND COMPARATIVE ANALYSIS

The opportunities and constraints inventory was used to identify those areas within the identified macro-corridors that may be suitable for the location of a transmission line, and also those areas that are not suitable for the location of a transmission line. Focusing on these suitable areas, specific alternative route corridors will be developed, attempting to minimize avoidance and exclusion areas within the route corridor. A comparative analysis between alternative route corridors will involve assessing the environmental consequences that are expected as a result of implementation of the Project. Issues and additional constraints or opportunities identified during this comparison, along with information from the public and resource agencies, may determine which alternative route corridors need to be adjusted or eliminated. The comparative analysis between alternative route corridors is meant to quantify impacts associated with each corridor, and to ultimately select a route corridor that maximizes opportunities, minimizes constraints and resource impacts, and is suitable for transmission line construction, operation, and maintenance.

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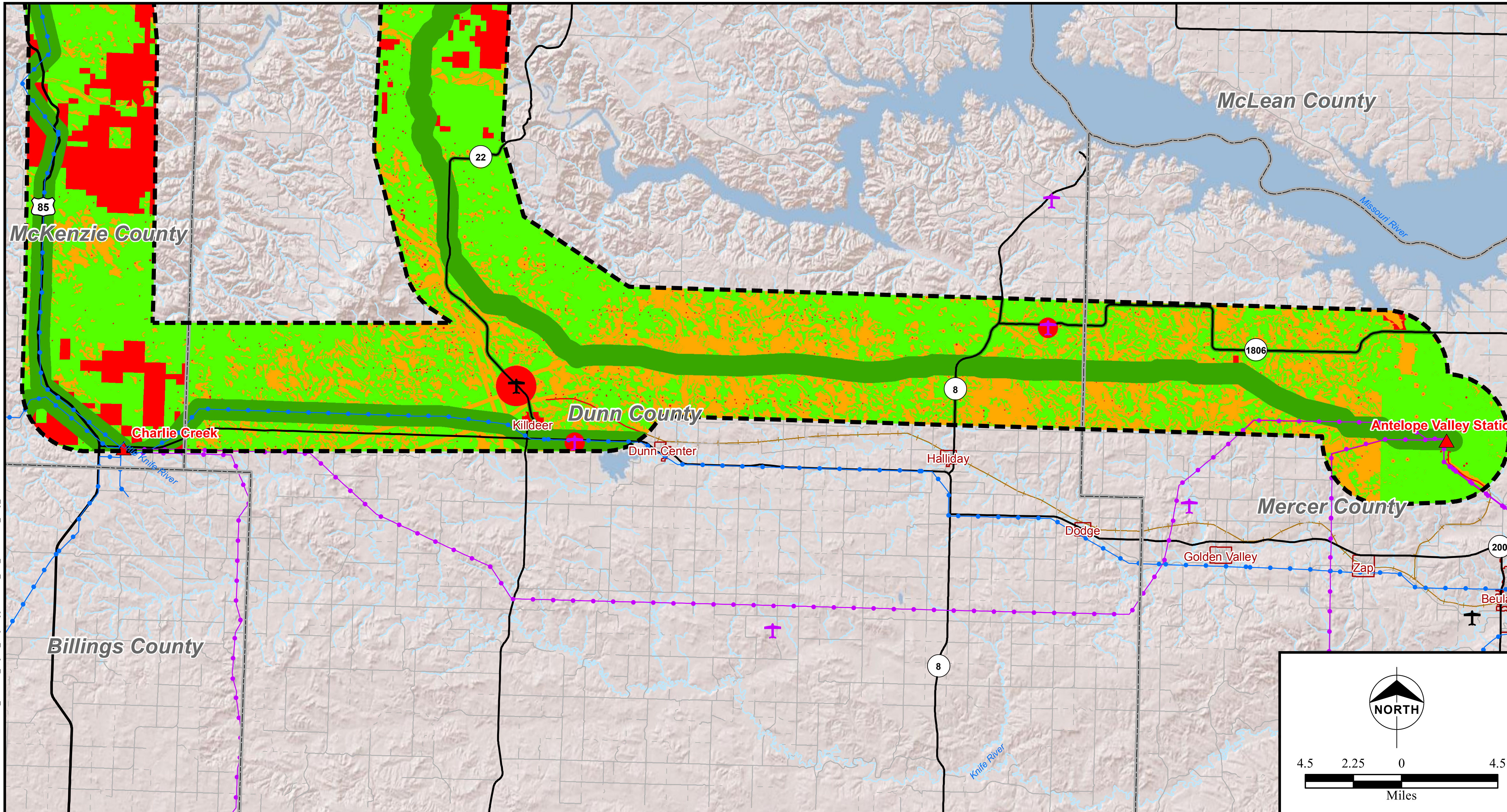

LEGEND

- Project Study Area
- Existing Substation
- Existing 115-kV & 230-kV Transmission Lines
- Existing 345-kV Transmission Lines
- Municipal Boundary
- County Boundary
- US Highway
- State Highway
- Other Road
- Trail
- Railroad
- Public Airport
- Private Airport

Opportunities and Constraints

- Higher Opportunity Area
- Lower Opportunity Area
- Avoidance Area
- Exclusion Area

Map Sheet Index

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NORTH DAKOTA

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BASIN ELECTRIC POWER COOPERATIVE
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Figure 5-1
Basin Electric Power Cooperative
Antelope Valley Station to Neset
345-kV Transmission Project
Opportunities and Constraints
Sheet 1 of 3

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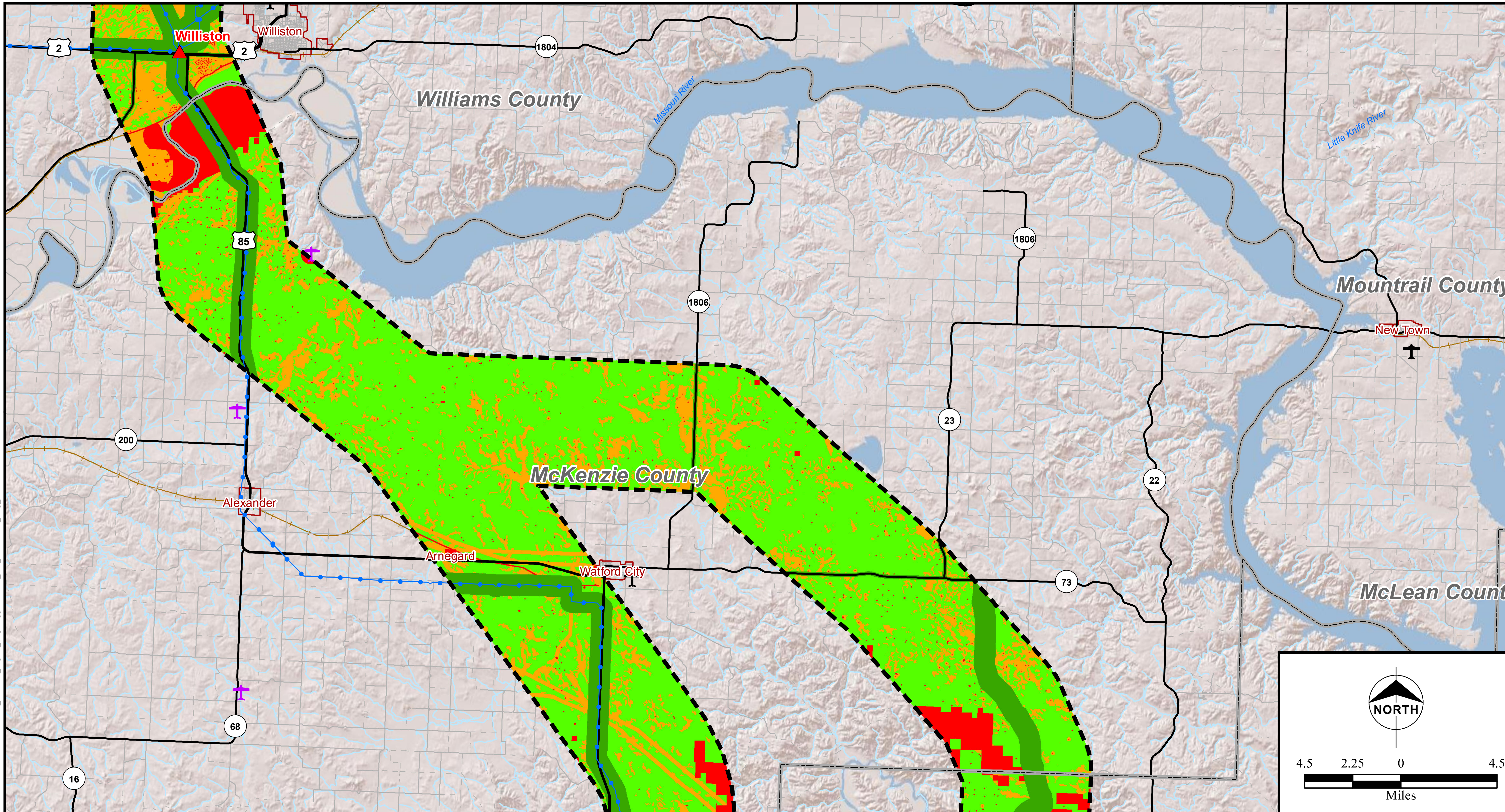
Source: North Dakota GIS, Esri, National Flight Data Center, USDA, USGS, USFWS, FCC, FEMA, US Census, Basin Electric, Burns & McDonnell.

Revised October 25, 2011



LEGEND

- Project Study Area
- Existing Substation
- Existing 115-kV & 230-kV Transmission Lines
- Existing 345-kV Transmission Lines
- Municipal Boundary
- County Boundary
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- State Highway
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Opportunities and Constraints

- Higher Opportunity Area
- Lower Opportunity Area
- Avoidance Area
- Exclusion Area

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1
NORTH DAKOTA

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Figure 5-1
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Opportunities and Constraints
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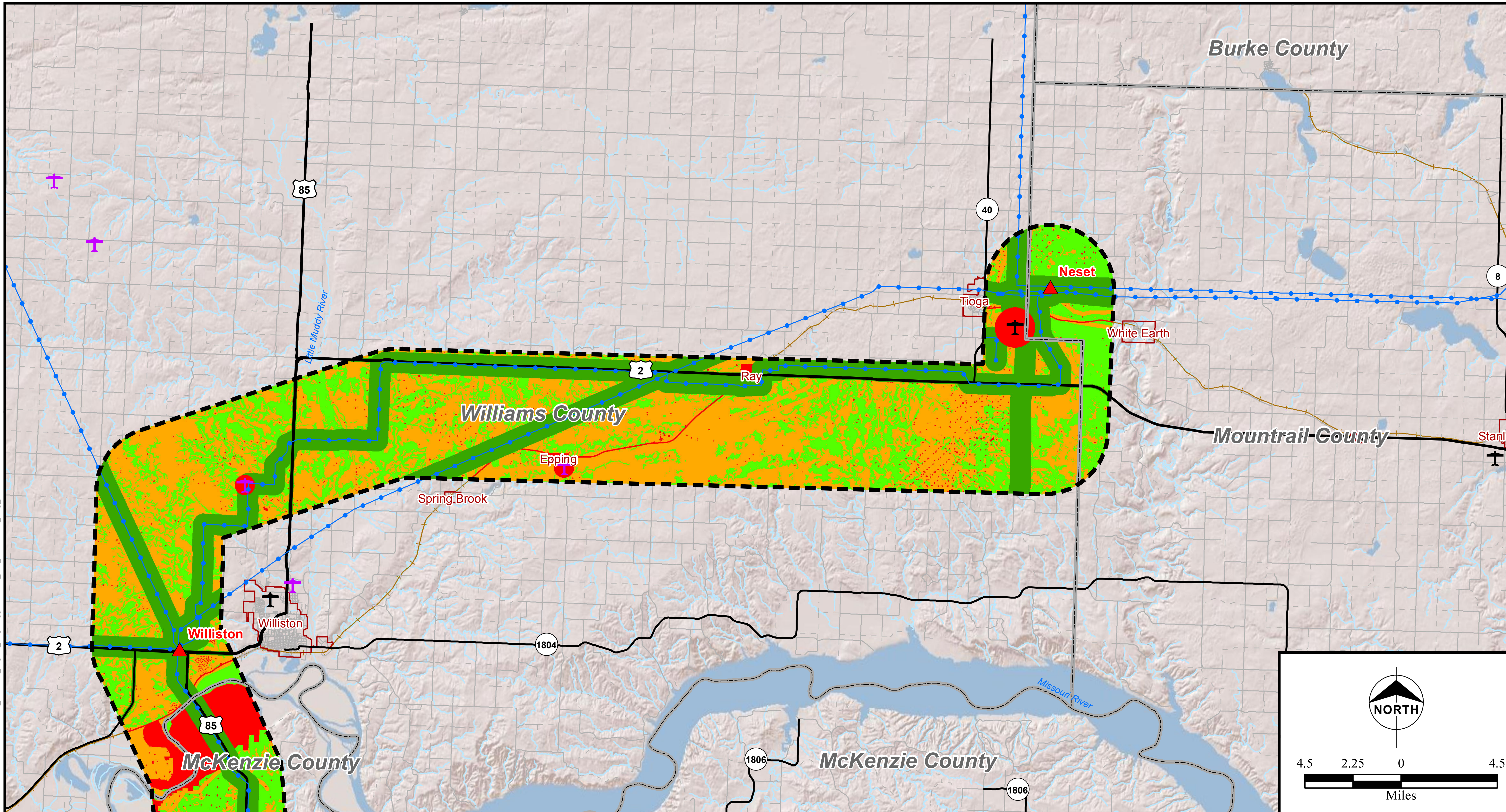

LEGEND

- Project Study Area
- Existing Substation
- Existing 115-kV & 230-kV Transmission Lines
- Existing 345-kV Transmission Lines
- Municipal Boundary
- County Boundary
- US Highway
- State Highway
- Other Road
- Trail
- Railroad
- Public Airport
- Private Airport

Opportunities and Constraints

- Higher Opportunity Area
- Lower Opportunity Area
- Avoidance Area
- Exclusion Area

Map Sheet Index

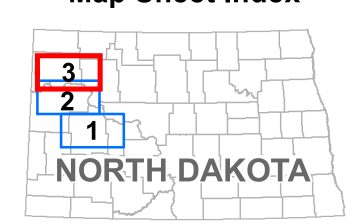

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Figure 5-1
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Antelope Valley Station to Neset
345-kV Transmission Project
Opportunities and Constraints
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Source: North Dakota GIS, Esri, National Flight Data Center, USDA, USGS, USFWS, FCC, FEMA, US Census, Basin Electric, Burns & McDonnell.

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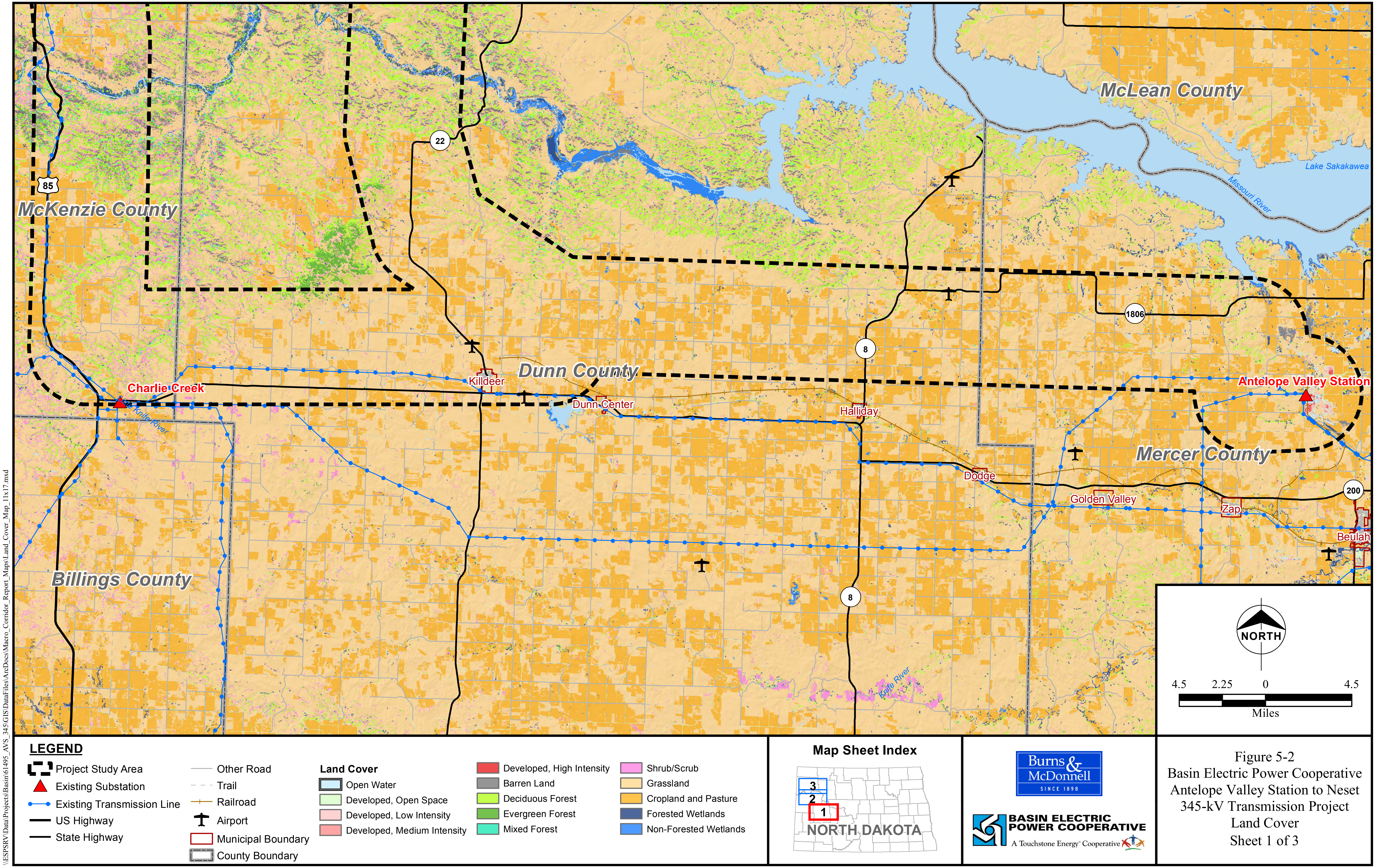

Figure 5-2
Basin Electric Power Cooperative
Antelope Valley Station to Neset
345-kV Transmission Project
Land Cover
Sheet 1 of 3

Source: North Dakota GIS, Esri, National Flight Data Center, USGS National Land Cover; Basin Electric, Burns & McDonnell.

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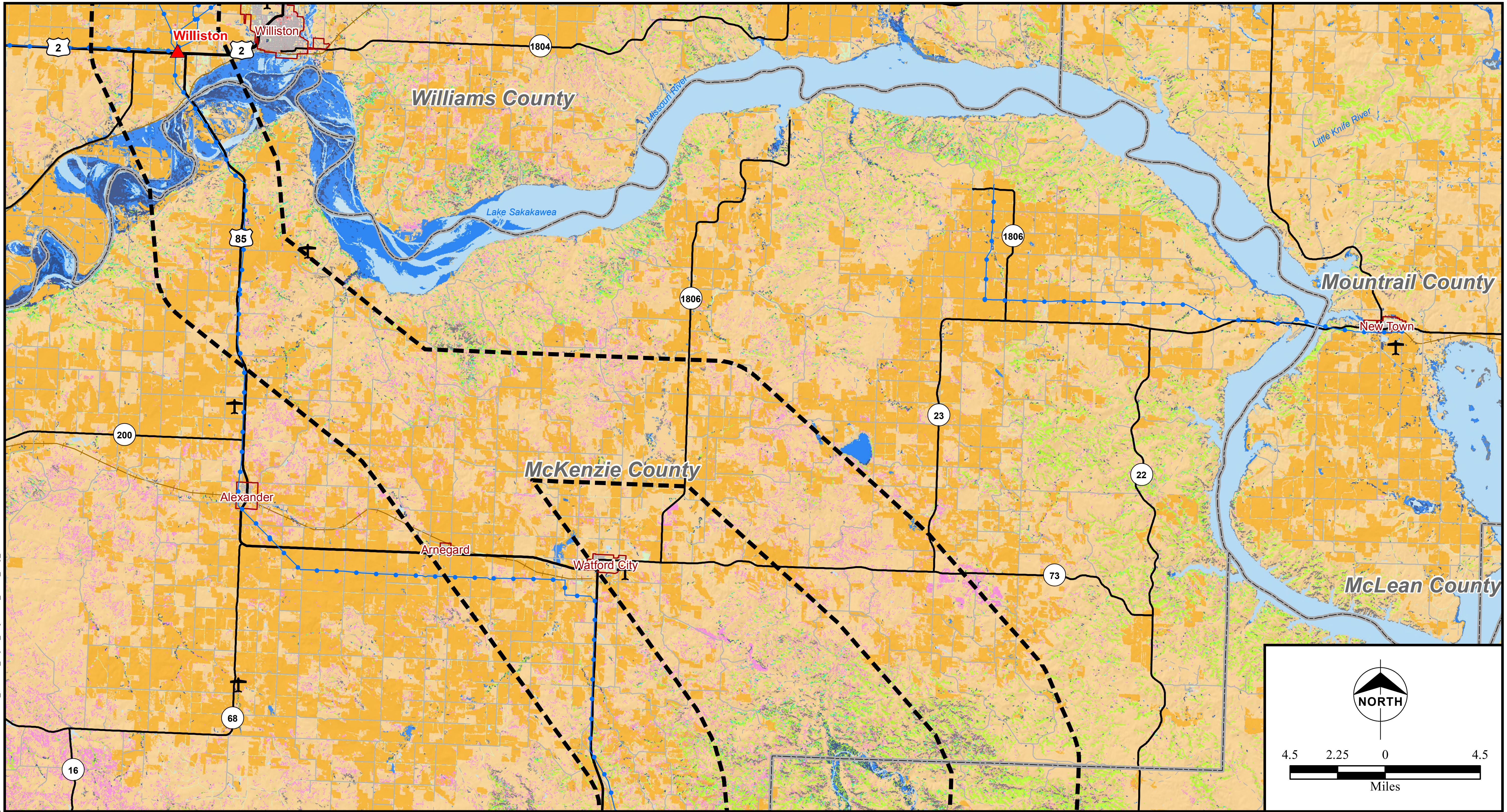

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LEGEND

- Project Study Area
- Existing Substation
- Existing Transmission Line
- US Highway
- State Highway
- Other Road
- Trail
- Railroad
- Airport
- Municipal Boundary
- County Boundary

Land Cover

- Open Water
- Developed, Open Space
- Developed, Low Intensity
- Developed, Medium Intensity
- Developed, High Intensity
- Barren Land
- Deciduous Forest
- Evergreen Forest
- Mixed Forest
- Shrub/Scrub
- Grassland
- Cropland and Pasture
- Forested Wetlands
- Non-Forested Wetlands

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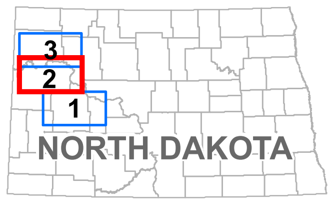

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Figure 5-2
Basin Electric Power Cooperative
Antelope Valley Station to Neset
345-kV Transmission Project
Land Cover
Sheet 2 of 3

Source: North Dakota GIS, Esri, National Flight Data Center, USGS National Land Cover; Basin Electric, Burns & McDonnell.

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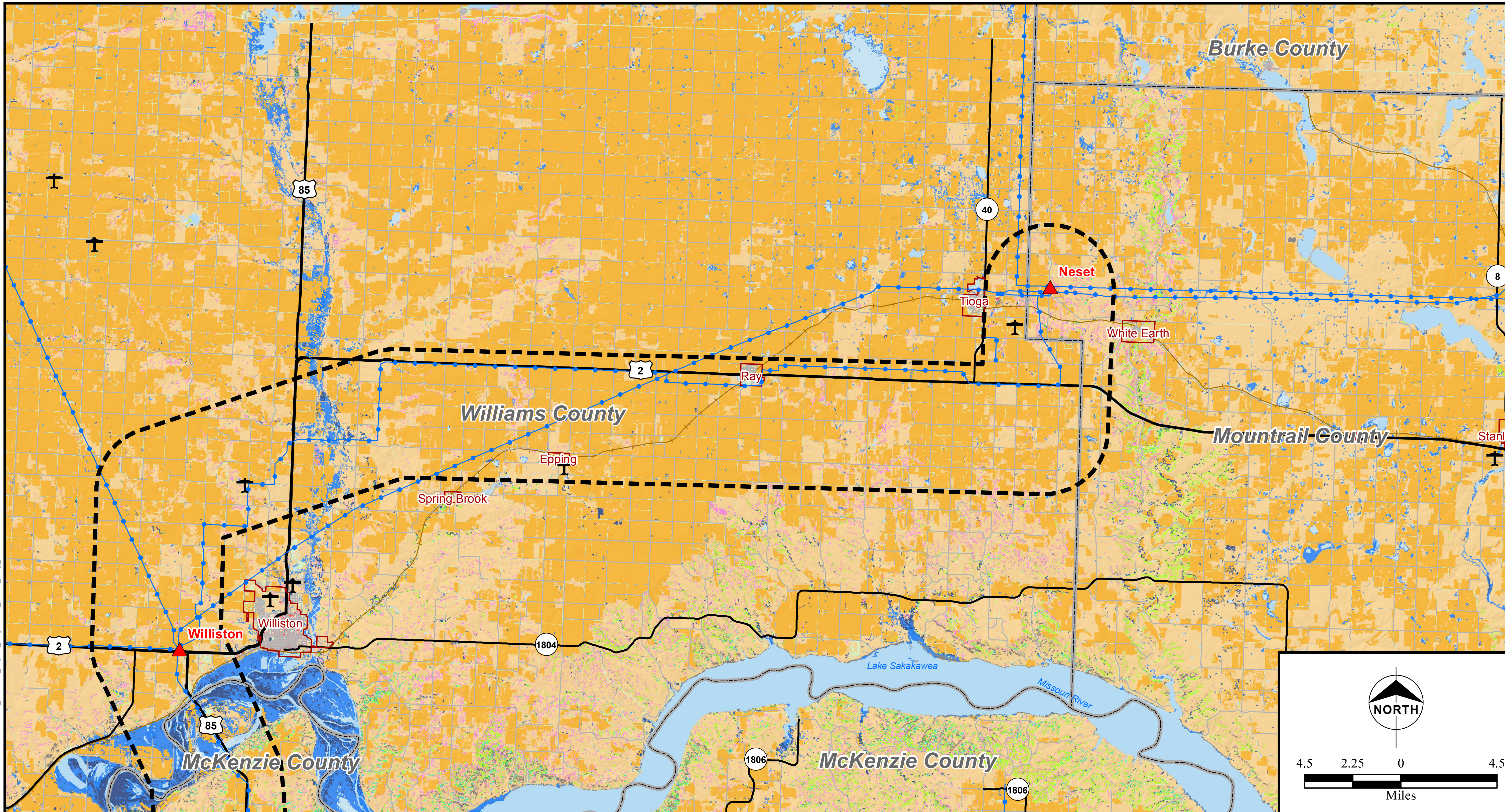

LEGEND

- Project Study Area
- Existing Substation
- Existing Transmission Line
- US Highway
- State Highway
- Other Road
- Trail
- Railroad
- Airport
- Municipal Boundary
- County Boundary

Land Cover

- Open Water
- Developed, Open Space
- Developed, Low Intensity
- Developed, Medium Intensity
- Developed, High Intensity
- Barren Land
- Deciduous Forest
- Evergreen Forest
- Mixed Forest
- Shrub/Scrub
- Grassland
- Cropland and Pasture
- Forested Wetlands
- Non-Forested Wetlands

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Figure 5-2
Basin Electric Power Cooperative
Antelope Valley Station to Neset
345-kV Transmission Project
Land Cover
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Source: North Dakota GIS, Esri, National Flight Data Center, USGS National Land Cover; Basin Electric, Burns & McDonnell.

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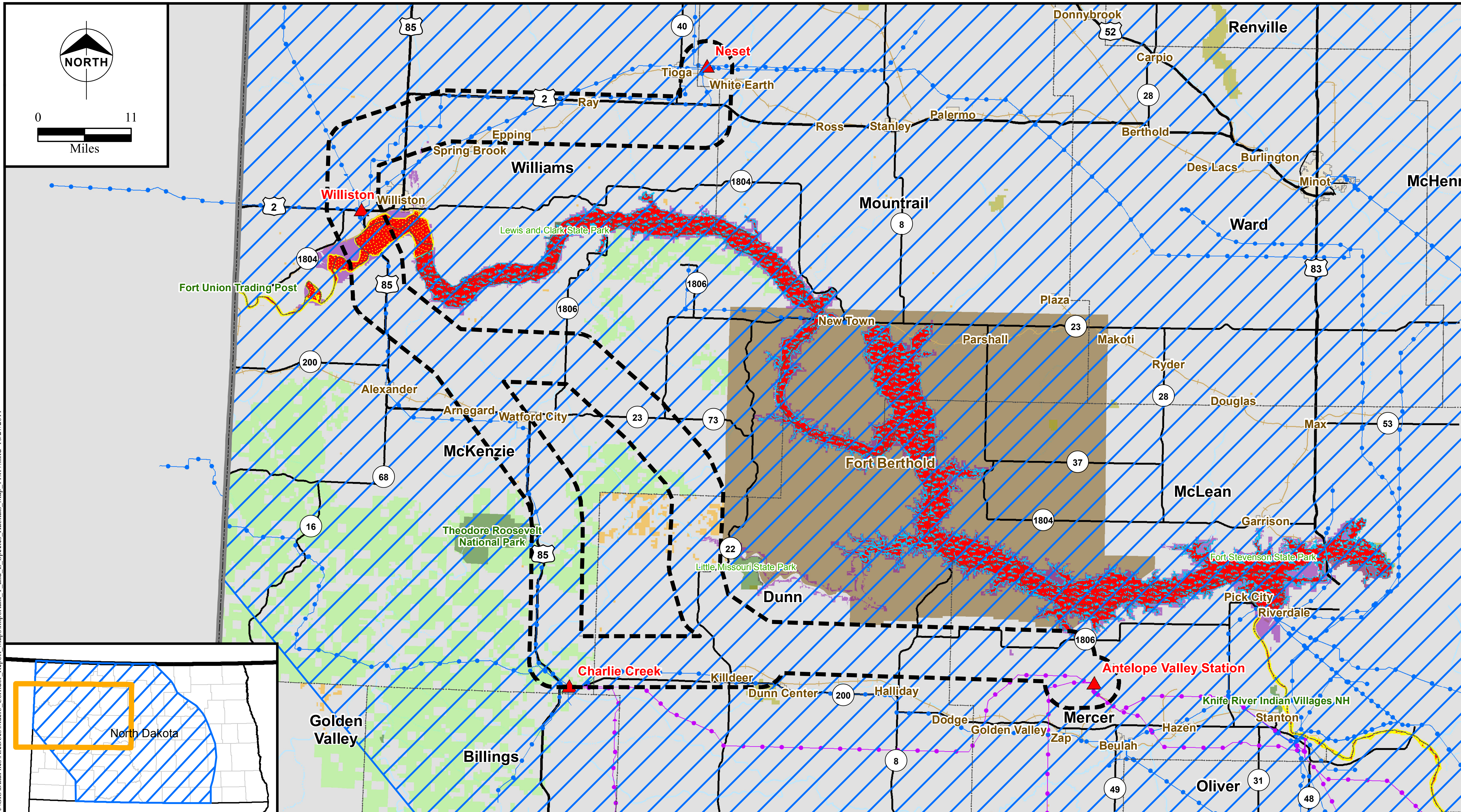

LEGEND

- Selected Macro Corridors
- Substation
- Army Corps of Engineers
- National or State Park
- National Wildlife Refuge
- National Grassland
- Tribal Lands
- BLM Lands
- State Boundary
- County Boundary
- Municipal Areas
- Railroad

Existing Transmission Lines

- 345-kV
- 230-kV and Below
- Piping Plover Critical Habitat
- Whooping Crane Migration Corridor in North Dakota
- Interior Least Tern Habitat
- Pallid Sturgeon Habitat

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Figure 5-3
Basin Electric Power Cooperative
Antelope Valley Station to Neset
345-kV Transmission Project
Important Threatened and Endangered
Species Habitat

Source: North Dakota GIS; USFWS Map; Esri; Basin Electric; Burns & McDonnell.

Revised October 27, 2011

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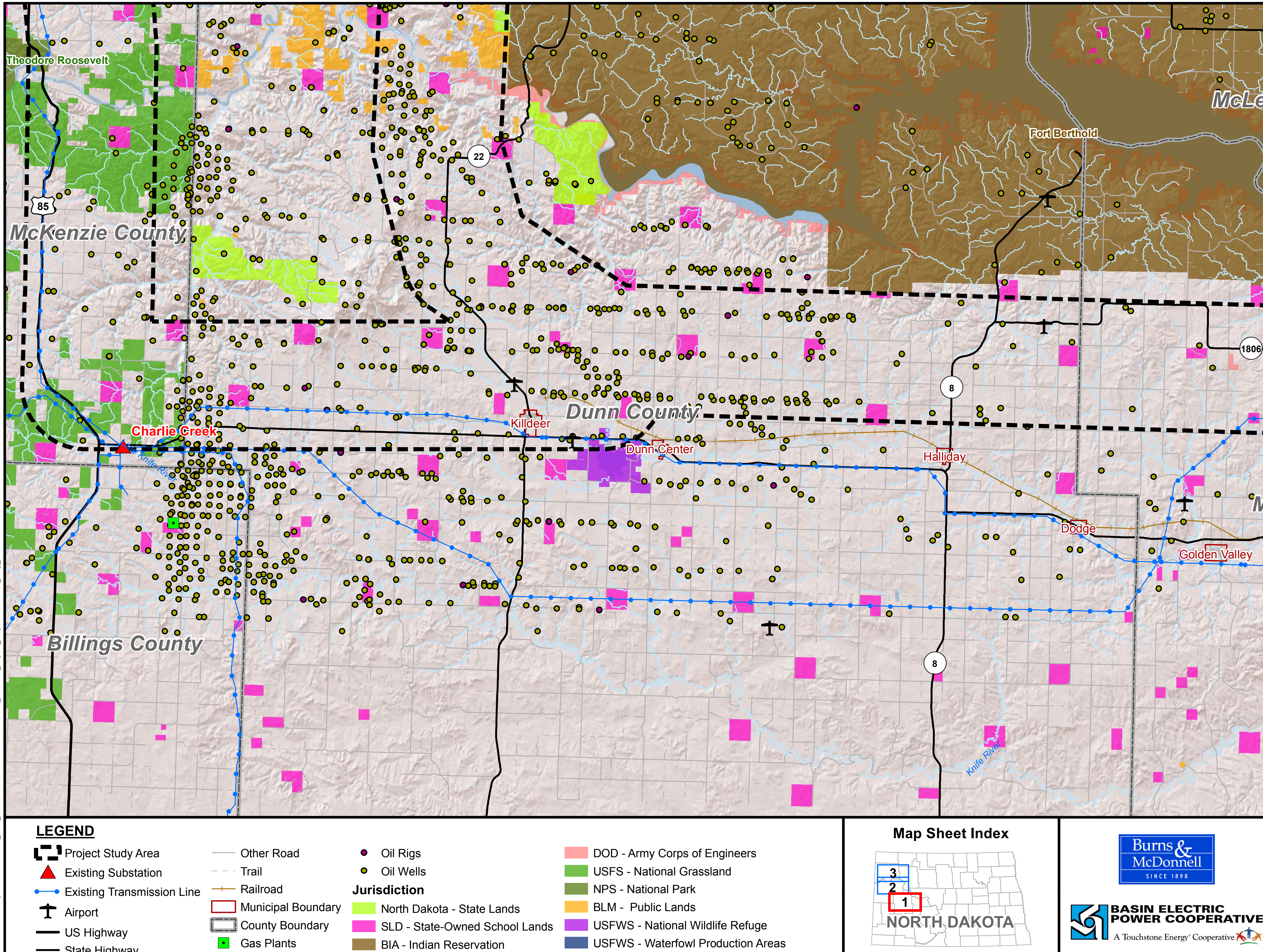

Figure 5-4
Basin Electric Power Cooperative
Antelope Valley Station to Neset
345-kV Transmission Project
Jurisdiction
Sheet 1 of 3

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Source: North Dakota GIS; North Dakota State Land Department; Esri; National Flight Data Center; Basin Electric; Burns & McDonnell.

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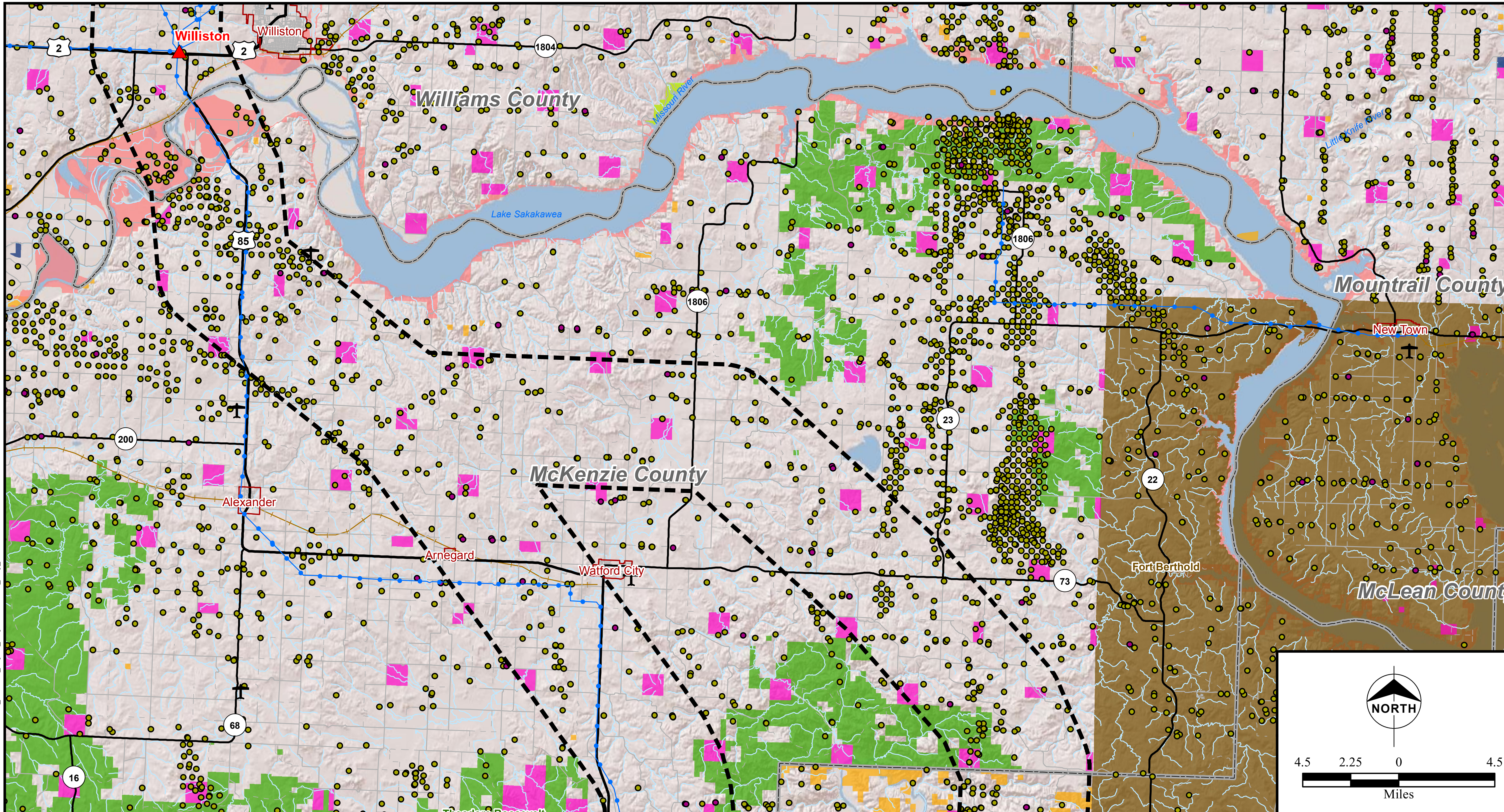


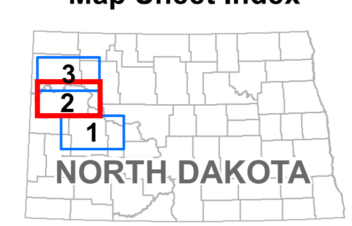
LEGEND

Project Study Area
Existing Substation
Existing Transmission Line
Airport
US Highway
State Highway
Other Road
Trail
Railroad
Municipal Boundary
County Boundary
Gas Plants
Oil Rigs
Oil Wells

Jurisdiction

North Dakota - State Lands
SLD - State-Owned School Lands
BIA - Indian Reservation
DOD - Army Corps of Engineers
USFS - National Grassland
NPS - National Park
BLM - Public Lands
USFWS - National Wildlife Refuge
USFWS - Waterfowl Production Areas

Map Sheet Index



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BASIN ELECTRIC POWER COOPERATIVE
A Touchstone Energy Cooperative

Figure 5-4
Basin Electric Power Cooperative
Antelope Valley Station to Neset
345-kV Transmission Project
Jurisdiction
Sheet 2 of 3

Source: North Dakota GIS; North Dakota State Land Department; Esri; National Flight Data Center; Basin Electric; Burns & McDonnell.

Revised October 26, 2011

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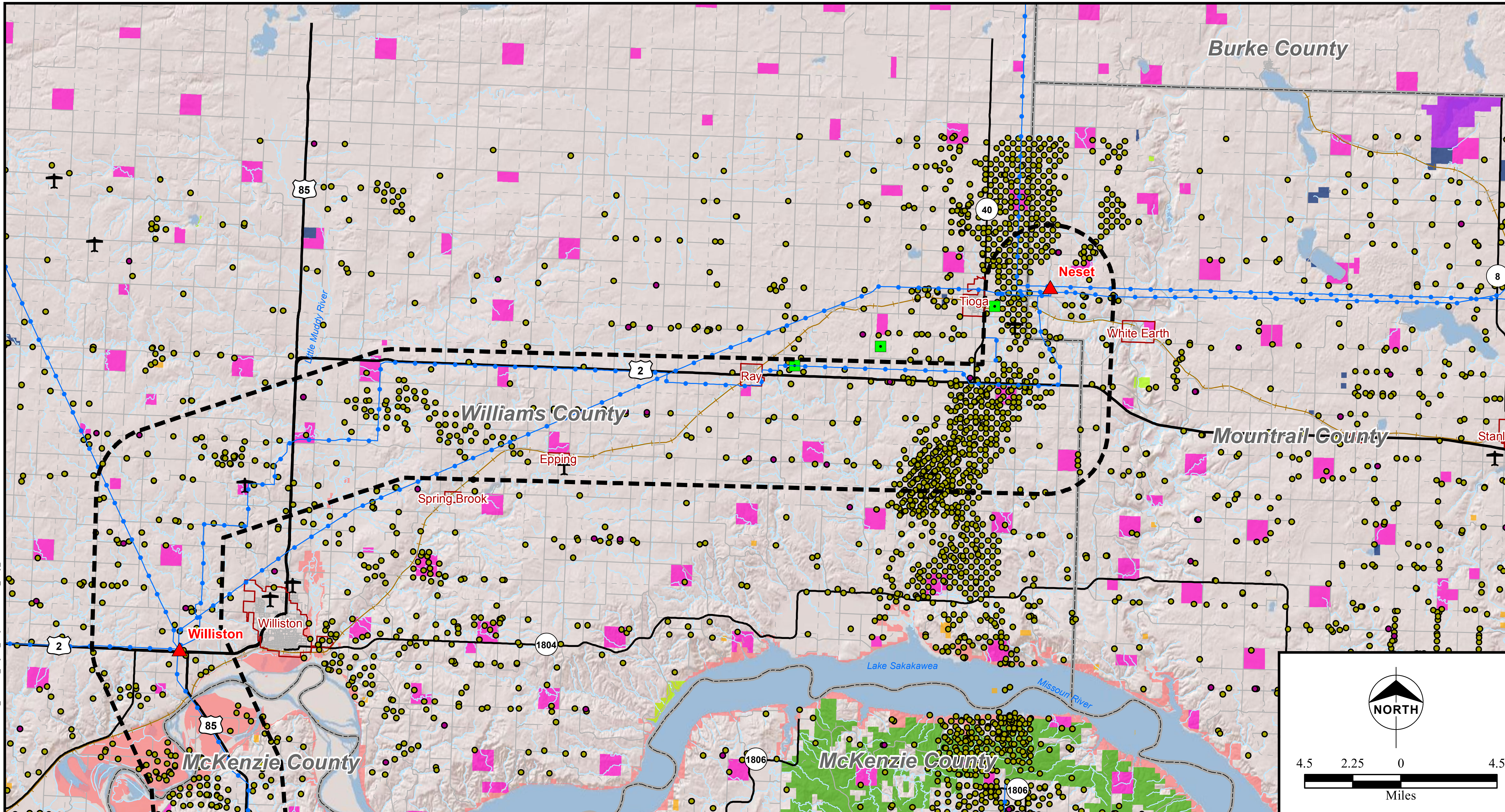


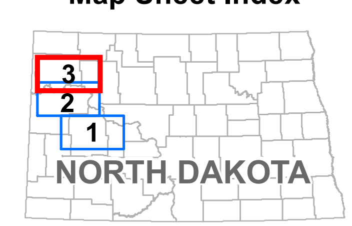
LEGEND

- Project Study Area
- Existing Substation
- Existing Transmission Line
- Airport
- US Highway
- State Highway
- Other Road
- Trail
- Railroad
- Municipal Boundary
- County Boundary
- Gas Plants
- Oil Rigs
- Oil Wells

Jurisdiction

- North Dakota - State Lands
- SLD - State-Owned School Lands
- BIA - Indian Reservation
- DOD - Army Corps of Engineers
- USFS - National Grassland
- NPS - National Park
- BLM - Public Lands
- USFWS - National Wildlife Refuge
- USFWS - Waterfowl Production Areas

Map Sheet Index



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BASIN ELECTRIC POWER COOPERATIVE
A Touchstone Energy® Cooperative

Figure 5-4
Basin Electric Power Cooperative
Antelope Valley Station to Neset
345-kV Transmission Project
Jurisdiction
Sheet 3 of 3

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Source: North Dakota GIS; North Dakota State Land Department; Esri; National Flight Data Center; Basin Electric; Burns & McDonnell.

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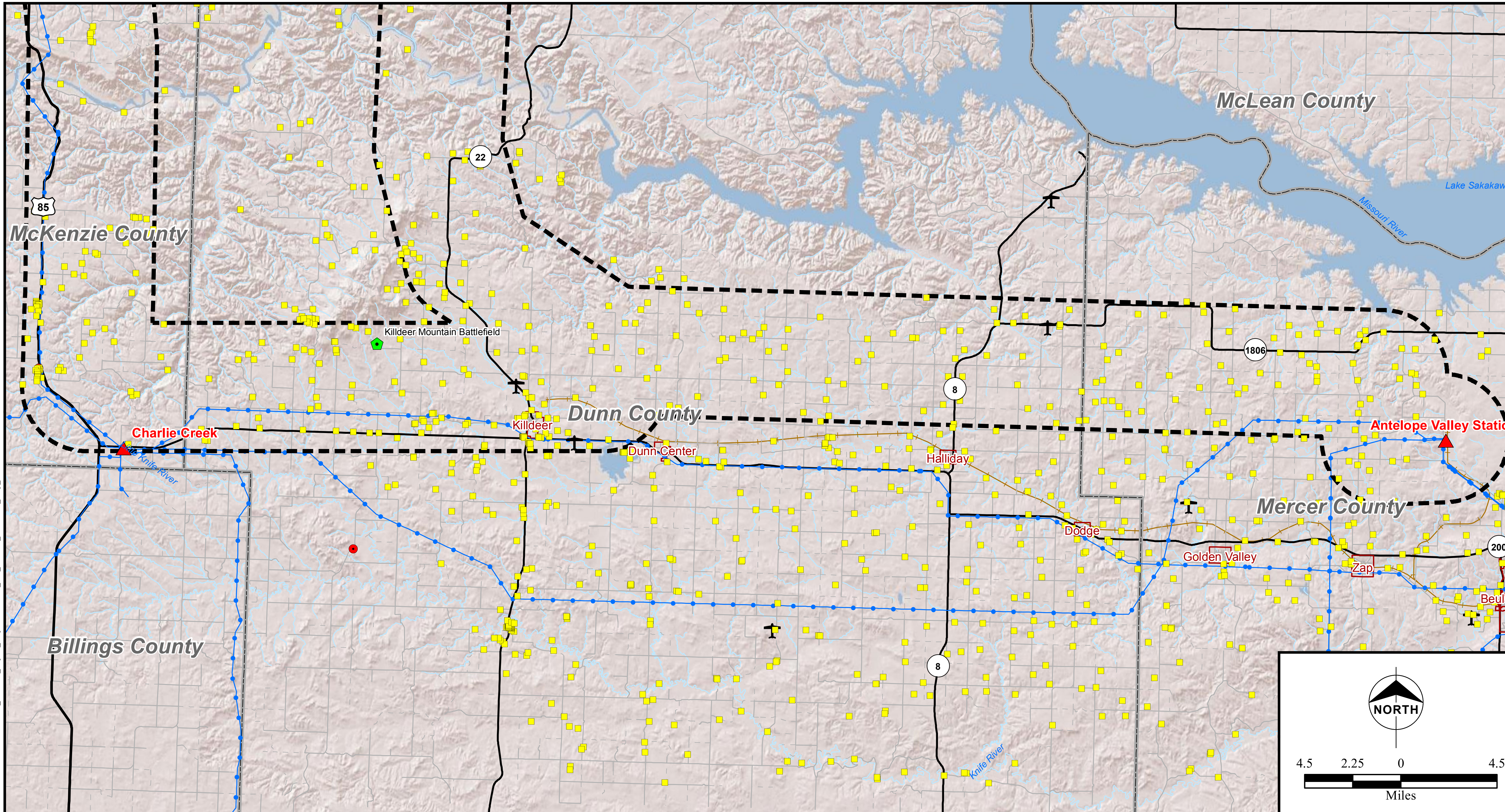

LEGEND

Project Study Area
Existing Substation
Existing Transmission Line
US Highway
State Highway
Other Road
Trail
Railroad
Airport
Municipal Boundary
County Boundary
Farmstead/Residence*
Cultural Resource
NRHP Structure
NRHP Bridge
State Historical Site

* Not field verified.

Map Sheet Index

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NORTH DAKOTA

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BASIN ELECTRIC POWER COOPERATIVE
A Touchstone Energy® Cooperative

Figure 5-5
Basin Electric Power Cooperative
Antelope Valley Station to Neset
345-kV Transmission Project
Residences & Cultural Resources
Sheet 1 of 3

Source: North Dakota GIS; Esri; National Flight Data Center; NPS NRHP data; North Dakota State Historical Society; Basin Electric; Burns & McDonnell.

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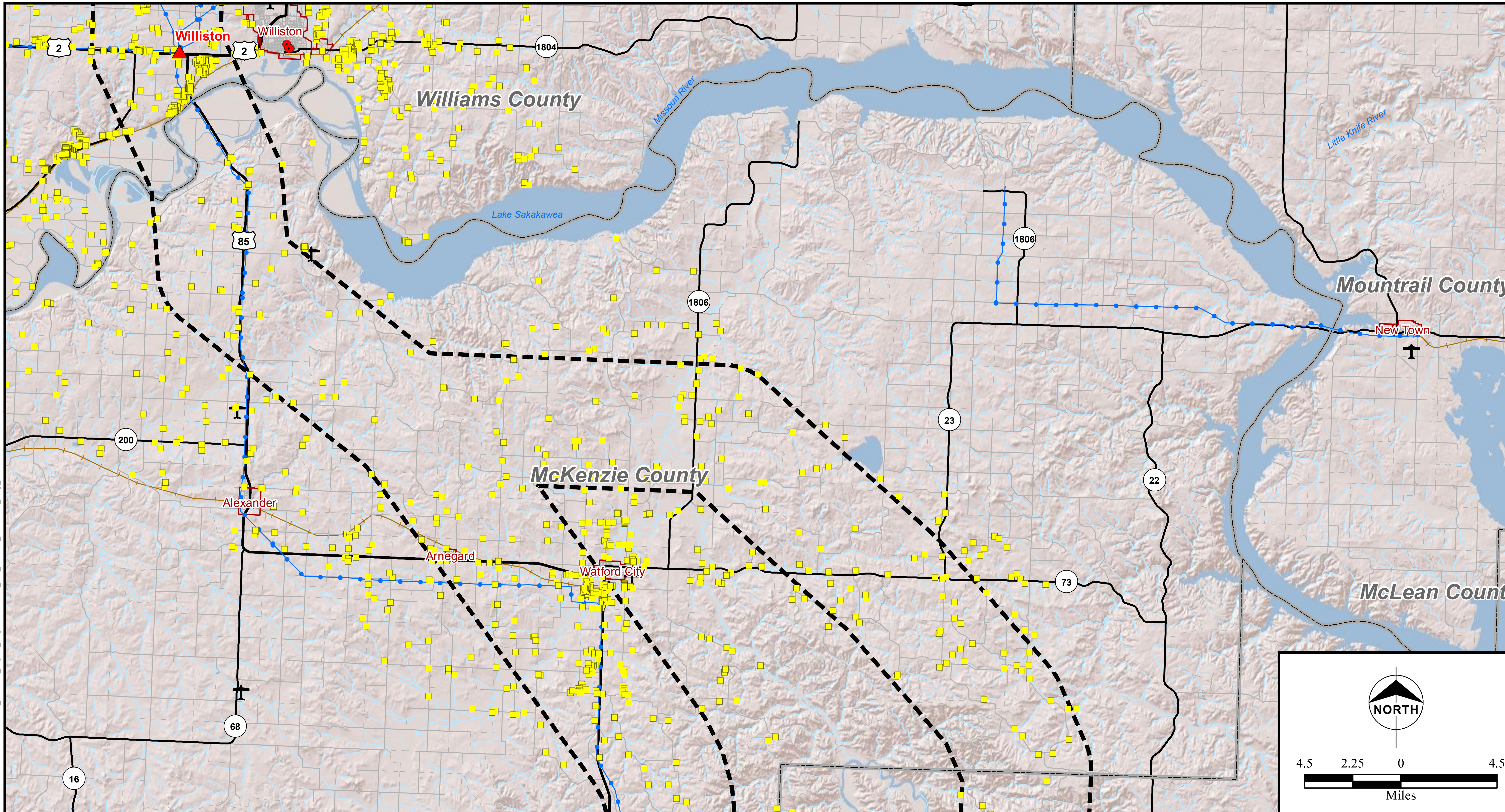

LEGEND

- Project Study Area
- Existing Substation
- Existing Transmission Line
- US Highway
- State Highway
- Other Road
- Trail
- Railroad
- Airport
- Municipal Boundary
- County Boundary
- Farmstead/Residence*

Cultural Resource

- NRHP Structure
- NRHP Bridge
- State Historical Site

* Not field verified.

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NORTH DAKOTA

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BASIN ELECTRIC POWER COOPERATIVE A Touchstone Energy® Cooperative

Figure 5-5
Basin Electric Power Cooperative
Antelope Valley Station to Neset
345-kV Transmission Project
Residences & Cultural Resources
Sheet 2 of 3

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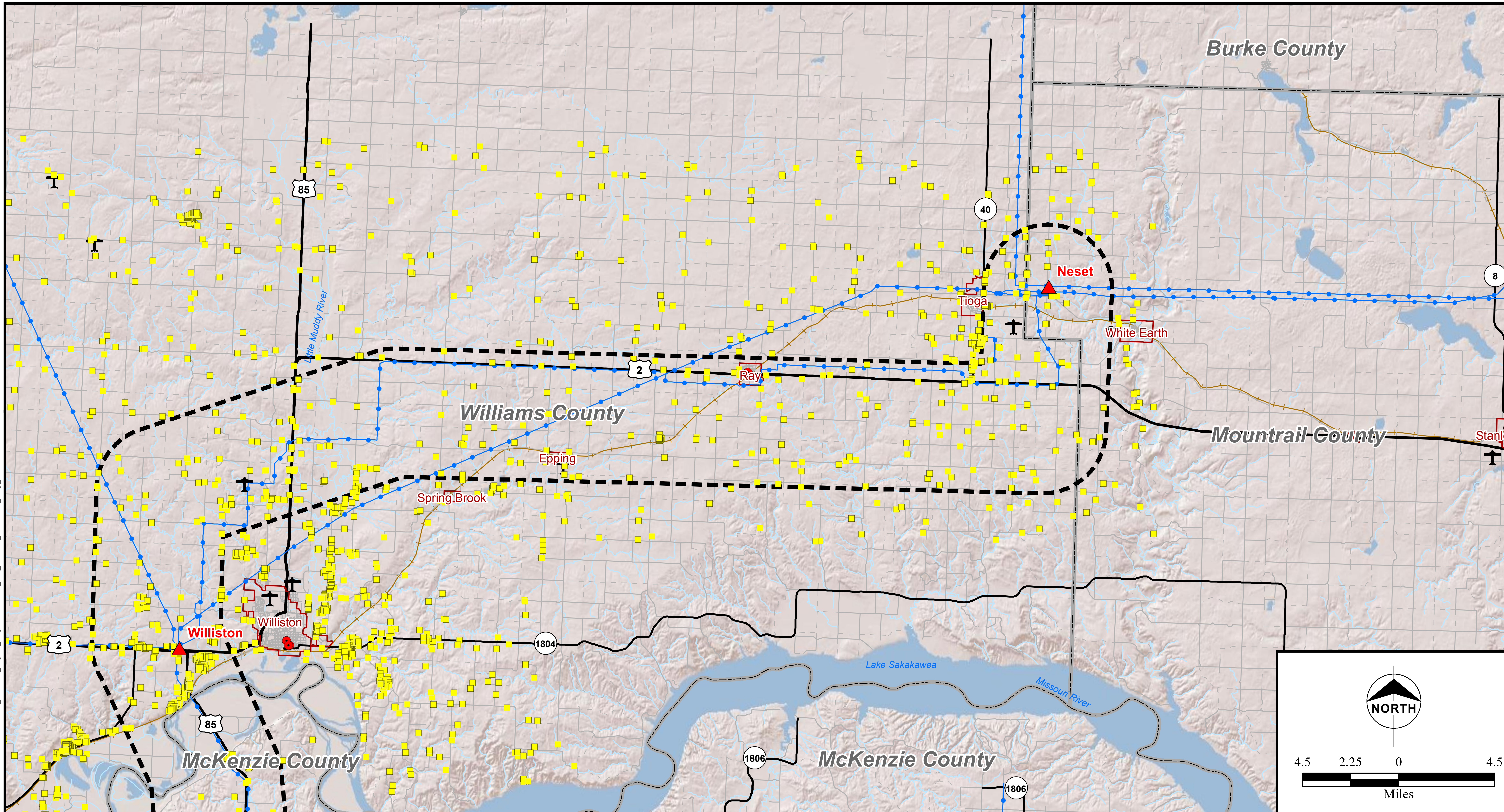

LEGEND

- Project Study Area
- Existing Substation
- Existing Transmission Line
- US Highway
- State Highway
- Other Road
- Trail
- Railroad
- Airport
- Municipal Boundary
- County Boundary
- Farmstead/Residence*

Cultural Resource

- NRHP Structure
- NRHP Bridge
- State Historical Site

* Not field verified.

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NORTH DAKOTA

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BASIN ELECTRIC POWER COOPERATIVE
A Touchstone Energy® Cooperative

Figure 5-5
Basin Electric Power Cooperative
Antelope Valley Station to Neset
345-kV Transmission Project
Residences & Cultural Resources
Sheet 3 of 3

Source: North Dakota GIS; Esri; National Flight Data Center; NPS NRHP data; North Dakota State Historical Society; Basin Electric; Burns & McDonnell.

Revised October 26, 2011

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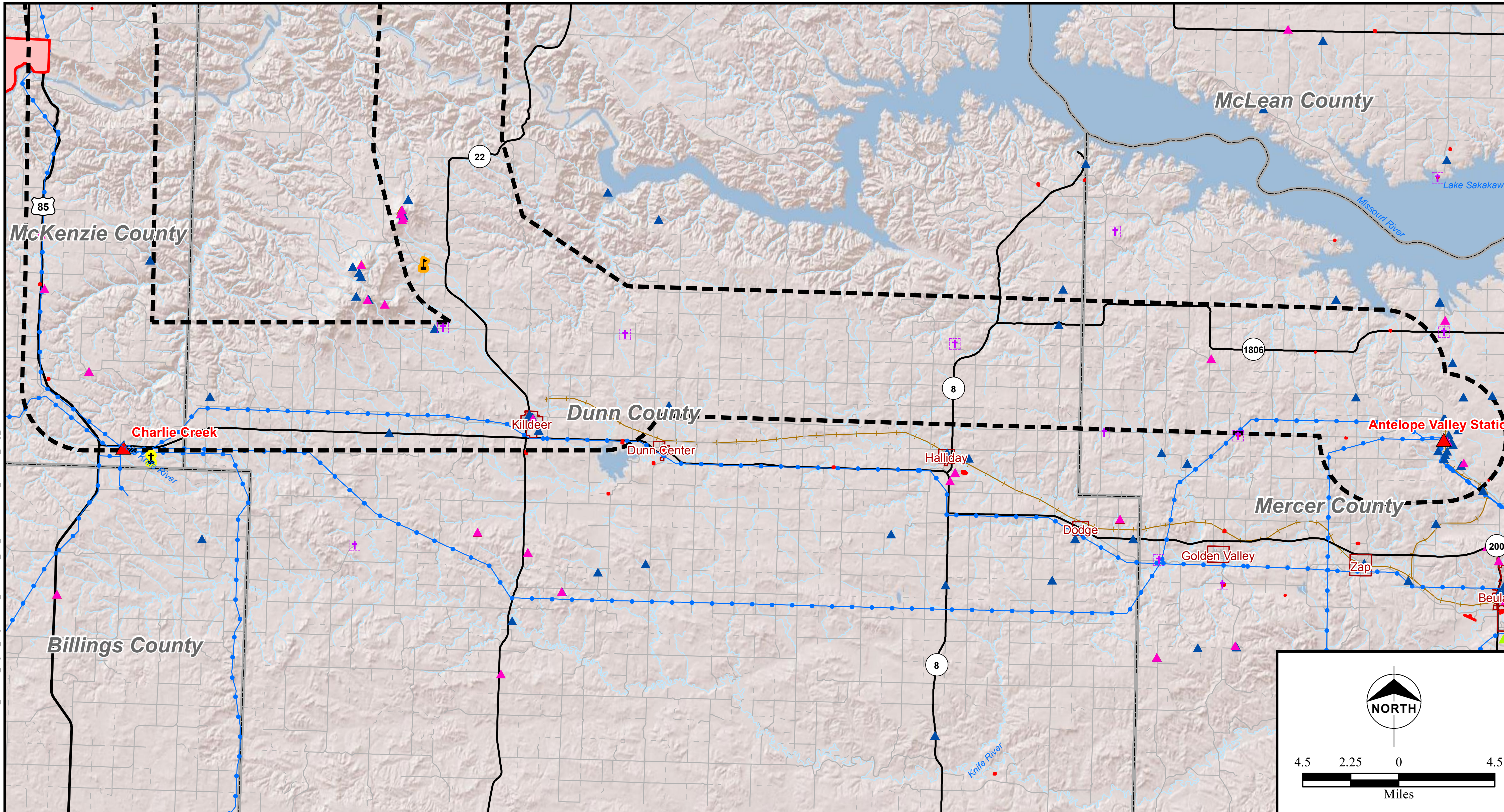


LEGEND

- Project Study Area
- Existing Substation
- Existing Transmission Line
- Railroad
- Municipal Boundary
- County Boundary

Census Landmarks

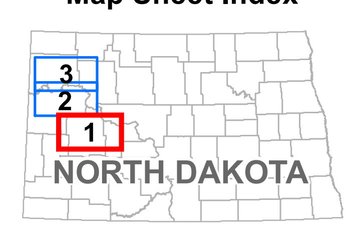
- Cemetery
- Hospital/Hospice
- Park
- Place of Worship
- School
- Golf Course

- Landmark Area

Communication Structures

- AM
- FM
- Antenna Structure Registration (ASR)
- BRS/EBS
- Cellular
- Land Mobile - Broadcast
- Land Mobile - Commercial
- Land Mobile - Private
- TV - NTSC
- TV - Digital
- Microwave

Map Sheet Index



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BASIN ELECTRIC POWER COOPERATIVE
A Touchstone Energy® Cooperative

Figure 5-6
Basin Electric Power Cooperative
Antelope Valley Station to Neset
345-kV Transmission Project
Census Landmarks &
Communication Facilities
Sheet 1 of 3

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Source: North Dakota GIS; US Census TIGER files; FCC; Esri; Basin Electric; Burns & McDonnell.

Revised October 26, 2011

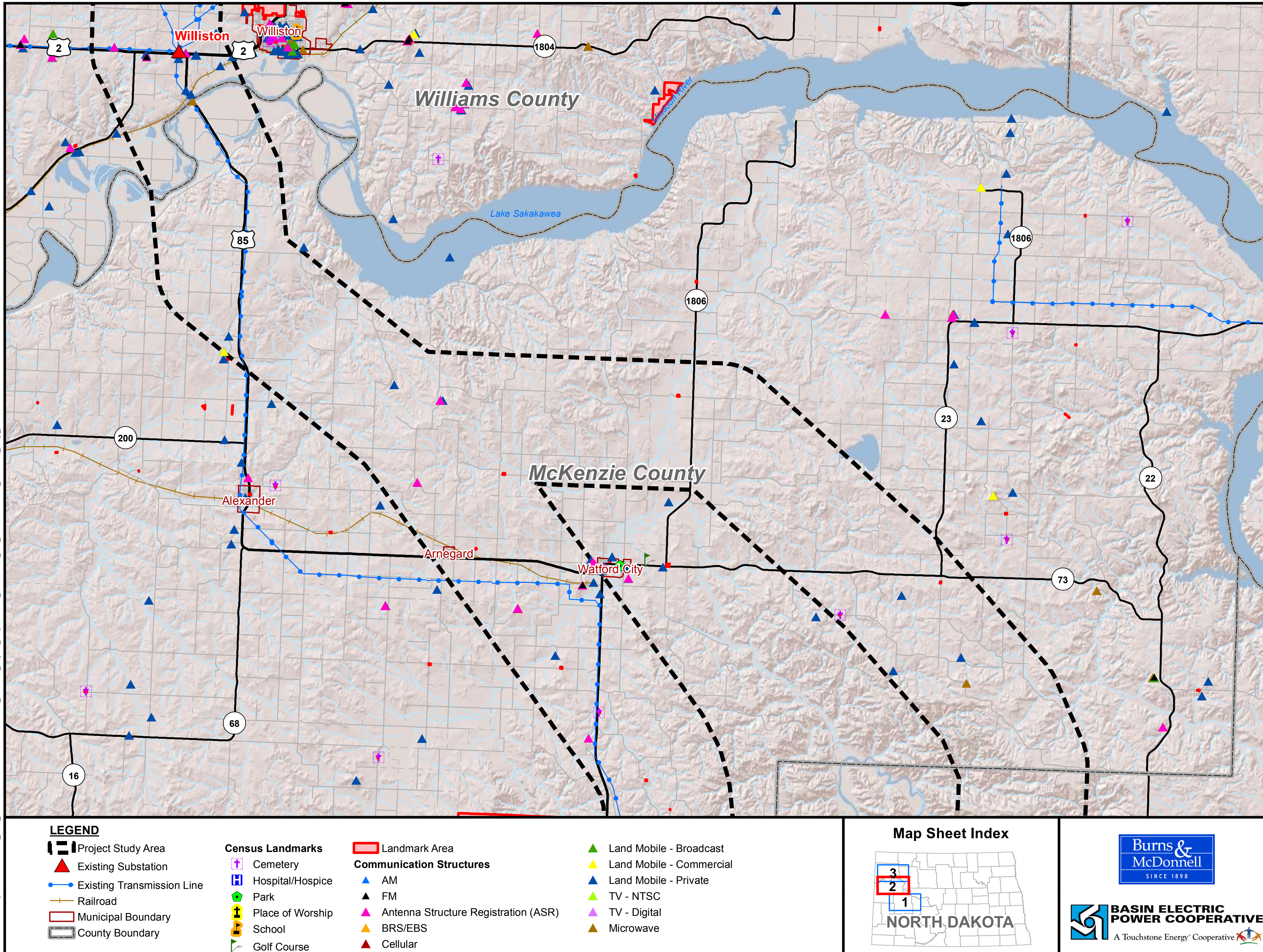


Figure 5-6
Basin Electric Power Cooperative
Antelope Valley Station to Neset
345-kV Transmission Project
Census Landmarks &
Communication Facilities
Sheet 2 of 3

Source: North Dakota GIS; US Census TIGER files; FCC; Esri; Basin Electric; Burns & McDonnell.

Revised October 26, 2011

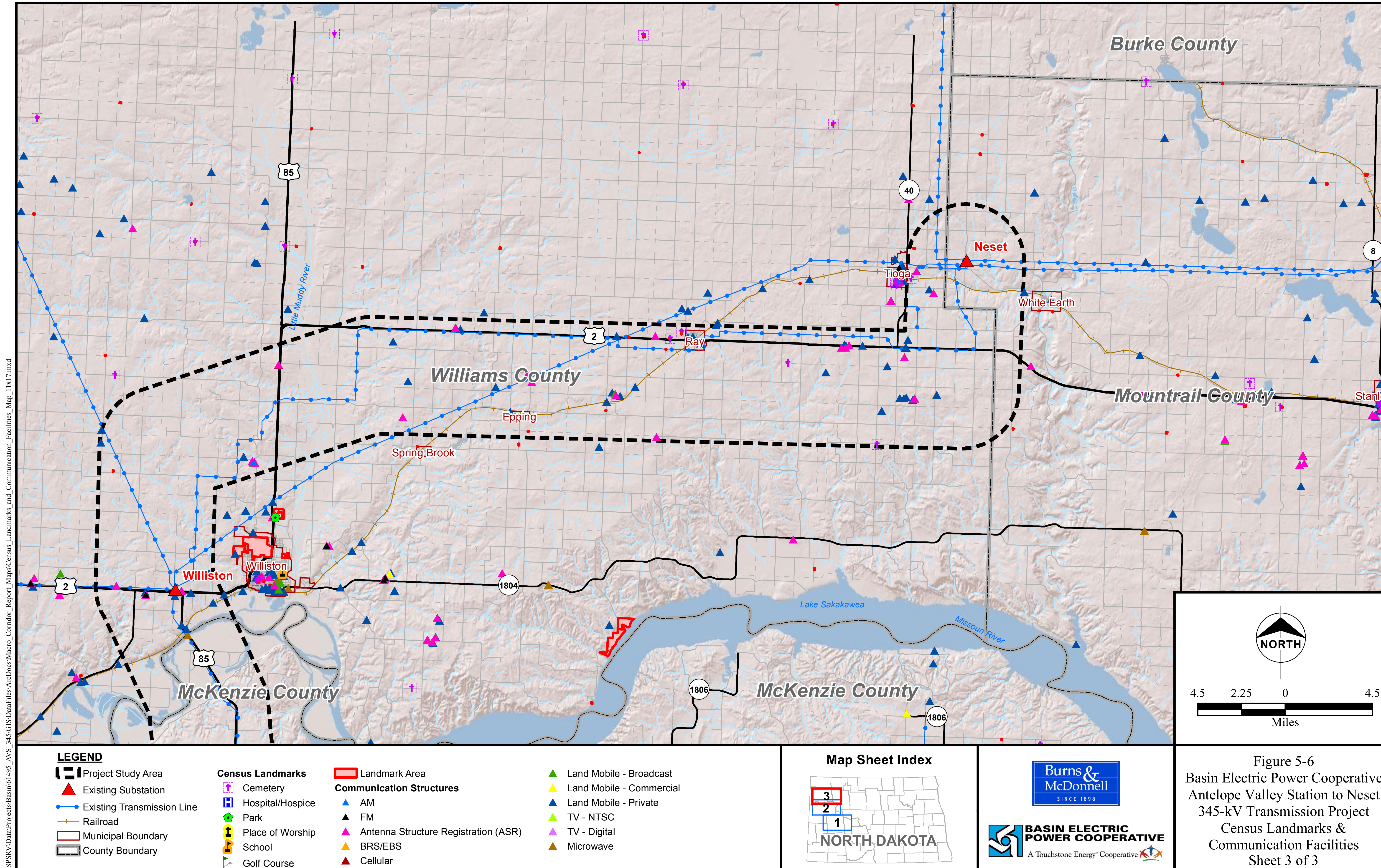
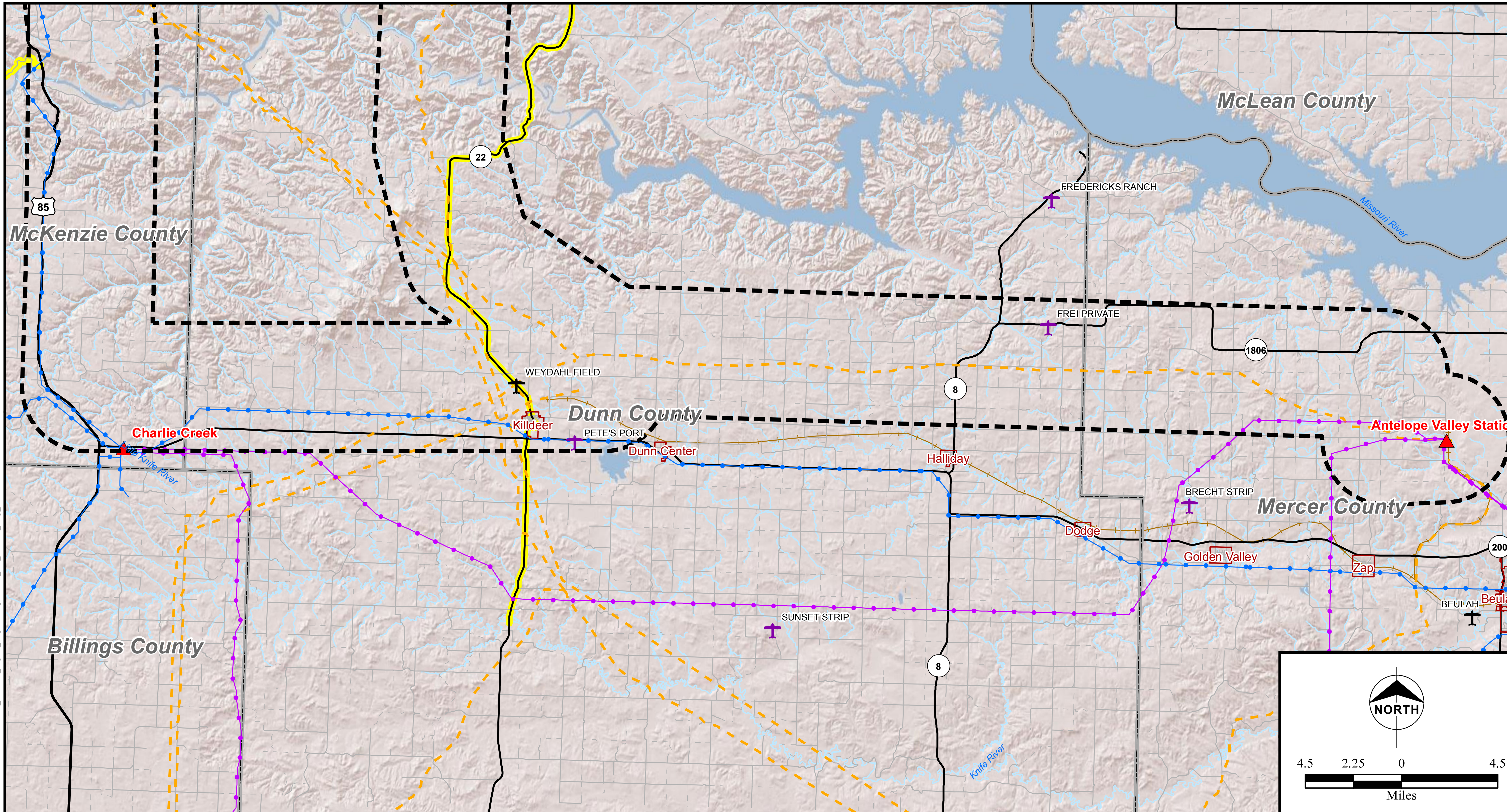


Figure 5-6
Basin Electric Power Cooperative
Antelope Valley Station to Neset
345-kV Transmission Project
Census Landmarks &
Communication Facilities
Sheet 3 of 3

Source: North Dakota GIS; US Census TIGER files; FCC; Esri; Basin Electric; Burns & McDonnell.

Revised October 26, 2011



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LEGEND

- Project Study Area
- Municipal Boundary
- County Boundary

Transportation

- US Highway
- State Highway
- Other Road
- Trail
- Scenic Byway
- Railroad
- Public Airport
- Private Airport

Utility System

- Existing Substation
- Existing 345-kV Transmission Lines
- Existing 230-kV and Below Transmission Lines
- Pipeline

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NORTH DAKOTA

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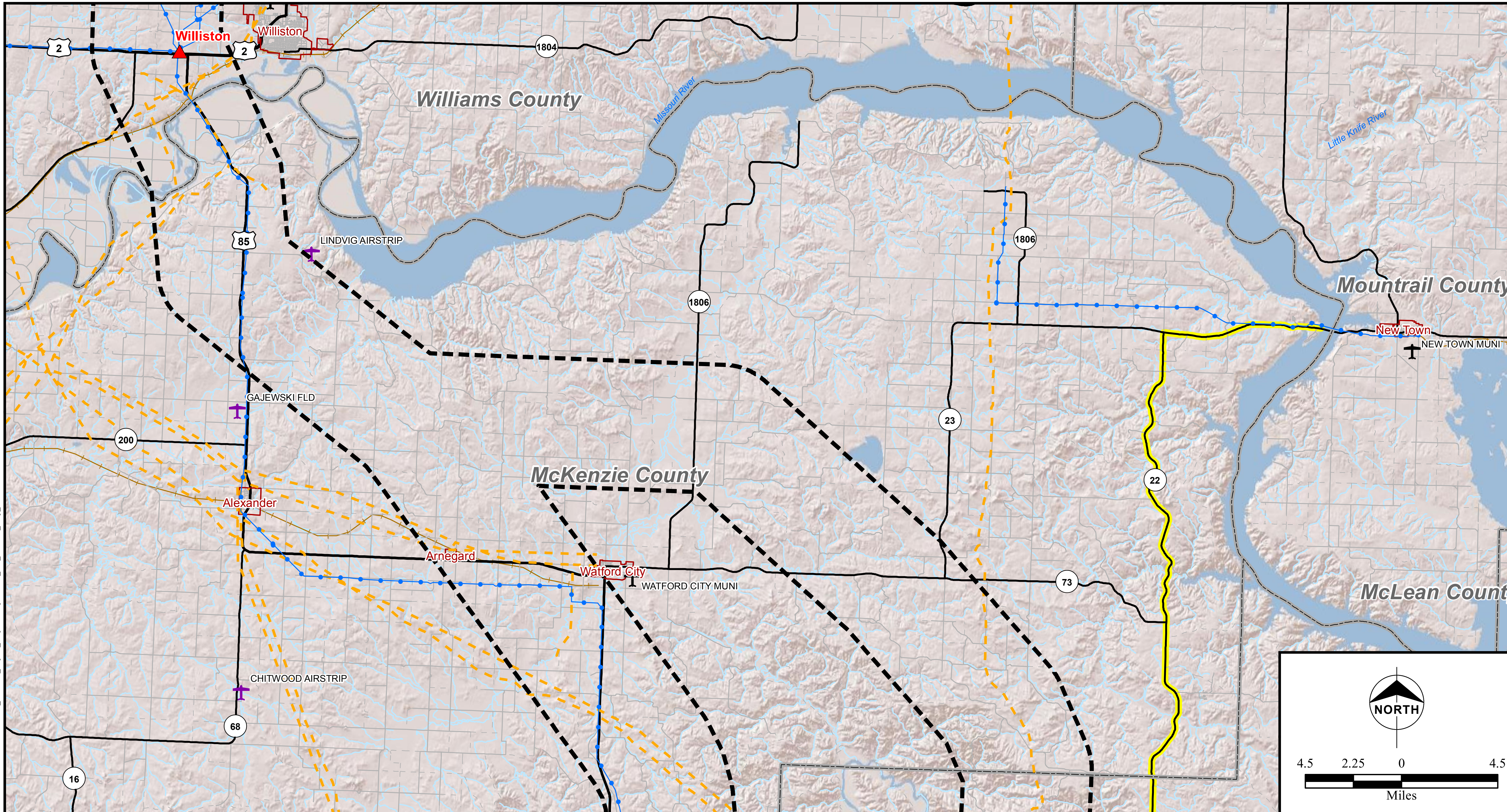
BASIN ELECTRIC POWER COOPERATIVE
A Touchstone Energy® Cooperative

Figure 5-7
Basin Electric Power Cooperative
Antelope Valley Station to Neset
345-kV Transmission Project
Transportation & Utilities
Sheet 1 of 3

Source: North Dakota GIS, Esri, National Flight Data Center, Basin Electric, Burns & McDonnell.

Revised October 26, 2011



LEGEND

Project Study Area
Municipal Boundary
County Boundary

Transportation
US Highway
State Highway
Other Road
Trail
Scenic Byway
Railroad
Public Airport
Private Airport

Utility System
Existing Substation
Existing 345-kV Transmission Lines
Existing 230-kV and Below Transmission Lines
Pipeline

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BASIN ELECTRIC POWER COOPERATIVE
A Touchstone Energy® Cooperative

Figure 5-7
Basin Electric Power Cooperative
Antelope Valley Station to Neset
345-kV Transmission Project
Transportation & Utilities
Sheet 2 of 3

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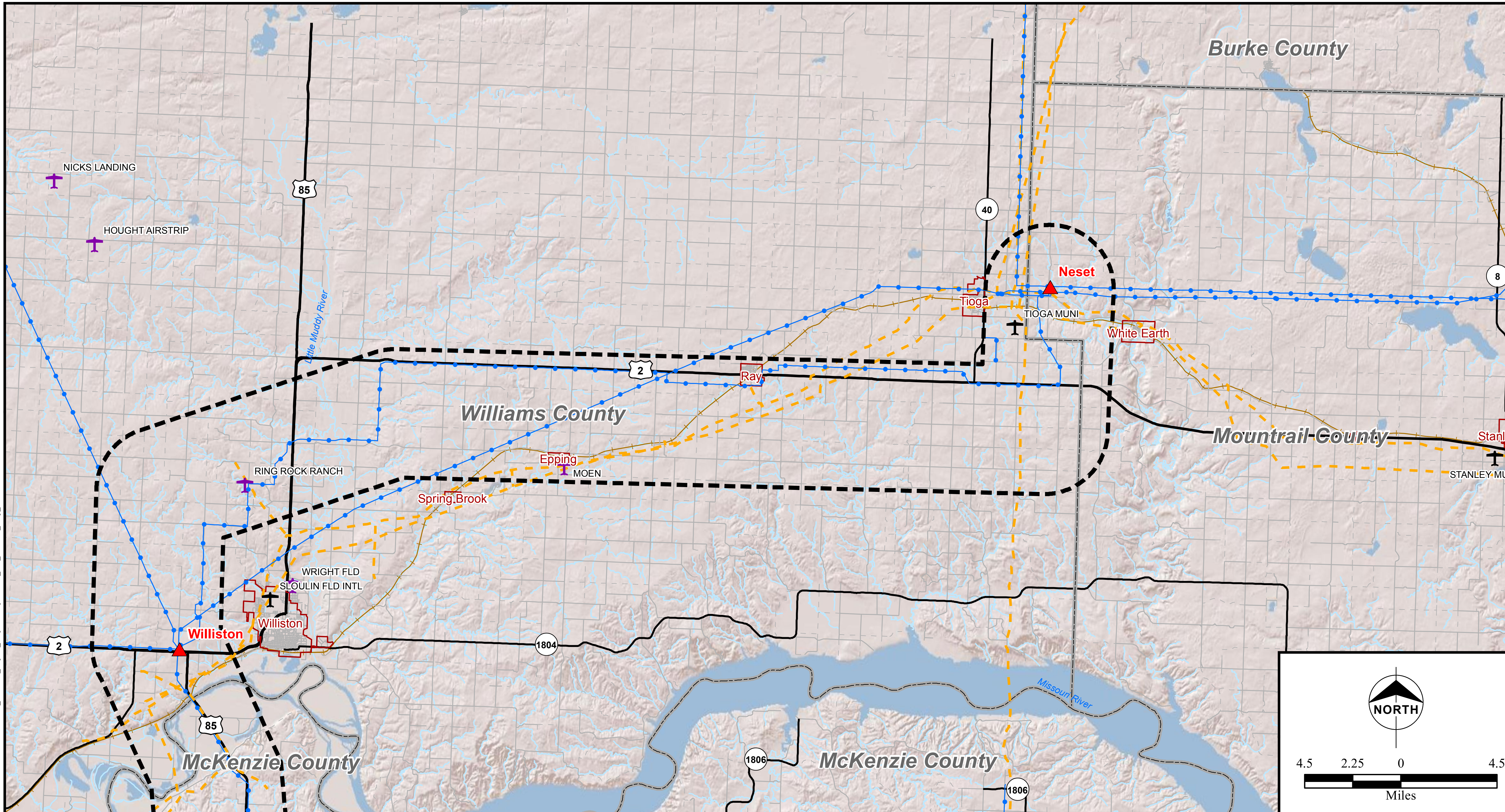
Source: North Dakota GIS, Esri, National Flight Data Center, Basin Electric, Burns & McDonnell.

Revised October 26, 2011



LEGEND

Project Study Area
Municipal Boundary
County Boundary

Transportation
US Highway
State Highway
Other Road
Trail
Scenic Byway
Railroad
Public Airport
Private Airport

Utility System
Existing Substation
Existing 345-kV Transmission Lines
Existing 230-kV and Below Transmission Lines
Pipeline

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BASIN ELECTRIC POWER COOPERATIVE
A Touchstone Energy® Cooperative

Figure 5-7
Basin Electric Power Cooperative
Antelope Valley Station to Neset
345-kV Transmission Project
Transportation & Utilities
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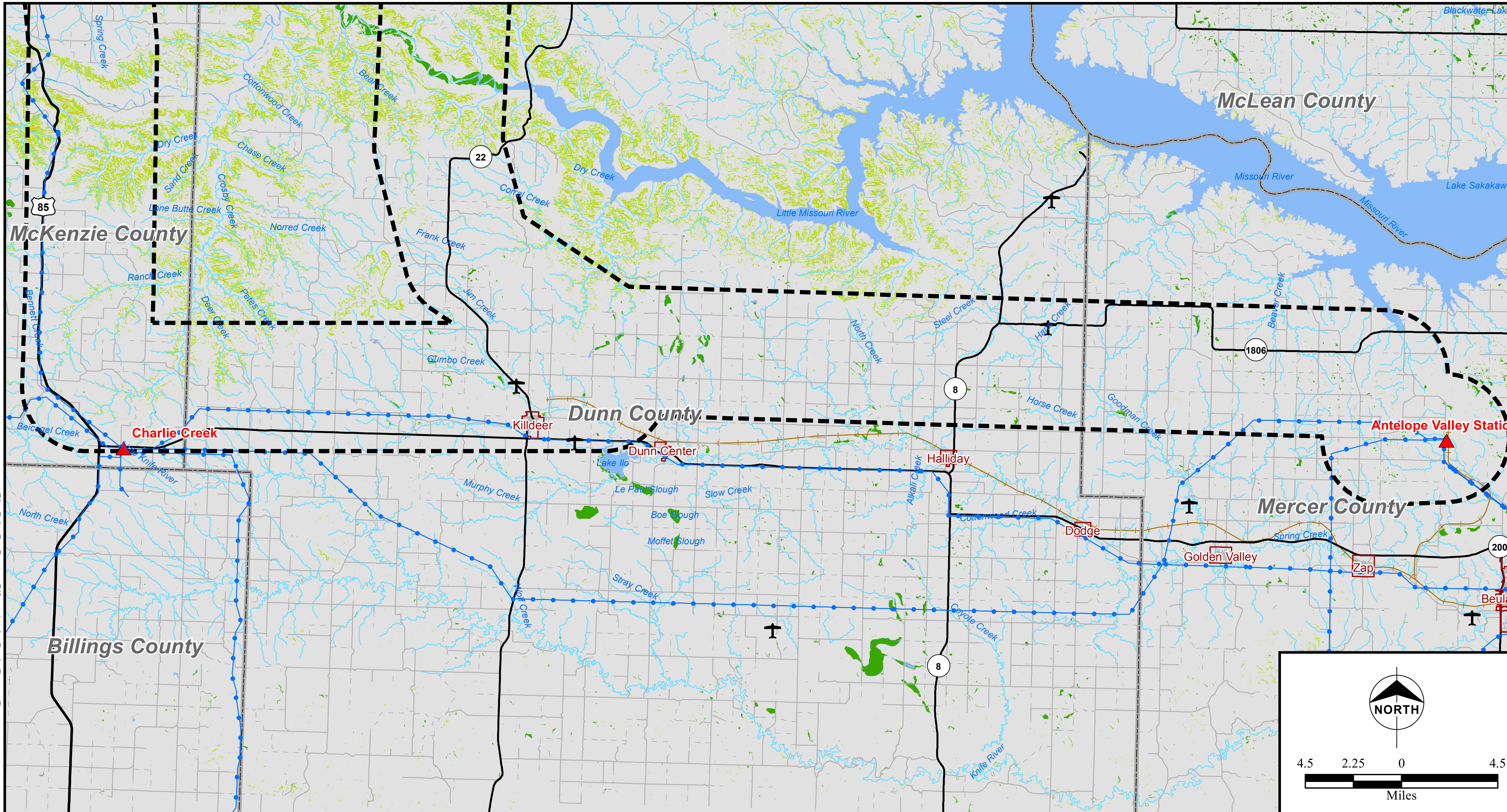

LEGEND

- Project Study Area
- Existing Substation
- Existing Transmission Line
- US Highway
- State Highway
- Other Road
- Trail
- Railroad
- Airport
- Municipal Boundary
- County Boundary

Hydrology & Wetlands

- Stream/River
- Waterbody
- NWI Wetlands

Percent Slope

- 0 - 10%
- 10 - 20%
- 20 - 30%
- >30%

Map Sheet Index

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NORTH DAKOTA

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BASIN ELECTRIC POWER COOPERATIVE
A Touchstone Energy® Cooperative

Figure 5-8
Basin Electric Power Cooperative
Antelope Valley Station to Neset
345-kV Transmission Project
Hydrology, Wetlands, & Slope
Sheet 1 of 3

Source: North Dakota GIS; Esri; National Flight Data Center; USFWS NWI Wetlands; USGS DEM Data; Basin Electric; Burns & McDonnell.

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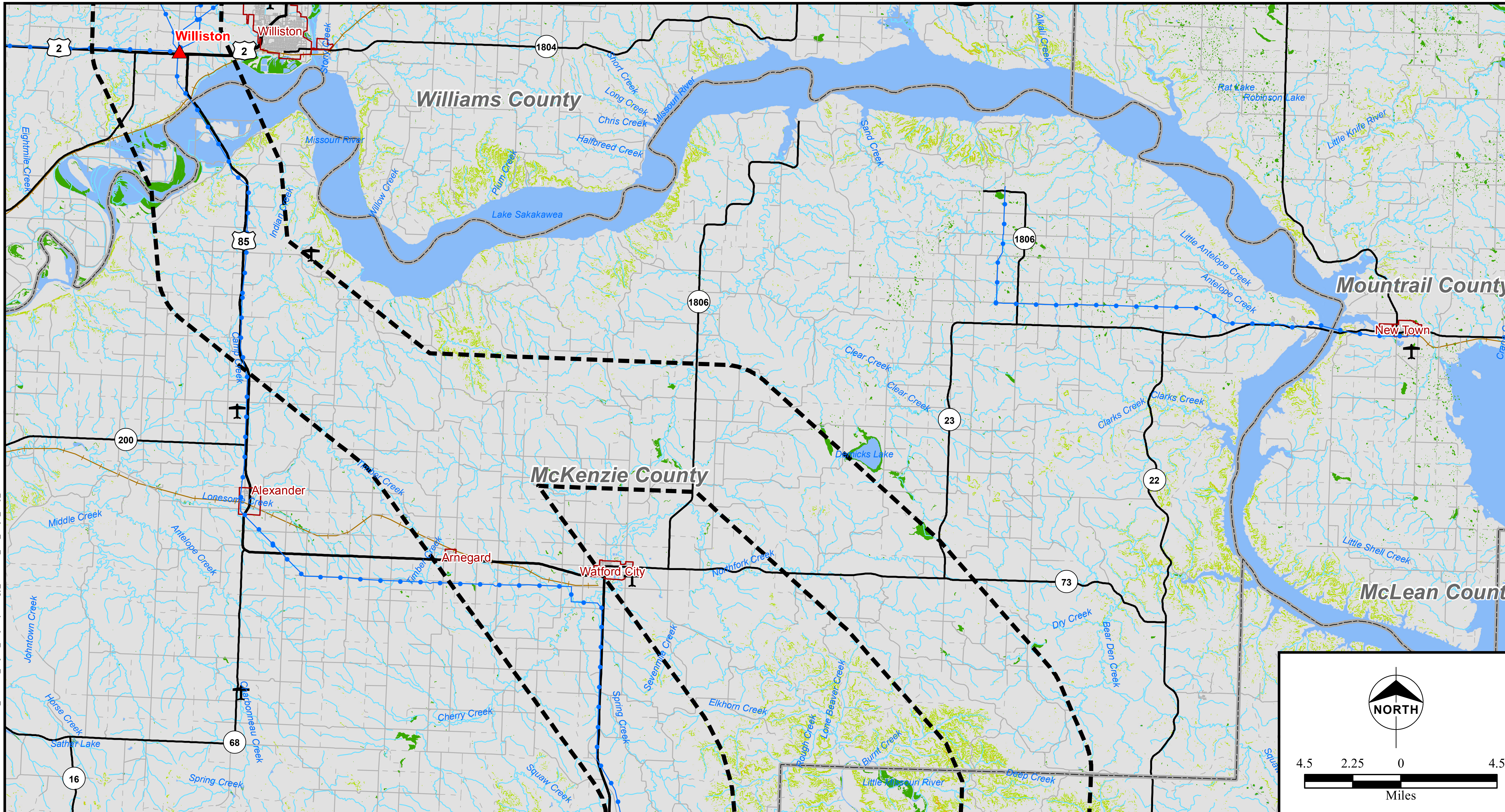


LEGEND

- Project Study Area
- Existing Substation
- Existing Transmission Line
- US Highway
- State Highway
- Other Road
- Trail
- Railroad
- Airport
- Municipal Boundary
- County Boundary

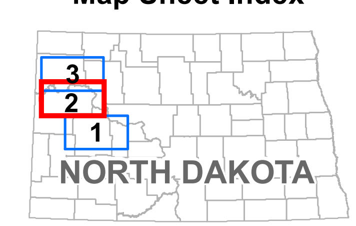
Hydrology & Wetlands

- Stream/River
- Waterbody
- NWI Wetlands

Percent Slope

- 0 - 10%
- 10 - 20%
- 20 - 30%
- >30%

Map Sheet Index



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BASIN ELECTRIC POWER COOPERATIVE
A Touchstone Energy® Cooperative

Figure 5-8
Basin Electric Power Cooperative
Antelope Valley Station to Neset
345-kV Transmission Project
Hydrology, Wetlands, & Slope
Sheet 2 of 3

Source: North Dakota GIS; Esri; National Flight Data Center; USFWS NWI Wetlands; USGS DEM Data; Basin Electric; Burns & McDonnell.

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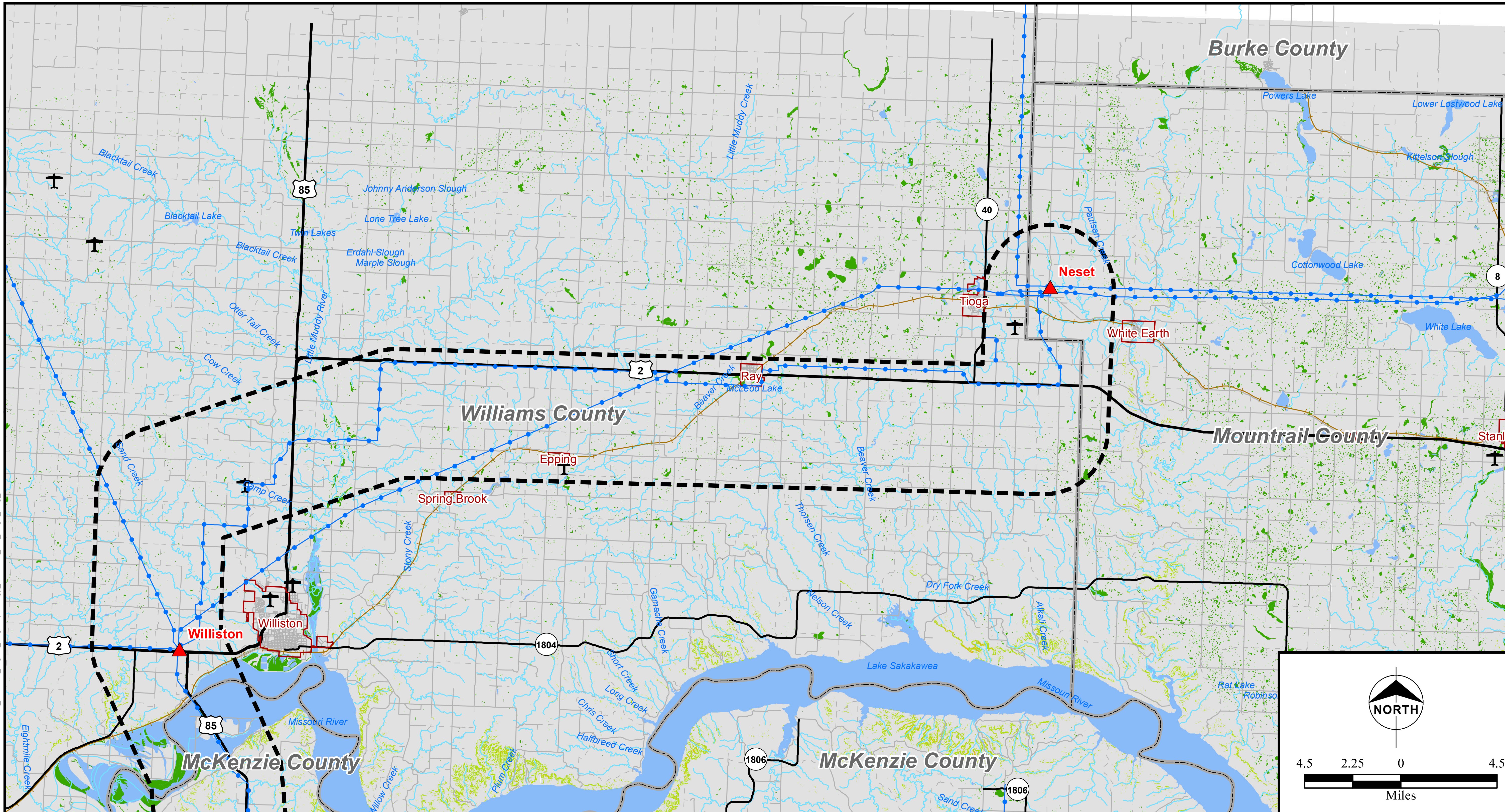

LEGEND

- Project Study Area
- Existing Substation
- Existing Transmission Line
- US Highway
- State Highway
- Other Road
- Trail
- Railroad
- Airport
- Municipal Boundary
- County Boundary

Hydrology & Wetlands

- Stream/River
- Waterbody
- NWI Wetlands

Percent Slope

- 0 - 10%
- 10 - 20%
- 20 - 30%
- >30%

Map Sheet Index

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NORTH DAKOTA

Burns & McDonnell
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BASIN ELECTRIC POWER COOPERATIVE
A Touchstone Energy® Cooperative

Figure 5-8
Basin Electric Power Cooperative
Antelope Valley Station to Neset
345-kV Transmission Project
Hydrology, Wetlands, & Slope
Sheet 3 of 3

Source: North Dakota GIS; Esri; National Flight Data Center; USFWS NWI Wetlands; USGS DEM Data; Basin Electric; Burns & McDonnell.

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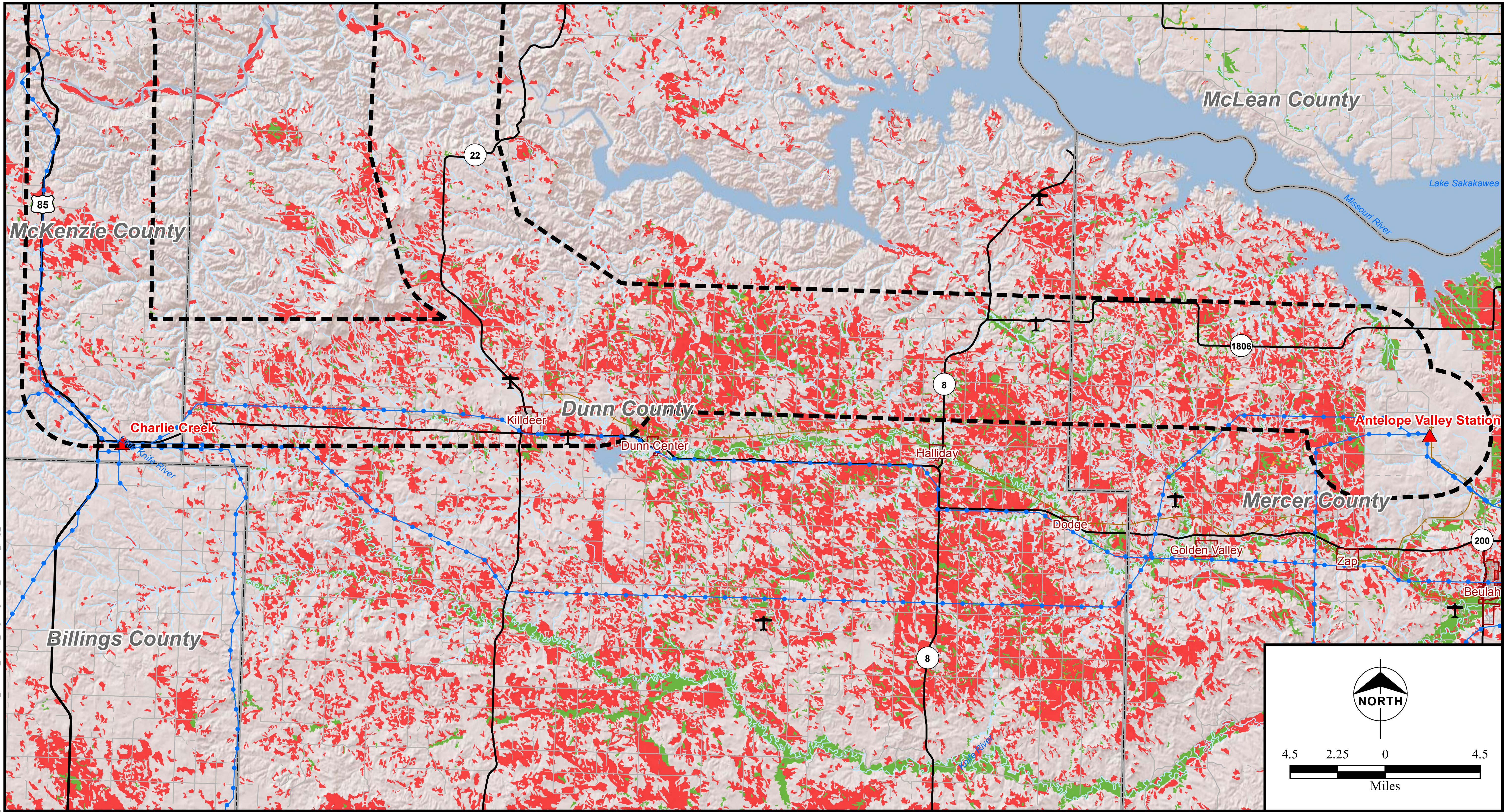


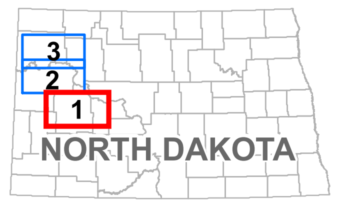
LEGEND

- Project Study Area
- Existing Substation
- Existing Transmission Line
- US Highway
- State Highway
- Other Road
- Trail
- Railroad
- Airport
- Municipal Boundary
- County Boundary

Important Farmland

- Prime Farmland
- Farmland of Statewide Importance
- Prime Farmland if Drained
- Prime Farmland if Irrigated

Map Sheet Index



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BASIN ELECTRIC POWER COOPERATIVE
A Touchstone Energy Cooperative

Figure 5-9
Basin Electric Power Cooperative
Antelope Valley Station to Neset
345-kV Transmission Project
Important Farmland
Sheet 1 of 3

Source: North Dakota GIS; Esri; National Flight Data Center; USDA NRCS SSURGO Soils; Basin Electric; Burns & McDonnell.

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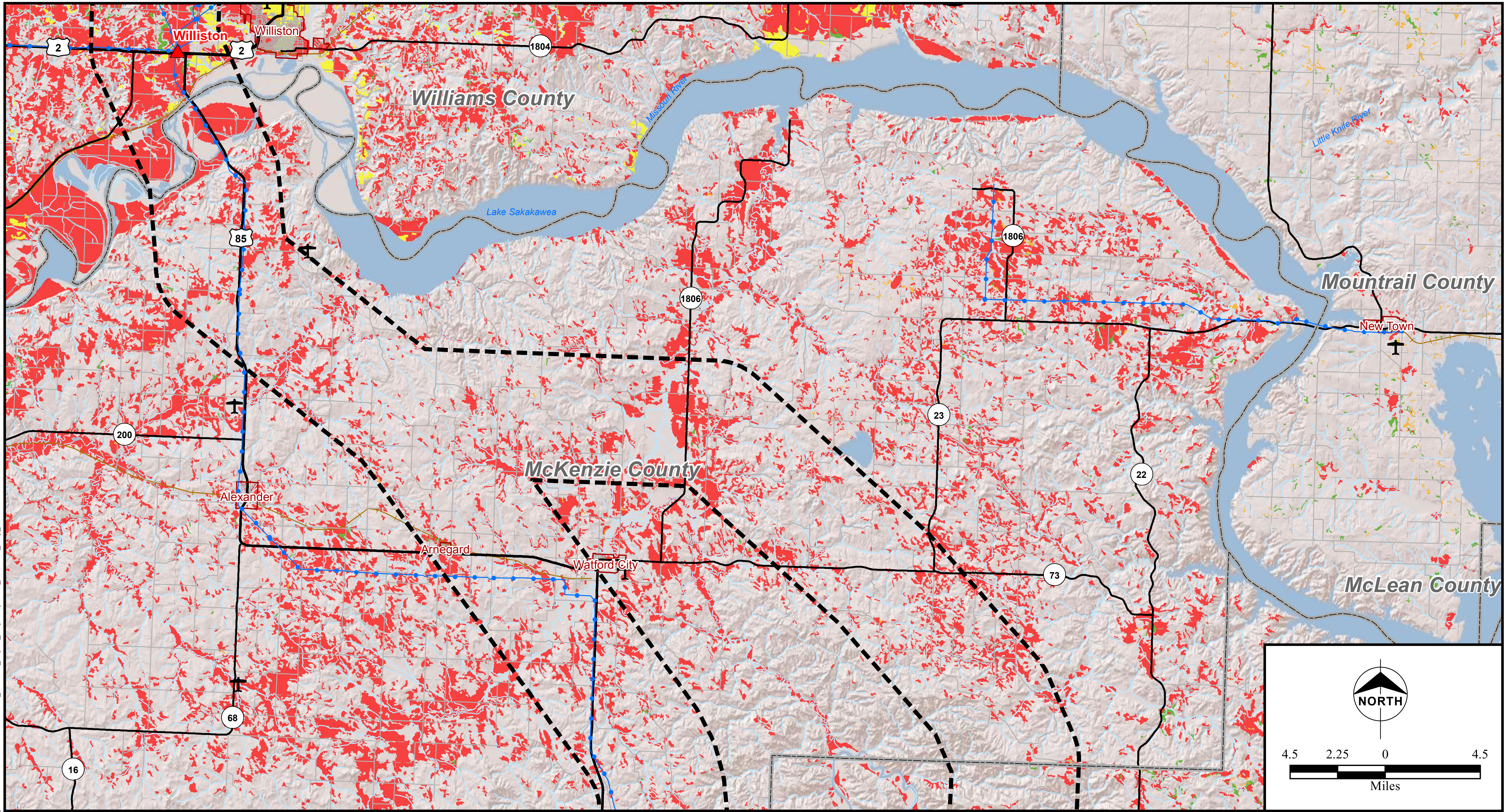


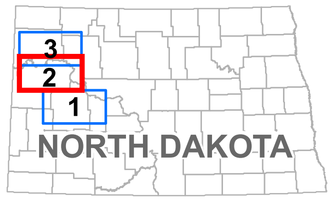
LEGEND

- Project Study Area
- Existing Substation
- Existing Transmission Line
- US Highway
- State Highway
- Other Road
- Trail
- Railroad
- Airport
- Municipal Boundary
- County Boundary

Important Farmland

- Prime Farmland
- Farmland of Statewide Importance
- Prime Farmland if Drained
- Prime Farmland if Irrigated

Map Sheet Index



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BASIN ELECTRIC POWER COOPERATIVE
A Touchstone Energy® Cooperative

Figure 5-9
Basin Electric Power Cooperative
Antelope Valley Station to Neset
345-kV Transmission Project
Important Farmland
Sheet 2 of 3

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Source: North Dakota GIS; Esri; National Flight Data Center; USDA NRCS SSURGO Soils; Basin Electric; Burns & McDonnell.

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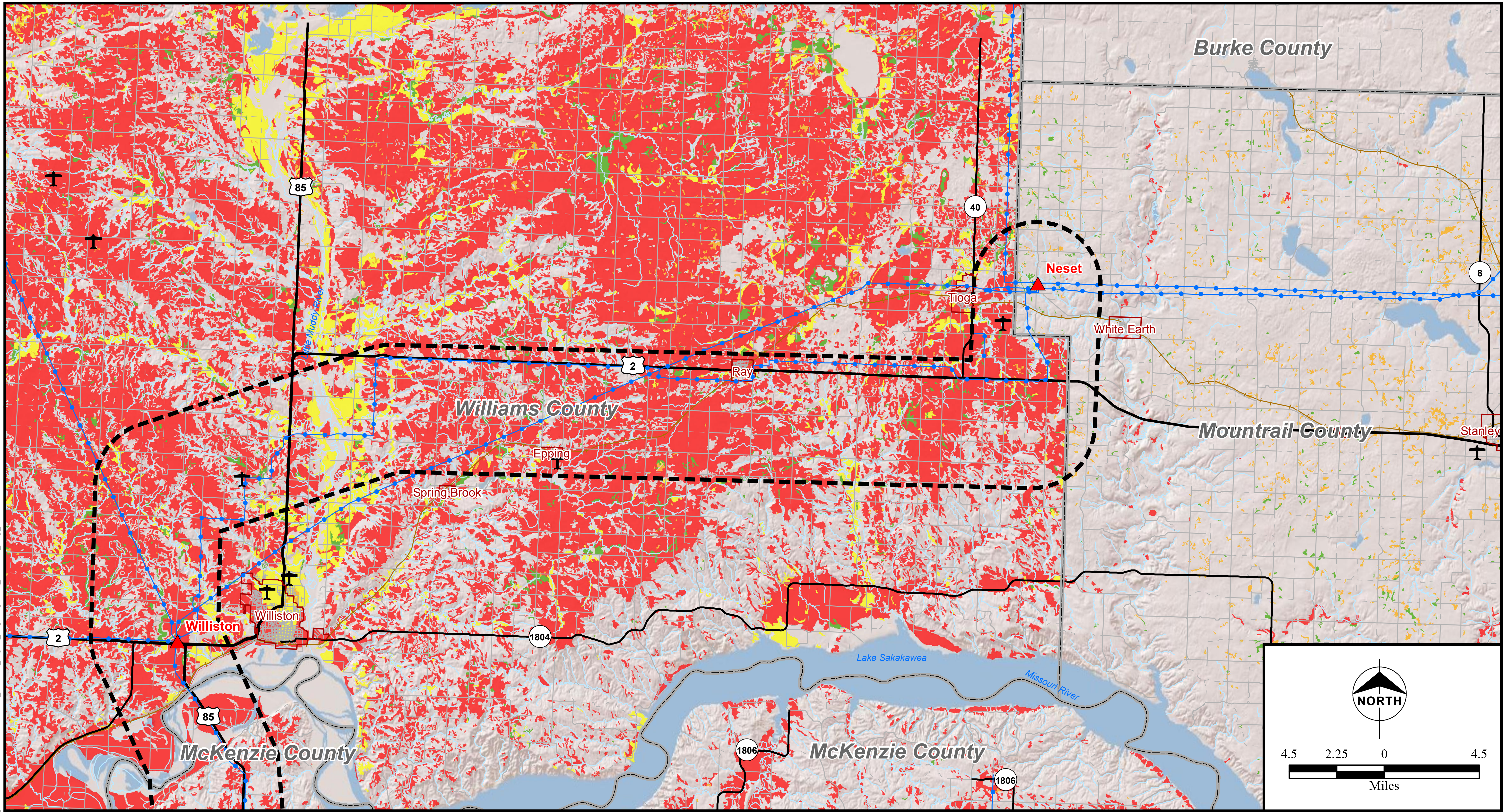


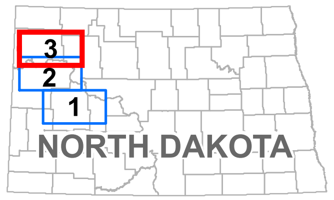
LEGEND

- Project Study Area
- Existing Substation
- Existing Transmission Line
- US Highway
- State Highway
- Other Road
- Trail
- Railroad
- Airport
- Municipal Boundary
- County Boundary

Important Farmland

- Prime Farmland
- Farmland of Statewide Importance
- Prime Farmland if Drained
- Prime Farmland if Irrigated

Map Sheet Index



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BASIN ELECTRIC POWER COOPERATIVE
A Touchstone Energy Cooperative

Figure 5-9
Basin Electric Power Cooperative
Antelope Valley Station to Neset
345-kV Transmission Project
Important Farmland
Sheet 3 of 3

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Source: North Dakota GIS; Esri; National Flight Data Center; USDA NRCS SSURGO Soils; Basin Electric; Burns & McDonnell.

Revised October 26, 2011

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APPENDIX B - SCOPING REPORT AND SCOPING COMMENTS RECEIVED

Antelope Valley Station (AVS) to Neset 345-kV Transmission Line Project

Scoping Report
March 2012

United States Department of Agriculture
Rural Utilities Service
Washington, DC

Contents

APPENDICES

TABLES

MAPS

1.0 INTRODUCTION

Basin Electric Power Cooperative (Basin Electric) has requested funding from the Rural Utilities Service (RUS) for the upgrade, construction, expansion, maintenance, and replacement of electric infrastructure in rural areas of western and northern North Dakota. The RUS, an agency that delivers the U.S. Department of Agriculture's Rural Development Utilities Program, is authorized to make loans and loan guarantees that finance the construction of electric distribution, transmission and generation facilities, including system improvements and replacements required to furnish and improve electric service in rural areas, as well as demand side management, energy conservation programs and on-grid and off-grid renewable energy systems.

Generally, RUS will prepare an environmental impact statement and hold public scoping meetings according to its Environmental Policies and Procedures (7 CFR Part 1784) to analyze requests for financing for certain types of projects. This scoping report identifies and summarizes substantive comments received during the scoping period for the Antelope Valley Station (AVS) to Neset 345-kV Transmission Project (Project) and is indicative of what will be evaluated in the EIS.

The Western Area Power Administration (Western) is serving as a cooperating agency in the environmental review process and will be the lead Federal agency for Section 7 and Section 106 compliance.

This report describes the proposed Project and activities associated with the agency and public scoping meetings. Substantive agency and public comments received during the scoping period held from November 2 through December 2, 2011 are summarized. In addition, this document includes seven appendices with supplementary information relating to the scoping process and the public meetings:

- Appendix A: Notice of Intent
- Appendix B: Public Meeting Newspaper Notices
- Appendix C: Public Mailer and Radio Bulletin Text
- Appendix D: Agency Scoping Letters and Mailing List
- Appendix E: Agency and Public Scoping Meeting Sign-In Sheets
- Appendix F: Public Scoping Meeting Materials
- Appendix G: Index of Public and Agency Comments by Category

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2.0 PROJECT DESCRIPTION

Basin Electric has identified the need for additional electric transmission capacity in northwestern North Dakota as a result of increased demand and to meet reliability and system stability requirements for the region. Investigations and analyses conducted for the overall power delivery systems found that without improvements, the flow of power along existing lines may result in local line overloads, especially in the vicinity of Williston, North Dakota.

To resolve these issues, Basin Electric is proposing to construct, own and operate a new 345-kV transmission line and associated supporting infrastructure. The entire project will consist of:

- construction of 190 miles of new single circuit 345-kV and double circuit 345/115-kV transmission lines,
- construction of two new substations,
- modifications to four existing substations,
- potential for construction of a 345-kV switchyard,
- construction of maintenance access roads, temporary construction roads and staging sites, river crossings, and other facilities.

The Project would connect to the integrated system at several locations, including Western's Williston Substation. The proposed Project would be located in portions of Billings, Dunn, McKenzie, Mercer, Mountrail, and Williams counties in western North Dakota. The proposed project area and preliminary transmission line routes can be seen in Maps 2-1 and 2-2.

Basin Electric is pursuing financial assistance for its ownership interest in the proposed Project from RUS. RUS funding of the proposed project would constitute a federal action subject to National Environmental Policy Act (NEPA) analysis (42 United States Code [USC], § 4321, specifically 7 CFR § 1794.3).

One preliminary document was prepared in preparation for scoping. The document contained both an Alternative Evaluation Study (AES) and a Macro Corridor Study (MCS). These studies are required by RUS when an environmental analysis for a proposed transmission line project is conducted. This document detailed the entire project area from AVS to Neset. The purpose of the document is to provide agencies and the public with a general understanding of the proposed Project. The AES portion explains the need for the proposed Project, discusses the alternative methods that have been considered to meet that need, and recommends an alternative that is considered the best for fulfilling the need. The MCS defines the project area and illustrates the Project end points. Within the Project area, macro-corridors have been developed based on environmental, engineering, economic, and land use data as well as conditions of regulatory constraints. This document is available for review on the RUS website at http://www.rurdev.usda.gov/UWP-AVS-Neset.html or upon request to RUS.

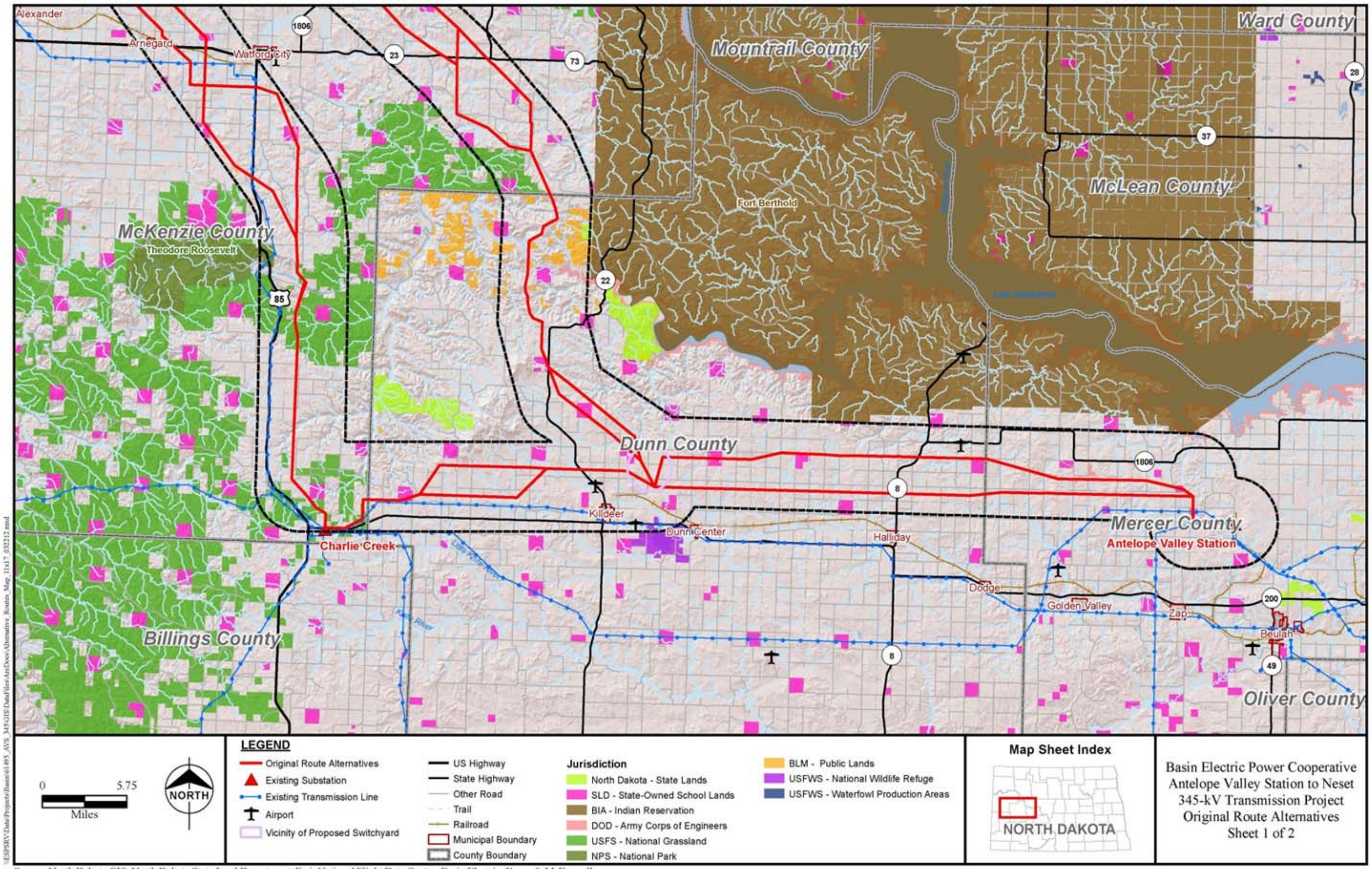
A Notice of Intent (NOI) was published in the *Federal Register* on November 2, 2011, informing the public of the intent by RUS to prepare an EIS with scoping. The notice initiated the 30-day public scoping period and included the dates for public scoping meetings during November 2011. A copy of the NOI is provided in Appendix A. Notices were printed in local newspapers in the weeks preceding the public scoping meetings, and a legal notice similar to the NOI was published as required by RUS guidance. A list of the names of the publications and dates of these advertisements and legal notices are included in Table 2-1. Copies of the newspaper advertisements and legal notices are included in Appendix B.

TABLE 2-1: NEWSPAPERS AND DATES OF PUBLIC NOTICES

Newspaper	Publication Dates	Location
Beulah Beacon	November 3 and 10, 2011	Beulah, North Dakota
Bismarck Tribune	October 31 and November 7, 2011	Bismarck, North Dakota
Dickinson Press	October 30 and November 6, 2011	Dickinson, North Dakota
Dunn County Herald	November 4 and 11, 2011	Killdeer, North Dakota
Tioga Tribune	November 2 and 9, 2011	Tioga, North Dakota
Williston Herald	October 31 and November 6, 2011	Williston, North Dakota

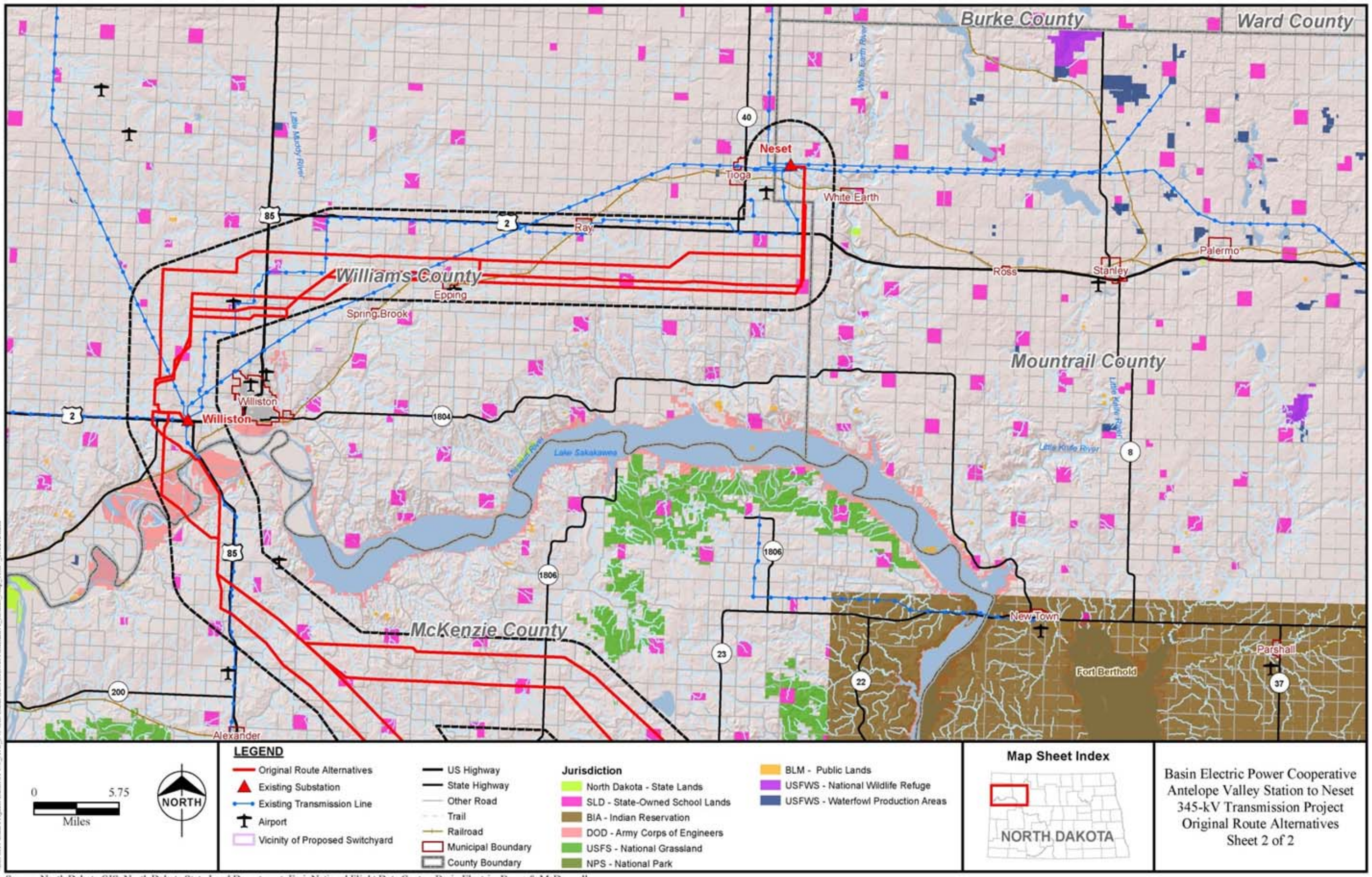
A public mailer was distributed to approximately 200 landowners surrounding the vicinity of Williston, ND, stakeholders as well as those individuals who requested to be on the Project mailing list. Basin Electric's public project website http://www.basinelectric.com/Projects/North_Dakota_Transmission/index.html was also used to disseminate the public scoping schedule and other project information to stakeholders. A copy of the public mailer and text from a public service announcement over radio broadcast is included in Appendix C.

MAP 2.1: ALTERNATIVE ROUTES MAP 1



Source: North Dakota GIS; North Dakota State Land Department; Esri; National Flight Data Center; Basin Electric; Burns & McDonnell.

MAP 2.2: ALTERNATIVE ROUTES MAP 2



Source: North Dakota GIS; North Dakota State Land Department; Esri; National Flight Data Center; Basin Electric; Burns & McDonnell.

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3.0 AGENCY SCOPING MEETING

RUS conducted one agency scoping meeting for interested federal, state, and local agencies and tribal representatives. The meeting involved a presentation by RUS followed by a question and answer session for the attending agencies. The agency scoping meeting was held on November 14, 2011, at the Basin Electric Headquarters, located at 1717 East Interstate Avenue, Bismarck, North Dakota.

3.1 Purpose

The purpose of the agency scoping meeting was to provide the agencies with information regarding the proposed Project, answer questions, identify concerns regarding the potential environmental impacts that may result from construction and operation of the Project, and gather information to determine the scope of issues to be addressed in RUS environment review and documentation of the Project. The notification process, public scoping meeting materials, and the process for collecting public comments are described in the following sections.

3.2 Notification

RUS notified federal, state, and local agencies of the proposed Project by mail. Federal and state agencies received a letter detailing the role of RUS in the proposed Project, the availability of the AES and MCS report, the dates and locations of the public and agency scoping meetings, contact information for the RUS and Basin Electric representatives assigned to the proposed Project, and methods for submitting comments. Local agencies and government representatives were sent similar letters, detailing the role of RUS in the proposed project, dates and locations of the public scoping meetings, the availability of the AES and MCS reports and methods for submitting comments. A list of federally recognized tribes near the proposed Project area was also compiled. The tribal leaders and the Tribal Historic Preservation Officers (THPOs) were notified by mail. A copy of the federal and state agency letter, the local agency, government representative and Tribal letter, and list of recipients for each are included in Appendix D.

3.3 Agency Attendance

A total of 18 participants representing the following entities signed in at the agency scoping meeting:

- Basin Electric Power Cooperative
- Little Missouri Scenic River Commission
- National Park Service (NPS)
- North Dakota State Department of Health
- North Dakota State Historic Preservation Office
- North Dakota State Department of Trust Lands
- North Dakota Transmission Authority
- U.S. Army Corps of Engineers (USACE)
- U.S. Department of Agriculture Rural Utilities Service (USDA – RUS)
- U.S. Department of Agriculture Natural Resource Conservation Service (USDA – NRCS)
- U.S. Forest Service (USFS)
- U.S. Fish and Wildlife Service (USFWS)
- Western Area Power Administration

Sign-in sheets used for the agency and public scoping meetings are included in Appendix E.

3.4 Agency Comments

The following Federal, and state agencies provided written scoping comments:

- Environmental Protection Agency (EPA)
- Federal Aviation Administration (FAA)
- National Park Service (NPS)
- North Dakota State Department of Health

- North Dakota State Department of Trust Land
- U.S. Department of Agriculture Rural Utilities Service (USDA – RUS)
- U.S. Fish and Wildlife Service (USFWS)

Appendix G if an index of comments by categories received by both agencies and the general public.

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4.0 PUBLIC SCOPING MEETINGS

The RUS conducted two public scoping meetings as listed in Table 4-1 using an open-house format. Both of the public scoping meetings were held between 4:00 and 7:00 p.m. RUS requires that public scoping meetings be held after regular business hours and at reasonable distance for all people in the Project area to attend. The proponents met the requirements with the evening public scoping meetings within reasonable driving distance held in Williston and Killdeer, North Dakota.

TABLE 4-1: PUBLIC SCOPING MEETINGS

Date	Time	Location
November 15, 2011	4:00-7:00 p.m.	Ernie French Center 14120 Highway 2 Williston, North Dakota 58801
November 16, 2011	4:00-7:00 p.m.	America Legion Hall Post 46 42 Central Avenue Killdeer, North Dakota 58604

4.1 Purpose

The purpose of the public scoping meetings was to provide the public with information regarding the proposed Project, answer questions, identify concerns regarding the potential environmental impacts that may result from construction and operation of the Project, and gather information to determine the scope of issues to be addressed in the RUS environmental review and documentation of the Project (RUS Bulletin 1794A-603).The notification process, public scoping meeting materials, and the process for collecting public comments are described in the following sections.

4.2 Notification Process

Several methods were used to notify the public of the scoping process and meetings, including those required by RUS, including the RUS *Federal Register* Notice *of Intent To Prepare An Environmental Impact Statement and Hold Public Meetings (NOI)*, the borrower public notice in newspapers, and general public notification by direct mail, radio bulletins and the use of Basin Electric's website to provide additional outreach to the public and stakeholders in the proposed Project area. The NOI was published in the *Federal Register* on November 2, 2011. A legal notice and newspaper ads were printed October 30 through November 10, 2011, in area newspapers. A mailer with information on the Project and scoping meeting dates and locations was sent to approximately 200 stakeholders in the proposed Project area during the week of November 1, 2011, to inform them of the public scoping meetings. Basin Electric posted meeting notice flyers in area restaurants and community bulletin boards.

4.3 Public Scoping Meeting Materials

An open house format was used to encourage discussion and information sharing and to ensure that the public had opportunities to speak with Agency and Project representatives. Stations detailing different areas of the proposed Project were staffed by either representatives of Basin Electric, Western, and consultants. Information stations at the public scoping meetings included the following:

- Sign-in and Welcome table
- USDA RUS, their NEPA process and background information regarding RUS and Basin Electric
- Project overview, purpose, and need
- Project alternatives and next steps
- Environmental resources to be analyzed
- Land and easement acquisitions, including acquisition process and Project land requirements
- Detailed macro-corridor sections, including GIS maps.

Sign-in sheets (Appendix E) and comment forms were made available to all scoping meeting attendees.
Public scoping meeting materials are included in Appendix F.

4.4 Collecting Public Comments

A total of 38 comments were received during the scoping comment period beginning on November 2, 2011, ending December 2, 2011. Comments received after the deadline are not included in this report, but will continue to be collected and considered by RUS. Public comments were submitted using comment forms, letters, and emails. All comments were directly delivered to RUS or forwarded if they were addressed to Basin Electric by the commenter. None of the comments received were in whole or part, identical form letters. A summary of the public comments received and organized by category is below. Each of these were referred to as an item and entered into the comment management database. Items were index based on the when they were received. Comments were then categorized based on the content of the comment, resulting in 12 categories. It is possible that comments address multiple topics; therefore comments may be included in multiple topics below. Appendix G is an index of comments by category. This index includes each comment that was considered under each of the categories described below.

4.4.1 Air Quality

Two (2) comments were received regarding air quality. Both comments mentioned minimizing and managing fugitive dust created during construction of the transmission line. One commented discussed the need to identify potential effects to air quality from AVS.

4.4.2 Aesthetics

Four (4) comments were received regarding aesthetics. Commenters mentioned that the proposed Project would negatively alter the existing landscape and reduce the aesthetic quality of the Project area, Theodore Roosevelt National Park and Lewis and Clark National Historic Trail, as well negatively affecting the viewshed of personal property owners.

4.4.3 Conservation

Twenty one (21) comments were received regarding conservation. Commenters noted the need for conservation in the area of the proposed Project, particularly in the area of Lone Butte within the Little Missouri National Grassland, Theodore Roosevelt National Park, and Lewis and Clark National Historic Trail. Multiple commenters requested that the proposed Project avoid all roadless areas. One commenter noted that the proposed Project could affect the possible designation of Lone Butte as a wilderness area and requested that the proposed Project avoid this area. Another commenter requested that the proposed Project adhere to all applicable conservation standards and strategies as prescribed by the USFWS. On commenter suggested that the proposed Project avoid all prime farmland. One commenter suggested that the Lone Butte and Long X Divide areas receive protection under the Wilderness Protection Act. One commenter mentioned preserving the Killdeer Mountains. Two comments requested that their personal property be conserved and avoided by the proposed Project.

Based on these comments requesting that roadless areas be avoided, different route alternatives were established. The updated alternatives can be seen in Map 4-1.

4.4.4 Environmental Justice

One (1) comment was received regarding concerns about environmental justice. The commenter requests that a full environmental justice impact assessment be conducted and screen for potential health and monetary effects to low income or minority populations.

4.4.5 Project Information/Communication

Five (5) comments were received which requested that they be kept informed regarding future meetings and happenings with the proposed Project. One commenter requested that all appropriate permits and documents be obtained by the North Dakota Department of Transportation.

4.4.6 Need

Two (2) comments were received regarding the Project's need. One commenter expressed satisfaction over the proposed Project and mentioned that the proposed Project is needed. Another commenter mentioned that the proposed Project was not needed and that in is an inappropriate use of taxpayer money.

4.4.7 Noise

One (1) comment was received regarding noise. The commenter stated that the construction of the proposed Project would create unwanted noise to surrounding landowners and suggested that all steps to minimize noise be taken.

4.4.8 Property Values

Two (2) comments were received regarding potential impacts to property values. Both commenters expressed worry that should the proposed Project cross their property that their property values would be negatively affected and requested that the proposed Project not be constructed on their property.

4.4.9 Route Alternatives/Land Use

Ten (10) comments were received regarding general routing guidelines and suggestions. Commenters requested that homes, residences and private property be avoided when the final routes are chosen. Multiple commenters suggested that proposed Project corridor D be removed, while another commenter requested that corridor E be removed. One commenter requested that the proposed Project avoid potential airport expansion sites at Williston. Another commenter requested that the potential Project adhere to all existing North Dakota School Trust property easements.

4.4.10 Vegetation

Two (2) comments were received regarding vegetation. Both commenters requested that all construction and maintenance adhere to vegetation protection standards. One commenter requested that all grassland vegetation be protected.

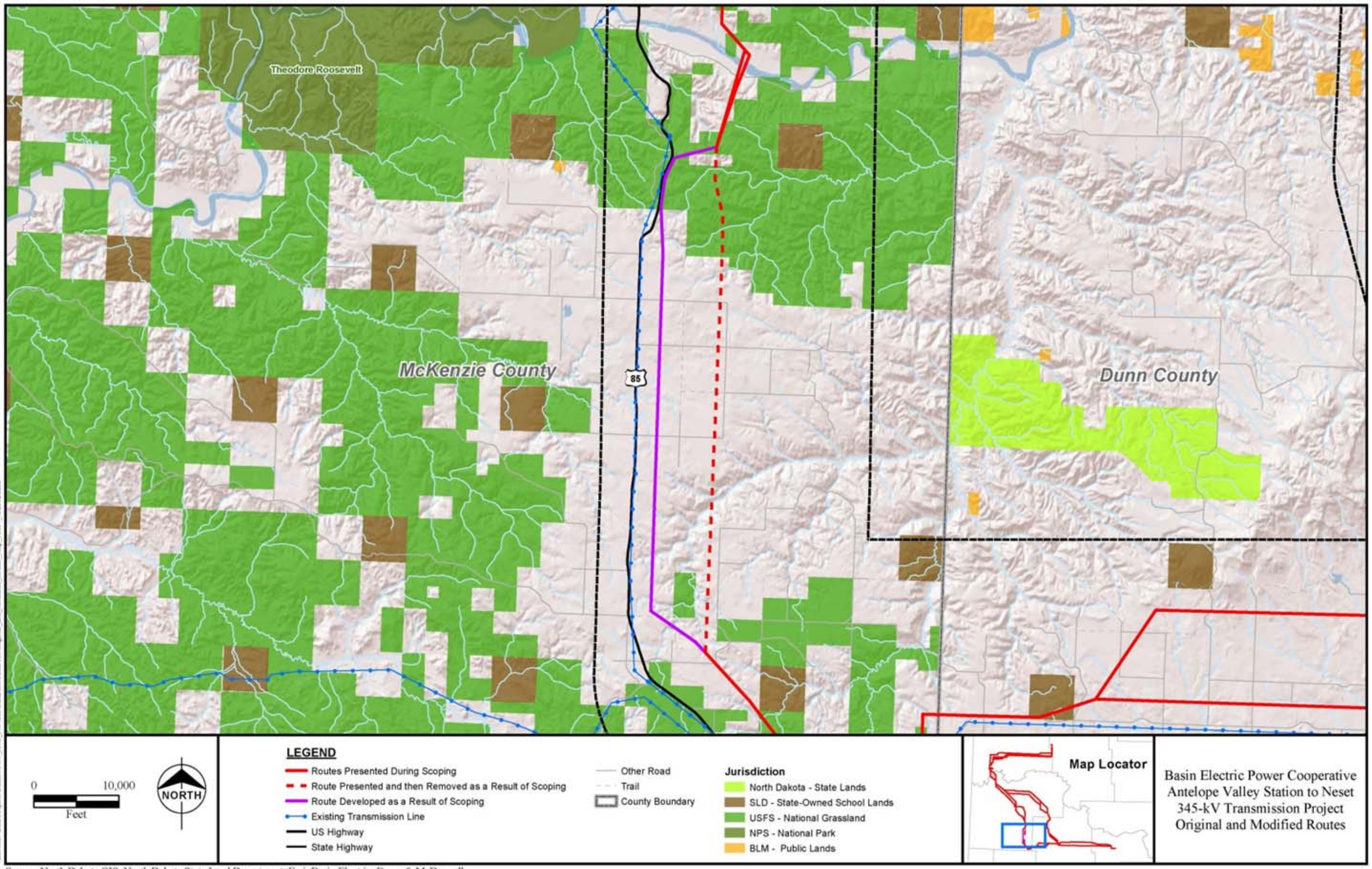
4.4.11 Water

Three (3) comments were received regarding potential impacts to water. Commenters requested that the proposed Project ensure satisfactory water quality and that existing water sources be protected from fill material as well as protecting wetlands, streambeds while not negatively affecting storm water flow

4.4.12 Wildlife

Nine (9) comments were received regarding wildlife and wildlife habitat. General comments mostly expressed concern about potential impacts to wildlife and wildlife habitat for common species. One commenter expressed concern for potential impacts to avian species, their migratory routes, and wetland habitats with one commenter specifically referring to the Golden eagle. One commenter mentioned the wildlife and wildlife habitat areas at the Missouri River bottoms and requested that the route avoid these areas.

MAP 4-1: UPDATED ALTERNATIVES ROUTE MAP



Source: North Dakota GIS; North Dakota State Land Department; Esri; Basin Electric; Burns & McDonnell.

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5.0 PROJECT STATUS

A second round of public meetings will be held in late 2012 or early 2013 to solicit public input and to present refined routes based on public input received at the November 2011 scoping meetings. A draft EIS is currently anticipated in late-2012. A public review and comment period on the Draft EIS would occur in that same timeframe. Additionally, RUS will continue to engage in all necessary agency consultation and coordination regarding potential effects to resources. RUS will continue and response to substantive comments provided to them. A Project Decision is anticipated in late-2013.

APPENDIX A:
NOTICE OF INTENT

DEPARTMENT OF AGRICULTURE

Rural Utilities Service

Basin Electric Power Cooperative, Inc.: Notice of Intent To Prepare an Environmental Impact Statement and Hold Public Scoping Meetings

AGENCY: Rural Utilities Service, USDA.

ACTION: Notice.

SUMMARY: The Rural Utilities Service (RUS), an agency within the U.S. Department of Agriculture (USDA), intends to prepare an environmental impact statement (EIS) for Basin Electric Power Cooperative's (Basin Electric) proposed Antelope Valley Station (AVS) to Neset Transmission Project (Project) in North Dakota. RUS is issuing this Notice of Intent (NOI) to inform the public and interested parties about the proposed Project, conduct a public scoping process, and invite the public to comment on the scope, proposed action, and other issues to be addressed in the EIS.

The EIS will address the construction, operation, and maintenance of Basin Electric's proposed Project. The Project includes construction, operation and maintenance of approximately 190 miles of new 345-kV single pole transmission line and double circuit 345/115-kV transmission lines, 2 new substations, modifications to 4 existing substations, a 345-kV switchyard, maintenance access roads, temporary construction roads, river crossings, temporary construction staging sites, and other facilities to be described in the proposed EIS. Basin Electric's proposed Project would be located in portions of Billings, Dunn, McKenzie, Mercer, Mountrail, and Williams counties in western North Dakota.

Portions of Basin Electric's proposed Project may affect floodplains and wetlands. This NOI also serves as a notice of proposed floodplain or wetland action. RUS will hold public scoping meetings to share information and receive comments and suggestions on the scope of the EIS in areas near and affected by the proposed Project.

DATES: An open-house public scoping meetings will be held on November 15, 2011, from 4 to 7 p.m. central time at the Ernie French Center, North Dakota State University Williston Research Extension Office, 14120 Highway 2, Williston, North Dakota 58801; and on November 16, 2011, from 4 to 7 p.m. mountain time at the American Legion Hall Post 46, 42 Central Avenue, Killdeer, North Dakota 58640. In order to be considered, all fax or email comments or suggestions regarding the appropriate scope of the EIS must be received by the end of the scoping period. Comments regarding the Project may be submitted in writing at the public scoping meeting or mailed to the RUS address provided in this Notice. Mailed comments must be postmarked no later than midnight on December 2, 2011.

ADDRESSES: Written comments on the scope of the EIS should be addressed to Mr. Dennis Rankin, Environmental Protection Specialist, USDA, Rural Utilities Service, 1400 Independence Avenue SW., Stop 1571, Washington, DC 20250–1571, *telephone:* (202) 720–1953, or *email: dennis.rankin@wdc.usda.gov.*

FOR FURTHER INFORMATION CONTACT: For information on the proposed Project, the EIS process, and RUS financing, contact Mr. Dennis Rankin, Engineering and Environmental Staff, Rural Utilities Service, 1400 Independence Avenue SW., Mail Stop 1571, Washington, DC 20250–1571, *telephone:* (202) 720–1953, or *email: dennis.rankin@wdc.usda.gov*. Parties wishing to be placed on the Project mailing list for future information and to receive copies of the Draft and Final EIS when they are available should also contact Mr. Rankin.

SUPPLEMENTARY INFORMATION: RUS is authorized to make loans and loan guarantees that finance the construction of electric distribution, transmission, and generation facilities, including system improvements and replacements required to furnish and improve electric service in rural areas, as well as demand side management, energy conservation programs, and on-grid and off-grid renewable energy systems. Based on an interconnection with the Western Area Power Administration's (Western) transmission system, Western has in accordance with 40 CFR 1501.6 Cooperating agencies, requested to serve as a cooperating agency for the environmental review of the proposed project.

Basin Electric is a regional wholesale electric generation and transmission cooperative owned and controlled by its member cooperatives. Basin Electric serves approximately 2.5 million customers covering 430,000 square miles in portions of nine states, including Colorado, Iowa, Minnesota, Montana, Nebraska, New Mexico, North Dakota, South Dakota, and Wyoming.

Project Description: Basin Electric has identified the need for additional electric transmission capacity in northwestern North Dakota as a result of increased demand and to meet reliability and system stability requirements for the region. Investigations and analyses conducted for the overall power delivery systems found that without improvements, the flow of power along existing lines may result in local line overloads, especially in the vicinity of Williston, North Dakota.

To resolve these issues, Basin Electric is proposing to construct, own and operate a new 345-kV transmission line and associated supporting infrastructure. The entire project will consist of constructing approximately 190 miles of new single circuit 345-kV and double circuit 345/115-kV transmission lines, the construction of 2 new substations, modifications to 4 existing substations, a 345-kV switchyard, maintenance access roads, temporary construction roads, river crossings, temporary construction staging sites, and other facilities. The Project would connect to the Integrated System at several locations, including Western's Williston Substation. The proposed Project would be located in portions of Billings, Dunn, McKenzie, Mercer, Mountrail, and Williams counties in western North Dakota.

Basin Electric has requested financial assistance for the proposed Project from the U.S. Department of Agriculture, Rural Utilities Service (RUS). Completing the EIS is one of RUS's requirements in processing Basin Electric's application, along with other technical and financial considerations.

In accordance with 40 CFR 1501.5(b) of the Council of Environmental Quality's Regulation for Implementing the Procedural Provisions of the National Environmental Policy Act, RUS will serve as the-lead agency in the preparation of the EIS. Other agencies and Native American Tribes with jurisdiction or special expertise will be invited to participate as cooperating agencies per § 1501.6.

The proposed Project is subject to the jurisdiction of the North Dakota Public Service Commission (NDPSC), which has regulatory authority for siting electrical transmission facilities within the State. Basin Electric will submit an application for NDPSC Transmission Corridor and Route Permits. The NDPSC Permits would authorize Basin Electric to construct the proposed Project under North Dakota rules and regulations.

RUS intends to prepare an EIS to analyze the impacts of its respective federal actions and the proposed Project in accordance with NEPA, as amended, CEQ's Regulation for Implementing the Procedural Provisions of the National Environmental Policy Act (40 CFR parts 1500–1508), DOE NEPA Implementing Procedures (10 CFR part 1021), and RS

Environmental Policies and Procedures (7 CFR part 1794).

Because the proposed Project may involve action in floodplains or wetlands, this NOI also serves as a notice of proposed floodplain or wetland action. The EIS will include a floodplain/wetland assessment and, if required, a floodplain/wetland statement of findings will be issued with the Final EIS.

Agency Responsibilities: RUS is serving as the lead Federal agency, as defined at 40 CFR 1501.5, for preparation of the EIS. With this notice, Native American Tribes and agencies with jurisdiction or special expertise are invited to be cooperating agencies. Such tribes or agencies may make a request to RUS to be a cooperating agency by contacting Mr. Rankin. Designated cooperating agencies have certain responsibilities to support the NEPA process, as specified at 40 CFR 1501.6(b).

Environmental Issues: This notice is to inform agencies and the public of RUS' federal action, and the proposed Project, and to solicit comments and suggestions for consideration in preparing the EIS. To help the public frame its comments, this notice contains a list of potential environmental issues that RUS has tentatively identified for analysis. These issues include:

1. Impacts on protected, threatened, endangered, or sensitive species of animals or plants;
2. Impacts on avian and bat species;
3. Impacts on land use, recreation, and transportation;
4. Impacts on cultural resources or historic properties and tribal values;
5. Impacts on human health and safety;
6. Impacts on air, soil, and water resources (including air quality and surface water impacts);
7. Visual impacts; and
8. Socioeconomic impacts and whether there would be any disproportionately high and adverse impacts to minority and low-income populations.

This list is not intended to be all-inclusive or to imply any predetermination of impacts. Environmental issues associated with the action of RUS, and Basin Electric's proposed Project will be addressed separately in the EIS. RUS invites interested parties to suggest specific issues within these general categories, or other issues not included above, to be considered in the EIS.

Public Participation: Public participation and full disclosure are planned for the entire EIS process. The EIS process will include open-house public scoping meetings and a scoping comment period to solicit comments from interested parties; consultation and involvement with appropriate Federal, State, local, and tribal governmental agencies; public review and a hearing on the draft EIS; publication of a final EIS; and publication of a Record of Decision. Expected EIS completion date is December 2013. Additional informal public meetings may be held in the proposed Project areas, if public interest and issues indicate a need; if additional public meeting are determined to be necessary public notices will be published as appropriate.

RUS will hold open-house public scoping meetings in Williston, North Dakota, and Killdeer, North Dakota as noted above. The time and locations of these meetings will be well advertised in local media outlets a minimum of 15 days prior to the time of the meetings. Attendees are welcome to come and go at their convenience and to speak one-on-one with Project representatives and agency staff. The public will have the opportunity to provide written comments at the meeting. In addition, attendees may provide written comments by letter, fax, email.

The public scoping period begins with publication of this notice in the **Federal Register** and closes December 2, 2011. To be considered in defining the scope of the EIS, comments should be received by the end of the scoping period.

Dated: October 27, 2011.

Mark Plank,

Director, Engineering and Environmental Staff, Rural Utilities Service.

[FR Doc. 2011–28309 Filed 11–1–11; 8:45 am]

BILLING CODE P

COMMISSION ON CIVIL RIGHTS

Agenda and Notice of Public Meeting of the Connecticut, District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, and Pennsylvania Advisory Committees

Notice is hereby given, pursuant to the provisions of the rules and regulations of the U.S. Commission on Civil Rights (Commission) and the Federal Advisory Committee Act (FACA), that a webinar briefing meeting of the Connecticut, District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, and Pennsylvania State Advisory Committees will convene on Monday, November 14, 2011, at 10:30 a.m. (E.S.T.). The briefing will be at Commission Headquarters, 624 9th Street NW., Room 540, Washington, DC 20425. The purpose of the meeting is to receive a briefing from experts on Human Trafficking.

Those who are unable to attend the briefing at the Commission Headquarters in person may join through an Internet connection. Please contact the Eastern Regional Office for details on the internet connection by calling (202) 376–7533 or by email at *ero@usccr.gov.*

Members of the public are entitled to submit written comments. The comments must be received in the regional office by Monday, December 5, 2011. The address is Eastern Regional Office, 624 9th Street NW., Suite 740, Washington, DC 20425. Persons wishing to email their comments, or who desire additional information should contact the Eastern Regional Office at (202) 376–7533 or by email to: *ero@usccr.gov.*

People seeking disability accommodations should contact the Eastern Regional Office at least five (5) working days before the scheduled meeting date.

Records generated from this briefing may be inspected and reproduced at the Eastern Regional Office, as they become available, both before and after the webinar. Persons interested in the work of these advisory committees are advised to go to the Commission's Web site, *http://www.usccr.gov,* or to contact the Eastern Regional Office at the above email or street address.

The briefing will be conducted pursuant to the rules and regulations of the Commission and FACA.

Dated in Washington, DC, on October 27, 2011.

Peter Minarik,

Acting Chief, Regional Programs Coordination Unit.

[FR Doc. 2011–28383 Filed 11–1–11; 8:45 am]

BILLING CODE 6335–01–P

DEPARTMENT OF COMMERCE

Foreign-Trade Zones Board

[Order No. 1795]

Grant of Authority for Subzone Status; VF Jeanswear, (Apparel Distribution), Mocksville, NC

Pursuant to its authority under the Foreign-Trade Zones Act of June 18, 1934, as amended (19 U.S.C. 81a–81u), the Foreign-Trade Zones Board (the Board) adopts the following Order:

Whereas, the Foreign-Trade Zones Act provides for "* * * the establishment

APPENDIX B:
PUBLIC MEETING NEWSPAPER NOTICES

AFFIDAVIT OF PUBLICATION

STATE OF NORTH DAKOTA)
SS
COUNTY OF Mercer)

I SHELLEY CHASE, being first duly sworn, on my own oath, say, that I am the bookkeeper of the Beulah Beacon , a weekly newspaper of general circulation, published in the city of Beulah, that the advertisement headed:

DAKOTA GASIFICATION/BEULAH BH- RUS LEGAL NOTICE OF INTENT/LEGAL

---

a printed copy of which is here annexed, was published in the regular and entire issue of said newspaper during the period and time of publication, and that the notice was published in the newspaper proper , and not in a supplement,

for 2 consecutive week 11/10/2011 to wit:

Straight Matter Lines 309	$0.67	$207.03	11/03/2011
Straight Matter Lines 309	$0.67	$207.03	11/10/2011

Notary Fee $1.00 Total Cost of Legal $415.06

Shelley Chase

Subscribed and sworn to before me this 15th day of November A.D. 2011.

(Seal) Darla J. Mautz

Notary Public, State of North Dakota

My Commission Expires

DARLA J MAUTZ
Notary Public
State of North Dakota
My commission expires July 22, 2016

DEPARTMENT OF AGRICULTURE

Rural Utilities Service

Basin Electric Power Cooperative, Inc.: Notice of Intent to Prepare an Environmental Impact Statement and Hold Public Scoping Meetings

AGENCY: Rural Utilities Service, USDA

ACTION: Notice of Intent to Prepare an Environmental Impact Statement and Hold Public Scoping Meetings

SUMMARY: The Rural Utilities Service (RUS), an agency within the U.S. Department of Agriculture (USDA), intends to prepare an environmental impact statement (EIS) for Basin Electric Power Cooperative's (Basin Electric) proposed Antelope Valley Station (AVS) to Neset Transmission Project (Project) in North Dakota. RUS is issuing this Notice of Intent (NOI) to inform the public and interested parties about the proposed Project, conduct a public scoping process, and invite the public to comment on the scope, proposed action, and other issues to be addressed in the EIS.

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Portions of Basin Electric's proposed

AFFIDAVIT OF PUBLICATION

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DATES: An open-house public scoping meetings will be held on November 15, 2011, from 4:00 to 7:00 p.m. central time at the Ernie French Center, North Dakota State University Williston Research Extension office, 14120 Highway 2, Williston, North Dakota 58801; and on November 16, 2011, from 4:00 to 7:00 p.m. mountain time at the at the American Legion Hall Post 46, 42 Central Avenue, Killdeer, North Dakota 58640. In order to be considered, all fax or e-mail comments or suggestions regarding the appropriate scope of the EIS must be received by the end of the scoping period. Comments regarding the Project may be submitted in writing at the public scoping meeting or mailed to the RUS address provided in this Notice. Mailed comments must be postmarked no later than midnight on December 2, 2011.

ADDRESSES: Written comments on the scope of the EIS should be addressed to Mr. Dennis Rankin, Environmental Protection Specialist, USDA, Rural Utilities Service, 1400 Independence Avenue, SW, Stop 1571, Washington, DC 20250-1571, telephone: (202) 720-1953 or e-mail: dennis.rankin@wdc.usda.gov.

FOR FURTHER INFORMATION CONTACT: For information on the proposed Project, the EIS process, and RUS financing, contact Mr. Dennis Rankin, Engineering and Environmental Staff, Rural Utilities Service, 1400 Independence Avenue SW, Mail Stop 1571, Washington, D.C. 20250-1571, telephone (202) 720-1953 or email dennis.rankin@wdc.usda.gov. Parties wishing to be placed on the Project mailing list for future information and to receive copies of the Draft and Final EIS when they are available should also contact Mr. Rankin.

SUPPLEMENTARY INFORMATION: RUS, is authorized to make loans and loan guarantees that finance the construction of electric distribution, transmission, and generation facilities, including system improvements and replacements required to furnish and improve electric service in rural areas, as well as demand side management, energy conservation programs, and on-grid and off-grid renewable energy systems. Based on an interconnection with the Western Area Power Administration's (Western) transmission system, Western has in accordance with 40 CFR 1501.6 Cooperating agencies, requested to serve as a cooperating agency for the environmental review of the proposed project.

Basin Electric is a regional wholesale electric generation and transmission cooperative owned and controlled by its member cooperatives. Basin Electric serves approximately 2.5 million customers covering 430,000 square miles in portions of nine states, including Colorado, Iowa, Minnesota, Montana, Nebraska, New Mexico, North Dakota, South Dakota, and Wyoming.

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To resolve these issues, Basin Electric is proposing to construct, own and operate a new 345-kV transmission line and associated supporting infrastructure. The entire project will consist of constructing approximately 190 miles of new single circuit 345-kV and double circuit 345/115-kV transmission lines, the construction of 2 new substations, modifications to 4 existing substations, a 345-kV switchyard, maintenance access roads, temporary construction roads, river crossings, temporary construction staging sites, and other facilities. The Project would connect to the Integrated System at several locations, including Western's Williston Substation. The proposed Project would be located in portions of Billings, Dunn, McKenzie, Mercer, Mountrail, and Williams counties in western North Dakota.

Basin Electric has requested financial assistance for the proposed Project from the U.S. Department of Agriculture, Rural Utilities Service (RUS). Completing the EIS is one of RUS's requirements in processing Basin Electric's application, along with other technical and financial considerations.

In accordance with 40 CFR 1501.5(b) of the Council of Environmental Quality's Regulation for Implementing the Procedural Provisions of the National Environmental Policy Act, RUS will serve as the lead agency in the preparation of the EIS. Other agencies and Native American Tribes with jurisdiction or special expertise will be invited to participate as cooperating agencies per §1501.6.

The proposed Project is subject to the jurisdiction of the North Dakota Public Service Commission (NDPSC), which has regulatory authority for siting electrical transmission facilities within the State. Basin Electric will submit an application for NDPSC Transmission Corridor and Route Permits. The NDPSC Permits would authorize Basin Electric to construct the proposed Project under North Dakota rules and regulations.

RUS intends to prepare an EIS to analyze the impacts of its respective federal actions and the proposed Project in accordance with NEPA, as amended, CEQ's Regulation for Implementing the Procedural Provisions of the National Environmental Policy Act (40 CFR 1500-1508), DOE NEPA Implementing Procedures (10 CFR 1021), the, and RS Environmental Policies and Procedures (7 CFR 1794).

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Agency Responsibilities: RUS is serving as the lead Federal agency, as defined at 40 CFR 1501.5, for preparation of the EIS. With this notice, Native American Tribes and agencies with jurisdiction or special expertise are invited to be cooperating agencies. Such tribes or agencies may make a request to RUS to be a cooperating agency by contacting Mr. Rankin. Designated cooperating agencies have certain responsibilities to support the NEPA process, as specified at 40 CFR 1501.6 (b).

Environmental Issues: This notice is to inform agencies and the public of RUS' federal action, and the proposed Project, and to solicit comments and suggestions for consideration in preparing the EIS. To help the public frame its comments, this notice contains a list of potential environmental issues that RUS has tentatively identified for analysis. These issues include:

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Impacts on avian and bat species;

Impacts on land use, recreation, and transportation;

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Impacts on human health and safety;

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Public Participation: Public participation and full disclosure are planned for the entire EIS process. The EIS process will include open-house public scoping meetings and a scoping comment period to solicit comments from interested parties; consultation and involvement with appropriate Federal, State, local, and tribal governmental agencies; public review and a hearing on the draft EIS; publication of a final EIS; and publication of a Record of Decision. Expected EIS completion date is December 2013. Additional informal public meetings may be held in the proposed Project areas, if public interest and issues indicate a need; if additional public meeting are determined to be necessary public notices will be published as appropriate.

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The public scoping period begins with publication of this notice in the Federal Register and closes December 2, 2011. To be considered in defining the scope of the EIS, comments should be received by the end of the scoping period.

Dated: 10/27/11
-SIGNED-
MARK PLANK
Director, Engineering and Environmental Staff
Rural Utilities Service
(11-3-11 11-10-11)

The Bismarck Tribune
www.bismarcktribune.com
The Finder

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1717 E INTERSTATE AV
BISMARCK ND 58503

Customer: 60001824
Phone: (701) 223-0441
Date: 11/07/2011

Date	Order #	Type	Order Amt
11/07/11	20549867	INV	879.00

Amount Paid: ________ CK #: ________

CashAmt

CREDIT CARD PAYMENT (circle one)

MasterCard DISCOVER NOVUS Cards VISA

Card #: ________
Exp Date: ________
Signature: ________
Credit card users: Fax to 701-223-6584

PLEASE DETACH AND RETURN TOP PORTION WITH YOUR PAYMENT

Date	Date	Times Run	Description	Lines	Class Code	Order Amt	Net Amt Due
10/31/11	11/07/11	2	607340/Rural Utilites Bismarck Tribune PO:Notice of Intent	293.00	Legals	879.00	879.00

Affidavit of Publication
State of North Dakota) SS County of Burleigh
Before me, a Notary Public for the State of North Dakota personally appeared CK who being duly sworn, deposes and says that he (she) is the Clerk of Bismarck Tribune Co., and that the publication(s) were made through the Bismarck Tribune on the following dates:
10/31, 11/7 Signed Calmer Kurtz
sworn and subscribed to before me this 9th day of November 20 11
[signature]
Notary Public in and for the State of North Dakota

GREGORY P. ZIEGLER
Notary Public
State of North Dakota
My Commission Expires July 22, 2015

Please return invoice or put order number on check. Thank You.

Remarks

Total Due: 879.00

Bismarck Tribune
www.bismarcktribune.com
PO BOX 4001
LaCrosse, WI 54602-4001

Terms: PAYMENT IS DUE UPON RECEIPT OF INVOICE

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Dated:10/27/11
-SIGNED-
MARK PLANK
Director, Engineering and Environmental Staff
Rural Utilities Service

10/31 & 11/7 - 607340

Affidavit of Publication

The Dickinson Press
Dickinson,North Dakota

STATE OF NORTH DAKOTA)
County of Stark) ss

Sonya Sacks being first duly sworn, on my oath, say that I am the bookkeeper of The Dickinson Press, a daily newspaper of general circulation, printed and published at Dickinson, in said county and state, and the advertisement headed:

Environmental Impact Statement

a printed copy of which is hereunto annexed, was printed and published in The Dickinson Press, and in the regular and entire issue of each and every number for 2 consecutive weeks, commencing on the 30 day of October A.D. 2011 and ending on the 6 day of November A.D. 2011, both inclusive.

Straight Matter Lines	299		,2011
First Time Line Rates	0.70	30-Oct	,2011
Subsequent Line Rates	0.70	6-Nov	,2011
Column Inches			,2011
First Time Inch Rate	$7.78		,2011
Subsequent Inch Rate	$7.78		,2011

Total Cost of Legal $ 418.60

Sonya Sacks

Subscribed and sworn to before me this 16th day of November A.D. 2011.

(Seal) Melanie Epperly

Notary Public, State Of North Dakota

My Commission Expires

MELANIE EPPERLY
NOTARY PUBLIC, STATE OF NORTH DAKOTA
MY COMMISSION EXPIRES NOV 5, 2016

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Basin Electric is a regional wholesale electric generation and transmission

DUNN COUNTY HERALD
AFFIDAVIT OF PUBLICATION

STATE OF NORTH DAKOTA)
)SS.
COUNTY OF DUNN

Carie Boster of said State and County being duly sworn on his oath says: That she is the editor of the The Dunn County Herald, a weekly newspaper of general circulation published in the City of Killdeer, in said County and State, that said newspaper is now the official newspaper for the County of Dunn, North Dakota, and during the time hereinafter mentioned and headed.

Basin Electric - BEPC Display

printed copy of which is hereunto annexed, was published in the regular and entire issue of said newspaper during the period and time of publication, and that notice was published in the newspaper proper, and not in a supplement, for 2 consecutive week(s) ______ to wit:

Straight Matter Lines	______		
First Time Line Rate	$.68	______	2011
Second Time Line Rate	$.68	______	2011
Subsequent Line Rate	$.68	______	2011
Column Inches	2x5.5		
First Time Inch Rate	$5.65	62.15 November 4	2011
Second Time Inch Rate	$5.65	62.15 November 11	2011
Subsequent Inch Rate	$5.65	______	2011

Notary Fee:______ Total Cost of Legal: $ 124.30

Carie Boster
______ Editor

Sworn and subscribed to before me 17 day of November AD, 2011

Norma J Peterson
Norma J. Peterson
Notary Public, State of North Dakota
My Commission Expires November 14, 2013

NORMA J PETERSON
Notary Public
State of North Dakota
My Commission Expires November 14, 2013

DUNN COUNTY HERALD
AFFIDAVIT OF PUBLICATION

STATE OF NORTH DAKOTA)
)SS

COUNTY OF DUNN

Carie Boster of said State and Coun
That she is the editor of the The D
general circulation published in the C
State, that said newspaper is now th
North Dakota, and during the time h
Basin Electric - BE

printed copy of which is hereunto an
and entire issue of said newspaper c
and that notice was published in the
for 2 consecutive week(

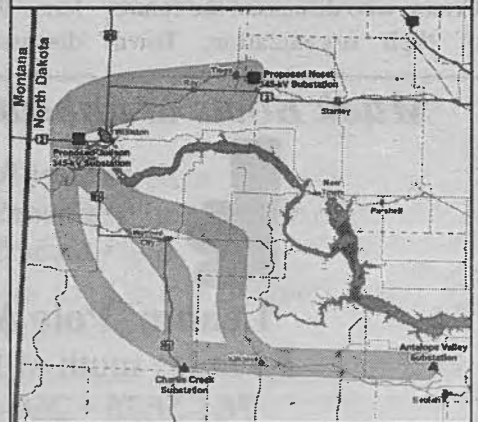
YOU ARE INVITED!

PUBLIC MEETINGS

The Rural Utilities Service and Basin Electric Power Cooperative are hosting two public meetings in your area. Basin Electric is proposing to construct an approximately 190-mile-long transmission line from the Antelope Valley Station near Beulah to a substation located near Tioga.

The public meetings are being held to obtain your input as well as to fulfill the primary principle of full disclosure and public participation in the National Environmental Policy Act scoping process. You are encouraged to attend either public meeting to learn more about the proposed project and provide your comments.

Proposed Corridor Alternatives



PLEASE JOIN US!

November 15, 2011 Ernie French Center NDSU Williston Research Extension Center Williston, North Dakota 4:00 p.m. – 7:00 p.m. Central Standard Time	November 16, 2011 American Legion Hall, Post 46 Killdeer, North Dakota 4:00 p.m. - 7:00 p.m. Mountain Standard Time

NEED MORE INFORMATION?

Mr. Dennis Rankin, Environmental Protection Specialist, USDA, Rural Utilities Service, 1400 Independence Avenue, SW., Stop 1571, Washington, DC 20250-1571, Telephone: (202) 720-1953, E-mail: *dennis.rankin@wdc.usda.gov*.

USDA Rural Development

BASIN ELECTRIC POWER COOPERATIVE
A Touchstone Energy® Cooperative

Straight Matter Lines ______
First Time Line Rate $.68 ______
Second Time Line Rate $.68 ______
Subsequent Line Rate $.68 ______

Column Inches 2x5.5
First Time Inch Rate $5.65 62.
Second Time Inch Rate $5.65 62.
Subsequent Inch Rate $5.65 ______ 2011

Notary Fee:______ Total Cost of Legal: $ 124.30

Carie Boster ______ Editor

Sworn and subscribed to before me 17 day of November AD, 2011

Norma J Peterson
Norma J. Peterson
Notary Public, State of North Dakota
My Commission Expires November 14, 2013

NORMA J PETERSON
Notary Public
State of North Dakota
My Commission Expires November 14, 2013

DUNN COUNTY HERALD
AFFIDAVIT OF PUBLICATION

STATE OF NORTH DAKOTA)
)SS.
COUNTY OF DUNN

Carie Boster of said State and County being duly sworn on his oath says:
That she is the editor of the The Dunn County Herald, a weekly newspaper of general circulation published in the City of Killdeer, in said County and State, that said newspaper is now the official newspaper for the County of Dunn, North Dakota, and during the time hereinafter mentioned and headed.
Basin Electric - RUS Legal Notice of Intent

printed copy of which is hereunto annexed, was published in the regular and entire issue of said newspaper during the period and time of publication, and that notice was published in the newspaper proper, and not in a supplement, for 2 consecutive week(s) to wit:

Straight Matter Lines	323 lines		
First Time Line Rate	$.68	$219.64	November 4 2011
Second Time Line Rate	$.68	$219.64	November 11 2011
Subsequent Line Rate	$.68		2011
Column Inches			
First Time Inch Rate	$5.65		2011
Second Time Inch Rate	$5.65		2011
Subsequent Inch Rate	$5.65		2011

Notary Fee: ____ Total Cost of Legal: $ 439.28

Carie Boster
Editor

Sworn and subscribed to before me 11 day of November AD, 2011

Norma J Peterson
Norma J. Peterson
Notary Public, State of North Dakota
My Commission Expires November 14, 2013

NORMA J PETERSON
Notary Public
State of North Dakota
My Commission Expires November 14, 2013

DEPARTMENT OF AGRICULTURE

Rural Utilities Service

Basin Electric Power Cooperative, Inc.: Notice of Intent to Prepare an Environmental Impact Statement and Hold Public Scoping Meetings

AGENCY: Rural Utilities Service, USDA

ACTION: Notice of Intent to Prepare an Environmental Impact Statement and Hold Public Scoping Meetings

SUMMARY: The Rural Utilities Service (RUS), an agency within the U.S. Department of Agriculture (USDA), intends to prepare an environmental impact statement (EIS) for Basin Electric Power Cooperative's (Basin Electric) proposed Antelope Valley Station (AVS) to Neset Transmission Project (Project) in North Dakota. RUS is issuing this Notice of Intent (NOI) to inform the public and interested parties about the proposed Project, conduct a public scoping process, and invite the public to comment on the scope, proposed action, and other issues to be addressed in the EIS.

The EIS will address the construction, operation, and maintenance of Basin Electric's proposed Project. The Project includes construction, operation and maintenance of approximately 190 miles of new 345-kV single pole transmission line and double circuit 345/115-kV transmission lines, 2 new substations, modifications to 4 existing substations, a 345-kV switchyard, maintenance access roads, temporary construction roads, river crossings, temporary construction staging sites, and other facilities to be described in the proposed EIS. Basin Electric's proposed Project would be located in portions of Billings, Dunn, McKenzie, Mercer, Mountrail, and Williams counties in western North Dakota.

Portions of Basin Electric's proposed Project may affect floodplains and wetlands. This NOI also serves as a notice of proposed floodplain or wetland action. RUS will hold public scoping meetings to share information and receive comments and suggestions on the scope of the EIS in areas near and affect by the proposed Project.

DATES: An open-house public scoping meetings will be held on November 15, 2011, from 4:00 to 7:00 p.m. central time at the Ernie French Center, North Dakota State University Williston Research Extension office, 14120 Highway 2, Williston, North Dakota 58801; and on November 16, 2011, from 4:00 to 7:00 p.m. mountain time at the at the American Legion Hall Post 46, 42 Central Avenue, Killdeer, North Dakota 58640. In order to be considered, all fax or e-mail comments or suggestions regarding the appropriate scope of the EIS must be received by the end of the scoping period. Comments regarding the Project may be submitted in writing at the public scoping meeting or mailed to the RUS address provided in this Notice. Mailed comments must be postmarked no later than midnight on December 2, 2011.

ADDRESSES: Written comments on the scope of the EIS should be addressed to Mr. Dennis Rankin, Environmental Protection Specialist, USDA, Rural Utilities Service, 1400 Independence Avenue, SW, Stop 1571, Washington, DC 20250-1571, telephone: (202) 720-1953 or e-mail: dennis.rankin@wdc.usda.gov.

FOR FURTHER INFORMATION CONTACT: For information on the proposed Project, the EIS process, and RUS financing, contact Mr. Dennis Rankin, Engineering and Environmental Staff, Rural Utilities Service, 1400 Independence Avenue SW, Mail Stop 1571, Washington, D.C. 20250-1571, telephone (202) 720-1953 or email dennis.rankin@wdc.usda.gov. Parties wishing to be placed on the Project mailing list for future information and to receive copies of the Draft and Final EIS when they are available should also contact Mr. Rankin.

SUPPLEMENTARY INFORMATION: RUS, is authorized to make loans and loan guarantees that finance the construction of electric distribution, transmission, and generation facilities, including system improvements and replacements required to furnish and improve electric service in rural areas, as well as demand side management, energy conservation programs, and on-grid and off-grid renewable energy systems. Based on an interconnection with the Western Area Power Administration's (Western) transmission system, Western has in accordance with 40 CFR 1501.6 Cooperating agencies, requested to serve as a cooperating agency for the environmental review of the proposed project.

Basin Electric is a regional wholesale electric generation and transmission cooperative owned and controlled by its member cooperatives. Basin Electric serves approximately 2.5 million customers covering 430,000 square miles in portions of nine states, including Colorado, Iowa, Minnesota, Montana, Nebraska, New Mexico, North Dakota, South Dakota, and Wyoming.

Project Description: Basin Electric has identified the need for additional electric transmission capacity in northwestern North Dakota as a result of increased demand and to meet reliability and system stability requirements for the region. Investigations and analyses conducted for the overall power delivery systems found that without improvements, the flow of power along existing lines may result in local line overloads, especially in the vicinity of Williston, North Dakota.

To resolve these issues, Basin Electric is proposing to construct, own and operate a new 345-kV transmission line and associated supporting infrastructure. The entire project will consist of constructing approximately 190 miles of new single circuit 345-kV and double circuit 345/115-kV transmission lines, the construction of 2 new substations, modifications to 4 existing substations, a 345-kV switchyard, maintenance access roads, temporary construction roads, river crossings, temporary construction staging sites, and other facilities. The Project would connect to the Integrated System at several locations, including Western's Williston Substation. The proposed Project would be located in portions of Billings, Dunn, McKenzie, Mercer, Mountrail, and Williams counties in western North Dakota.

Basin Electric has requested financial assistance for the proposed Project from the U.S. Department of Agriculture, Rural Utilities Service (RUS). Completing the EIS is one of RUS's requirements in processing Basin Electric's application, along with other technical and financial considerations.

In accordance with 40 CFR 1501.5(b) of the Council of Environmental Quality's Regulation for Implementing the Procedural Provisions of the National Environmental Policy Act, RUS will serve as the-lead agency in the preparation of the EIS. Other agencies and Native American Tribes with jurisdiction or special expertise will be invited to participate as cooperating agencies per §1501.6.

The proposed Project is subject to the jurisdiction of the North Dakota Public Service Commission (NDPSC), which has regulatory authority for siting electrical transmission facilities within the State. Basin Electric will submit an application for NDPSC Transmission Corridor and Route Permits. The NDPSC Permits would authorize Basin Electric to construct the proposed Project under North Dakota rules and regulations.

RUS intends to prepare an EIS to analyze the impacts of its respective federal actions and the proposed Project in accordance with NEPA, as amended, CEQ's Regulation for Implementing the Procedural Provisions of the National Environmental Policy Act (40 CFR 1500-1508), DOE NEPA Implementing Procedures (10 CFR 1021), the, and RS Environmental Policies and Procedures (7 CFR 1794).

Because the proposed Project may involve action in floodplains or wetlands, this NOI also serves as a notice of proposed floodplain or wetland action. The EIS will include a floodplain/wetland assessment and, if required, a floodplain/wetland statement of findings will be issued with the Final EIS.

Agency Responsibilities: RUS is serving as the lead Federal agency, as defined at 40 CFR 1501.5, for preparation of the EIS. With this notice, Native American Tribes and agencies with jurisdiction or special expertise are invited to be cooperating agencies. Such tribes or agencies may make a request to RUS to be a cooperating agency by contacting Mr. Rankin. Designated cooperating agencies have certain responsibilities to support the NEPA process, as specified at 40 CFR 1501.6 (b).

Environmental Issues: This notice is to inform agencies and the public of RUS' federal action, and the proposed Project, and to solicit comments and suggestions for consideration in preparing the EIS. To help the public frame its comments, this notice contains a list of potential environmental issues that RUS has tentatively identified for analysis. These issues include:

1. Impacts on protected, threatened, endangered, or sensitive species of animals or plants;
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7. Visual impacts; and
8. Socioeconomic impacts and whether there would be any disproportionately high and adverse impacts to minority and low-income populations.

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Public Participation: Public participation and full disclosure are planned for the entire EIS process. The EIS process will include open-house public scoping meetings and a scoping comment period to solicit comments from interested parties; consultation and involvement with appropriate Federal, State, local, and tribal governmental agencies; public review and a hearing on the draft EIS; publication of a final EIS; and publication of a Record of Decision. Expected EIS completion date is December 2013. Additional informal public meetings may be held in the proposed Project areas, if public interest and issues indicate a need; if additional public meeting are determined to be necessary public notices will be published as appropriate.

RUS will hold open-house public scoping meetings in Williston, North Dakota, and Killdeer, North Dakota as noted above. The time and locations of these meetings will be well advertised in local media outlets a minimum of 15 days prior to the time of the meetings. Attendees are welcome to come and go at their convenience and to speak one-on-one with Project representatives and agency staff. The public will have the opportunity to provide written comments at the meeting. In addition, attendees may provide written comments by letter, fax, e-mail.

The public scoping period begins with publication of this notice in the Federal Register and closes December 2, 2011. To be considered in defining the scope of the EIS, comments should be received by the end of the scoping period.

Dated: 10/27/11

-SIGNED-

MARK PLANK
Director, Engineering and
Environmental Staff
Rural Utilities Service
(11/4, 11/11)

PUBLIC NOTICE

DEPARTMENT OF AGRICULTURE

Rural Utilities Service

Basin Electric Power Cooperative, Inc.: Notice of Intent to Prepare an Environmental Impact Statement and Hold Public Scoping Meetings

AGENCY: Rural Utilities Service, USDA

ACTION: Notice of Intent to Prepare an Environmental Impact Statement and Hold Public Scoping Meetings

SUMMARY: The Rural Utilities Service (RUS), an agency within the U.S. Department of Agriculture (USDA), intends to prepare an environmental impact statement (EIS) for Basin Electric Power Cooperative's (Basin Electric) proposed Antelope Valley Station (AVS) to Neset Transmission Project (Project) in North Dakota. RUS is issuing this Notice of Intent (NOI) to inform the public and interested parties about the proposed Project, conduct a public scoping process, and invite the public to comment on the scope, proposed action, and other issues to be addressed in the EIS.

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SUPPLEMENTARY INFORMATION: RUS, is authorized to make loans and loan guarantees that finance the construction of electric distribution, transmission, and generation facilities, including system improvements and replacements required to furnish and improve electric service in rural areas, as well as demand side management, energy conservation programs, and on-grid and off-grid renewable energy systems. Based on an interconnection with the Western Area Power Administration's (Western) transmission system, Western has in accordance with 40 CFR 1501.6 Cooperating agencies, requested to serve as a cooperating agency for the environmental review of the proposed project.

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Project Description: Basin Electric has identified the need for additional electric transmission capacity in northwestern North Dakota as a result of increased demand and to meet reliability and system stability requirements for the region. Investigations and analyses conducted for the overall power delivery systems found that without improvements, the flow of power along existing lines may result in local line overloads, especially in the vicinity of Williston, North Dakota.

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Basin Electric has requested financial assistance for the proposed Project from the U.S. Department of Agriculture, Rural Utilities Service (RUS). Completing the EIS is one of RUS's requirements in processing Basin Electric's application, along with other technical and financial considerations.

In accordance with 40 CFR 1501.5(b) of the Council of Environmental Quality's

Regulation for Implementing the Procedural Provisions of the National Environmental Policy Act, RUS will serve as the lead agency in the preparation of the EIS. Other agencies and Native American Tribes with jurisdiction or special expertise will be invited to participate as cooperating agencies per §1501.6.

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The public scoping period begins with publication of this notice in the Federal Register and closes December 2, 2011. To be considered in defining the scope of the EIS, comments should be received by the end of the scoping period.

Dated: 10/27/11

MARK PLANK

Director, Engineering and Environmental Staff

Rural Utilities Service

Affidavit of Publication

State of North Dakota, County of Williams,ss:

I, Stacey Sundhagen, being first duly sworn, on my oath, say that I am the advertising sales manager of The Tioga Tribune, a weekly newspaper of general circulation and official newspaper of Tioga, State of North Dakota, published in the city of Tioga, ND, and that the advertisement headed

NOTICE OF INTENT TO PREPARE AN ENVIRONMENTAL IMPACT STATEMENT AND HOLD PUBLIC SCOPING MEETINGS (RURAL UTILITIES SERVICE, USDA, AND BASIN ELECTRIC POWER COOPERATIVE, INC.)

a printed copy of which is here attached, was published in The Tioga Tribune on the following dates:

November 2, 2011.....52 inches @ $5.65 per inch $293.80
November 2, 2011.....12 inches @ $6.00 per inch $72.00
November 9, 2011.....52 inches @ $5.65 per inch $293.80
November 9, 2011.....12 inches @ $6.00 per inch $72.00

TOTAL CHARGE............ $731.60

Signed Stacey Sundhagen
Stacey Sundhagen

Subscribed and sworn to before me 11-28-11

Traci Papineau
Traci Papineau
Notary Public, State of North Dakota
My Commission Expires October 17, 2017

TRACI PAPINEAU
Notary Public
State of North Dakota
My Commission Expires Oct. 17, 2017

AFFIDAVIT OF PUBLICATION

STATE OF NORTH DAKOTA)
:ss.
COUNTY OF WILLIAMS)

Veronica Arrowsmith being first duly sworn, deposes and says: That (he) (she) is the Agent to the Publisher of the WILLISTON HERALD a newspaper printed and published six days a week in the County of Williams, State of North Dakota, and of general circulation in the city of Williston, County of Williams, State of North Dakota and elsewhere, and the hereto attached

Notice of Intent to Prepare an Environmental Impact Statement and Hold Public Scoping meetings

was printed and published correctly in the regular and entire issue of said WILLISTON HERALD for 2 issues, that the first was made on the 31st day of October 20 11 and the last publication thereof was made on the 6th day of November 20 11 that said publication was made on each of the following dates, to wit:

10/31/11
11/6/11

Request of

Basin Electric

Williston Herald

By

Veronica Arrowsmith

Subscribed sworn to before me this day of

20

CARLA HURAVITCH
Notary Public
State of North Dakota
My Commission Expires August 30, 2017

Carla Huravitch

Notary Public in and for the County of Williams, State of North Dakota

Legal Rate $.82 per line or $7.78 per Column inch.

My Commission Expires:

#4 PIA

DEPARTMENT OF AGRICULTURE

Rural Utilities Service

Basin Electric Power Cooperative, Inc.: Notice of Intent to Prepare an Environmental Impact Statement and Hold Public Scoping Meetings

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4. Impacts on cultural resources or historic properties and tribal values;
5. Impacts on human health and safety;
6. Impacts on air, soil, and water resources (including air quality and surface water impacts);
7. Visual impacts; and
8. Socioeconomic impacts and whether there would be any disproportionately high and adverse impacts to minority and low-income populations.

This list is not intended to be all-inclusive or to imply any predetermination of impacts. Environmental issues associated with the action of RUS, and Basin Electric's proposed Project will be addressed separately in the EIS. RUS invites interested parties to suggest specific issues within these general categories, or other issues not included above, to be considered in the EIS.

Public Participation: Public participation and full disclosure are planned for the entire EIS process. The EIS process will include open-house public scoping meetings and a scoping comment period to solicit comments from interested parties; consultation and involvement with appropriate Federal, State, local, and tribal governmental agencies; public review and a hearing on the draft EIS; publication of a final EIS; and publication of a Record of Decision. Expected EIS completion date is December 2013. Additional informal public meetings may be held in the proposed Project areas, if public interest and issues indicate a need; if additional public meeting are determined to be necessary public notices will be published as appropriate.

RUS will hold open-house public scoping meetings in Williston, North Dakota, and Killdeer, North Dakota as noted above. The time and locations of these meetings will be well advertised in local media outlets a minimum of 15 days prior to the time of the meetings. Attendees are welcome to come and go at their convenience and to speak one-on-one with Project representatives and agency staff. The public will have the opportunity to provide written comments at the meeting. In addition, attendees may provide written comments by letter, fax, e-mail.

The public scoping period begins with publication of this notice in the Federal Register and closes December 2, 2011. To [illegible]nsidered in defining the [illegible], comments should be re[illegible] b[illegible] of the scoping period.

Dated: 10/27/11

/S/ MARK PLANK

Mark Plank

Director, Engineering and Environmental Staff

Rural Utilities Service

(October 31, November 6, 2011)

APPENDIX C:
PUBLIC MAILER AND RADIO BULLETIN TEXT

About the project

Basin Electric Power Cooperative has proposed construction of a 345-kilovolt transmission line in northwestern North Dakota that will run approximately 200 miles from Antelope Valley Station (AVS) near Beulah, North Dakota, connect to substations near Grassy Butte and Williston, and end at the Neset 345-kV Substation near Tioga, North Dakota.

Why is the line needed?
Increasing demand for electricity is driving the need for additional transmission capacity. Transmission studies have indicated that the current system is reaching its limit, and additional lines are needed. This new 345-kV line will also improve the reliability of the existing system, making a stronger infrastructure throughout the region.

What does the project include?
The AVS to Neset 345-kV Project includes three major components: approximately 200 miles of 345-kV transmission line, new substations near Williston and Tioga as well as additions to Basin Electric's Charlie Creek and AVS Substations.

Building the transmission line

Four major elements are required for transmission lines to be constructed. They include regulatory approvals, surveying, line design, and right of way.

Regulatory Approvals Required
Western Area Power Administration and the Rural Utility Service, both federal agencies, will evaluate the 345-kV project thru an Environmental Impact Statement (EIS). Approval from the North Dakota Public Service Commission is required to site the project. Both the federal and state processes require public notification and public meetings to gather input into their decision making processes. Formal notices of the public meetings will be given through newspapers and radio ads in the future.

Surveying
Landowners will be contacted to request their permission for property boundary, biological, terrain mapping, and archeological surveys. Each of these surveys is required for the project. The survey permit form is NOT an easement and does not obligate the landowner to grant an easement.

Biologists will complete the biological survey, thoroughly reviewing the route. Survey work will be done by registered land surveyors to determine the location of section and property corners so easement descriptions can be prepared. Mapping includes high resolution photography and laser mapping of the terrain. Archeologists will inspect for archeological sites by walking the preferred route's right of way, once it is determined.

Line Design
Engineering has started work on the project's design, which includes determination of electrical and physical details. Design work will meet or exceed all applicable codes and standards and will continue until the fall of 2013. The exact locations for structures will be determined at that time. Landowner's requests for structure placement will be accommodated if possible.

Right of way
The right of way width is 150 feet which is approximately 18.18 acres per mile. The line will consist of mainly single pole steel structures. Terrain will determine how many structures there will be in a mile, but will likely be 5 to 7 per mile. H-frame structures will be used in areas of high relief.

After land values are determined, landowners will be contacted to start the easement acquisition process. Basin Electric staff will give landowners ample time to review and comment on the easement location. Payment for the easement will be made ASAP or at a later time if requested by the landowner.

Construction
Construction on the AVS to Neset 345-kV line is scheduled to begin in 2014. If any damages to public and private roads are incurred during construction, they will be repaired. Landowners will be compensated for all crop damage caused by construction activities.

Contact Information

If you have any questions, concerns or would like a map showing the line route in your area, please contact:

Valeree King
Basin Electric Watford City office
701-557-5146

Mike Murray
Basin Electric Headquarters
701-557-5454

Duey Marthaller
Basin Electric Headquarters
701-557-5658

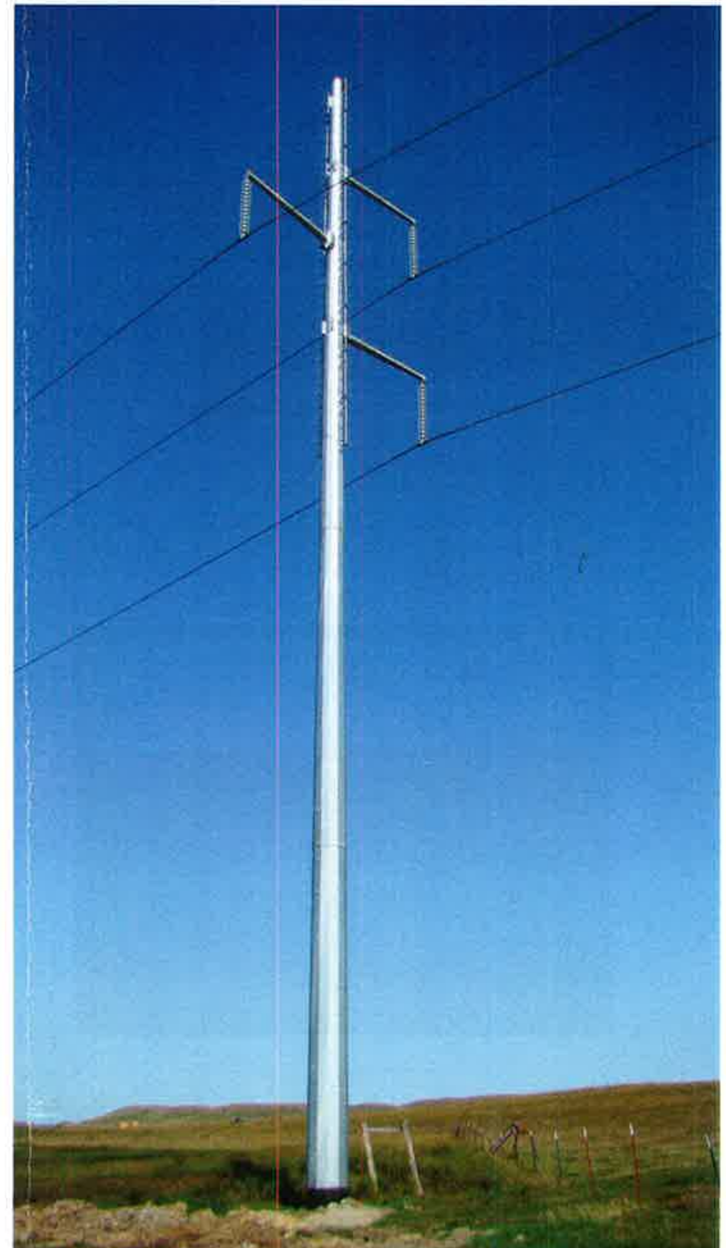
BASIN ELECTRIC POWER COOPERATIVE
A Touchstone Energy® Cooperative

1717 East Interstate Avenue
Bismarck, ND 58503-0564

Project information for landowners along the proposed AVS to Neset 345-kV Transmission Line.

Antelope Valley Station to Neset 345-kV Transmission Project

Strengthening Power Delivery in Western North Dakota



APPENDIX D:
AGENCY SCOPING LETTERS AND MAILING LIST

USDA Rural Development

United States Department of Agriculture
Rural Development

October 31, 2011

Recipient Name
Recipient Address
Recipient Address

Proposed Basin Electric Power Cooperative
Antelope Valley Station to Neset 345-kV Transmission Project

Dear Recipient,

The Rural Utilities Service (RUS), an agency which administers the programs of the US Department of Agriculture's Rural Development Utilities Programs, is the lead agency preparing an Environmental Impact Statement (EIS) in connection with a proposal by Basin Electric Power Cooperative (Basin Electric). Basin Electric proposes to construct approximately 190 miles of 345-kV transmission line, two new substations and a potential switchyard in northwestern North Dakota. The project would extend from near Beulah to Williston and then proceed on to Tioga.

In accordance with RUS environmental regulations, 7 CRF 1794, Environmental Policies and Procedures, RUS will be the lead agency for preparing the EIS. As part of the scoping process and prior to any public scoping meetings, RUS is distributing and making available specific planning documents prepared for review and comment by Federal, State, and local agencies and the public. Enclosed is a compact disk that contains the Macro-Corridor and Alternatives Report for the AVS to Neset 345-kV Transmission Project in Adobe Acrobat portable document file (pdf) format. Copies of the document are also available on RUS' website at: http://www.rurdev.usda.gov/UWP-eis4.htm

As part of the scoping process, you are invited to an interagency scoping meeting at 1:30 pm on November 14, 2011, at Basin Electric Power Cooperative, 1717 E. Interstate Ave. Bismarck, North Dakota. RUS and Basin Electric representatives will be at this meeting to discuss the project, answer questions, and accept your comments regarding the proposal. If you are interested in attending the interagency meeting, please contact Mr. Dennis Rankin at dennis.rankin@wdc.usda.gov.

In addition, open-house public scoping meetings will be held from 4-7 p.m. CST November 15, 2011, at the Ernie French Center, NDSU Williston Research Extension, 14120 Highway 2, Williston, North Dakota and from 4-7 p.m. MST November 16, 2011 at the American Legion Hall Post 46, 42 Central Avenue North, Killdeer, North Dakota.

USDA Rural Development

United States Department of Agriculture
Rural Development

If you have any questions or need additional information, please contact RUS representative Dennis Rankin at the email address listed above or telephone number 202-720-1953 or Basin Electric representative Cris Miller (cmiller@bepc.om) at 701-557-5635.

Sincerely,

Mark S. Plank

Mark S. Plank
Director, Engineering and Environmental Staff
Rural Utilities Service

October 31, 2011

USDA Rural Development

United States Department of Agriculture
Rural Development

Recipient Name
Recipient Address
Recipient Address

Re: Proposed Basin Electric Power Cooperative
Antelope Valley Station to Neset 345-kV Transmission Project

Dear Senator Hoeven,

The Rural Utilities Service (RUS), an agency within the U.S. Department of Agriculture (USDA), intends to prepare an environmental impact statement (EIS) for Basin Electric Power Cooperative's (Basin Electric) proposed Antelope Valley Station (AVS) to Neset 345-kV Transmission Project (Project) in North Dakota. Basin Electric's project will ensure electrical transmission system reliability in Northwestern North Dakota. RUS has issued a Notice of Intent (NOI) in the Federal Register and notices have been published in regional and local newspapers to inform the public and interested parties about the proposed Project, conduct a public scoping process, and invite the public to comment on the scope, proposed action, and other issues to be addressed in the EIS.

The EIS will address the construction, operation, and maintenance of approximately 190 miles of new 345-kV single pole transmission line and double circuit 345/115-kV transmission lines, 2 new substations, modifications to 4 existing substations, a 345-kV switchyard, maintenance access roads, temporary construction roads, river crossings, temporary construction staging sites, and other facilities to be described in the proposed EIS. Basin Electric's proposed Project would be located in portions of Billings, Dunn, McKenzie, Mercer, Mountrail, and Williams counties in western North Dakota.

Two open-house scoping meetings are scheduled. An open-house public scoping meeting will be held on November 15, 2011, from 4:00 to 7:00 p.m. central time at the Ernie French Center, North Dakota State University Williston Research Extension office, 14120 Highway 2, Williston, North Dakota 58801; and on November 16, 2011, from 4:00 to 7:00 p.m. mountain time at the American Legion Hall Post 46, 42 Central Avenue, Killdeer, North Dakota 58640. RUS and Basin Electric representatives will be at this meeting to discuss the project, answer questions, and accept your comments regarding the proposal

RUS has prepared a Macro-Corridor Report and Alternatives Report that is available for review at local libraries or at RUS' website at: http://www.rurdev.usda.gov/UWP-eis4.htm. In order to be considered, all fax or e-mail comments or suggestions regarding the appropriate scope of the EIS must be received by the end of the scoping period. Comments regarding the Project may be submitted in writing at the public scoping meeting, mailed to the RUS address below and be postmarked no later than midnight on December 2, 2011 or sent by email to the address below.

Written or email comments on the scope of the EIS should be addressed to:

Mr. Dennis Rankin, Environmental Protection Specialist
USDA, Rural Utilities Service, 1400 Independence Avenue, SW, Stop 1571
Washington, DC 20250-1571
Telephone: (202) 720-1953 or e-mail: ***dennis.rankin@wdc.usda.gov***.

Sincerely,

Mark S. Plank

Mark S. Plank
Director, Engineering and Environmental Staff
Rural Utilities Service

Basin Electric AVS 345-kV Transmission Line Project
Agency Contact List

= Agency Coordination Letters

First Name	Last Name	Title	Agency	Address 1	Address 2	City	State	Zip Code
Mr. Jeffrey	Towner	Field Supervisor	U.S. Fish & Wildlife Service	North Dakota Field Office	3425 Miriam Avenue	Bismarck	ND	58501
Col. David	Press	District Commander	U.S. Army Corps of Engineers	Omaha District	106 South 15th Street	Omaha	NE	68102
Mr. Todd	Lindquist	Project Manager	U.S. Army Corps of Engineers	Lake Sakakawea Project	201 1st Street	Riverdale	ND	58565
Mr. Lonny	Bagley	Field Manager	U.S. Department of the Interior-Bureau of Land Management	North Dakota Field Office	99 23rd Avenue West, Suite A	Dickinson	ND	58601
Mr. Steve	Hardegen	Regional Environmental Officer	Federal Emergency Management Agency	Denver Federal Center, Building 710-B		Denver	CO	80225
Mr. Wendall	Meyer	Division Administrator	Federal Highway Administration		1471 Interstate Loop	Bismarck	ND	58503
Mr. Michael	Black	Regional Director	U.S. Office of the Interior-Bureau of Indian Affairs	Great Plains Regional Office	115 4th Avenue Southeast	Aberdeen	SD	57401
Mr. Larry	Svoboda	Regional NEPA Coordinator	U.S. Environmental Protection Agency		1595 Wynkoop Street	Denver	CO	80202
Mr. Mark	Palmer	Director, External Affairs	U.S. Department of Agriculture	Farm Service Agency-Public Affairs Staff	1400 Independence Ave., SW STOP 0506	Washington	DC	20250
Mr. Jeff	Wright	Director	Federal Energy Regulatory Commission	Office of Energy Projects	888 First Street, NE	Washington	DC	20426
Mr. John	Fowler	Executive Director	Advisory Council on Historic Preservation	Old Post Office Building, Suite 803	1100 Pennsylvania Avenue, NW	Washington	DC	20004
Ms. Melissa	Hammond	Director, Public Affairs	U.S. Department of Agriculture	Natural Resources Conservation Service	1400 Independence Avenue, SW, Room 6121-S	Washington	DC	20250
Mr. Mark	Plank	Director	U.S. Department of Agriculture-Rural Utilities Service	Engineering and Environmental Staff	Room 2242-S, Mail Stop 1571, 1400 Independence Ave, SW	Washington	DC	20250
Mr. Jim	Keefer	District Office Manager	U.S. Department of Transportation	Federal Aviation Administration-Great Lakes Region	Chicago Airports District Office, 2300 East Devon Avenue	Des Plaines	IL	60018
Mr. Irwin	Russell	Acting State Conservationist	North Dakota NRCS State Office	Federal Building	220 East Rosser Avenue, Room 270	Bismarck	ND	58501
Mr. Aaron	Krauter	State Executive Director	U.S. Department of Agriculture	North Dakota Farm Service Agency	1025 28th Street S	Fargo	ND	58103
Mr. Doug	Goehring	Agriculture Commissioner	North Dakota Department of Agriculture		600 E. Boulevard Avenue, Dept. 602	Bismarck	ND	58505
Mr. Larry	Kotchman	State Forester	North Dakota Forest Service	Molberg Forestry Center	307 First Street East	Bottineau	ND	58318
Mr. Bruce	Hicks	Assistant Director, Oil & Gas Division	North Dakota Industrial Commission	Department of Mineral Resources	600 E. Boulevard Avenue, Dept. 405	Bismarck	ND	58505
Mr. Kent	Luttschwager		North Dakota Game and Fish Department	Williston Office	13932 West Front Street	Williston	ND	58801
Mr. Terry	Steinwand	Director	North Dakota Game and Fish Department		100 N. Bismarck Expressway	Bismarck	ND	58501
Mr. Merlan	Paaverud, Jr.		North Dakota State Historical Society	North Dakota Heritage Center	612 E. Boulevard Ave.	Bismarck	ND	58505
Mr. Scott	Davis	Executive Director	North Dakota Indian Affairs Commission	1st Floor Judicial Wing-Room 117	600 East Boulevard Avenue	Bismarck	ND	58505
Mr. Mike	Haupt		North Dakota State Land Department		1707 North 9th Street	Bismarck	ND	58506
Mr. Paul	Govig	Director	North Dakota Department of Commerce	Division of Community Services-Century Center	1600 E. Century Avenue, Suite 2	Bismarck	ND	58503
Mr. Francis	Ziegler	Director	North Dakota Department of Transportation		608 East Boulevard Avenue	Bismarck	ND	58505
Mr. Tony	Clark	Chairman	North Dakota Public Service Commission		600 East Boulevard Avenue, Dept. 408	Bismarck	ND	58505
Ms. Sandi	Tabor		North Dakota Transmission Authority	State Capitol, 14th Floor	600 East Boulevard Avenue, Dept. 405	Bismarck	ND	58505
Mr. Dave	Glatt	Chief	North Dakota Department of Health	Environmental Health Section	918 East Divide Avenue	Bismarck	ND	58501
Mr. Mark	Zimmerman	Director	North Dakota Parks and Recreation Department		1600 E. Century Avenue, Suite 3	Bismarck	ND	58503
Mr. Thomas	Hanson		ND Assoc of Soil Conservation District		3310 University Drive	Bismarck	ND	58504
Mr. Ed	Murphy		North Dakota Geological Survey		600 East Boulevard Avenue	Bismarck	ND	58505
Mr. Dale	Frink	State Engineer	North Dakota Water Commission		900 East Boulevard	Bismarck	ND	58505
		Chief of Resource Management	Theodore Roosevelt National Park		315 2nd Avenue/P.O. Box 7	Medora	ND	58647
Ms. Valerie	Naylor		Theodore Roosevelt National Park		315 2nd Avenue/P.O. Box 8	Medora	ND	58647
Mr. Steve	Williams		United States Forest Service		240 W. Century Ave	Bismarck	ND	58501
		District Chief	United States Geological Survey		821 E. Interstate Ave	Bismarck	ND	58501
		District Ranger	USFS Little Missouri National Grassland (McKenzie)		1901 S. Main Street	Watford City	ND	58854
Ms. Sherrie	Schwenke	Planning and Public Affairs Staff Officer	USFS Dakota Prairie Grasslands		240 W. Century Ave	Bismarck	ND	58503
Mr. Alvin	Nelson	Chairman	Little Missouri Scenic River Commission	McKenzie County	HC2, Box 11	Grassy Butte	ND	58634
Mr. Merle	Clark	Member	Little Missouri Scenic River Commission	Slope County	P.O. Box 49	Marmarth	ND	58643
Mr. John	Combs	Member	Little Missouri Scenic River Commission	Dunn County	P.O. Box 455	Killdeer	ND	58640
Mr. John	Hild	Member	Little Missouri Scenic River Commission	Billings County	P.O. Box 386	Medora	ND	58645
Ms. Pam	Hestekin	Member	Little Missouri Scenic River Commission	Bowman County	9410 169th Avenue SW	Rhame	ND	58651
Mr. Ray	Clouse	Member	Little Missouri Scenic River Commission	Golden Valley County	5511 3 V Road	Sentinel Butte	ND	58654
Mr. Mike	Sauer	Member	Little Missouri Scenic River Commission	North Dakota Department of Health	P.O. Box 5520	Bismarck	ND	58505
Ms. Linda	Weispfenning	Member	Little Missouri Scenic River Commission	State Water Commission	900 East Boulevard Ave.	Bismarck	ND	58504
Ms. Denise	Nelson	Environmental Protection Specialist	Lewis & Clark National Historic Trail		601 Riverfront Drive	Omaha	NE	68102
Senator John	Hoeven		North Dakota State Legislature	Federal Building	220 E. Rosser Avenue, Room 312	Bismarck	ND	58501
Senator Kent	Conrad		North Dakota State Legislature	Federal Building	220 E. Rosser Avenue, Room 228	Bismarck	ND	58501
Congressman Rick	Berg		North Dakota State Legislature	Federal Building	220 E. Rosser Avenue, Room 328	Bismarck	ND	58501
Mr. David	Leith	County Executive Director	Mountrail County Farm Service Agency		21 1st Street SE	Stanley	ND	58784
Mr. Corey	Paryzek	County Executive Director	Williams County Farm Service Agency		1106 West 2nd Street	Williston	ND	58801
Ms. Marcy	Feilmeier	County Executive Director	McKenzie County Farm Service Agency		109 5th Street SW	Watford City	ND	58854
Ms. Clare	Messmer	County Executive Director	Dunn County Farm Service Agency		105 Rodeo Drive	Killdeer	ND	58640
Ms. Alison	Hoffer	County Executive Director	Mercer County Farm Service Agency		1400 Hwy 49 N. STE 101	Beulah	ND	58523
Mr. Arlo	Borud	Commissioner	Mountrail County		PO Box 542	Stanley	ND	58784
Mr. David	Hynek	Commissioner	Mountrail County		9148 59th St. NW	Ross	ND	58776
Mr. Greg	Boschee	Commissioner	Mountrail County		7566 34th Street NW	Parshall	ND	58771
Ms. Joan	Hollekim	County Auditor	Mountrail County	Mountrail County Courthouse	PO Box 69	Stanley	ND	58784
Mr. Wayne	Aberle	Commissioner	Williams County		1003 Sioux St.	Williston	ND	58801
Mr. David	Montgomery	Commissioner	Williams County		222 14th Street E	Williston	ND	58801
Mr. Raymond	Schmidt	Commissioner	Williams County		10788 68th Street NW	Tioga	ND	58852
Mr. Martin	Hanson	Commissioner	Williams County		7783 141st Ave. NW	Zahl	ND	58856
Mr. Daniel	Kalil	Commissioner	Williams County		13295 51st NW	Williston	ND	58801
Ms. Beth	Innis	County Auditor	Williams County	Williams County Courthouse	PO Box 2047	Williston	ND	58801
Mr. Roger	Chinn	Commissioner	McKenzie County	McKenzie County Courthouse	201 5th Street NW	Watford City	ND	58854
Mr. Ronald	Anderson	Commissioner	McKenzie County	McKenzie County Courthouse	PO Box 543	Watford City	ND	58854

Mr. Dale	Patten	Commissioner	McKenzie County	McKenzie County Courthouse	PO Box 543	Watford City	ND	58854
Mr. Rick	Lawlar	Commissioner	McKenzie County	McKenzie County Courthouse	PO Box 543	Watford City	ND	58854
Mr. Richard	Cayko	Commissioner	McKenzie County	McKenzie County Courthouse	PO Box 543	Watford City	ND	58854
Ms. Jodi	Hanson	County Auditor	McKenzie County	McKenzie County Courthouse	PO Box 543	Watford City	ND	58854
Mr. Robert	Kleeman	Commissioner	Dunn County	Dunn County Courthouse	205 Owens Street	Manning	ND	58642
Mr. Tim	Steffan	Commissioner	Dunn County	Dunn County Courthouse	205 Owens Street	Manning	ND	58642
Mr. Daryl	Dukart	Commissioner	Dunn County	Dunn County Courthouse	205 Owens Street	Manning	ND	58642
Mr. Glenn	Eckelberg	Commissioner	Dunn County	Dunn County Courthouse	205 Owens Street	Manning	ND	58642
Ms. Donna	Scott	Commissioner	Dunn County	Dunn County Courthouse	205 Owens Street	Manning	ND	58642
Mr. Reinhard	Hauck	County Auditor	Dunn County	Dunn County Courthouse	205 Owens Street	Manning	ND	58642
Mr. Lyle	Latimer	Commissioner	Mercer County	Mercer County Courthouse	1021 Arthur Street	Stanton	ND	58571
Mr. Wayne	Entze	Commissioner	Mercer County	Mercer County Courthouse	1021 Arthur Street	Stanton	ND	58571
Mr. Frank	Bitterman	Commissioner	Mercer County	Mercer County Courthouse	1021 Arthur Street	Stanton	ND	58571
Mr. Monte	Erhardt	County Auditor	Mercer County	Mercer County Courthouse	PO Box 39	Stanton	ND	58571
Mr. E. Ward	Koeser	Commission President	Williston City Commission	City Hall	22 East Broadway	Williston	ND	58802
Mr. Nathan	Germundson	Commission President	Tioga City Commission	City Hall	12 1st Street NE	Tioga	ND	58852
Mr. Gerald	Ranum	Mayor	City of Ray	Ray City Hall	101 Main Street	Ray	ND	58849
Mr. Brian	Hayes	Mayor	Town of Epping	City Hall	P.O. Box 44	Epping	ND	58843
Mr. Brent	Sanford	Mayor	City of Watford City	City Hall	213 2nd Street NE	Watford City	ND	58854
Mr. Dan	Dolechek	Commission President	City of Kildeer	City Hall	165 Railroad Street SE	Killdeer	ND	58640
Mr. Darrell	Bjerke	Mayor	City of Beulah	City Hall	120 Central Ave. North	Beulah	ND	58523
The Honorable Lyle	Morken	Mayor	Town of Springbrook	City Hall	111 Springbrook St.	Springbrook	ND	58843
The Honorable Kay	Glick	Mayor	Town of Alexander	City Hall	112 Manning Avenue W	Alexander	ND	58831
		Mayor	Town of Rawson	City Hall	112 Manning Avenue W	Alexander	ND	58831
The Honorable Virginia	Elliot	Mayor	Town of Arnegard	City Hall	PO Box 488	Arnegard	ND	58835
The Honorable Scott	Lynch	Mayor	Town of Dunn Center	City Hall	PO Box 38	Dunn Center	ND	58626
The Honorable Carolyn	Klopp	Mayor	Town of Halliday	City Hall	PO Box 438	Halliday	ND	58636
The Honorable Leonard	Streifel	Mayor	Town of Dodge	City Hall	PO Box 96	Dodge	ND	58625
The Honorable Deen	Brecht	Mayor	Town of Golden Valley	City Hall	110 First Avenue SW	Golden Valley	ND	58541
The Honorable Terry	Barden	Mayor	Town of Zap	City Hall	PO Box 97	Zap	ND	58580
Mr. Mike	Lajeunesse	Chairman	Shoshone Business Council		P.O. Box 538	Fort Washakie	WY	82514
Mr. Wes	Martel		Shoshone Business Council		P.O. Box 538	Fort Washakie	WY	82514
Kim	Harjo	Chairperson	Arapaho Business Council		533 Ethete Road	Ethete	WY	82520
Ms. JoAnn	White	Tribal Historic Preservation Officer	Northern Arapaho Tribe			Fort Washakie	WY	82514
Mr. Leroy	Spang	President	Northern Cheyenne Tribal Council		P.O. Box 128	Lame Deer	MT	59043
Mr. Conrad	Fisher	Tribal Historic Preservation Officer	Northern Cheyenne Tribe		P.O. Box 128	Lame Deer	MT	59043
Mr. Steven	Brady	Traditional Spokesperson	Northern Cheyenne Tribe		P.O. Box 542	Lame Deer	MT	59043
Mr. John	Yellow Bird Steele	President	Oglala Sioux Tribal Council		P.O. Box 2070	Pine Ridge	SD	57770
Mr. Rodney	Bordeaux	President	Rosebud Sioux Tribal Council		P.O. Box 430	Rosebud	SD	57570
Mr. Russell	Eagle Bear	Tribal Historic Preservation Officer	Rosebud Sioux Tribe of Indians		P.O. Box 809	Rosebud	SD	57570
Mr. Kevin	Keckler, Sr.	Chairman	Cheyenne River Sioux Tribal Council		P.O. Box 590	Eagle Butte	SD	57625
Mr. Albert	Lebeau	Tribal Historic Preservation Officer	Cheyenne River Sioux Tribe		P.O. Box 590	Eagle Butte	SD	57625
Mr. Charles	Murphy	Chairman	Standing Rock Sioux Tribal Council		P.O. Box D	Fort Yates	ND	58538
Waste'Win	Young	Tribal Historic Preservation Officer	Standing Rock Sioux Tribe		P.O. Box D	Fort Yates	ND	58538
Mr. Cedric	Black Eagle	Chairman	Crow Tribal Council		P.O. Box 159	Crow Agency	MT	59022
Mr. Darrin	Old Coyote	Cultural Director	Crow Tribal Administration		P.O. Box 159	Crow Agency	MT	59022
Mr. Rusty	Stafne	Chairman	Fort Peck Tribes		P.O. Box 836	Poplar	MT	59255
Mr. Curley	Youpee	Tribal Historic Preservation Officer	Fort Peck Tribes		P.O. Box 836	Poplar	MT	59255
Mr. Tex	Hall	Chairman	Three Affiliated Tribes Business Council		404 Frontage Road	New Town	ND	58763
Mr. Elgin	Crows Breast	Tribal Historic Preservation Officer	Three Affiliated Tribes		405 Frontage Road	New Town	ND	58764
			Ducks Unlimited		2525 River Road	Bismarck	ND	58503
Mr. Gerald	Reichert	Field Representative	The Nature Conservancy	North Dakota Field Office	P.O. Box 1156	Bismarck	ND	58502
			Sierra Club	Dacotah Chapter	311 E. Thayer Avenue, Suite 113	Bismarck	ND	58501
	Andrist	State Senator	North Dakota	Williams County - District 2	P.O. Box E	Crosby	ND	58730
The Honorable David	Rust	State House Representative	North Dakota	Williams County - District 2	P.O. Box 1198	Tioga	ND	58852
The Honorable Bob	Skarphol	State House Representative	North Dakota	Williams County - District 2	P.O. Box 725	Tioga	ND	58852
The Honorable John	Warner	State Senator	North Dakota	Montrail County - District 4	33200 331st Ave. SW	Ryder	ND	58779
The Honorable Tom	Conklin	State House Representative	North Dakota	Montrail County - District 4	4260 22nd Street NW	Douglas	ND	58735
The Honorable Kenton	Onstad	State House Representative	North Dakota	Montrail County - District 4	3515 66th Avenue NW	Parshall	ND	58770
The Honorable Randel	Christmann	State Senator	North Dakota	Oliver-Mercer County - District 33	401 Third Ave. NE	Hazen	ND	58545
The Honorable Brenda	Heller	State House Representative	North Dakota	Oliver-Mercer County - District 33	1661 60th Avenue SW	Beulah	ND	58523
The Honorable Gary	Kreidt	State House Representative	North Dakota	Oliver-Mercer County - District 33	3892 County Road 86	New Salem	ND	58563
The Honorable Bill	Bowman	State Senator	North Dakota	McKenzie County - District 39	408 First Street SW	Bowman	ND	58623
The Honorable David	Drovdal	State House Representative	North Dakota	McKenzie County - District 39	2802 131st Avenue NW	Arnegard	ND	58835
The Honorable Keith	Kempenich	State House Representative	North Dakota	McKenzie County - District 39	9005 151st Avenue SW	Bowman	ND	58623
The Honorable George	Nodland	State Senator	North Dakota	Dunn County - District 36	3296 110V Avenue SW	Dickinson	ND	58601
The Honorable Shirley	Meyer	State House Representative	North Dakota	Dunn County - District 36	4031 Highway 22 South	Dickinson	ND	58601
The Honorable Mike	Schatz	State House Representative	North Dakota	Dunn County - District 36	400 Ninth Street East	New England	ND	58647

APPENDIX E:
AGENCY AND PUBLIC SCOPING MEETING SIGN-IN SHEETS

USDA Rural Development

AVS to Neset 345-kV Transmission Project
Agency Scoping Meeting
Basin Electric Headquarters
Sign-In Sheet
November 14, 2011 1:30 p.m. – 3:30 p.m.

Agency/Name/Address/email

1 Basin Electric — Cris Miller — 1717 E Interstate Ave, Bismarck, cmiller@bepc.com
2 Louis Berger — Bob Hughes — 1250 23rd St. NW Washington DC rhughes@louisberger...
3 Louis Berger Group — David Plakorus — 535 16TH St, Denver, CO dplakorus@louisberger.com
4 Corps of Engineers — Linda Phelps — 201 1st St. Riverdale, ND linda.m.phelps@usace.army.mil
5 NDSHPD — Susan Quinnell — 612 E Boulevard Ave Bis 58505 squinnell...
6 National Park Service — Valerie Naylor — Box 7 Medora ND 58645 valerie_naylor@nps.gov
7 NDSHPO /SHSND — Paul Picha — 612 E. Blvd. Bismarck, ND ppicha@nd.gov
8 Louis Berger — Lisa McDonald — 535 16th St. Suite 600, Denver, CO 80015 lmcdonald@louisberger.com
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USDA Rural Development

AVS to Neset 345-kV Transmission Project
Agency Scoping Meeting
Basin Electric Headquarters
Sign-In Sheet
November 14, 2011 1:30 p.m. – 3:30 p.m.

Agency/Name/Address/email

1. David Kluth / WAPA / 200 4TH ST. SW, HURON, SD 57350, kluth@wapa.gov
2. Mike SAUER ND Dept of Health Bismarck, ND MSAUER@ND.GOV
3. Pam Hestekin / Little Missouri Scenic River Comm. Rhame, ND
4. Michael Haupt ND Dept of Trust Lands Bismarck ND mhaupt@nd.gov
5. Misti Schriner Western (WAPA) Lakewood, CO mschriner@wapa.gov
6. Carol Aron USFWS Bismarck, ND carol_aron@fws.gov
7. TIM BOHAN RUS BISMARCK timothy.bohan@wdc.usda.gov
8. Clayton Derby WEST Bismarck ND cderby@west-inc.com
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AVS to Neset 345-kV Transmission Project
Agency Scoping Meeting
Basin Electric Headquarters
Sign-In Sheet
November 14, 2011 1:30 p.m. – 3:30 p.m.

Agency/Name/Address/email

1 USDA-NRCS / DONALD E. FELCH / 1458 E. ROSSER AVE / donald.felch@nd.usda.gov
2 BMcD John Dunham 9400 Ward Pkwy. KC, MO. 64114 jdunham@burnsmcd.com
3 BMcD Steve Thornhill 9400 Ward Parkway KCMO 64114 sthornh@burnsmcd.com
4 BMcD Greg Knauer 9400 Ward Parkway KCMO 64114 gknauer@burnsmcd.com
5 NDTA Sandi Tabor 1016 E. Owens Ave. Bismarck ND Sanditabor@lignite.com
6 US Forest Service Sherri Schwenke 240 W. Century Ave, Bismarck, ND sschwenke@fs.fed.us
7 US FOREST SERVICE, JOBY P. TIMM WATFORD, CITY jtimm@fs.fed.us
8
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USDA Rural Development

AVS to Neset 345-kV Transmission Project
Scoping Meeting Sign-In Sheet
Ernie French Center, Williston, ND
November 15, 2011 4 p.m. – 7 p.m.

Name/Address

1 Levi Jacobson 13732 w. front st. williston ND 58801
2 Richard Ryan 4819 Southview Drive Williston ND 58801
3 Carolyn Nemon 4831 Hwy 85 S Williston, ND 58801
4 Wes Stearns 14298 Painted Woods Williston N.D. 58801
5 Matt Vannatta 4983 142 Ave NW Williston N.D. 58801
6 Alison Clausen PO Box 204 Watford City, ND 58854
7 Carol Monson 14057 Southview St Williston ND 58801
8 John Hein 4963 142nd Ave NW Williston, ND 58801
9 Charles Zervas, 29551 130th Ave, Welch, Mn 55089
10 David [illegible] 4820 Southview Drive, Williston ND.
11 [illegible] Carlstad 1100 4th St W Williston ND
12 David + Betty Rod 14064 South View St. Williston, N. Dak. 58801
13 Carl Ranum 2415 13th Ave W Williston ND 58801
14
15

USDA Rural Development

AVS to Neset 345-kV Transmission Project
Scoping Meeting Sign-In Sheet
Ernie French Center, Williston, ND
November 15, 2011 4 p.m. – 7 p.m.

Name/Address

1. CHRIS BROSTUEN 2035 9th AVE E WILLISTON, ND 58801
2. Donald Prevost Upper Missouri G&T Sidney, MT 59270
3. Chris Hillesland Lower Yellowstone REA Sidney, MT 59270
4. Don Link McKenzie Elec Watford City
5. DALE HAUGEN MWEC PO Box 1346 Williston ND 58802-1346
6. Clayton Hansen McKenzie Elec Watford City
7. Patricia Hereford P.O. Box 1342 Williston ND
8. Kent Luttschwager ND Game & Fish Dept 13932 West Front St, Williston 58801
9. Wayne Aberle MWEC P.O. Box 1346 Williston ND
10. Dave Nelson 14962 22nd St NW Alexander ND
11. Leah Johnson Ellis 718 1st Ave EAST Williston ND 58801
12. John Monson 14057 Southview St Williston, ND 58801
13. Kyle Sorenson 615 Hazel Ave #C Laurel, MT 59044
14. Melody Lamb ~~(1602 42nd St West)~~ Mailing address 4820 South View Drive Williston ND
15.

USDA Rural Development

AVS to Neset 345-kV Transmission Project
Scoping Meeting Sign-In Sheet
American Legion Hall Post 46, Killdeer, ND
November 16, 20114 p.m. – 7 p.m.

	Name/Address	
1	Myron E. Henderson	2930 Garnet Pl. Bs. N.D.
2	Tim Volk	800 Hilda Dr. Hazen ND
3	Malachi Fourbear	227 Main Street New Town
4	Larry Melland	McKenzie Electric WC
5	[illegible]	McKenzie Electric WC
6	Darryl Berg Killdeer	McKenzie Electric KLD
7	Alvin Nelson	Grassy Butte McK Electric
8	Steve Finsaas (NDFB)	South Heart ND.
9	Cam Booth	Halliday ND
10	Larry Freer	Halliday ND
11	Bill Flagget	Halliday ND
12	Mel [illegible]	Killdeer
13	Laurie Richardson	Theodore Roosevelt Nat Park
14	Clara Goetz	Killdeer ND
15	Elmer W. Goetz	

AVS to Neset 345-kV Transmission Project
Scoping Meeting Sign-In Sheet
American Legion Hall Post 46, Killdeer, ND
November 16, 20114 p.m. – 7 p.m.

Name/Address

1 [illegible] [illegible] — [illegible] 109th Ave. S.W. Killdeer
2 Brad Quenette — 800 Hwy Drive Hazen ND 58545 Roughrider Electric
3 Minnie Felix-Wells — 227 Main St New Town ND 58763
4 Felicia Felix — TAT Easement Program 227 Main Street New Town ND
5 John Skurupey — McKenzie Electric
6 Steve Lautenschlager — McKenzie Electric
7 [illegible] Hoots — Box 462 Killdeer
8 Frank H. [illegible] — Mercer County Commission
9 Chris Gessele — Hazen Star [illegible] ND
10 Jim Swenson — Badlands Conservation Alliance Bismarck
11 Daryl Dukart — Dunn County Commission, 170 96th AVE SW Dunn Center
12 [illegible] — Watford City ND
13 Leonard [illegible] — Dickinson ND 58601
14 Mariah Lancaster — 9291 13th St SW Halliday, ND 58636
15

AVS to Neset 345-kV Transmission Project
Scoping Meeting Sign-In Sheet
American Legion Hall Post 46, Killdeer, ND
November 16, 20114 p.m. – 7 p.m.

Name/Address

1 Deb Lancaster 9291 134th St SW Halliday ND 58636
2 Rob Sand 93 112th Ave NW Killdeer 58640
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APPENDIX F:
PUBLIC SCOPING MEETING MATERIALS

United States Department of Agriculture

Rural Utilities Service (RUS)

Public Scoping Meeting for the AVS to Neset 345-kV Transmission Project

WELCOME

United States Department of Agriculture
Rural Utilities Service (RUS)

Public Scoping Meeting for the Proposed AVS to Neset 345-kV Transmission Project

- **Registration**
- **Comments Sheets**
- **Open House 4 – 7 p.m.**

COMMENTS

- ✓ Visit the RUS website for more information
  http://www.usda.gov/rus.water/ees/eis.htm

- ✓ Contact RUS
  Dennis Rankin, 202-720-1953
  email: Dennis.Rankin@wdc.usda.gov

- ✓ Submit your comments on the provided sheets tonight by mail or email to RUS within the next 30 days

USDA Rural Development

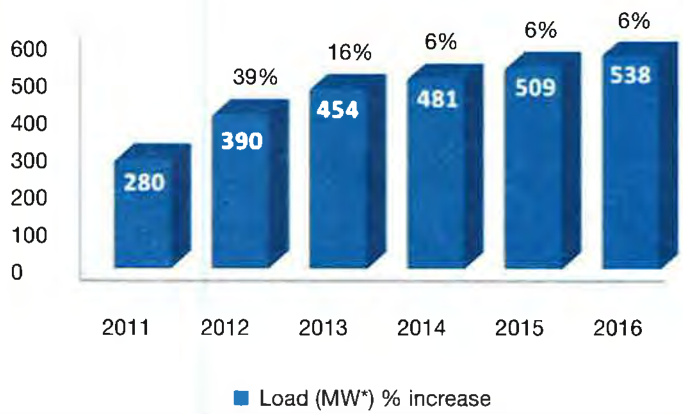
PROJECT OVERVIEW

AVS to NESET 345-kV Transmission Project

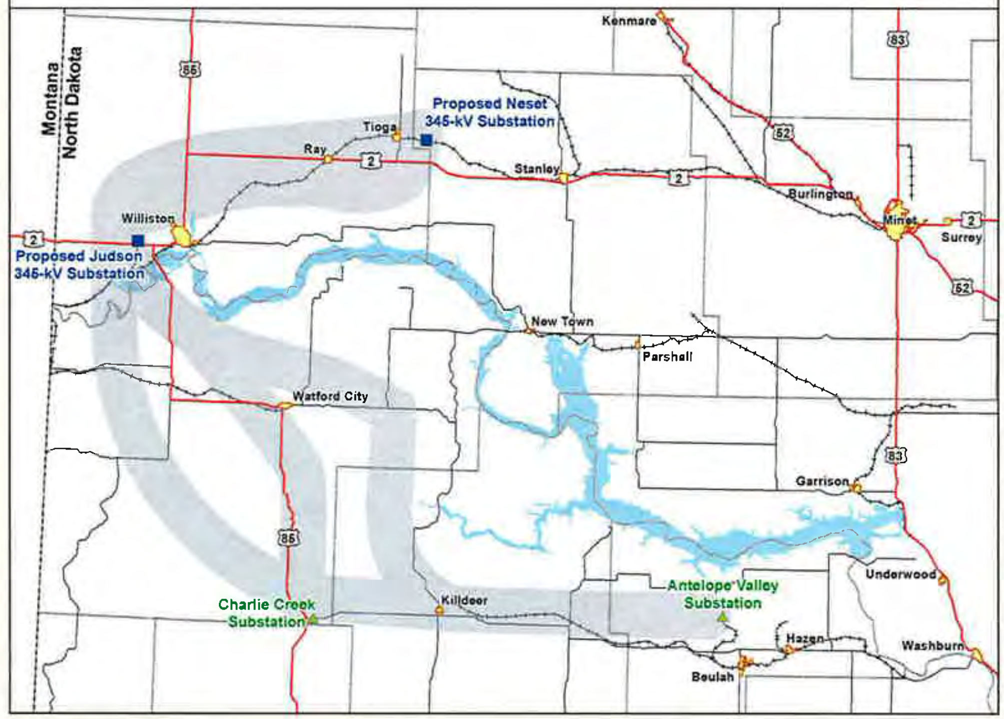
Basin Electric's Purpose and Need

- Northwestern North Dakota is experiencing rapid growth
- Increased development is a result of oil extraction activities from the Bakken oil shale
- Studies have identified the long-term need for increased transmission capacity and reliability
- Recommended solution is a new 345 kV transmission line

Load Forecast for Transmission Lines in the Williston/Tioga Region



Proposed Corridor Alternatives



Project Timeline

NEPA PROCESS

AVS to NESET 345-kV Transmission Project

What is NEPA?

- The National Environmental Policy Act (NEPA) is a law that requires all federal agencies to consider the effects of their proposed actions.
- It promotes better agency decision-making by ensuring that high-quality information is available to officials and the public before the agency decides whether and how to undertake a major federal action.
- For major federal actions that may significantly affect the quality of the human environment, an Environmental Impact Statement (EIS) is prepared.
- An EIS is a detailed analysis of the effects of a proposed action and the range of reasonable alternatives, including a no-action alternative.
- The EIS also examines ways to avoid or reduce adverse effects.
- Through the NEPA process, the public has an opportunity to learn about the proposed action and provide information and comments.

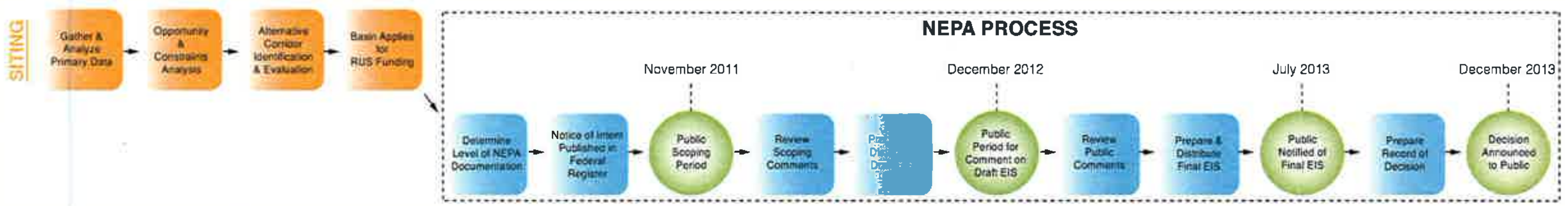
NEPA Process

A macro corridor study identifies potential areas for the alternate transmission line corridors. The NEPA process includes:

- Public scoping open house and a period to solicit comments from interested parties
- Consultation and involvement with appropriate federal, state, local and tribal governmental agencies
- Public review and hearings on the draft EIS
- Publication of a final EIS and record of decision

RUS's Role

The project would receive financing from the Rural Utilities Service and in order to meet their requirements for NEPA under 7 CFR part 1794, RUS will prepare an EIS.



Who is USDA-Rural Utilities Service?

The Rural Utilities Service (formerly REA, the Rural Electrification Administration), as part of the U.S. Department of Agriculture (USDA), is committed to helping improve the economy and quality of life in rural America. USDA provides funding opportunities in the form of payments, grants, loans, and loan guarantees, for the development and commercialization of vital utility services. Their financial programs support essential public facilities and services. These investments support our long-term national prosperity by ensuring that rural communities have the basic infrastructure to become self-sustaining with the ability to compete in the global economy.

Providing electricity is essential to the economic well-being and quality of life for all of the nation's rural residents. The Electric Programs provide leadership and capital to upgrade, expand, maintain, and replace America's vast rural electric infrastructure. Under the authority of the Rural Electrification Act of 1936, the Electric Programs make direct loans and loan guarantees to electric utilities to serve customers in rural areas. Through the Electric Programs, the Federal government is the majority noteholder for approximately 700 electric systems borrowers in 46 states.

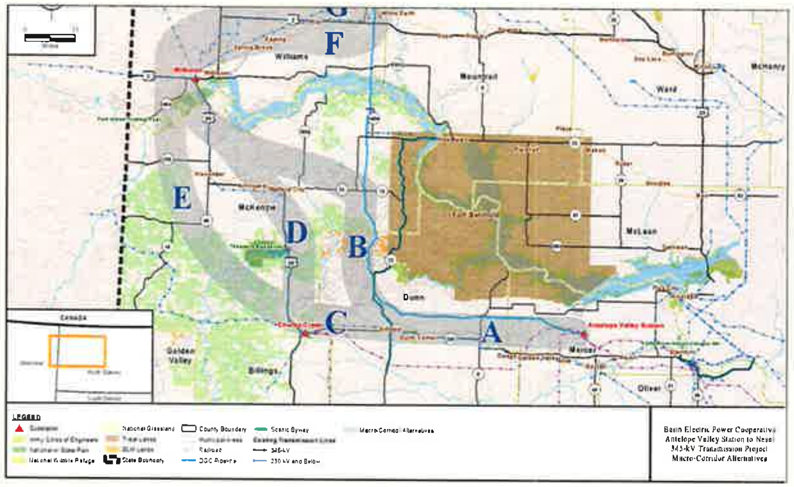
Who is Basin Electric Power Cooperative?

Basin Electric Power Cooperative is a regional wholesale electric generation and transmission cooperative owned and controlled by its member cooperatives. Basin Electric's service territory includes approximately 2.5 million customers and covers 430,000 square miles in portions of nine states: South Dakota, Colorado, Iowa, Minnesota, Montana, Nebraska, New Mexico, North Dakota and Wyoming.

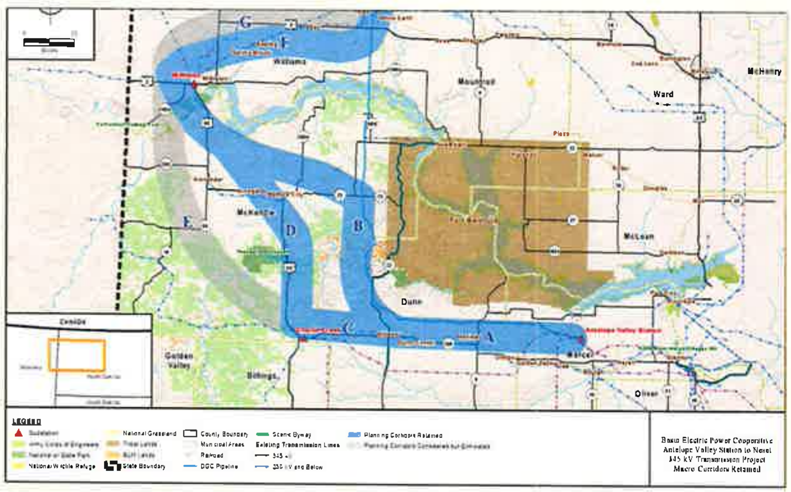
PROJECT ALTERNATIVES

AVS to NESET 345-kV Transmission Project

PRELIMINARY MACRO-CORRIDORS



MACRO-CORRIDORS TO BE EVALUATED



THE PROJECT

To meet future demand for electricity and increase transmission line reliability, Basin Electric is proposing the AVS to Neset 345-kV Transmission Project in Northwestern North Dakota. The Project would consist of electrical transmission lines, new substations and modifications to existing substations, and potentially a new switchyard.
The Project would extend from near Beulah to Williston to Tioga.

MACRO-CORRIDORS

The initial generalized macro-corridors are approximately 6 miles wide. These macro-corridors were developed using primary-level siting criteria that included major features to avoid and major opportunities:

- Communities
- Lake Sakakawea
- Theodore Roosevelt National Park
- Little Missouri River National Grasslands
- Steep Terrain along the Missouri River and Little Missouri River
- Pipeline Corridors
- Highway Routes

Through a screening process involving a review of the opportunities and constraints for each corridor, one of the macro-corridors was eliminated from further study.

NEXT STEP

- Develop specific transmission line route alternatives within macro-corridors
- Obtain input from the scoping process
- Conduct field work to review potential transmission lines
- Refine transmission line route alternatives
- Prepare environmental analysis of route alternatives

ENVIRONMENTAL RESOURCES

AVS to NESET 345-kV Transmission Project

RESOURCES TO BE ANALYZED

Water

- Wetlands
- Floodplains
- River/Streams

Biology

- Threatened, endangered and special-status species, migratory birds and wetlands
- General wildlife, vegetation and habitat surveys

Visual

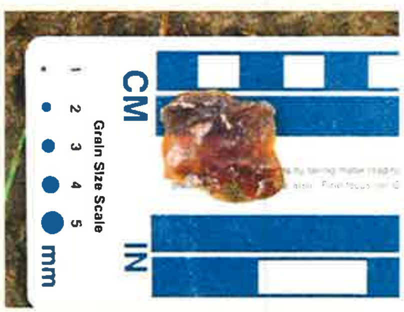
- Location of visual resources
- Visibility of the proposed project relative to the existing landscape

Geology & Soils

- Geological surface features and the locations of potential seismic risk, mass movements and historical earthquakes
- Locations of mineral, oil and natural gas deposits

Land Use & Recreation

- Project compatibility with local land use plans, county codes and ordinances, state parks, recreation areas and wilderness areas
- Rural life, farming activities/ practices
- USFWS Easements
- National Grasslands



Cultural Resources

- Compliance with the National Historic Preservation Act
- Review of historic, archaeological and sensitive sites

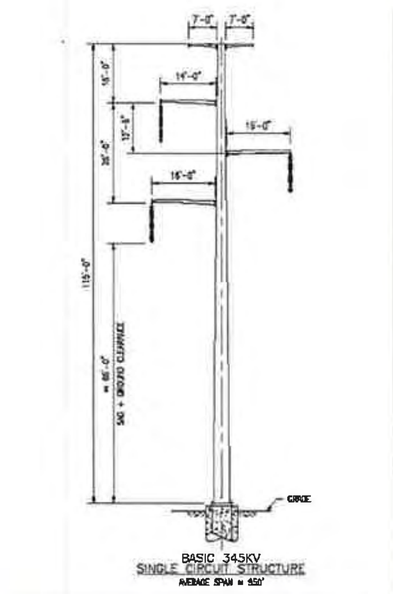
Socioeconomics

- Project area demographics, including population, income and employment
- Regional economic effects of construction and operation
- Environmental Justice

LAND & EASEMENT ACQUISITIONS

AVS to NESET 345-kV Transmission Project

Typical Single-Pole Structures



Project Land Requirements

To meet project objectives, Basin Electric would need to acquire long-term easements for the new transmission line rights-of-way. Normally, access by landowners within the easement is not restricted and agricultural activities can continue.

What Is an Easement?

An easement is a right to use land to construct, operate and maintain utilities. For the linear facilities, the typical right-of-way would be up to 150 feet wide for transmission lines. Basin Electric would require easements for construction of the lines and access for maintenance.

The Easement Acquisition Process

Survey Permission

Basin Electric would meet individually with each landowner to ask permission to survey a centerline right-of-way for transmission lines. Basin Electric would use this information to prepare the necessary easement documents. It would also contact landowners when access is needed for resource surveys.

Compensation

Basin Electric would use market data from recent sales of similar properties to determine fair and appropriate compensation. Basin Electric would discuss the value of the easement for the right-of-way crossing each landowner's property and make every effort to reach a fair and reasonable settlement with landowners.

Construction and Operation

In addition to the easement agreement, Basin Electric would provide compensation for damage to crops, pasture land or other property affected during construction or resulting from the maintenance of the transmission line. A Basin Electric inspector would monitor construction activities, and a right-of-way agent would be available to help resolve questions, concerns or problems during or after construction.

APPENDIX G:
INDEX OF PUBLIC AND AGENCY COMMENTS BY CATEGORY

CommentID	FIRSTNAME	LASTNAME	CATEGORIES	COMMENTCARDDATE
6263	Susan	Dickey	Conservation; Other; Wildlife	Dec 23 2011 12:00AM
6262	Robert	Fode	Other; State Commission	Nov 30 2011 12:00AM
6261	Kent	Luttschwager	Keep Informed; Other; State Commission; Water; Wildlife	Jan 3 2012 12:00AM
6234	Jerome	Schaar	Conservation; Other	Dec 8 2011 12:00AM
6232	Corinne	Lee	Conservation; Other; Wildlife	Dec 2 2011 12:00AM
6231	Suzanne	Bohan	Conservation; Other; Vegetation Management; Water; Wildlife	Dec 2 2011 12:00AM
6230	Deb	Lancaster	Conservation; Other; Wildlife	Dec 2 2011 12:00AM
6225	Jon	Rask	Conservation; Other; Wildlife	Dec 2 2011 12:00AM
6224	Anne	Coyle	Other; Vegetation Management; Wildlife	Dec 2 2011 12:00AM
6223	Patricia	Dressler	Keep Informed; Other; Wildlife	Dec 16 2011 12:00AM
6222	Mark	Weekly	Aesthetics; Conservation; Other	Dec 1 2011 12:00AM
6221	Michael	Haupt	Other	Dec 8 2011 12:00AM
6220	Jan	Swenson	Conservation; Other; Wildlife	Nov 29 2011 12:00AM
6219	Doug	Nenow	Property Values	Nov 17 2011 12:00AM
6218	Valerie	Naylor	Aesthetics; Other; Wildlife	Nov 23 2011 12:00AM
6217	L. David	Glatt	Other; Vegetation Management; Water	Nov 8 2011 12:00AM
6216	Jeffrey	Towner	Other; Water; Wildlife	Nov 23 2011 12:00AM
6213	Laska	Nygaard	Aesthetics; Conservation; Keep Informed; Wildlife	Dec 3 2011 12:00AM
6211	N/A	N/A	Other	Nov 2 2011 12:00AM
6209	Donald	Prevost	Need	
6208	Richard	Ryan	Aesthetics	Nov 15 2011 12:00AM
6207	John	Herr	Other	
6201	Bill	Kingsbury	Aesthetics; Conservation	Dec 2 2011 12:00AM
6200	Nancy	Peak	Keep Informed	Dec 2 2011 12:00AM
6199	Rodney	McVey	Historic / Cultural	Nov 30 2011 12:00AM
6155	Gary	Cummisk	Conservation; Wildlife	Dec 1 2011 12:00AM
6150	Al	Dominek	Keep Informed; Property Values	Nov 8 2011 12:00AM
6137	Lillian	Crook	Conservation; Other; Recreation; Wildlife	Dec 2 2011 12:00AM
6136	Erik	Sorensen	Conservation; Other	Dec 1 2011 12:00AM
6135	Mariah	Lancaster	Conservation	
6134	Barbara	Hatfield	Conservation	Dec 1 2011 12:00AM
6133	Gia	Cummisk	Conservation; Wildlife	Dec 1 2011 12:00AM
6131	Mike	McEnroe	Conservation; Other; Wildlife	Dec 1 2011 12:00AM
6130	Rob	Sand	Conservation; Other	Nov 30 2011 12:00AM
6129	Mary	Sand	Conservation; Recreation; Wildlife	Nov 30 2011 12:00AM
6128	Roberta	Baker	Conservation	Nov 29 2011 12:00AM

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
3425 Miriam Avenue
Bismarck, North Dakota 58501

NOV 23 2011

Mr. Mark Plank
Director, Engineering and Environmental Staff
1400 Independence Avenue, SW
Washington, DC 20250

Dear Mr. Plank:

The U.S. Fish and Wildlife Service (Service) has reviewed the proposed Basin Electric Power Cooperative (Basin) 345 kilovolt (kV) high-voltage transmission line project, as described in your October 31, 2011, letter. The proposed project includes construction of approximately 190 miles of 345 kV transmission line from Basin's electrical generating facility at Antelope Valley Station to the Western Area Power Administration (Western) substation near Williston, North Dakota, and extending to Basin's Neset Substation located near Tioga, North Dakota. The USDA Rural Utilities Service (RUS) is the lead Federal agency responsible for preparing the Environmental Impact Statement (EIS) for the proposed project. We offer the following comments under the authority of and in accordance with the Migratory Bird Treaty Act (MBTA) (16 U.S.C. 703 et seq.); Bald and Golden Eagle Protection Act (BGEPA) (16 U.S.C. 668-668d, 54 Stat. 250), Executive Order 13186 "Responsibilities of Federal Agencies to Protect Migratory Birds", the Endangered Species Act (ESA) (16 U.S.C. 1531 et seq.), the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57), and the National Environmental Policy Act (NEPA) (Pub. L. 91-190, 42 U.S.C. 4321-4347, January 1, 1970, as amended).

The Service holds certain resources in trust and manages them for the benefit of the American people. These resources include migratory birds, inter-jurisdictional fisheries, federally-listed threatened and endangered species of plants and animals and their habitats, and units of the National Wildlife Refuge system. When planning an activity, project proponents and Federal action agencies should give careful consideration to potential impacts to these trust resources and compliance with the laws mentioned above. Additional information is provided below.

Migratory Birds

Adequate consideration for avian resources early in the project planning process can help to minimize impacts to migratory birds. The Service has coordinated with the Avian Power Line Interaction Committee (APLIC) to develop guidelines to assist companies in formulating Avian Protection Plans (APP). These plans are utility-specific and designed to provide a structured way for a company to reduce avian mortality resulting from interactions with electric utility facilities (e.g. collisions and electrocutions). The APP can be tailored to each utility's industry-specific and site-specific wildlife needs, while in the process furthering avian conservation and improved reliability and customer service. A utility that implements the principles contained in these APP guidelines will greatly reduce avian risk as well its own risk of enforcement under the Migratory Bird Treaty Act (MBTA). The guidelines can be accessed from the Service's website at http://www.fws.gov/migratorybirds/.

To minimize the electrocution hazard to birds, the Service, with support from the Rural Utilities Service, recommends that new or updated overhead power lines be constructed in accordance with the current guidelines for preventing raptor electrocutions. The recommended guidelines can be found in "Suggested Practices for Raptor Protection on Power Lines: The State of the Art in 1996". To increase power line visibility and reduce bird fatalities resulting from collisions with power lines, the Service recommends new power lines that cross or run adjacent to rivers or large wetlands be modified according to "Mitigating Bird Collisions with Power Lines: The State of the Art in 1994". Both publications can be obtained by writing or calling the Edison Electric Institute, P.O. Box 266, Waldorf, Maryland 20604-0266, (1-800-334-5453) or visiting their website at www.eei.org.

The MBTA prohibits the taking, killing, possession, and transportation (among other actions), of migratory birds, their eggs, parts, and nests, except when specifically permitted by regulations. While the MBTA has no provision for authorizing unintentional take, the Service realizes that some birds may be killed by power lines during project construction and operation even if all known reasonable and effective measures to protect birds are used. The Service Office of Law Enforcement carries out its mission to protect migratory birds through investigations and enforcement, as well as by fostering relationships with individuals, companies, and agencies that have taken effective steps to avoid take of migratory birds, and by encouraging others to implement measures to avoid take of migratory birds. It is not possible to absolve individuals, companies, or agencies from liability even if they implement bird mortality avoidance or other similar protective measures. However, the Office of Law Enforcement focuses its resources on investigating those who take migratory birds without identifying and implementing all reasonable, prudent, and effective measures to avoid that take. Individuals, companies, and agencies are encouraged to work closely with Service biologists to identify available protective measures when developing project plans and/or avian protection plans, and to implement those measures prior to/during construction or similar activities.

Bald and Golden Eagles

The BGEPA prohibits anyone without a permit issued by the Secretary of the Interior from taking bald eagles, including their parts, nests, or eggs. The Act provides criminal and civil penalties for persons who take, possess, sell, purchase, barter, offer to sell, purchase or barter, transport, export or import, at any time or any manner, any bald or golden eagle, alive or dead, or any part, nest, or egg thereof. The Act defines take as pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb. "Disturb means to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, 1) injury to an eagle, 2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior." In addition to immediate impacts, this definition also covers impacts that result from human-induced alterations initiated around a previously-used nest site during a time when eagles are not present, if, upon the eagles return, such alterations agitate or bother an eagle to a degree that injures an eagle or substantially interferes with normal breeding, feeding, or sheltering habits and causes, or is likely to cause, a loss of productivity or nest abandonment. The Service is aware of numerous bald and golden eagle nests in the project area.

The North Dakota Fish and Game Department maintains a GIS database with eagle nest location that can be accessed by contacting Sandra Johnson, Nongame Biologist at (701) 328-6382. We recommend conducting surveys to identify bald or golden eagle nests within 1/2 mile of the proposed route in winter/early spring before trees have leaves that could screen possible nests. To avoid/minimize impacts to nesting eagles from transmission line construction activities, the Service recommends: (1) keeping a 0.5 mile distance between the activity and the nest, (2) maintaining natural areas between the activity and around nest trees (landscape buffers), and (3) avoiding activities during the breeding season (February 1 – July 15). 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 sites and provide for alternative or replacement nest sites. The Service's May 2007, National Bald Eagle Management Guidelines contains 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/issues/BaldEagle/NationalBaldEagleManagementGuidelines.pdf).

Threatened and Endangered Species

A list of federally endangered and threatened species that may be present within the proposed project's area of influence is enclosed. (enclosure 1). This list fulfills requirements of the Service under Section 7 of the Endangered Species Act.

If a Federal agency authorizes, funds, or carries out a proposed action, in this case RUS, or their designated agent(s), is required to evaluate whether the action "may affect" listed species. If RUS determines the action "may affect, is likely to adversely affect" listed species, then RUS shall request formal section 7 consultation with this office, or work with this office to remove the likely adverse effects before proceeding. If the evaluation shows a "no effect" determination on listed species, further consultation is not necessary. If a private entity receives Federal funding for a construction project, or if any Federal permit is required, the Federal agency may designate the fund recipient or permittee in writing as its agent for purposes of informal section 7 consultation. The funding, permitting, or licensing Federal agency is responsible to ensure that its actions comply with the ESA, including obtaining concurrence from the Service for any action that may affect a threatened or endangered species, or result in the destruction or adverse modification of designated critical habitat.

Piping plovers, a federally threatened species, are known to use the Missouri River in the proposed project area during the breeding season. There is designated piping plover critical habitat in the project area consisting of Missouri River and reservoir sandbar, shoreline, and island habitats.

The Aransas Wood Buffalo Population (AWBP) of whooping cranes is the only self-sustaining migratory population of whooping cranes remaining in the wild. These birds breed in the wetlands of Wood Buffalo National Park in Alberta and the Northwest Territories of northern Canada, and overwinter on the Texas coast. Whooping cranes in the AWBP annually migrate through North Dakota during their spring and fall migrations.

Endangered whooping cranes have been documented using roosting/feeding habitat in the vicinity of the proposed transmission line route, which is located within whooping crane migration corridor that includes 95 percent of all confirmed whooping crane sightings in North Dakota (enclosure 2). The presence of suitable roosting and feeding habitat for whooping cranes within the proposed project area, and confirmed whooping crane sightings, document the potential for whooping crane presence in the area. A new transmission line in this area has the potential to adversely affect whooping cranes during their annual spring and fall migration through North Dakota. Currently, collisions with power lines are the greatest known source of mortality for fledged whooping cranes, and have accounted for the death or serious injury of at least 46 whooping cranes since 1956.

Due to the transmission line route location within the whooping crane migration corridor, the Service recommends that conservation measures be included in the project description. Conservation measures to avoid or reduce potential impacts to whooping cranes include, but are not limited to:

- Burying the new electrical transmission line.
- If burying the new line is not feasible, install and maintain visual marking devices on the new transmission line in the 95 percent whooping crane migration corridor within 1 mile of suitable whooping crane stopover habitat and an equal length of existing transmission/distribution line within 1 mile of suitable whooping crane stopover habitat in the whooping crane migration corridor (preferably in the 75 percent migration corridor, but at a minimum within the 95 percent migration corridor).

The recommendation to mark the line within 1 mile of stopover wetlands is intended to provide protection at a distance (1 mile) between stopover habitat and the line(s), which represent the greatest collision risk to whooping cranes. Whooping cranes are most vulnerable to collision during low-level flight as they are taking off from or landing in stopover wetlands or as they are moving between stopover wetlands and nearby foraging areas. For local flights, the proximity of power lines to locations where birds are landing and taking off is critical. Power lines dividing wetlands used for roosting from grain fields used for feeding caused the most collisions for cranes because these circumstances encouraged crossing the lines at low altitude. Cranes frequently fly 10-15 m (33-49 ft) above the ground between fields; as a consequence, a 12-m high (39 ft) transmission line obstructs their typical flight path. In some power line collision mortality studies, no sandhill crane or waterfowl collisions were observed where distances from power lines to bird use areas exceeded 1.6 km (1 mi).

If the above recommendations are followed, and line markers are maintained, the Service believes that RUS would be justified in making a "not likely to adversely affect" determination for the whooping crane, and that the Service would typically concur.

Service Property Interests

The Service administers Waterfowl Production Areas owned in fee title as well as wetland and grassland easements throughout North Dakota. A review of Service realty records indicates Service property interests are located in the planning area. The Service has an ongoing easement acquisition program and we recommend that for Williams and Mountrail Counties, contact David Gillund, Project Leader, Lostwood Wetland Management District, 8315 Hwy 8, Kenmare, ND 58746-9046; Phone: (701)848-2466; Email: david_gillund@fws.gov, for more specific information relative to Service easements and up-to-date realty records. For information related to Lake Ilo National Wildlife Refuge in Dunn County contact Kory Richardson, 489 102nd Avenue SW, Dunn Center, ND 58626; Phone (701) 548-8110; Email: kory_richardson@fws.gov. Cultural resource compliance requires coordination with the Zone Archeologist early in the NEPA process. Cultural Resource field investigations on USFWS easements and fee lands requires a permit issued by the Zone Archeologist. Contact Barry G. Williams, USFWS Dakotas Zone Archeologist (barry_williams@fws.gov, 701-355-8577).

Following are some suggestions and explanations of the various land interests the Service is responsible for in the proposed project area. Wetland easements are legal agreements with private landowners that permanently protect wetland basins from being drained, burned, leveled, or filled. Grassland easements are legal agreements with landowners that permanently protect grassland vegetation, primarily native prairie, from being destroyed or developed. The primary responsibility in protecting these easements is to review all proposed uses to ensure that the requests are compatible with Service easement regulations and various laws and policies. Therefore, these comments and suggestions are made in an attempt to accomplish three goals: 1) avoid impacts to Service grassland and wetland easements in the project area as much as possible; 2) if unavoidable, ensure that any proposed project and associated infrastructure impacts on any Service easement areas are kept to a minimum; and 3) investigate potential alternatives to eliminate or reduce impacts to easement areas to protect the integrity of the easement.

General Comments

Our review of the National Wetland Inventory (NWI) maps and photographs indicate the proposed planning area includes numerous wetland basins and stream channels. You may access the NWI data directly through their website (wetlands.fws.gov). Other high-value wildlife habitat types in North Dakota include native prairie, wooded draws, and riparian forests. The Service recommends that construction through or adjacent to these areas be avoided where possible or measures be taken to minimize disturbance to these areas.

To minimize disturbance to existing fish and wildlife resources in the project area, the Service provides the following recommendations:

- Schedule construction 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 for nesting birds, along with information regarding the qualification of the biologist(s) performing the 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 proposed project has been completed.

- Avoid construction in native prairie, if possible, and reseed disturbed native prairie with a comparable native grass/forb seed mixture. Obtain seed stock from nurseries within 250 miles of the project area to insure the particular cultivars are well adapted to the local climate.

- Make no stream channel alterations or changes in drainage patterns.

- Install and maintain appropriate erosion control measures to reduce sediment transport to adjacent wetlands and stream channels.

If construction routes intersect wetlands, streams, or rivers, the Corps of Engineers (Corps) may require a Department of the Army permit for the placement of dredge or fill material into waters of the U.S., including wetlands, or other impacts to navigable waters. We suggest you contact Mr. Daniel Cimarosti, Regulatory Office, Corps of Engineers, 1513 South 12th Street, Bismarck, North Dakota 58504, (701-255-0015), to determine the Corps' permit requirements.

Thank you for the opportunity to comment on this project. If additional information is required, please have your staff contact Terry Ellsworth of my staff, or contact me directly, at (701) 250-4481 or at the letterhead address.

Sincerely,

Jeffrey K. Towner

Jeffrey K. Towner
Field Supervisor
North Dakota Field Office

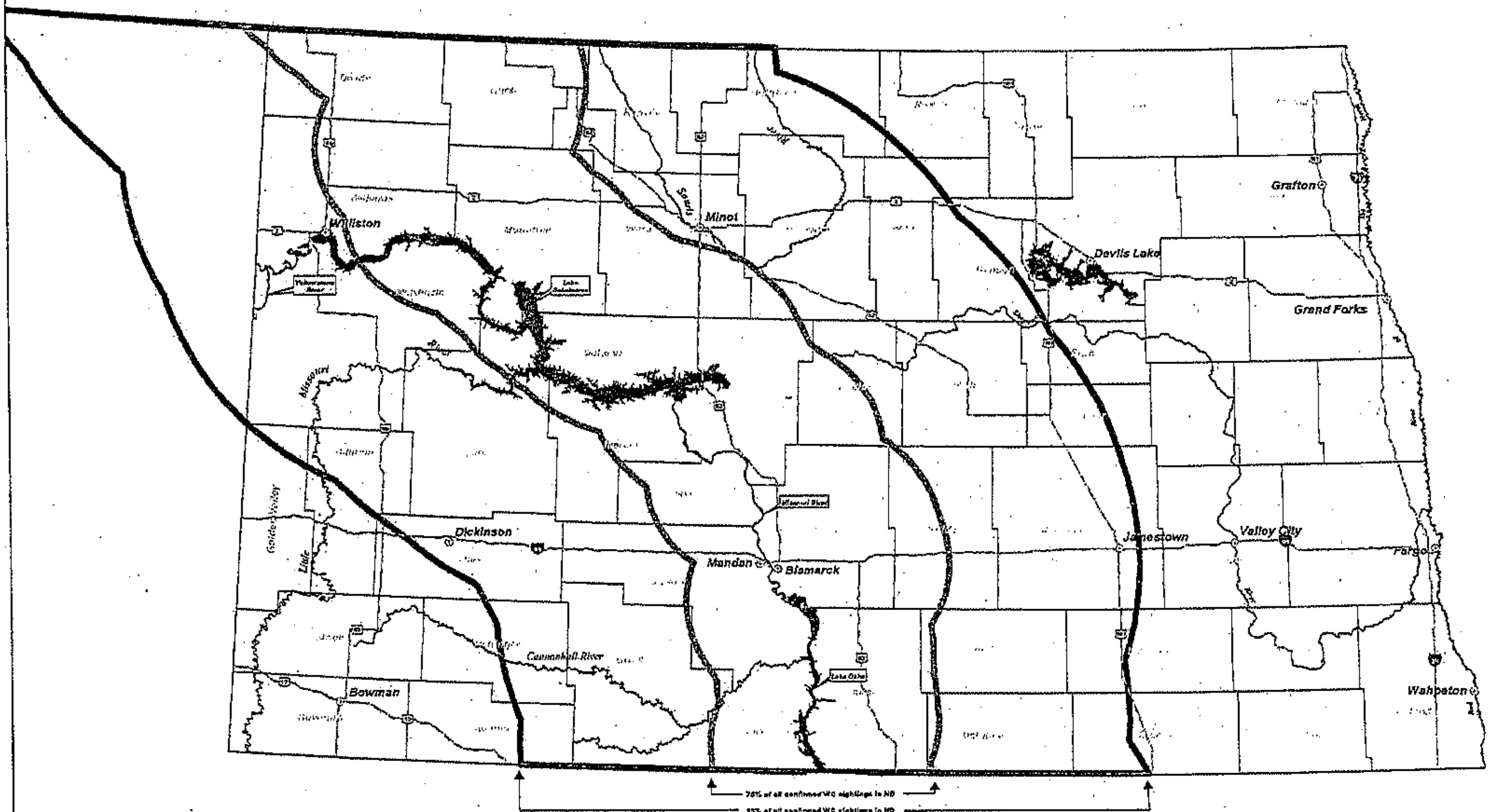
Enclosures (2)

cc: Project Leader, Lostwood NWR
Project Leader, Lake Ilo NWR
Regulatory Office, Army Corps of Engineers, Bismarck
(Attn: D. Cimarosti)
Director, ND Game & Fish Department, Bismarck
(Attn: G. Link and S. Johnson)

cc/att: Environmental Manager, Western Area Power Administration, Billings
Basin Electric Cooperative, Bismarck
(Attn: C. Miller)

North Dakota
Whooping Crane Migration Corridor

N
W E
S



75% Whooping Crane Migration Corridor
95% Whooping Crane Migration Corridor

DISCLAIMER:

The USFWS makes no claim as to the accuracy or completeness of the displayed information. Species occurrence and habitat information is provided for illustrative purposes only. Federal action agencies and project proponents should contact the USFWS North Dakota Field Office for more detailed species information and technical assistance in evaluating potential project impacts to fish and wildlife resources.

Map produced 04/21/2010 by USFWS Ecological Services, Bismarck, ND.

0 12.5 25 50 75 100 Miles

FEDERAL THREATENED, ENDANGERED, AND CANDIDATE SPECIES
AND DESIGNATED CRITICAL HABITAT FOUND IN
DUNN, MCKENZIE, MERCER, MOUNTRAIL,
AND WILLIAMS COUNTIES, NORTH DAKOTA

ENDANGERED SPECIES

Birds

Interior least tern (Sterna antillarum): Nests along midstream sandbars of the Missouri and Yellowstone Rivers.

Whooping crane (Grus Americana): Aransas-Wood Buffalo Population (264 birds) occurs in North Dakota counties during spring and fall migration between breeding and wintering areas. Whooping cranes prefer to roost overnight in shallow open water wetland habitat with good visibility during migration stopovers.

Fish

Pallid sturgeon (Scaphirhynchus albus): Known only from the Missouri and Yellowstone Rivers. No reproduction has been documented in 15 years.

Mammals

Black-footed ferret (Mustela nigripes): Exclusively associated with prairie dog towns. No records of occurrence in recent years, although there is potential for reintroduction in the future.

Gray wolf (Canis lupus): Occasional visitor in North Dakota. Most frequently observed in the Turtle Mountains area.

THREATENED SPECIES

Birds

Piping plover (Charadrius melodus): Nests on midstream sandbars of the Missouri and Yellowstone Rivers and along shorelines of saline wetlands. More nest in North Dakota than any other state.

CANDIDATE SPECIES

Birds

Sprague's Pipit (Anthus spragueii): Nests in native and planted grassland. Prefers patches of grassland at least 72 acres (29 hectares).

Invertebrates

Dakota skipper (Hesperia dacotae): Found in native prairie containing a high diversity of wildflowers and grasses. Habitat includes two prairie types: 1) low (wet) prairie dominated by bluestem grasses, wood lily, harebell, and smooth camas; 2) upland (dry) prairie on ridges and hillsides dominated by bluestem grasses, needlegrass, pale purple and upright coneflowers and blanketflower.

DESIGNATED CRITICAL HABITAT

Birds

Piping Plover - 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 (61 meters) above the high water mark of the alkali lake or wetland.

Piping Plover - 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.

Piping Plover - Lake Sakakawea and Oahe - Critical habitat includes sparsely vegetated shoreline beaches, peninsulas, islands composed of sand, gravel, or shale, and their interface with the water bodies.

NORTH DAKOTA
DEPARTMENT *of* HEALTH

ENVIRONMENTAL HEALTH SECTION
Gold Seal Center, 918 E. Divide Ave.
Bismarck, ND 58501-1947
701.328.5200 (fax)
www.ndhealth.gov

November 8, 2011

Mr. Mark S. Plank, Director
Engineering and Environmental Staff
Rural Utilities Service
USDA Rural Development
1400 Independence Ave., SW
Washington, D.C. 20250

Re: Proposed Basin Electric Power Cooperative
Antelope Valley Station to Neset 345-kV Transmission Project
Mercer, Dunn, Billings, McKenzie, Williams and Mountrail Counties in North Dakota

Dear Mr. Plank:

This department has reviewed the information concerning the above-referenced project submitted under date of October 31, 2011, with respect to possible environmental impacts.

This department believes that environmental impacts from the proposed construction will be minor and can be controlled by proper construction methods. With respect to construction, we have the following comments:

1. All necessary measures must be taken to minimize fugitive dust emissions created during construction activities. Any complaints that may arise are to be dealt with in an efficient and effective manner.

2. Care is to be taken during construction activity near any water of the state to minimize adverse effects on a water body. This includes minimal disturbance of stream beds and banks to prevent excess siltation, and the replacement and revegetation of any disturbed area as soon as possible after work has been completed. Caution must also be taken to prevent spills of oil and grease that may reach the receiving water from equipment maintenance, and/or the handling of fuels on the site. Guidelines for minimizing degradation to waterways during construction are attached.

3. Projects disturbing one or more acres are required to have a permit to discharge storm water runoff until the site is stabilized by the reestablishment of vegetation or other permanent cover. Further information on the storm water permit may be obtained from the Department's website or by calling the Division of Water Quality (701-328-5210). Also, cities or counties may impose additional requirements and/or specific best management practices for construction affecting their storm drainage system and may require provisions to address the quality of post-construction storm water runoff. Check with the local officials to be sure any local storm water management considerations are addressed.

4. Noise from construction activities may have adverse effects on persons who live near the construction area. Noise levels can be minimized by ensuring that construction equipment is equipped with a recommended muffler in good working order. Noise effects can also be minimized by ensuring that construction activities are not conducted during early morning or late evening hours.

The department owns no land in or adjacent to the proposed improvements, nor does it have any projects scheduled in the area. In addition, we believe the proposed activities are consistent with the State Implementation Plan for the Control of Air Pollution for the State of North Dakota.

These comments are based on the information provided about the project in the above-referenced submittal. The U.S. Army Corps of Engineers may require a water quality certification from this department for the project if the project is subject to their Section 404 permitting process. Any additional information which may be required by the U.S. Army Corps of Engineers under the process will be considered by this department in our determination regarding the issuance of such a certification.

If you have any questions regarding our comments, please feel free to contact this office.

Sincerely,

L. David Glatt, P.E., Chief
Environmental Health Section

LDG:cc
Attach.

NORTH DAKOTA
DEPARTMENT *of* HEALTH

ENVIRONMENTAL HEALTH SECTION
Gold Seal Center, 918 E. Divide Ave.
Bismarck, ND 58501-1947
701.328.5200 (fax)
www.ndhealth.gov

Construction and Environmental Disturbance Requirements

These represent the minimum requirements of the North Dakota Department of Health. They ensure that minimal environmental degradation occurs as a result of construction or related work which has the potential to affect the waters of the State of North Dakota. All projects will be designed and implemented to restrict the losses or disturbances of soil, vegetative cover, and pollutants (chemical or biological) from a site.

Soils

Prevent the erosion of exposed soil surfaces and trapping sediments being transported. Examples include, but are not restricted to, sediment dams or berms, diversion dikes, hay bales as erosion checks, riprap, mesh or burlap blankets to hold soil during construction, and immediately establishing vegetative cover on disturbed areas after construction is completed. Fragile and sensitive areas such as wetlands, riparian zones, delicate flora, or land resources will be protected against compaction, vegetation loss, and unnecessary damage.

Surface Waters

All construction which directly or indirectly impacts aquatic systems will be managed to minimize impacts. All attempts will be made to prevent the contamination of water at construction sites from fuel spillage, lubricants, and chemicals, by following safe storage and handling procedures. Stream bank and stream bed disturbances will be controlled to minimize and/or prevent silt movement, nutrient upsurges, plant dislocation, and any physical, chemical, or biological disruption. The use of pesticides or herbicides in or near these systems is forbidden without approval from this Department.

Fill Material

Any fill material placed below the high water mark must be free of top soils, decomposable materials, and persistent synthetic organic compounds (in toxic concentrations). This includes, but is not limited to, asphalt, tires, treated lumber, and construction debris. The Department may require testing of fill materials. All temporary fills must be removed. Debris and solid wastes will be removed from the site and the impacted areas restored as nearly as possible to the original condition.

United States Department of the Interior

National Park Service
Theodore Roosevelt National Park
Post Office Box 7
Medora, North Dakota 58645

IN REPLY REFER TO
N1629

November 23, 2011

Mr. Dennis Rankin, Environmental Protection Specialist
USDA, Rural Utilities Service
1400 Independence Avenue SW., Stop 1571
Washington, DC 20250–1571

Dear Mr. Rankin:

We attended the interagency scoping meeting in Bismarck on November 14, as well as the public scoping meeting in Killdeer on November 16 regarding the AVS to Neset 345-kV Transmission Project in North Dakota. We appreciated the opportunity to learn more about the proposed project in order to evaluate possible issues for Theodore Roosevelt National Park.

With the explosion of energy development in the North Dakota badlands, we must remain vigilant to protect the ecological integrity and scenic views of all three units of Theodore Roosevelt National Park. This treasured national park area is extremely significant to the nation, to North Dakota, and to the 600,000 visitors who enjoy it annually.

We understand that Basin Electric is currently considering two potential corridors for the powerline. We are concerned about several issues related to "Alternative D." First, **the macro-corridor appears to overlay the eastern portion of the North Unit of Theodore Roosevelt National Park.** Please note that National Park Service lands and the administrative boundary of Theodore Roosevelt National Park extend considerably east of Highway 85. In a related issue, we are concerned about the area known as the Lone Butte Inventoried Roadless Area on adjacent US Forest Service lands. Much of the North Unit of Theodore Roosevelt National Park is Congressionally designated Wilderness. However, the park's small wilderness area is becoming isolated as areas around the park are developed with roads and oil infrastructure. Therefore, it is increasingly important that we allow roadless areas to remain undisturbed, to allow for wildlife habitat and human enjoyment. Any utility corridor should be outside the current roadless area in order to provide needed wildlife corridors near the park. In the macro-corridor development considerations listed in the corridor alternatives report, large contiguous tracts of grasslands are listed as exclusion areas.

We want to ensure that the powerline would be far to the east of the park – well outside the park's legislative boundary, and well outside the viewshed. In order to keep the powerline away from the park and out of the adjacent roadless areas, it would need to be nearly as east far as the western edge of macro-corridor B.

The National Park Service has no specific concerns about macro-corridor B, which would have no direct impact on the park or adjacent roadless areas.

Thank you for the opportunity to participate in the scoping process. We will remain engaged throughout the planning process for this project.

Sincerely,

Valerie J. Naylor

Valerie J. Naylor
Superintendent

cc: Chief of Resource Management

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8
1595 Wynkoop Street
DENVER, CO 80202-1129
Phone 800-227-8917
http://www.epa.gov/region08

DEC 02 2011

Ref: 8EPR-N

Mr. Dennis Rankin
Environmental Protection Specialist
USDA
Rural Utilities Service
1400 Independence Avenue SW, Stop 1571
Washington, DC 20250-1571

Re: Scoping Comments on the Antelope Valley Station to Neset Transmission Project

Dear Mr. Rankin:

The U.S. Environmental Protection Agency (EPA) Region 8 has reviewed the Rural Utilities Service's Notice of Intent (NOI) to prepare an Environmental Impact Statement (EIS) for the Antelope Valley Station to Neset Transmission Project (Project) in North Dakota. In accordance with our authority under the National Environmental Policy Act and Section 309 of the Clear Air Act, we are responding to your NOI with the following comments for your consideration as you proceed with the development of the Draft EIS.

Project Description

The Project, sponsored by Basin Electric Power Cooperative, includes the construction, operation, and maintenance of approximately 190 miles of new 345-kilovolt(kV) single pole transmission lines, 2 new substations, a 345-kV switchyard, maintenance access roads, temporary construction roads, river crossings, temporary construction staging sites, and other support facilities. The Project would be located in portions of Billings, Dunn, McKenzie, Mercer, Mountrail, and Williams counties in western North Dakota. The EPA understands that approximately 20 percent of the Project will occur in existing rights-of-ways (ROWs) located primarily to the west of the Antelope Valley Station. The Project will require a Transmission Corridor and Route Permit from the North Dakota Public Service Commission. This permit would authorize Basin Electric to construct the proposed Project under North Dakota rules and regulations.

Project Purpose and Need for Action

The purpose of the Project is to achieve the following goals:

(1) Provide additional electric transmission capacity in northwestern North Dakota to meet increased demand; and
(2) Meet reliability and system stability requirements for the region.

In order to support the purpose and need for this project, we recommend that the EIS provide clear and concise documentation that illustrates a deficiency in power delivery infrastructure in the region and also defines the current transmission constraints.

The NOI does not offer any alternatives to the proposed action. The EPA recommends that the EIS consider other alternatives based on the following criteria:

- Paralleling existing linear features such as transmission lines and roads;
- Using corridors designated by federal land management agencies and identified in local planning documents to contain linear facilities; and
- Avoiding wilderness areas, critical habitat and irrigated farm land.

The EPA encourages the Rural Utilities Service to objectively evaluate reasonable alternatives to the proposed action that meet the project purpose and need, including alternatives that are outside the legal jurisdiction of the Rural Utilities Service, if they are reasonable and responsive to the issues identified during the scoping process for the EIS.

Environmental Effects Analysis

The NOI identifies several environmental resources that may be impacted by the construction and operation of the proposed transmission line. Environmental issues identified include the following:

- Impacts on protected, threatened, endangered, or sensitive species of plants and wildlife;
- Impacts on avian and bat species including sensitive species such as sage grouse, goshawks, and other raptors;
- Impacts on land use, recreation, and transportation;
- Impacts on cultural resources or historic properties and tribal values;
- Impacts on human health and safety;
- Impacts on air, soil, and water resources (including air quality and surface water impacts);
- Visual resources; and
- Socioeconomic impacts including disproportionately high and adverse impacts to minority and low-income populations

The EPA agrees with the need to assess impacts to these resources and recommends that the Rural Utilities Service consider the following information in analyzing the Project's direct, indirect, and cumulative impacts on specific social and natural resources.

Water Resources

The EPA recommends that the EIS describe water bodies and ground water resources within the analysis area that may be impacted by project activities. Please include water quality impaired waters designated by States under Section 303(d) of the Clean Water Act (CWA) along the proposed transmission line ROW and discuss State efforts to develop or revise Total Maximum Daily Loads to achieve compliance.

We recommend that the EIS include an appropriate stormwater pollution prevention plan and a hazardous materials spill plan to ensure protection of any impaired streams and all other water bodies and habitats within, adjacent to, or near any of the proposed ROWs.

We recommend that the EIS discuss best management practices to reduce potential impacts. Impacts to surface waters can be avoided by rerouting the line away from a waterbody, adjusting pole placements to span the resource overhead, and constructing temporary bridge structures across creeks and small streams. Methods to minimize impacts include avoiding pole placements adjacent to the resource and using erosion control methods. To be effective, erosion controls need to be regularly inspected and maintained throughout the construction phase of the project until exposed soil has been stabilized.

Wetland and Riparian Areas

The EPA considers the protection, improvement and restoration of wetlands and riparian areas to be a high priority. Wetlands serve vital functions including storing runoff, regenerating groundwater, filtering sediments and pollutants, and providing habitat for aquatic species and wildlife. The EPA suggests that all identified wetland sites be clearly marked, posted, flagged and/or fenced prior to construction, to prevent accidental impacts during construction. Once the project is completed, the EPA recommends that a post construction review be held to determine whether wetland impacts were avoided. According to the NOI for this project, the EIS will include a floodplain/wetland assessment and, if required, a floodplain/wetland statement of findings will be issued in the Final EIS. We support this approach.

Discharge of dredged or fill material into waters of the United States, including wetlands, is regulated under CWA Section 404. This permit program is administered jointly by the U.S. Army Corps of Engineers (Corps) and EPA. Please consult with the Corps to determine the applicability of CWA Section 404 to waters in the project area.

We recommend avoiding aquatic resources that are considered "difficult to replace" under EPA's and the Corps' Final Rule for Mitigation for Losses of Aquatic Resources [33 CFR Parts 325 and 332; 40 CFR Part 230 (73 FR 19594, April 10, 2008)]. The rule emphasizes the need to avoid and minimize impacts to these "difficult-to-replace" resources and requires that any compensation be provided by in-kind preservation, rehabilitation, or enhancement to the extent practicable. We recommend restoration requirements include re-establishment of soil profiles and hydrology as close as possible to the original state. In addition, EPA recommends the Rural Utilities Services consider the mitigation rule to protect aquatic resources even when a CWA Section 404 permit is not required, in accordance with Executive Order 11990.

We recommend that no construction of transmission ROWs occurs in waterways, banks of waterways or within the riparian zone of any waterway. Soil disturbances may permanently alter wetland hydrology and may cause the spread of invasive weed species that are not native to the area.

Environmental Justice

With regard to possible impacts to environmental justice communities, Executive Order 12898 requires each Federal agency to identify and address the disproportionately high and adverse human health impacts of its activities on minority and low-income populations. While we understand that the transmission line ROW does not cross the Fort Berthold Indian Reservation, the EPA believes a thorough environmental justice impact assessment is necessary. Nevertheless, the EPA has the following recommendations to ensure that impacts to all environmental justice populations are analyzed:

- Focus the analysis both on the overall affected area and population and on smaller areas and/or communities within the affected area;
- Conduct an initial screening exercise to identify the presence of minority and/or low-income communities and whether such communities are likely to experience adverse impacts; and
- Identify whether the project may have disproportionately high and adverse human health or environmental effects on minority and /or low income communities.

We are pleased to know that the Western Area Power Administration, a cooperating agency, will be completing a Section 106 consultation, pursuant to the National Historic Preservation Act, to identify historic properties of traditional religious and cultural importance, as part of the EIS.

Fish, Wildlife and Vegetation

The EPA recommends that the EIS disclose and evaluate the effects of project activities on area ecology, including vegetation, fish and wildlife, and associated aquatic and terrestrial habitat from transmission line construction and operation. Power transmission projects have the potential to disrupt important wildlife species habitat, resulting in mortality of migratory species such as birds and bats due to electrocution on power lines and collisions with towers, power lines or other related structures. In the affected environment section, please include current quality and capacity of habitat, usage by wildlife near the proposed ROW, known wildlife corridors/trails that may be affected and fisheries resources and aquatic habitat in surface waters that may be affected. In addition, the EPA recommends the EIS disclose the Rural Utilities Services' consultation activities with the Fish and Wildlife Service regarding threatened and endangered species and their habitat.

Noxious Weeds and Invasive Plants

Among the greatest threats to biodiversity is the spread of noxious weeds and exotic (non-indigenous) plants. Many noxious weeds can out-compete native plants and produce a monoculture that has little or no plant species diversity or benefit to wildlife. Noxious weeds tend to gain a foothold where there is disturbance in the ecosystem. Studies show that new roads and utilities ROWs can become pathways for the spread of invasive plants.

The EPA suggests that a vegetation management plan be prepared to address control of such plant intrusions. The plan should list the noxious weeds and exotic plants that occur in the project area. In areas where noxious weeds are a threat, the EPA recommends that the EIS detail a strategy for prevention, early detection of invasion and control procedures for each species. Early recognition and control of new infestations is essential in stopping the spread of infestation and avoiding future widespread use of herbicides, which could correspondingly have more adverse impacts on diversity and nearby water resources.

Air Quality

The EPA recommends that the EIS evaluate and disclose potential air quality effects of transmission line construction and operation alternatives including emissions of dust particulates related to proposed road improvements and new road construction. Airborne dust may not only be a visual nuisance, but can be potentially dangerous to asthma sufferers and others with respiratory illnesses. The EPA recommends that construction techniques and appropriate dust control methods to reduce airborne dust and sediment runoff from the project area be addressed in the EIS.

Based on consultation with Rural Utilities Services, the EPA understands that the proposed project will be transporting electricity primarily from the Antelope Power Station. As a connected action to the proposed project, we recommend that the EIS discuss any additional air emissions from the power station that are a result of producing additional electricity for the new proposed transmission line. We recommend that the EIS also discuss any potential means to mitigate project-related air emissions.

Greenhouse Gas Emissions and Climate Change

The EPA recommends that the EIS include an analysis and disclosure of direct and indirect greenhouse gas (GHG) emissions. Indirect GHG emissions are related to the sources of the electricity that are carried by the proposed transmission line. We suggest the following approach:

- Quantify and disclose projected annual and total project lifetime cumulative GHG emissions in CO_2-equivalent terms and translate the emissions into equivalencies that are easily understood by the public (see http://www.epa.gov/cleanenergy/energy-resources/calculator.html).
- Analyze reasonable alternatives and/or potential means to mitigate project-related GHG emissions.

These scoping comments are intended to help ensure a comprehensive assessment of the project's environmental impacts, adequate public disclosure, and an informed decision-making process for alternatives selection. We understand that you are well versed in many of these topics but offer a complete letter to provide our input early in the process. We sincerely hope that our scoping comments will be beneficial to you and the project, and that they will help streamline the process. If you have any questions about these scoping comments, please contact me at (303) 312-6925, or Robert Edgar of my staff at (303) 312-6669, or via e-mail at robert.edgar@epa.gov.

Sincerely,

Suzanne J. Bohan
Director, NEPA Compliance and Review Program
Office of Ecosystems Protection and Remediation

Knauer, Greg

From:	Rankin, Dennis - RD, Washington, DC <Dennis.Rankin@wdc.usda.gov>
Sent:	Tuesday, December 06, 2011 6:40 AM
To:	Hughes, Robert; Matt Marsh
Cc:	Cris Miller
Subject:	FW: Scoping Comments on Antelope Valley Station to Neset Transmission Project
Attachments:	Antelope Valley Station.pdf

fyi

-----Original Message-----
From: Edgar.Robert@epamail.epa.gov [mailto:Edgar.Robert@epamail.epa.gov]
Sent: Friday, December 02, 2011 6:06 PM
To: Rankin, Dennis - RD, Washington, DC
Subject: Scoping Comments on Antelope Valley Station to Neset Transmission Project

Dennis -

Here are EPA's comments in pdf file format.

These comments have been sent to you in letter form today.

Call me if you have any questions.

(See attached file: Antelope Valley Station.pdf)

Robert

Robert T. Edgar, Ph.D.
Technical Assistance Unit
Air Quality Specialist
US EPA Region 8, EPR-PS
1595 Wynkoop Street
Denver, CO 80202-1129

(303) 312-6669 Tel.
(303) 312-7151 Fax.

United States Department of the Interior
National Park Service
Lewis & Clark National Historic Trail
601 Riverfront Drive
Omaha, Nebraska 68102-4226

L7619(LECL)

December 1, 2011

Mr. Dennis Rankin
Environmental Protection Specialist
United States Department of Agriculture
Rural Utilities Service
1400 Independence Avenue S.W., Stop 1571
Washington, DC 20250–1571

Dear Mr. Rankin:

The Lewis and Clark National Historic Trail is located within and proximate to the area under consideration for development of the Antelope Valley to Neset 345-kV Transmission Project (the Project). We reviewed the notice of intent to prepare an Environmental Impact Statement (EIS) for the Project and the Macro-Corridor and Alternatives Report and offer the following comments for consideration.

The Lewis and Clark National Historic Trail (the Trail) was established by Congress in an amendment to the National Trails System Act in 1978 [16 U.S.C. § 1244(a)(6)]. The National Park Service (NPS) administers the Trail and is charged under this Act with the identification and protection of the historic route, remnants, and artifacts of the Lewis and Clark Expedition (the Expedition) for public use and enjoyment. In addition, NPS has responsibility under the Organic Act (16 U.S.C. §1, *et seq.*) to conserve unimpaired the scenery and the natural and historic resources of the National Park System for the enjoyment of this and future generations.

The Trail follows the outbound and inbound routes of the Expedition, from Wood River, Illinois to the mouth of the Columbia River in Oregon. In North Dakota, the historic Trail follows the Missouri River. Trail visitors retrace the historic route along or on the Missouri River or by traveling the Trail auto tour route, stopping at wayside exhibits and visitor centers. A map of the auto tour route is enclosed for your reference.

The Project may impact Trail resources and the visitor experience where it crosses the historic Trail or auto tour route and anywhere the proposed transmission lines or associated infrastructure are visible from the historic trail or the auto tour route. An analysis of impacts to the Trail, including a visual impact analysis, should be included in the EIS.

All alternative corridors currently under consideration for the Project cross the Trail at the Missouri River near Williston, North Dakota. The Expedition likely camped at several locations within the proposed Missouri River crossing corridor. The NPS requests to be consulted regarding ways to minimize and/or mitigate impacts to the Trail at the river crossing and any other Trail locations identified as potentially impacted during the planning process and analysis.

The NPS urges avoidance or minimization of adverse impacts to Trail resources from the proposed project wherever feasible. There is a great deal of local, regional, and national significance in recognizing and preserving the resources of the Lewis and Clark National Historic Trail.

Thank you for the opportunity to comment. We look forward to further consultation on this Project and request a copy of the draft EIS when it is available for review. If you have questions regarding our comments, or would like more information on the Trail, please contact Chief of Resource Stewardship Dan Wiley at 402-661-1830, or Dan_Wiley@nps.gov.

Sincerely,

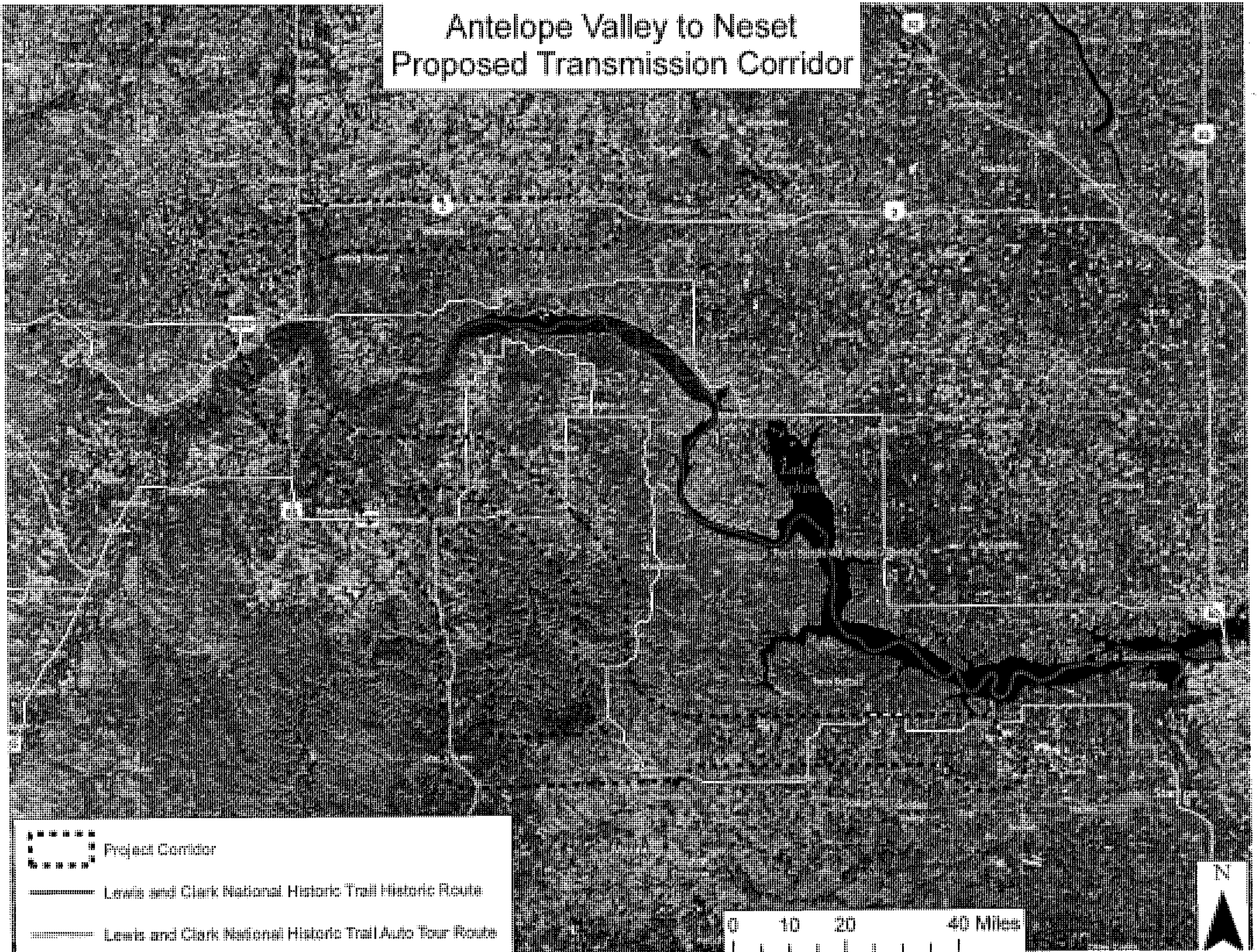
/s/Mark R Weekley

Mark R. Weekley
Superintendent

Enclosure

cc:
Mr. Nick Chevance
National Park Service
Midwest Region Environmental Coordinator
601 Riverfront Drive
Omaha, Nebraska 68122-4226

Ms. Valerie J. Naylor, Superintendent
National Park Service
Theodore Roosevelt National Park
P.O. Box 7
Medora, North Dakota 58645-0007


Antelope Valley to Neset
Proposed Transmission Corridor
Project Corridor
Lewis and Clark National Historic Trail Historic Route
Lewis and Clark National Historic Trail Auto Tour Route
0 10 20 40 Miles
N

Knauer, Greg

From: Rankin, Dennis - RD, Washington, DC <Dennis.Rankin@wdc.usda.gov>
Sent: Tuesday, December 06, 2011 6:43 AM
To: Hughes, Robert; Matt Marsh
Cc: Cris Miller
Subject: FW: Antelope Valley Station to Neset Transmission Project
Attachments: AntelopeValleyNesetScoping FINAL 12-1-2011.doc; Antelope to Neset map 12-1-11.pdf

fyi

-----Original Message-----
From: Denise_Nelson@nps.gov [mailto:Denise_Nelson@nps.gov]
Sent: Friday, December 02, 2011 1:13 PM
To: Rankin, Dennis - RD, Washington, DC
Cc: Nicholas_Chevance@nps.gov; Valerie_Naylor@nps.gov
Subject: Antelope Valley Station to Neset Transmission Project

Hello Dennis,

Attached are comments from the Lewis and Clark National Historic Trail on the NOI to prepare an EIS and hold public scoping meetings for the subject project. A hard copy of these comments is being mailed today.

(See attached file: AntelopeValleyNesetScoping FINAL 12-1-2011.doc)(See attached file: Antelope to Neset map 12-1-11.pdf)

Thank you,

Denise L. Nelson
Environmental Protection Specialist
Lewis & Clark National Historic Trail
601 Riverfront Drive
Omaha, NE 68102
402-661-1812

Trail Newsletter
http://digital.turn-page.com/issue/45689

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8
1595 Wynkoop Street
DENVER, CO 80202-1129
Phone 800-227-8917
http://www.epa.gov/region08

DEC 02 2011

Ref: 8EPR-N

Mr. Dennis Rankin
Environmental Protection Specialist
USDA
Rural Utilities Service
1400 Independence Avenue SW, Stop 1571
Washington, DC 20250-1571

Re: Scoping Comments on the Antelope Valley Station to Neset Transmission Project

Dear Mr. Rankin:

The U.S. Environmental Protection Agency (EPA) Region 8 has reviewed the Rural Utilities Service's Notice of Intent (NOI) to prepare an Environmental Impact Statement (EIS) for the Antelope Valley Station to Neset Transmission Project (Project) in North Dakota. In accordance with our authority under the National Environmental Policy Act and Section 309 of the Clear Air Act, we are responding to your NOI with the following comments for your consideration as you proceed with the development of the Draft EIS.

Project Description

The Project, sponsored by Basin Electric Power Cooperative, includes the construction, operation, and maintenance of approximately 190 miles of new 345-kilovolt(kV) single pole transmission lines, 2 new substations, a 345-kV switchyard, maintenance access roads, temporary construction roads, river crossings, temporary construction staging sites, and other support facilities. The Project would be located in portions of Billings, Dunn, McKenzie, Mercer, Mountrail, and Williams counties in western North Dakota. The EPA understands that approximately 20 percent of the Project will occur in existing rights-of-ways (ROWs) located primarily to the west of the Antelope Valley Station. The Project will require a Transmission Corridor and Route Permit from the North Dakota Public Service Commission. This permit would authorize Basin Electric to construct the proposed Project under North Dakota rules and regulations.

Project Purpose and Need for Action

The purpose of the Project is to achieve the following goals:

(1) Provide additional electric transmission capacity in northwestern North Dakota to meet increased demand; and
(2) Meet reliability and system stability requirements for the region.

In order to support the purpose and need for this project, we recommend that the EIS provide clear and concise documentation that illustrates a deficiency in power delivery infrastructure in the region and also defines the current transmission constraints.

The NOI does not offer any alternatives to the proposed action. The EPA recommends that the EIS consider other alternatives based on the following criteria:

- Paralleling existing linear features such as transmission lines and roads;
- Using corridors designated by federal land management agencies and identified in local planning documents to contain linear facilities; and
- Avoiding wilderness areas, critical habitat and irrigated farm land.

The EPA encourages the Rural Utilities Service to objectively evaluate reasonable alternatives to the proposed action that meet the project purpose and need, including alternatives that are outside the legal jurisdiction of the Rural Utilities Service, if they are reasonable and responsive to the issues identified during the scoping process for the EIS.

Environmental Effects Analysis

The NOI identifies several environmental resources that may be impacted by the construction and operation of the proposed transmission line. Environmental issues identified include the following:

- Impacts on protected, threatened, endangered, or sensitive species of plants and wildlife;
- Impacts on avian and bat species including sensitive species such as sage grouse, goshawks, and other raptors;
- Impacts on land use, recreation, and transportation;
- Impacts on cultural resources or historic properties and tribal values;
- Impacts on human health and safety;
- Impacts on air, soil, and water resources (including air quality and surface water impacts);
- Visual resources; and
- Socioeconomic impacts including disproportionately high and adverse impacts to minority and low-income populations

The EPA agrees with the need to assess impacts to these resources and recommends that the Rural Utilities Service consider the following information in analyzing the Project's direct, indirect, and cumulative impacts on specific social and natural resources.

Water Resources

The EPA recommends that the EIS describe water bodies and ground water resources within the analysis area that may be impacted by project activities. Please include water quality impaired waters designated by States under Section 303(d) of the Clean Water Act (CWA) along the proposed transmission line ROW and discuss State efforts to develop or revise Total Maximum Daily Loads to achieve compliance.

We recommend that the EIS include an appropriate stormwater pollution prevention plan and a hazardous materials spill plan to ensure protection of any impaired streams and all other water bodies and habitats within, adjacent to, or near any of the proposed ROWs.

We recommend that the EIS discuss best management practices to reduce potential impacts. Impacts to surface waters can be avoided by rerouting the line away from a waterbody, adjusting pole placements to span the resource overhead, and constructing temporary bridge structures across creeks and small streams. Methods to minimize impacts include avoiding pole placements adjacent to the resource and using erosion control methods. To be effective, erosion controls need to be regularly inspected and maintained throughout the construction phase of the project until exposed soil has been stabilized.

Wetland and Riparian Areas

The EPA considers the protection, improvement and restoration of wetlands and riparian areas to be a high priority. Wetlands serve vital functions including storing runoff, regenerating groundwater, filtering sediments and pollutants, and providing habitat for aquatic species and wildlife. The EPA suggests that all identified wetland sites be clearly marked, posted, flagged and/or fenced prior to construction, to prevent accidental impacts during construction. Once the project is completed, the EPA recommends that a post construction review be held to determine whether wetland impacts were avoided. According to the NOI for this project, the EIS will include a floodplain/wetland assessment and, if required, a floodplain/wetland statement of findings will be issued in the Final EIS. We support this approach.

Discharge of dredged or fill material into waters of the United States, including wetlands, is regulated under CWA Section 404. This permit program is administered jointly by the U.S. Army Corps of Engineers (Corps) and EPA. Please consult with the Corps to determine the applicability of CWA Section 404 to waters in the project area.

We recommend avoiding aquatic resources that are considered "difficult to replace" under EPA's and the Corps' Final Rule for Mitigation for Losses of Aquatic Resources [33 CFR Parts 325 and 332; 40 CFR Part 230 (73 FR 19594, April 10, 2008)]. The rule emphasizes the need to avoid and minimize impacts to these "difficult-to-replace" resources and requires that any compensation be provided by in-kind preservation, rehabilitation, or enhancement to the extent practicable. We recommend restoration requirements include re-establishment of soil profiles and hydrology as close as possible to the original state. In addition, EPA recommends the Rural Utilities Services consider the mitigation rule to protect aquatic resources even when a CWA Section 404 permit is not required, in accordance with Executive Order 11990.

We recommend that no construction of transmission ROWs occurs in waterways, banks of waterways or within the riparian zone of any waterway. Soil disturbances may permanently alter wetland hydrology and may cause the spread of invasive weed species that are not native to the area.

Environmental Justice

With regard to possible impacts to environmental justice communities, Executive Order 12898 requires each Federal agency to identify and address the disproportionately high and adverse human health impacts of its activities on minority and low-income populations. While we understand that the transmission line ROW does not cross the Fort Berthold Indian Reservation, the EPA believes a thorough environmental justice impact assessment is necessary. Nevertheless, the EPA has the following recommendations to ensure that impacts to all environmental justice populations are analyzed:

- Focus the analysis both on the overall affected area and population and on smaller areas and/or communities within the affected area;
- Conduct an initial screening exercise to identify the presence of minority and/or low-income communities and whether such communities are likely to experience adverse impacts; and
- Identify whether the project may have disproportionately high and adverse human health or environmental effects on minority and /or low income communities.

We are pleased to know that the Western Area Power Administration, a cooperating agency, will be completing a Section 106 consultation, pursuant to the National Historic Preservation Act, to identify historic properties of traditional religious and cultural importance, as part of the EIS.

Fish, Wildlife and Vegetation

The EPA recommends that the EIS disclose and evaluate the effects of project activities on area ecology, including vegetation, fish and wildlife, and associated aquatic and terrestrial habitat from transmission line construction and operation. Power transmission projects have the potential to disrupt important wildlife species habitat, resulting in mortality of migratory species such as birds and bats due to electrocution on power lines and collisions with towers, power lines or other related structures. In the affected environment section, please include current quality and capacity of habitat, usage by wildlife near the proposed ROW, known wildlife corridors/trails that may be affected and fisheries resources and aquatic habitat in surface waters that may be affected. In addition, the EPA recommends the EIS disclose the Rural Utilities Services' consultation activities with the Fish and Wildlife Service regarding threatened and endangered species and their habitat.

Noxious Weeds and Invasive Plants

Among the greatest threats to biodiversity is the spread of noxious weeds and exotic (non-indigenous) plants. Many noxious weeds can out-compete native plants and produce a monoculture that has little or no plant species diversity or benefit to wildlife. Noxious weeds tend to gain a foothold where there is disturbance in the ecosystem. Studies show that new roads and utilities ROWs can become pathways for the spread of invasive plants.

The EPA suggests that a vegetation management plan be prepared to address control of such plant intrusions. The plan should list the noxious weeds and exotic plants that occur in the project area. In areas where noxious weeds are a threat, the EPA recommends that the EIS detail a strategy for prevention, early detection of invasion and control procedures for each species. Early recognition and control of new infestations is essential in stopping the spread of infestation and avoiding future widespread use of herbicides, which could correspondingly have more adverse impacts on diversity and nearby water resources.

Air Quality

The EPA recommends that the EIS evaluate and disclose potential air quality effects of transmission line construction and operation alternatives including emissions of dust particulates related to proposed road improvements and new road construction. Airborne dust may not only be a visual nuisance, but can be potentially dangerous to asthma sufferers and others with respiratory illnesses. The EPA recommends that construction techniques and appropriate dust control methods to reduce airborne dust and sediment runoff from the project area be addressed in the EIS.

Based on consultation with Rural Utilities Services, the EPA understands that the proposed project will be transporting electricity primarily from the Antelope Power Station. As a connected action to the proposed project, we recommend that the EIS discuss any additional air emissions from the power station that are a result of producing additional electricity for the new proposed transmission line. We recommend that the EIS also discuss any potential means to mitigate project-related air emissions.

Greenhouse Gas Emissions and Climate Change

The EPA recommends that the EIS include an analysis and disclosure of direct and indirect greenhouse gas (GHG) emissions. Indirect GHG emissions are related to the sources of the electricity that are carried by the proposed transmission line. We suggest the following approach:

- Quantify and disclose projected annual and total project lifetime cumulative GHG emissions in CO_2-equivalent terms and translate the emissions into equivalencies that are easily understood by the public (see http://www.epa.gov/cleanenergy/energy-resources/calculator.html).
- Analyze reasonable alternatives and/or potential means to mitigate project-related GHG emissions.

These scoping comments are intended to help ensure a comprehensive assessment of the project's environmental impacts, adequate public disclosure, and an informed decision-making process for alternatives selection. We understand that you are well versed in many of these topics but offer a complete letter to provide our input early in the process. We sincerely hope that our scoping comments will be beneficial to you and the project, and that they will help streamline the process. If you have any questions about these scoping comments, please contact me at (303) 312-6925, or Robert Edgar of my staff at (303) 312-6669, or via e-mail at robert.edgar@epa.gov.

Sincerely,

Suzanne J. Bohan
Director, NEPA Compliance and Review Program
Office of Ecosystems Protection and Remediation

USDA Rural Development

Comments/Questions

U. S. Department of Agriculture, Rural Development, Utilities Programs (Rural Utilities Service) Scoping Meeting

AVS to Neset 345-kV Transmission Project

I own property in The SW1/4 - 154 - 101 of Williams County And Am Happy To See The line will be west of My Property rather Than on it which would have Concerned Me. A WAPA Line Already Exists on Our Property And Affects property Values on Land I can sell for residential use.

Name: Doug & Carolyn Nenow

Address: 14962 22nd. St. NW Alexander ND 58831

If you would like to take this form with you, please mail to:

Mr. Dennis Rankin
USDA, Rural Utilities Service,
Engineering & Environmental Staff
1400 Independence Ave. SW
Mail Stop 1571, Room 2244
Washington, DC 20250-1570
202-720-1953 or dennis.rankin@wdc.usda.gov

Knauer, Greg

From: Rankin, Dennis - RD, Washington, DC <Dennis.Rankin@wdc.usda.gov>
Sent: Tuesday, December 06, 2011 6:39 AM
To: Hughes, Robert; Matt Marsh
Cc: Cris Miller
Subject: FW:

fyi

From: Laska Nygaard [mailto:laskaandbrent@comcast.net]
Sent: Saturday, December 03, 2011 12:01 AM
To: Rankin, Dennis - RD, Washington, DC
Cc: brenttap@comcast.net; 'Laska Nygaard'
Subject:

Mr. Rankin,

I have just heard about the proposal to run an electric transmission line through a roadless area right near Theodore Roosevelt National Park. And I have learned that the deadline for public comment is today (2 Dec.), so I want to get this email to you in time.

I was born in North Dakota. My parents moved away to college in the Twin Cities when I was a toddler, so I grew up there, but western North Dakota and especially Theodore Roosevelt National Park (the Park) are the land of my family and heart and spirit. They are irreplaceable and they are fragile and blessedly beautiful. When you stand there, no matter the time of year or the weather, you can get a last, almost forever lost sense of earth as God made it, as he intended it as a communication to us as stewards of our beautiful home.

I am terribly concerned that location of a power transmission line – not to mention all the traffic and, well, mess needed to build it and maintain it – would be a horrendous detriment to this area already so threatened today. And how threatened? By hungry searching and fracking for oil without taking time to pre-think of the consequences it will have for future North Dakotans, future Americans, due to an irreparable hurt to our land and general environment.

The Park and the roadless areas around it are among the last few avenues for wildlife and for wild recreation by caring people. If we are to preserve something for our children, we must preserve it. If we want to continue to be America strong and a showcase for the dreams of the rest of the world, more and more that showcase will need to include natural surroundings, because that is what the rest of the world is fast destroying; keeping these vestiges strong and protected is an investment in our nation on the ground now, for posterity's well-being, and to keep America strong. I firmly believe this, and I firmly believe ignoring it is short-sighted and will be our downfall if we do not heed it. We must preserve a place for animals to live, people to actual see some, and people to actually see some natural earth. These things will soon be the most precious things in the world, not only as a matter of fact but as a matter of money.

And, the area we are talking about is small, and there are viable, healthier alternatives for the line. There is little protected area left, and the more of that little we maintain the better we'll be.

Kindly put me on your mailing for future information about the NEPA process. Thank you.

Best regards,
Laska Bairne Nygaard

1088 Hyacinth Avenue East
St Paul MN 55106
612-518-8371

Knauer, Greg

From: Rankin, Dennis - RD, Washington, DC <Dennis.Rankin@wdc.usda.gov>
Sent: Tuesday, December 06, 2011 6:48 AM
To: Hughes, Robert; Matt Marsh
Cc: Cris Miller
Subject: FW: Basin Electric transmission line ND

fyi

From: RBaker [mailto:rdbaker12@gmail.com]
Sent: Tuesday, November 29, 2011 9:53 PM
To: Rankin, Dennis - RD, Washington, DC
Subject: Basin Electric transmission line ND

Dear Mr. Rankin,
I'm writing to ask that all efforts be made to keep Basin Electric from building a transmission line through the Lone Butte roadless area or anywhere near Theodore Roosevelt National Park in North Dakota. Western N D has been devastated by oil and gas development in the last several years, there are few places left that have not been altered forever. Please keep Loan Butte and Theodore Roosevelt National Park wild. The human soul needs wild places.

Roberta Baker
619 3rd St. E
Northfield, MN 55057

a North Dakota native

Knauer, Greg

From: Rankin, Dennis - RD, Washington, DC <Dennis.Rankin@wdc.usda.gov>
Sent: Tuesday, December 06, 2011 6:48 AM
To: Hughes, Robert; Matt Marsh
Cc: Cris Miller
Subject: FW: concerns about utility corridor

fyi

From: Mary Sand [mailto:marysand01@gmail.com]
Sent: Wednesday, November 30, 2011 1:14 PM
To: Rankin, Dennis - RD, Washington, DC
Subject: concerns about utility corridor

Mr. Dennis Rankin
Environmental Protection Specialist
USDA, Rural Utilities Service
1400 Independence Avenue SW
Mail Stop 1571, Room 2244
Washington, DC 20250-1571
dennis.rankin@wdc.usda.gov

Dear Mr. Rankin,

I understand that Basin Electric Power Cooperative is proposing to run a large electrical transmission line for the oil industry through Lone Butte roadless area. Please do not let this happen! Besides being part of the Prairie Legacy Wilderness proposal, the Lone Butte area is adjacent to the North Unit of Theodore Roosevelt National Park and the Long X Divide. These areas are already seriously encircled by development. They are precious wildlife habitat and wildlife corridors, among the few that remain.

Western ND now has roads and traffic and oil wells almost everywhere, because of oil development. Many of us are feeling overwhelmed by the rapidity, enormity, and relentlessness of it all. Please help us protect the few roadless areas we have left, for the sake of recreation, wildlife, and the spirit of North Dakota. We must reserve some natural landscape to pass on to our children. Move this proposed utility corridor wholly away from our few remaining undeveloped public lands.

Sincerely,

Mary Sand
93 112th Avenue NW
Killdeer, ND 58640

Knauer, Greg

From: Rankin, Dennis - RD, Washington, DC <Dennis.Rankin@wdc.usda.gov>
Sent: Tuesday, December 06, 2011 6:47 AM
To: Hughes, Robert; Matt Marsh
Cc: Cris Miller
Subject: FW: Basin Electric Power Line proposal through Lone Butte roadless area, North Dakota

fyi

-----Original Message-----
From: Rob Sand [mailto:straw@ndsupernet.com]
Sent: Wednesday, November 30, 2011 2:05 PM
To: Rankin, Dennis - RD, Washington, DC
Cc: Jan Swenson
Subject: Basin Electric Power Line proposal through Lone Butte roadless area, North Dakota

Mr. Dennis Rankin
Environmental Protection Specialist
USDA, Rural Utilities Service
1400 Independence Avenue SW
Mail Stop 1571, Room 2244
Washington, DC 20250-1571

Mr. Dennis Rankin,

I attended the informational session in Killdeer, ND on Nov. 18. My home is in the Killdeer Mountains, which puts me close to and familiar with the areas that are put forward as sites for a large electric power transmission line.

I am firmly opposed to the "preferred" route through the Lone Butte Roadless Area, an area that is strikingly beautiful as well as a buffer to the Theodore Roosevelt National Park. The Badlands Conservation Alliance, of which I am president, has a proposal, the Prairie Legacy Wilderness Proposal, to give protection under the Wilderness Act to some blocks of land in the Little Missouri National
Grasslands. Lone Butte is is one of the jewels in that Proposal,
Another jewel is the Long X Divide, which is south of and adjacent to the North Unit of the Theodore Roosevelt National Park.

The vast majority of western North Dakota is open to oil and gas exploration and the infrastructure that comes with it. The entire area, including the Parks and wild areas, are feeling the impact to a greater or lesser degree. Setting some areas aside for the sake of solitude, spiritual renewal, scientific study, non-motorized recreation, hunting, and ranching is our urgent responsibiity to this and future generations.

Building the proposed power line through the Lone Butte Roadless Area/ proposed wilderness would diminish the environment and also damage the chances for wilderness designation. Our organziation, and our co- sponsors, will go to more lengths to make the case for leaving the Lone Butte area alone. We insist that the case be taken seriously.

Sincerely yours,

Rob Sand
93 112th Avenue NW
Killdeer, ND 58640

(701) 764-6400

Knauer, Greg

From: Rankin, Dennis - RD, Washington, DC <Dennis.Rankin@wdc.usda.gov>
Sent: Tuesday, December 06, 2011 6:47 AM
To: Hughes, Robert; Matt Marsh
Cc: Cris Miller
Subject: FW: Lone Butte roadless area; Basin Electric

fyi

From: Mcenroe [mailto:memcenroe@midco.net]
Sent: Thursday, December 01, 2011 11:18 AM
To: Rankin, Dennis - RD, Washington, DC
Subject: Lone Butte roadless area; Basin Electric

Mr. Dennis Rankin
Environmental Protection Specialist
USDA, Rural Utilities Service
1400 Independence Avenue SW
Mail Stop 1571, Room 2244
Washington, DC 20250-1571

Dear Mr. Rankin:

I am writing to voice my opposition to Basin Electric Power Cooperative's proposal to route an electric transmission line through the Lone Butte roadless area of the Little Missouri National Grasslands. The 11,510 acre Lone Butte roadless area has been proposed for several years as a Wilderness Study Area. I support keeping Lone Butte roadless and becoming a Wilderness Study Area. The proposed transmission line would destroy both those options.

Currently only 60,000 acres of the Little Missouri National Grasslands out of over one million acres remain in a roadless condition. The Badlands/National Grasslands are the spirit and legacy of North Dakota's western heritage. The rapid and largely un-directed oil and gas development in North Dakota threatens this heritage and the State's rural and pastoral way of life. Keeping a few areas such as the Lone Butte area in their natural condition is a worthy consideration of the USDA.

Places such as Lone Butte are very important to me and are one of the reasons my family and I chose to live in North Dakota. I visited Lone Butte last summer and was appalled at the oil and industrial development occurring in the Badlands all around places like Lone Butte. Lone Butte as a roadless area with minimal use, provides a valuable buffer to the North Unit of Theodore Roosevelt National Park.

Basin Electric has an alternative route for this transmission line. Please direct them to chose the less damaging route that avoids the Lone Butte area.

Thank you for the consideration of my comments.

Mike McEnroe
7455 Brook Loop
Bismarck, ND 58503

Knauer, Greg

From:	Rankin, Dennis - RD, Washington, DC <Dennis.Rankin@wdc.usda.gov>
Sent:	Tuesday, December 06, 2011 6:46 AM
To:	Hughes, Robert; Matt Marsh
Cc:	Cris Miller
Subject:	FW: Basin Electric Cooperative Power Line Proposal
Attachments:	Cummisk, Lone Butte letter to Dennis Rankin.docx

fyi

From: Gary Cummisk [mailto:cummisk@hotmail.com]
Sent: Thursday, December 01, 2011 12:48 PM
To: Rankin, Dennis - RD, Washington, DC
Subject: Basin Electric Cooperative Power Line Proposal

Dear Mr. Rankin,

Please see that attached letter regarding the proposed Basin Electric Cooperative proposal for an electrical transmission line through Lone Butte and adjacent to Theodore Roosevelt National Park.

Gary Cummisk
836 13th Avenue West
Dickinson, ND 58601 [home]
(701) 225-2005 home
(701) 590-3470 cell
cummisk@hotmail.com

December 1, 2011

Gary Cummisk
836 13th Avenue West
Dickinson, ND 58601

Mr. Dennis Rankin
Environmental Protection Specialist
USDA, Rural Utilities Service
1400 Independence Avenue SW
Mail Stop 1571, Room 2244
Washington, DC 20250-1571

Dear Mr. Rankin:

I am writing you regarding Basin Electric Cooperative's proposal to run an electrical transmission line through the proposed Lone Butte roadless area and close to the Theodore Roosevelt National Park boundary. As I understand it, this is Basin Electric's preferred alternative. I think that this is a very bad idea. The Lone Butte area and Theodore Roosevelt National Parks are two of the most scenic and pristine landscapes in western North Dakota. As a member of the Badlands Conservation Alliance and as a concerned citizen, I know that the grasslands and badlands of western North Dakota are under pressure from rapid oil development. Many of these habitats are becoming isolated islands. It is imperative that we act now to protect these delicate natural resources while they are intact.

I have spent considerable time in the Lone Butte area. It is a haven for wildlife and a place where one can experience the quietude and majesty that Theodore Roosevelt celebrated over a century ago. This backcountry has been a haven for ecotourism and hunting. Power lines will mar the landscape and disturb wildlife. There are only six identified areas suitable for future wilderness designation in North Dakota. The Lone Butte area is one of them, and perhaps the best example left in the western region of our state.

This proposal is required to go through the NEPA process. It would be best to avoid the costs of analyzing the Lone Butte alternative and to plan for an alternate route now. The Lone Butte alternative is short-sighted and harmful to the ecology and long-term human benefit of North Dakota.

Sincerely,

Gary Cummisk

Gary Cummisk
(701) 225-2005

Knauer, Greg

From: Rankin, Dennis - RD, Washington, DC <Dennis.Rankin@wdc.usda.gov>
Sent: Tuesday, December 06, 2011 6:46 AM
To: Hughes, Robert; Matt Marsh
Cc: Cris Miller
Subject: FW: Basin Electric - Macro-Corridor and Alternatives Report for the AVS to Neset 345-kV Transmission Project

fyi

From: Gia Cummisk [mailto:giacummisk@hotmail.com]
Sent: Thursday, December 01, 2011 6:49 PM
To: Rankin, Dennis - RD, Washington, DC
Subject: Basin Electric - Macro-Corridor and Alternatives Report for the AVS to Neset 345-kV Transmission Project

December 1, 2011

Gia Cummisk
836 13th Ave. West
Dickinson, ND 58601

Mr. Dennis Rankin
Environmental Protection Specialist
USDA, Rural Utilities Service
1400 Independence Avenue SW
Mail Stop 1571, Room 2244
Washington, DC 20250-1571

Dear Mr. Rankin,

I'm concerned about the recent proposal "Macro-Corridor and Alternatives Report for the AVS to Neset 345-kV Transmission Project" by Basin Electric. My choice to reside in North Dakota was for its isolated, wild and untrammeled feeling. Its low population density and lack of industrialization is and was part of the draw for me to this region. The oilfield pressure on all infrastructures is overwhelming the roads, agencies, and any other officials designed to provide services for the public and the region. Many of the public and private lands are being drilled and although the footprint of the drilling pad may be rather small the impact of the drilling and pumping is much larger. It affects the solitude for humans and wildlife, and the wild and wilderness feel is impacted with noise, light, and lowered air quality. Violating one or two of the few small roadless areas that are "wilderness like" is a detriment to all future generations. The Lone Butte Wilderness Study Area is a sensitive and very special place for wildlife that needs quiet and solitude for key habitat requirements. This area has been proposed as one of six relatively small areas to become wilderness. Coupled with the other five small areas it would amount to 1/10 th of 1% of the land area in North Dakota. Another small area of concern is the area just south of the North Unit of Theodore Roosevelt National Park. The two combined areas are roughly 31 sections of public land managed by the US Forest Service and two sections of North Dakota School lands. These small areas and their proximity to the North Unit of Theodore Roosevelt National Park will benefit the wildlife in all these areas allowing them more area and habitat for hunting and feeding their young.

I urge you to help the citizens of North Dakota to try and retain the small wild areas that are wilderness like and can provide for the experience of solitude for all living creatures, wildlife and humans. Although I recognize that you are responding to a need, I hope that Basin Electric can and will utilize existing rights-of-ways and upgrade their existing towers, etc. for more efficiency and leave and support the few small wild and sensitive areas that have the possibility of wilderness designation for future generations.

Sincerely,

Gia Cummisk
giacummisk@hotmail.com

Areas of concern include the following sections of ground.
Township 147 North Range 98 West, sections 11, 14, 15, 16, 17, 19, 20, 21, 22, 23, 24, 26,27,28, 29,30, part of 32, 33, part of 34. Also Township 147 North Range 99 West, sections 3, 7, 8, 9, 10, part of 11, 14, 15, 16, 17, 18, 19, 23 and 24.

Knauer, Greg

From:	Rankin, Dennis - RD, Washington, DC <Dennis.Rankin@wdc.usda.gov>
Sent:	Tuesday, December 06, 2011 6:45 AM
To:	Hughes, Robert; Matt Marsh
Cc:	Cris Miller
Subject:	FW: North Dakota Basin Electric transmission line comment

fyi

From: Barbara Hatfield [mailto:bhfield27@hotmail.com]
Sent: Thursday, December 01, 2011 7:41 PM
To: Rankin, Dennis - RD, Washington, DC
Subject: North Dakota Basin Electric transmission line comment

Mr. Dennis Rankin
Environmental Protection Specialist
USDA, Rural Utilities Service
1400 Independence Avenue SW
Mail Stop 1571, Room 2244
Washington, DC 20250-1571

Dear Mr. Rankin:

I am writing to state my opposition to the route for the electrical transmission line that Basin Electric Power Cooperative is proposing to run through the Lone Butte roadless area in southwestern North Dakota. Basin Electric must find another route that leaves both Lone Butte and the North Unit of Theodore Roosevelt National Park undisturbed.

My opposition to this project as currently proposed is huge as the prairie sky and as steadfast as the planet's bedrock. The Lone Butte roadless area is an essential place of respite in a larger area under great stress from rapid development. People, plants and animals are all well served by this area remaining undisturbed.

It is clear that the development that is taking place in western North Dakota will go forward. I propose that it be done with some balance in mind. The protection of Lone Butte roadless area and the National Park is an excellent opportunity to take a stand for the essential value inherent in the areas themselves and as a general statement of the broad and long-term considerations to be taken into account as development proceeds.

I am a North Dakotan. Though I grew up in the eastern part of the state in the Red River Valley I visited the Badlands regularly with my family and later, on my own and with friends. I live away right now and come back as often as I can. In future visits I will bring my granddaughter who lives in Fargo to Lone Butte and renew my own experience there as she discovers its plants and critters, its openness and solace. I want her to be able to breathe free and hear the silence and be moved to return again and again and one day bring her own grandchildren to share in the quiet majesty of wilderness.

Basin Electric must find another route that leaves both Lone Butte and the North Unit of Theodore Roosevelt National Park undisturbed.

Thank you for your consideration of my comments.

Sincerely,
Barbara Hatfield

Knauer, Greg

From: Rankin, Dennis - RD, Washington, DC <Dennis.Rankin@wdc.usda.gov>
Sent: Tuesday, December 06, 2011 6:45 AM
To: Hughes, Robert; Matt Marsh
Cc: Cris Miller
Subject: FW: AVS to NESET 345-Kv Transmission Project

fyi

From: Mariah Lancaster [mailto:mariah_hallidayhorsegirl@yahoo.com]
Sent: Thursday, December 01, 2011 10:56 PM
To: Rankin, Dennis - RD, Washington, DC
Subject: AVS to NESET 345-Kv Transmission Project

I am writing to submit comments on the propsed Basin Electric Powerline route. I am deeply concerned about the threat to the North Unit of Theodore Roosevelt National Park and the Little Missouri National Grasslands, including Lone Butte. I feel these areas need to be protected from development. I enjoy spending time in the Park and feeling like I am witnessing how the wilderness is meant to be. The joy of standing on a butte and viewing the rugged landscape and the occasional buffalo is priceless. I spent a week this summer volunteering at the North Unit of Theodore Roosevelt National Park maintaining trails and fixing fences with a group of students. It was hard work but it was great to see how much visitors appreciated our work on making the Park look better. I truly realized the wonderful area we (as North Dakotans) have by watching the amazement in the other students (from out of state and out of country) eyes as they watched a beautiful sunset, or climbing up a butte to search for wildlife. I then understood how much this land meant to me and how much it can mean to others. One of the students was from Hong Kong and he told me repeatedly how amazing it was to just look off and see nothing but badlands! This is a place I strongly believe we should keep natural. The North Unit of Theodore Roosevel National Park and the surrounding area is increasingly becoming one of the few remaing places that is untouched by development. The rapid growth of oil development has damaged many areas across western North Dakota. The amount of traffic and buildings is pushing wildlife into smaller and smaller regions. I hope that the Little Missouri National Grasslands and The North Unit Of Theodore Roosevelt National Park Park can be with held from this rush to build. This natural beauty shouldn't be changed. I hope that alternative routes can be used.

Sincerely,

Mariah Lancaster

Knauer, Greg

From: Rankin, Dennis - RD, Washington, DC <Dennis.Rankin@wdc.usda.gov>
Sent: Tuesday, December 06, 2011 6:44 AM
To: Hughes, Robert; Matt Marsh
Cc: Cris Miller
Subject: FW: Public comment on Basin Electric power line

fyi

From: Erik Sorensen [mailto:erikpsorensen@yahoo.com]
Sent: Thursday, December 01, 2011 11:28 PM
To: Rankin, Dennis - RD, Washington, DC
Subject: Public comment on Basin Electric power line

Mr. Rankin,

I am writing to express my opposition to one of the possible macro-corridor segments of the transmission line that Basin Electric Power Cooperative has proposed building to service the oil fields of western North Dakota.

Proposed segment D would take the transmission line in close proximity to the North Unit of Theodore Roosevelt National Park as well as the Lone Butte area, a portion of the Little Missouri National Grasslands that has been identified by the US Forest Service as suitable for wilderness.

I grew up camping, hiking, and picnicking in the national park, and hunting in the grasslands. The experience in the badlands today is hugely different than it was just a few years ago due to the impact of oil development. As an example, while deer hunting in the grasslands this fall near Highway 85, my father and I heard the continuous drone of traffic from the highway. A few years ago, the traffic noise would have been sporadic instead of constant.

I am not against oil development, and I realize there needs to be infrastructure improvements to support the industry. However, North Dakota has painfully few areas that are not already cut up by roads and other development. Besides the units of the national park, there are only a handful of areas like the land around Lone Butte that are suitable for protection as wilderness areas.

I feel that segment D should be eliminated as a possible route for Basin's proposed transmission line, and that this line and any future power transmission projects should be routed to avoid the national park units and the areas in the grasslands that have been identified as suitable for wilderness. We need to preserve the few wild lands we have left in North Dakota.

Thank you,

Erik P. Sorensen
1057 41st Ave W
West Fargo, ND 58078
701-234-1989(h)

Knauer, Greg

From:	Rankin, Dennis - RD, Washington, DC <Dennis.Rankin@wdc.usda.gov>
Sent:	Tuesday, December 06, 2011 6:44 AM
To:	Hughes, Robert; Matt Marsh
Cc:	Cris Miller
Subject:	FW: Notice of Intent for Preparation of an Environmental Impact Statement for Basin Electric Power Cooperative's proposed Antelope Valley Station to Neset Transmission Project in North Dakota

fyi

From: Lillian Crook [mailto:lilliancrook@hotmail.com]
Sent: Friday, December 02, 2011 11:06 AM
To: Rankin, Dennis - RD, Washington, DC
Subject: RE: Notice of Intent for Preparation of an Environmental Impact Statement for Basin Electric Power Cooperative's proposed Antelope Valley Station to Neset Transmission Project in North Dakota

Lillian Crook and Jim Fuglie
920 Arthur Drive
Bismarck, ND 58501

December 2, 2011

Mr. Dennis Rankin
Environmental Protection Specialist
USDA, Rural Utilities Service
1400 Independence Avenue SW
Stop 1571
Washington, DC 20250-1571

RE: Notice of Intent for Preparation of an Environmental Impact Statement for Basin Electric Power Cooperative's proposed Antelope Valley Station to Neset Transmission Project in North Dakota

Dear Mr. Rankin:

We are contacting you as lifelong western North Dakotan and as the founder and a member of Badlands Conservation Alliance (BCA), a western North Dakota based non-profit organization focused on public lands and public natural resources in western North Dakota, particularly Theodore Roosevelt National Park and the Little Missouri National Grassland. We have a deep familiarity with these lands and visit them regularly, as well as maintain close friendships with those who live in these areas.

We strongly assert that that Macro-Corridor D should be dropped from consideration for this project. With the development of the past thirty years in western North Dakotan accelerating in the most recent years in an alarming fashion, these remaining wild lands are but fragments, and more precious fragments than ever before. As this has become apparent, we believe that more and more North Dakotans are insisting upon cautious, careful and judicious development.

The proposal results in unacceptable negative impacts to not only the Lone Butte area but also to a jewel in the crown of North Dakota, the North Unit of Theodore Roosevelt National Park.

These are not only areas that are of value to people, both residents and visitors, but are also critical to unfragmented wildlife habitat.

We love this area and visit it regularly for renewal: physical, emotional, cognitive, and spiritual. It is for us the equivalent to a cathedral in Rome or Boston or Bismarck – and its formation took millions of years more than these edifices humankind values so. I've taken people there when convincing them to return to North Dakota to contribute here, and I've taken people here who are healing from terrible grief. We hunt, hike, camp, and canoe in this area – and so much more.

Yes, there are some existing developments in this corridor, but let's not open the door wide to complete industrialization in this sensitive and beautiful area. There are so few wild areas left. Please let's leave the precious fragments from this point forward as the creator intended.

Sincerely,

Lillian Crook and Jim Fuglie

Knauer, Greg

From: Rankin, Dennis - RD, Washington, DC <Dennis.Rankin@wdc.usda.gov>
Sent: Tuesday, December 06, 2011 6:42 AM
To: Hughes, Robert; Matt Marsh
Cc: Cris Miller
Subject: FW: Notice of Intent for Preparation of an Environmental Impact Statement for Basin Electric Power Cooperative's proposed Antelope Valley Station to Neset Transmission Project in North Dakota
Attachments: Rask_Lone Butte_letter_to_USDA.pdf

fyi

From: Jon Rask [mailto:jonrask1@gmail.com]
Sent: Friday, December 02, 2011 1:27 PM
To: Rankin, Dennis - RD, Washington, DC
Subject: RE: Notice of Intent for Preparation of an Environmental Impact Statement for Basin Electric Power Cooperative's proposed Antelope Valley Station to Neset Transmission Project in North Dakota

Dear Mr. Rankin:

I want you to understand how important this is to myself, and provide you some insight into the perspective I have, and what I have seen on the Earth. I grew up farming and ranching in North Dakota. I have also traveled a great deal. I am currently a scientist and explorer who works for our Nation's space program. My research has allowed me to experience wilderness in North America, South America, the Middle East, Australia, the Arctic, and in Antarctica. My work has also allowed me to explore the vast prairies of North America; I have seen all the National Grasslands between Denver and Bismarck.

While I have explored the interior of glaciers, lifeforms at the South Pole, the craters of volcanoes, the hottest and coldest deserts, and the most ancient landforms and fossils on Earth, I have never been more inspired by, or seen a more stunning landscape than the lands of the Little Missouri National Grasslands. They are truly sublime in their native state. It is why the Macro-Corridor D should be completely and totally dropped from consideration for this project.

The prairie is arguably one of the most misunderstood and most abused of all of Earth's biomes. To those who do not understand, it is considered empty, and should be passed by quickly, or be modified for a purpose it was not designed to ever accomplish. The current oil and gas industrialization tsunami that is currently ongoing in North Dakota exemplifies this heartbreaking misunderstanding.

To those with trained eyes, and for those who have experienced it, we know it is something very special and worth preserving. Prairie wilderness is a quiet, haunting, and rich landscape with fertile and fragile soils that gives rise to wildlife; it feeds our cattle, our horses, our sheep, and ourselves. It sequesters massive amounts of carbon from the atmosphere. The LMNG prairie landscapes also preserve evidence of ancient life, and have landforms useful to NASA in its search for life elsewhere in the solar system. It provides recreation opportunities, and reminds us that we are human, and that we are part of the Earth. It is the setting of jaw-dropping historical drama, and inspired a man to become the President of the United States–and establish our National Parks!

Preserving the last remaining roadless areas of the LMNG is of the utmost priority for all of these reasons. Moreover, the cumulative impacts of oil and gas development in North Dakota are overwhelming, and threaten every aspect of the environment in the North Dakota. A staggering amount of prairie and agricultural land has been industrialized in less than five years; the scars are even visible from space.

In the early 1970s, approximately half of the LMNG's 1.1 million acres was undeveloped. By the late 1970s that acreage had been cut in half. Today, less than 40,000 acres under what the 2002 Land and Resource Management Plan are identified as "suitable for wilderness." This includes the Lone Butte Roadless area, where Macro-Corridor D is proposed. The policies and actions that have caused the rapid, startling loss of wilderness quality lands in North Dakota begs to be addressed, and we need to ensure that areas like the Lone Butte Roadless area are preserved, left roadless, and allowed to remain undeveloped forever. If we do not, it will be a "wedge factor" that will likely encourage the further plunder of our roadless public lands in North Dakota.

Again, it is my strongly held position, that Macro-Corridor D should be completely dropped from consideration for this project. If the Lone Butte roadless area is industrialized, it will destroy the local and Teddy Roosevelt National Park viewsheds. Furthermore, it will likely alter local Golden Eagle territorial usage, which is protected by the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act. The industrialization of Macro-Corridor D will degrade the local ecological integrity, *and eliminate one of the finest roadless areas of Planet Earth from the possibility of wilderness designation.* This is absolutely unacceptable.

At a September 2011 meeting in Dickinson, North Dakota, I asked Governor Schweitzer of Montana what he would do. He looked at me straight in the eyes and said, "Do everything you can to keep the last remaining roadless, wilderness-like areas of the North Dakota badlands undeveloped. Our most valuable lands are the roadless wilderness areas."

It is that kind of leadership that North Dakota, and the Little Missouri National Grasslands needs from the United States Department of Agriculture and the Forest Service right now. North Dakota and its people are uniquely positioned to create a greater awareness in all Americans with regard to changing climate and energy development. It is there where we can say, "Yes, we want our energy, but we want our environment too!"

We owe it to ourselves and to future generations: we must ensure that the last remaining wilderness-like quality landscapes of North Dakota's public lands are preserved. There is so little left. I hope everyone can experience what it has to offer because it is truly inspiring. I hope you have, or that you see it some day. We have the power to save it.

Sincerely,

Jon Rask
PO Box 228
Moffett Field, CA 94035
408.655.9284

Mr. Dennis Rankin
Environmental Protection Specialist
USDA, Rural Utilities Service
1400 Independence Avenue SW
Mail Stop 1571, Room 2244
Washington, DC 20250-1571

RE: Notice of Intent for Preparation of an Environmental Impact Statement for Basin Electric Power Cooperative's proposed Antelope Valley Station to Neset Transmission Project in North Dakota

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Sincerely,

Jon Rask

Jon Rask
PO Box 228
Moffett Field, CA 94035
408.655.9284

Knauer, Greg

From:	Rankin, Dennis - RD, Washington, DC <Dennis.Rankin@wdc.usda.gov>
Sent:	Tuesday, December 06, 2011 6:42 AM
To:	Hughes, Robert; Matt Marsh
Cc:	Cris Miller
Subject:	FW: Comments RE Basin Powerline
Attachments:	BasinElectric2.pdf

fyi

From: Anne Marguerite Coyle [mailto:flyfreege@aim.com]
Sent: Friday, December 02, 2011 2:11 PM
To: Rankin, Dennis - RD, Washington, DC
Subject: Comments RE Basin Powerline

Greetings Mr. Rankin,

I hope you will please read and take serious consideration to the comments I have provided concerning the following:

RE: Notice of Intent for Preparation of an Environmental Impact Statement for Basin Electric Power Cooperative's proposed Antelope Valley Station to Neset Transmission Project in North Dakota.

Thank you for your time and consideration,

Dr. Anne Marguerite Coyle

Assistant Professor of Biology
Jamestown College
Principle Investigator: North Dakota Golden Eagle Project

UnderGoldenWings
North Dakota Golden Eagle Project

December 2, 2011

Mr. Dennis Rankin
Environmental Protection Specialist
USDA, Rural Utilities Service
1400 Independence Avenue SW
Stop 1571
Washington, DC 20250-1571

RE: Notice of Intent for Preparation of an Environmental Impact Statement for Basin Electric Power Cooperative's proposed Antelope Valley Station to Neset Transmission Project in North Dakota

Dear Mr. Rankin:

I will start by introducing myself professionally. My name is Dr. Anne Marguerite Coyle (Margi), I am currently an assistant professor of biology at Jamestown College. My past employment as an ecologist/wildlife/ landscape biologist includes working for the UFWS, USFS, and the USGS. For the past 9 years I have served as the principle investigator of the North Dakota golden eagle project. I have studied the population in North Dakota extensively since 2002. I compiled all known nests, conducted nest site checks, new nest surveys, monitored reproduction, survival, mortality, juvenile dispersal and movements, created potential habitat models, and investigated the potential impacts of disturbance. I work closely with the USFWS federal agent, the Dakota Zoo, and the Minnesota Raptor Rehabilitation Center with the recovery of injured raptors. I not only created and managed the North Dakota golden eagle database, I also serve on the North America Conservation of the Golden Eagle Working Group with the other experts in North America.

I grew up in northeastern Indiana. My family was in the oil business for years. I understand perspectives of both business and biology. I was raised to believe that people in positions of power have an obligation to be leaders in the community. I also believe politicians, heads of industry, and other leaders have an obligation to lead with responsible citizenship. That means always placing human, community, and subsequently environmental health for-front in the decision-making process. As any successful business understands, on the job safety must be a top priority. This proactive preventative strategy reduces risk and saves the industry money in the long run. Similarly, being preventative on environmental, community, and human health issues will also lead to long-term success.

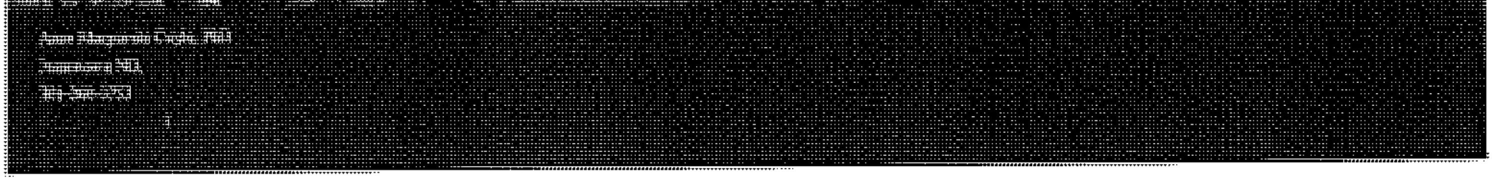
The Little Missouri National Grassland in western North Dakota provides some of the largest expanses of grasslands in North America. Grasslands are the second most heavily used and disturbed habitats worldwide. Approximately 47% of the temperate grasslands worldwide have been converted to agriculture or urban development. The remaining grasslands are under pressure from over-grazing and multi-use activities that compromise habitat integrity and species diversity. One of the largest threats to the remaining grasslands is habitat fragmentation. Once disturbed, the land can never recover completely. Most of the vegetative regeneration must come from root propagation, and in some cases this is prohibited by constructed and disturbed locations. Disturbed areas such as roads, oil pads, and industry infrastructure, hinder species movements, increase habitat fragmentation, and decreasing available habitat. Habitat is compromised in two ways, first by reduction of habitat area and second by providing corridors for invasive species. These non-native invasive species thrive in disturbed areas, out-compete native species, spread, and cause a cascading degradation to the integrity of neighboring in-tack grasslands habitats and consequently decrease species diversity and richness. Minimizing disturbance and maintaining large continuous sections of habitat provide core areas essential for maintaining ecological integrity and biodiversity.

Disturbances and invasive species can penetrate the exposed edges of a habitat. This is termed "edge effect". Large road-less and undisturbed areas have a larger "core" area compared to their perimeter. Therefore, lager core habitats are less influenced by activities and disturbances along the perimeter. Consequently, sections of habitat that have larger core areas contain greater biodiversity. These "core" areas if protected can be sources for populations of species. The species in the core area can flourish and help to maintain surrounding areas with dispersing individuals.

The core areas that have habitat surrounding them with minimal use have greater ecological integrity and greater biodiversity. This is because the surrounding areas can "buffer" the "edge effect" created by disturbances and invasive species. Theodore Roosevelt National Park and the surrounding National Grassland is an ideal example of such a system. The TRNP together with LMNG managed by the USFS then acts as a source for the overall ecological health and integrity of the entire grasslands ecosystem of western North Dakota.

Additionally, these grasslands provide the vital habitat for nesting golden eagles in North Dakota.

Therefore, I present to you two recommendations and supporting evidence to minimize potential impacts of the proposed placement of a major power line (Basin Electric Power Cooperative) on: 1) core habitat areas in the grasslands ecosystem and 2) the golden eagle population in Western North Dakota.



Recommendations:

1) Macro-Corridor D & E should be dropped from consideration for this project
2) All Power lines, all junctions, and related structures be constructed with the most effective raptor friendly equipment.

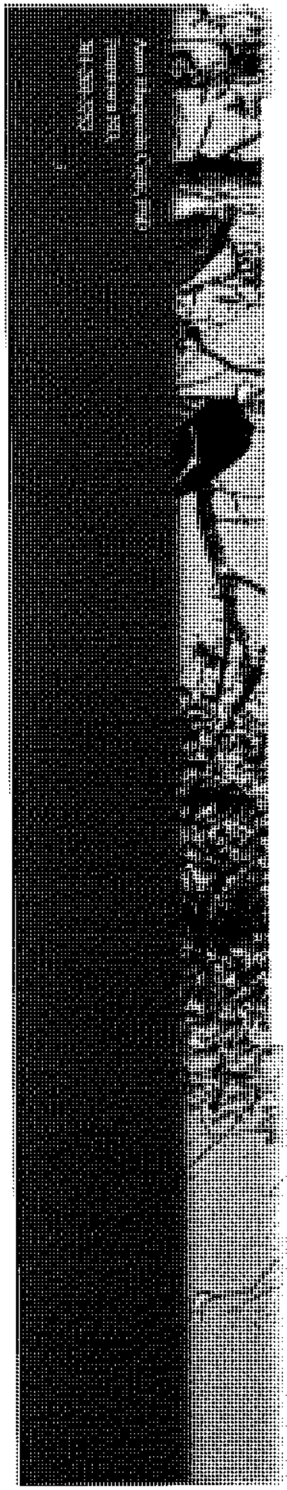
1) Figure 1 - There are over 200+ known potential territories and an uncertain number of undiscovered territories centered along the Little Missouri River and throughout the Little Missouri National Grassland extending west into Montana, as far east as Flasher, ND, and south into South Dakota. In some cases these birds can endure disturbance; however, each pair reacts differently and many have illustrated intolerance to disturbance. My research along with research in North America illustrates that electrocutions are a significant cause of mortality; and therefore, still present a direct threat to the population. Ensuring major power lines are directed away from known nesting territories is my strong recommendation. This will minimize fragmentation and disturbance in areas of critical habitat, and reduce the chance for electrocutions of golden eagles in high nest density areas. Therefore, I recommend Macro-Corridor D & E be dropped from consideration for this project.

2) Figure 2 - Not only do the LMNG serves as the primary nesting ground for golden eagles in North Dakota, they also provide vital habitat for dispersing juveniles. During my research I tagged 18 juvenile golden eagles and monitored their movements from 2002 - 2011. The data show that the entire Little Missouri National Grassland is extensively used by juvenile golden eagles. Data from birds collected during this study and data from other collections by the USFWS and the Minnesota Raptor Rehabilitation Center show numerous incidents of mortality resulting from electrocutions. The territory location and movement data, coupled with the mortality data. This will illustrate the imperative need to use raptor friendly equipment on any and all power lines in western North Dakota to ensure compliance with the US Migratory Bird Act and the Bald and Golden Eagle Act. Therefore, I strongly recommend that all power lines, junctions, and related infrastructure be constructed with the most effective raptor friendly equipment.

This study was funded by UND, NDGF, USFS, USFWS, DSU, and UGW.

Thank you for your time and consideration,

Dr. Anne Marguerite Coyle (Margi)
Jamestown ND,
701-260-3753; flyfreege@aim.cm / http://undergoldenwings.org/



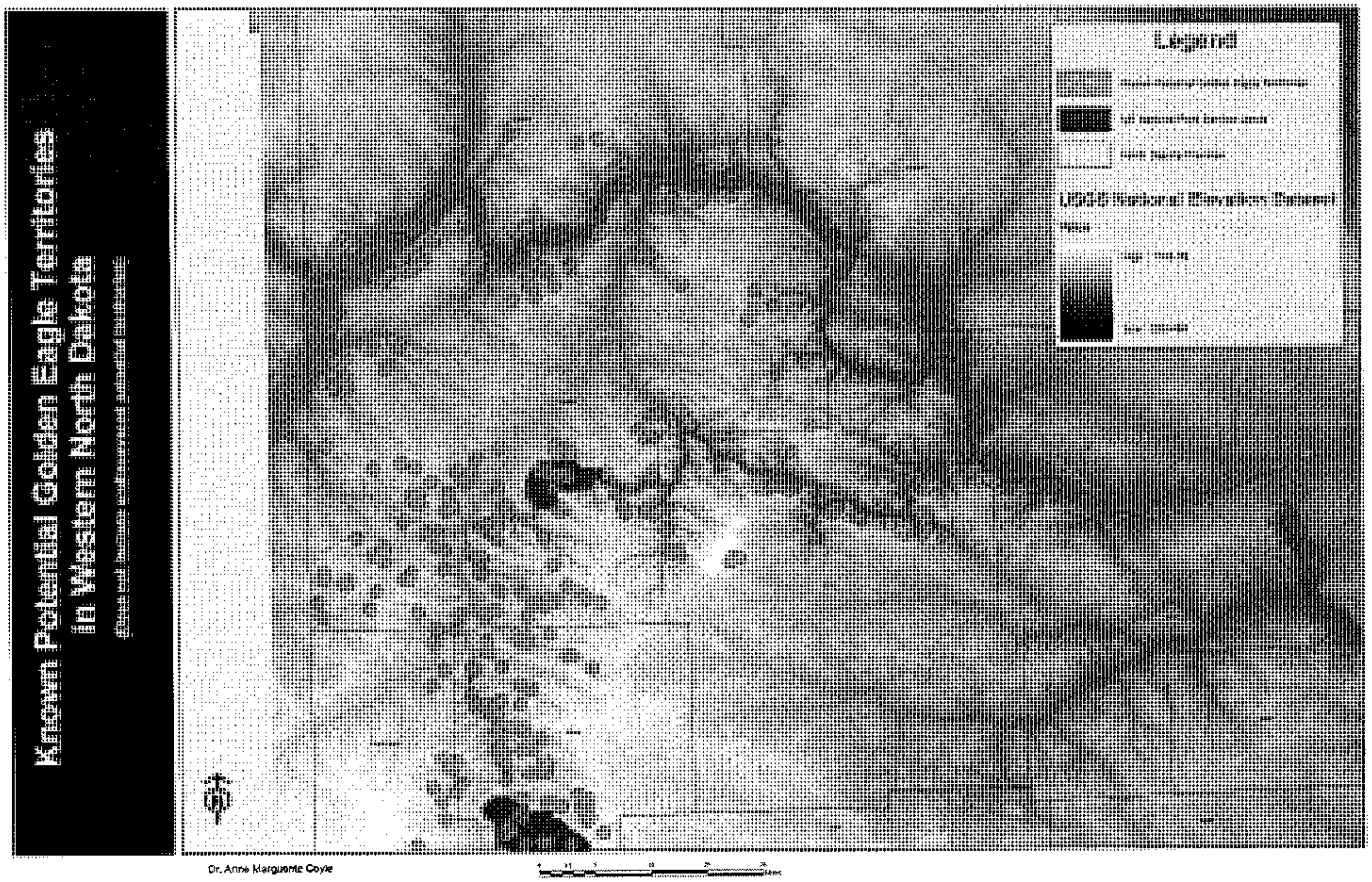


Figure 1. Known potential golden eagle nesting territories in western North Dakota. These were developed from known nesting site locations. Other undiscovered or new nest sites may exist therefore continued monitoring in areas prior to construction is necessary.

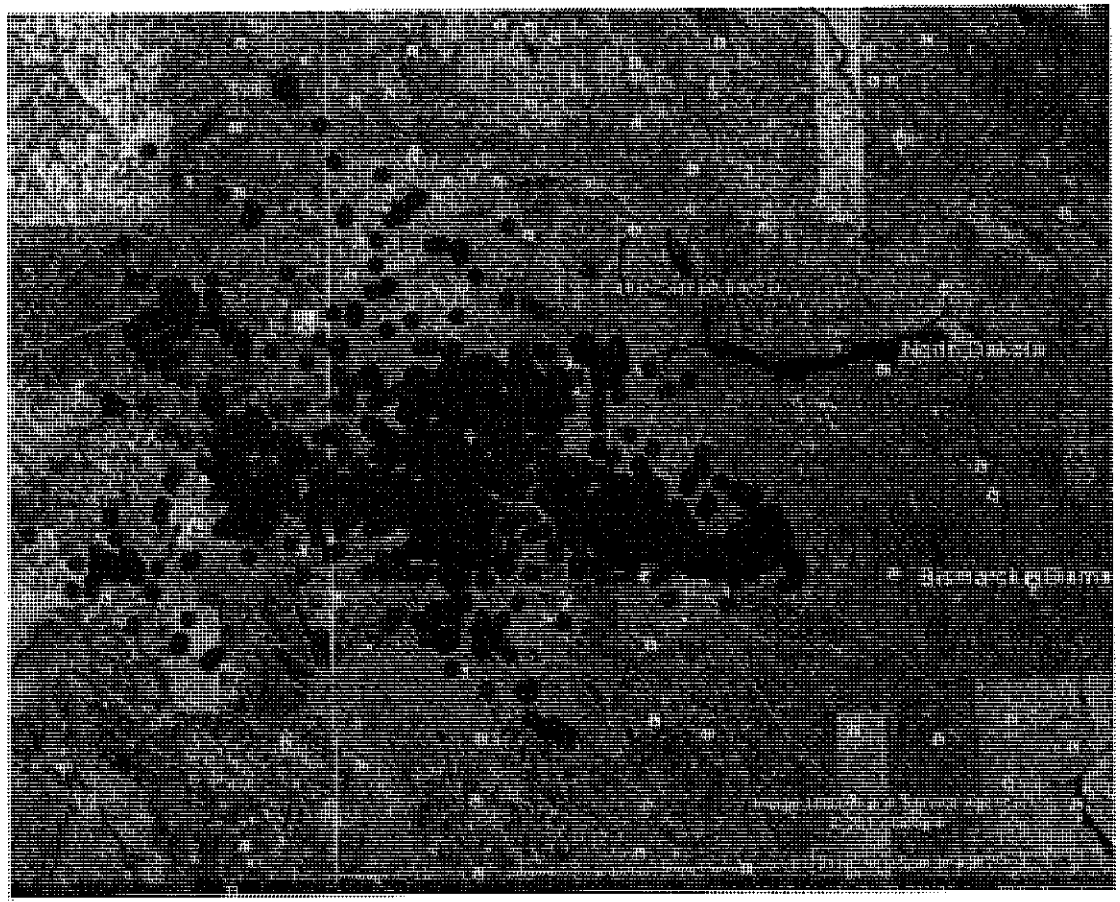
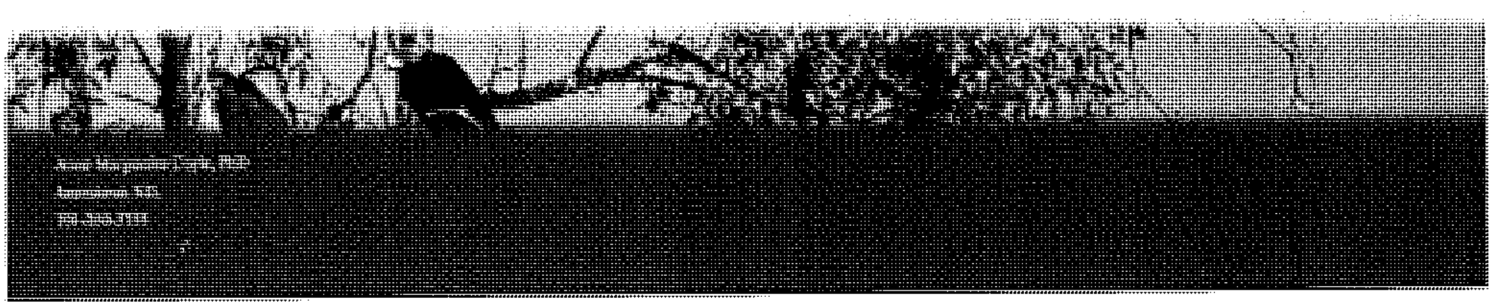


Figure 2. Evidence supporting the need to ensure all power lines and associated structures are constructed with raptor friendly equipment. Locations of 18 juvenile golden eagles tagged over 8 years with PPT Solar Paneled GPS units (2004-2011). The yellow lines depict the shortest distance between recorded GPS locations to indicate the sequence of movements. The lines do not represent the actual path taken by the bird between recorded points. Each bend in the line is a single GPS location. There may also be additional locations along the line used extensively by juvenile golden eagles. Not all locations are depicted on this map.



Knauer, Greg

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Attachments: BasinElectric2.pdf

fyi

From: Anne Marguerite Coyle [mailto:flyfreege@aim.com]
Sent: Friday, December 02, 2011 2:20 PM
To: Rankin, Dennis - RD, Washington, DC
Subject: RE: Comments RE Basin Powerline/

Mr. Rankin,

Please see attachment: Corrected version.
Thank you,

Dr. Coyle

From: Anne Marguerite Coyle [mailto:flyfreege@aim.com]
Sent: Friday, December 02, 2011 1:11 PM
To: 'dennis.rankin@wdc.usda.gov'
Subject: Comments RE Basin Powerline

Greetings Mr. Rankin,

I hope you will please read and take serious consideration to the comments I have provided concerning the following:

RE: Notice of Intent for Preparation of an Environmental Impact Statement for Basin Electric Power Cooperative's proposed Antelope Valley Station to Neset Transmission Project in North Dakota.

Thank you for your time and consideration,

Dr. Anne Marguerite Coyle

Assistant Professor of Biology
Jamestown College
Principle Investigator: North Dakota Golden Eagle Project

UnderGoldenWings
North Dakota Golden Eagle Project

December 2, 2011

Mr. Dennis Rankin
Environmental Protection Specialist
USDA, Rural Utilities Service
1400 Independence Avenue SW
Stop 1571
Washington, DC 20250-1571

RE: Notice of Intent for Preparation of an Environmental Impact Statement for Basin Electric Power Cooperative's proposed Antelope Valley Station to Neset Transmission Project in North Dakota

Dear Mr. Rankin:

I will start by introducing myself professionally. My name is Dr. Anne Marguerite Coyle (Margi), I am currently an assistant professor of biology at Jamestown College. My past employment as an ecologist/wildlife/ landscape biologist includes working for the UFWS, USFS, and the USGS. For the past 9 years I have served as the principle investigator of the North Dakota golden eagle project. I have studied the population in North Dakota extensively since 2002. I compiled all known nests, conducted nest site checks, new nest surveys, monitored reproduction, survival, mortality, juvenile dispersal and movements, created potential habitat models, and investigated the potential impacts of disturbance. I work closely with the USFWS federal agent, the Dakota Zoo, and the Minnesota Raptor Rehabilitation Center with the recovery of injured raptors. I not only created and managed the North Dakota golden eagle database, I also serve on the North America Conservation of the Golden Eagle Working Group with the other experts in North America.

I grew up in northeastern Indiana. My family was in the oil business for years. I understand perspectives of both business and biology. I was raised to believe that people in positions of power have an obligation to be leaders in the community. I also believe politicians, heads of industry, and other leaders have an obligation to lead with responsible citizenship. That means always placing human, community, and subsequently environmental health for-front in the decision-making process. As any successful business understands, on the job safety must be a top priority. This proactive preventative strategy reduces risk and saves the industry money in the long run. Similarly, being preventative on environmental, community, and human health issues will also lead to long-term success.

The Little Missouri National Grassland in western North Dakota provides some of the largest expanses of grasslands in North America. Grasslands are the second most heavily used and disturbed habitats worldwide. Approximately 47% of the temperate grasslands worldwide have been converted to agriculture or urban development. The remaining grasslands are under pressure from over-grazing and multi-use activities that compromise habitat integrity and species diversity. One of the largest threats to the remaining grasslands is habitat fragmentation. Once disturbed, the land can never recover completely. Most of the vegetative regeneration must come from root propagation, and in some cases this is prohibited by constructed and disturbed locations. Disturbed areas such as roads, oil pads, and industry infrastructure, hinder species movements, increase habitat fragmentation, and decreasing available habitat. Habitat is compromised in two ways, first by reduction of habitat area and second by providing corridors for invasive species. These non-native invasive species thrive in disturbed areas, out-compete native species, spread, and cause a cascading degradation to the integrity of neighboring in-tack grasslands habitats and consequently decrease species diversity and richness. Minimizing disturbance and maintaining large continuous sections of habitat provide core areas essential for maintaining ecological integrity and biodiversity.

Disturbances and invasive species can penetrate the exposed edges of a habitat. This is termed "edge effect". Large road-less and undisturbed areas have a larger "core" area compared to their perimeter. Therefore, larger core habitats are less influenced by activities and disturbances along the perimeter. Consequently, sections of habitat that have larger core areas contain greater biodiversity. These "core" areas if protected can be sources for populations of species. The species in the core area can flourish and help to maintain surrounding areas with dispersing individuals.

The core areas that have habitat surrounding them with minimal use have greater ecological integrity and greater biodiversity. This is because the surrounding areas can "buffer" the "edge effect" created by disturbances and invasive species. Theodore Roosevelt National Park and the surrounding National Grassland is an ideal example of such a system. The TRNP together with LMNG managed by the USFS then acts as a source for the overall ecological health and integrity of the entire grasslands ecosystem of western North Dakota.

Additionally, these grasslands provide the vital habitat for nesting golden eagles in North Dakota.

Therefore, I present to you two recommendations and supporting evidence to minimize potential impacts of the proposed placement of a major power line (Basin Electric Power Cooperative) on: 1) core habitat areas in the grasslands ecosystem and 2) the golden eagle population in Western North Dakota.

Recommendations:

1) Macro-Corridor D & E should be dropped from consideration for this project
2) All Power lines, all junctions, and related structures be constructed with the most effective raptor friendly equipment.

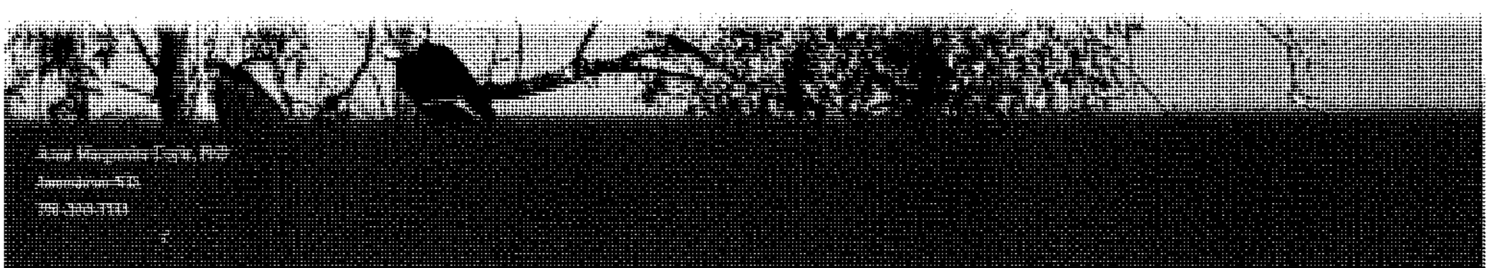
1) Figure 1 - There are over 200+ known potential territories and an uncertain number of undiscovered territories centered along the Little Missouri River and throughout the Little Missouri National Grassland extending west into Montana, as far east as Flasher, ND, and south into South Dakota. In some cases these birds can endure disturbance; however, each pair reacts differently and many have illustrated intolerance to disturbance. My research along with research in North America illustrates that electrocutions are a significant cause of mortality; and therefore, still present a direct threat to the population. Ensuring major power lines are directed away from known nesting territories is my strong recommendation. This will minimize fragmentation and disturbance in areas of critical habitat, and reduce the chance for electrocutions of golden eagles in high nest density areas. Therefore, I recommend Macro-Corridor D & E be dropped from consideration for this project.

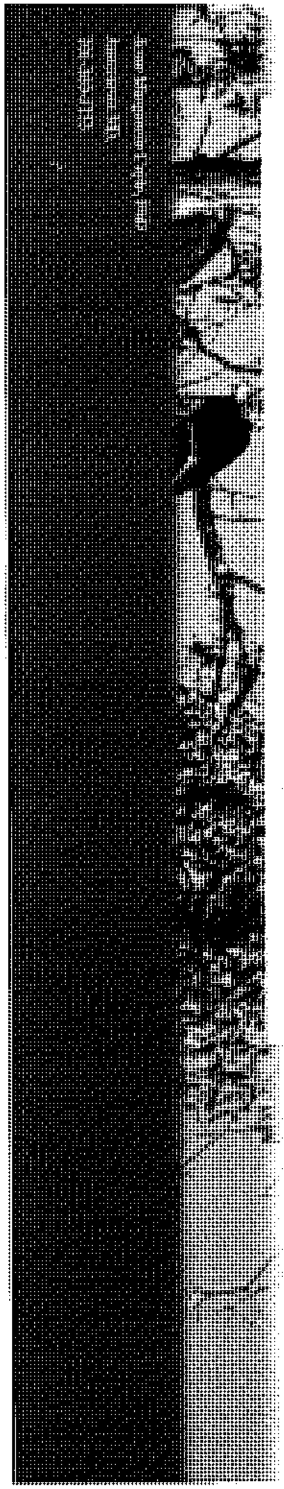
2) Figure 2 - The LMNG serves as the primary nesting ground for golden eagles in North Dakota, and also provides vital habitat for dispersing juveniles. During my research I tagged 18 juvenile golden eagles and monitored their movements from 2002 - 2011. The data show that the entire Little Missouri National Grassland is extensively used by juvenile golden eagles. Data from birds collected during this study and data from other collections by the USFWS and the Minnesota Raptor Rehabilitation Center show numerous incidents of mortality resulting from electrocutions. The territory location and movement data, coupled with the mortality data. This will illustrate the imperative need to use raptor friendly equipment on any and all power lines in western North Dakota to ensure compliance with the US Migratory Bird Act and the Bald and Golden Eagle Act. Therefore, I strongly recommend that all power lines, junctions, and related infrastructure be constructed with the most effective raptor friendly equipment.

This study was funded by UND, NDGF, USFS, USFWS, DSU, and UGW.

Thank you for your time and consideration,

Dr. Anne Marguerite Coyle (Margi)
Jamestown ND,
701-260-3753; flyfreege@aim.cm / http://undergoldenwings.org/





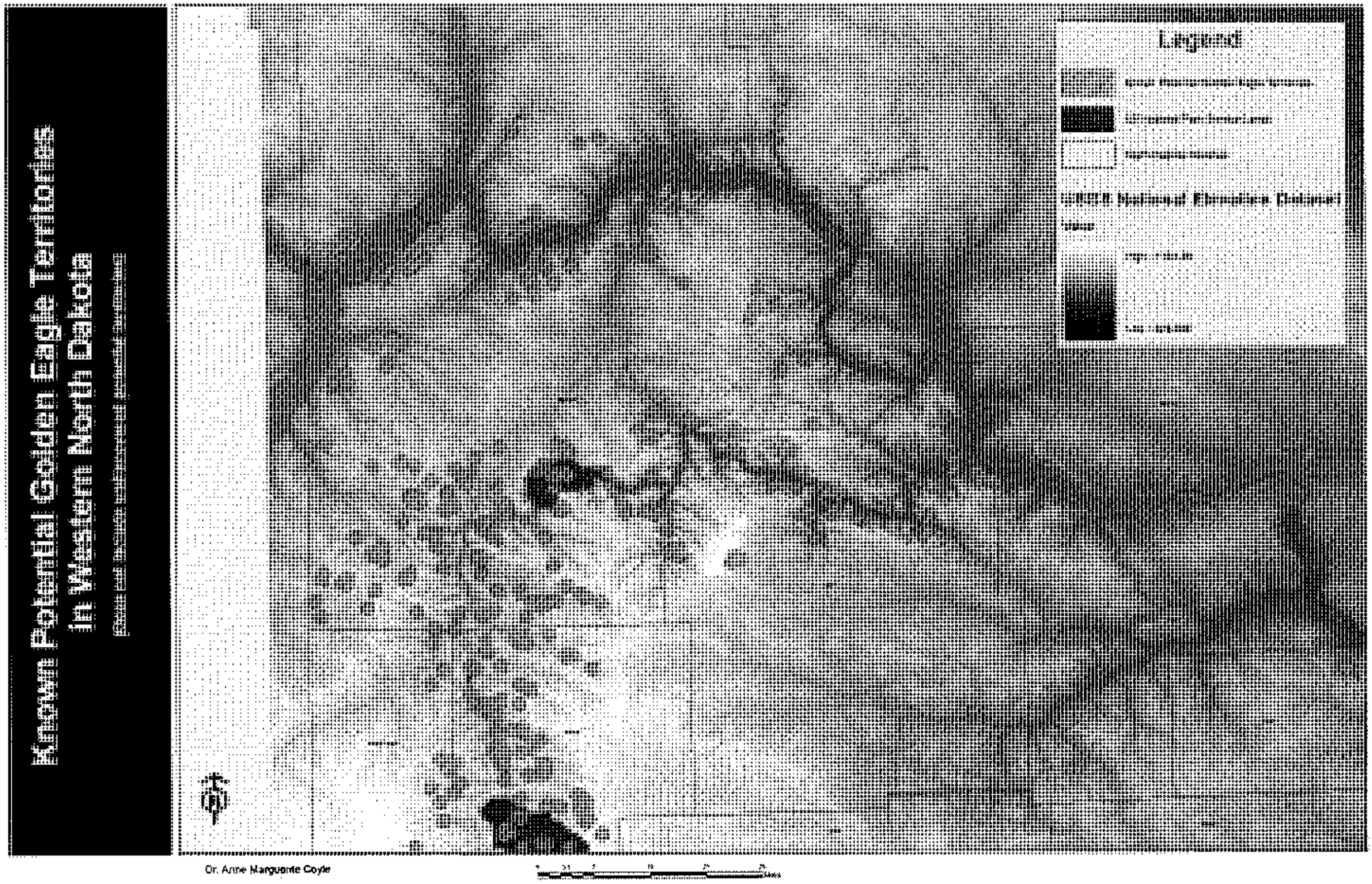


Figure 1. Known potential golden eagle nesting territories in western North Dakota. These were developed from known nesting site locations. Other undiscovered or new nest sites may exist therefore continued monitoring in areas prior to construction is necessary.

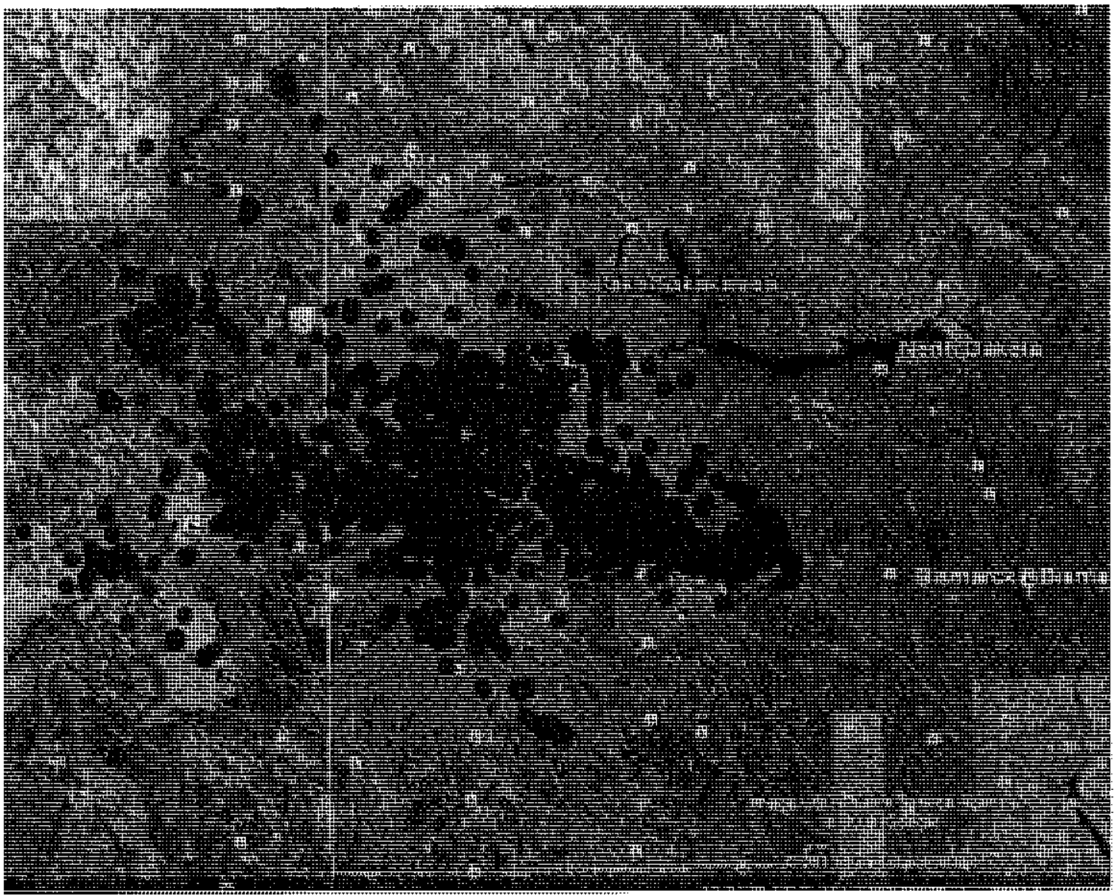
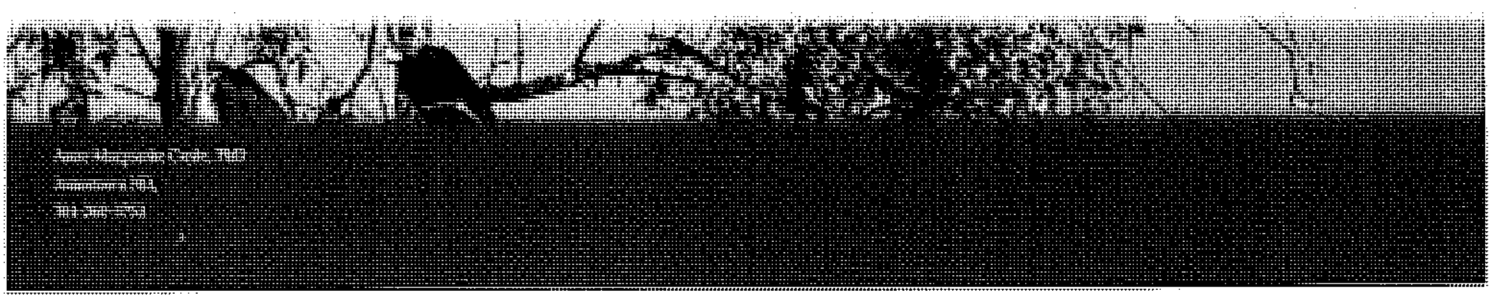


Figure 2. Evidence supporting the need to ensure all power lines and associated structures are constructed with raptor friendly equipment. Locations of 18 juvenile golden eagles tagged over 8 years with PPT Solar Paneled GPS units (2004-2011). The yellow lines depict the shortest distance between recorded GPS locations to indicate the sequence of movements. The lines do not represent the actual path taken by the bird between recorded points. Each bend in the line is a single GPS location. There may also be additional locations along the line used extensively by juvenile golden eagles. Not all locations are depicted on this map.



Knauer, Greg

From: Rankin, Dennis - RD, Washington, DC <Dennis.Rankin@wdc.usda.gov>
Sent: Tuesday, December 06, 2011 6:41 AM
To: Hughes, Robert; Matt Marsh
Cc: Cris Miller
Subject: FW: basin electric transmission line

fyi

-----Original Message-----
From: Terry L [mailto:ebzl73@mac.com]
Sent: Friday, December 02, 2011 3:32 PM
To: Rankin, Dennis - RD, Washington, DC
Subject: basin electric transmission line

Dear Mr. Rankin,

Here we go again, another attempt to tamper with any bit of beautiful land in North Dakota. Last month it was the proposed coal mine 13 miles from Teddy Roosevelt National Park, two weeks ago it was the proposed gravel mining by the Elkhorn Ranch. It seems like the energy industries are determined to destroy every bit of beauty in this state for their selfish, short-term monetary gain.

Please do NOT let them put a transmission line through Lone Butte roadless area. This is an important wildlife corridor and this is an area that we want to receive wilderness protection. The North Dakota Wilderness Coalition has been working on a proposal to grant wilderness protection to the Lone Butte area and five other tiny pieces of land in North Dakota. As you probably know, only one tenth of one percent of ND land (let me put that another way... ONLY .01 of 1% !!! of ND land) is protected as wilderness and the proposal to add Lone Butte and the other lands would only increase Wilderness Protection lands by another .01 of 1%. If the basin transmission line crosses the lone butte area, it will violate the wilderness aspect of the area. Really, is it too much to ask for this tiny area to be left untouched? The sole reason for the creation of the national park system, roadless areas, wilderness designations, etc. was to protect and preserve some (and in North Dakota's case, a very tiny, tiny bit) of land. Lately though, greedy energy companies are trying every possible way to destroy these lands...please don't let them do it! There is an alternative route proposed that does not interfere with Lone Butte or Teddy Roosevelt National Park and that is the one that should be used.

Thank you,

Corinne Lee

711 2nd st. n

Bismarck, ND

58501

Knauer, Greg

From: Rankin, Dennis - RD, Washington, DC <Dennis.Rankin@wdc.usda.gov>
Sent: Tuesday, December 06, 2011 6:40 AM
To: Hughes, Robert; Matt Marsh
Cc: Cris Miller
Subject: FW: AVS to Neset 345-kv Transmission Project

fyi

From: Deb Lancaster [mailto:debdakota9291@yahoo.com]
Sent: Friday, December 02, 2011 4:05 PM
To: Rankin, Dennis - RD, Washington, DC
Subject: AVS to Neset 345-kv Transmission Project

Dear Sir, I am sending this e-mail in order to submit comments on the proposed Basin Electric powerline going from Antelope Valley Station to the Williston/Tioga area of North Dakota. Ten years ago I purchased property in Western North Dakota and moved to the area from New Hampshire, because I was attracted to the peace and quiet, limited population, varied and abundant wildlife, and availability of recreational opportunities in the nearby Theodore Roosevelt National Park and the Little Missouri National Grasslands. Since the time of my move, I have witnessed an incredible change in the area due to the development of oil and gas reserves in the Bakken formation. The peace and quiet which I came here for is virtually gone. I have seen a decline in sightings of mammals and birds. Traffic has increased dramatically even on small rural gravel roads.Gas flares and work lights have taken away the total darkness of the night sky that used to be present here. However, within a few areas there are still opportuniteis to experience the land as it previously was. One of those places is the North Unit of Theodore National Park, and the other is the roadless area of the Little Missouri National Grasslands near Lone Butte. It was with sadness and fear, for the beauty and integrity of these areas, that I learned of the plan to erect the electric transmission line through/adjacent to these pristine areas. So much of the previously undisturbed wildlife habitat has already been lost; so many of the opportunities to experience wilderness are completely gone. Most of what made western North Dakota such a special place to me, my family and friends, has disapperared. I am very concerned that the proposed corridor which would take the powerline directly past Theodore Roosevelt Nat'l Park and thriough the Lone Butte roadless area would further, irreversibly, degrade the environment of these places. Few chances still exist to preserve pristine areas from development. I believe that stopping the use of this proposed powerline corridor would be a major chance to mitigate some of the effects of the recent devlopment, by recognizing the importance of keeping these pristine areas as they are now. Placing the powerline in this corridor would be certain to disrupt wildlife, scenic beauty and wilderness recreational opportunities. Views would be changed within the Park and the Grasslands. I urge the USDA to please eliminate this proposed corridor from consideration for the powerline. I realize that the oil development has brought many economic advantages to some residents and many businesses, but not all citizens, myself included, are benefitting from oil development. I understand it is inevitable that more power be brought to the northwest corner of the state. However,there are alternatives that are available for placement of the powerline. Keeping the transmission line out of this corridor would enable important pieces of land to remain protected from disturbance and give future generations a chance to see a piece of the landscape as it was before the environment of the rest of the area was totally changed. I do not believe that a price can be placed on the value of preserving these places. There are so many other chances for economic gain - I beleive it would be a travesty to my children and grandchildren to not allow them to have the wilderness and Park experiences that I have been fortunate enoiugh to experience here. I urge you to deny Basin Electric the use of this particular corridor,and construct this new powerline in a less sensitive and pristine location. Thank you. Sincerely, Deb Lancaster, Halliday, North Dakota

Knauer, Greg

From: Rankin, Dennis - RD, Washington, DC <Dennis.Rankin@wdc.usda.gov>
Sent: Tuesday, December 06, 2011 6:39 AM
To: Hughes, Robert; Matt Marsh
Cc: Cris Miller
Subject: FW:

fyi

From: Laska Nygaard [mailto:laskaandbrent@comcast.net]
Sent: Saturday, December 03, 2011 12:01 AM
To: Rankin, Dennis - RD, Washington, DC
Cc: brenttap@comcast.net; 'Laska Nygaard'
Subject:

Mr. Rankin,

I have just heard about the proposal to run an electric transmission line through a roadless area right near Theodore Roosevelt National Park. And I have learned that the deadline for public comment is today (2 Dec.), so I want to get this email to you in time.

I was born in North Dakota. My parents moved away to college in the Twin Cities when I was a toddler, so I grew up there, but western North Dakota and especially Theodore Roosevelt National Park (the Park) are the land of my family and heart and spirit. They are irreplaceable and they are fragile and blessedly beautiful. When you stand there, no matter the time of year or the weather, you can get a last, almost forever lost sense of earth as God made it, as he intended it as a communication to us as stewards of our beautiful home.

I am terribly concerned that location of a power transmission line – not to mention all the traffic and, well, mess needed to build it and maintain it – would be a horrendous detriment to this area already so threatened today. And how threatened? By hungry searching and fracking for oil without taking time to pre-think of the consequences it will have for future North Dakotans, future Americans, due to an irreparable hurt to our land and general environment.

The Park and the roadless areas around it are among the last few avenues for wildlife and for wild recreation by caring people. If we are to preserve something for our children, we must preserve it. If we want to continue to be America strong and a showcase for the dreams of the rest of the world, more and more that showcase will need to include natural surroundings, because that is what the rest of the world is fast destroying; keeping these vestiges strong and protected is an investment in our nation on the ground now, for posterity's well-being, and to keep America strong. I firmly believe this, and I firmly believe ignoring it is short-sighted and will be our downfall if we do not heed it. We must preserve a place for animals to live, people to actual see some, and people to actually see some natural earth. These things will soon be the most precious things in the world, not only as a matter of fact but as a matter of money.

And, the area we are talking about is small, and there are viable, healthier alternatives for the line. There is little protected area left, and the more of that little we maintain the better we'll be.

Kindly put me on your mailing for future information about the NEPA process. Thank you.

Best regards,
Laska Bairne Nygaard

1088 Hyacinth Avenue East
St Paul MN 55106
612-518-8371

APPENDIX C – DRAFT ENVIRONMENTAL IMPACT STATEMENT

Antelope Valley Station to Neset Transmission Project

Draft Environmental Impact Statement

Volume I | November 2012

Prepared for:
U.S. Department of Agriculture, Rural Utilities Service
Cooperating Agencies:
Western Area Power Administration
U.S. Forest Service

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Antelope Valley Station to Neset Transmission Project

Responsible Federal Agency (Lead): U.S. Department of Agriculture, Rural Utilities Service

Cooperating Agencies: Western Area Power Administration and the U.S. Department of Agriculture, Forest Service

Responsible State Agency: North Dakota Public Service Commission

Title: Antelope Valley Station to Neset Transmission Project, Draft Environmental Impact Statement

Location: Central and Western North Dakota

Contacts:

For further information about this Environmental Impact Statement, contact:

Dennis Rankin
Project Manager
U.S. Department of Agriculture, Rural Utilities Service
Engineering and Environmental Staff
1400 Independence Avenue, SW
Stop 1571, Room 2244
Washington, DC 20250-1571
202-720-1953
dennis.rankin@wdc.usda.gov

For general information on the U.S. Department of Agriculture's process for implementing the National Environmental Policy Act, contact:

Mark Plank
Director, Engineering and Environmental Staff
1400 Independence Avenue, SW
Stop 1571, Room 2244
Washington, DC 20250-1571
202-720-1649
mark.plank@wdc.usda.gov

Abstract:

This environmental impact statement (EIS) prepared by the U.S. Department of Agriculture (USDA), Rural Utilities Service (RUS) provides information about the potential environmental impacts of the proposed Antelope Valley Station (AVS) to Neset Transmission Project. This project, proposed by Basin Electric Power Cooperative (Basin Electric), would include a new 345-kilovolt (kV) transmission line connecting the existing AVS, Charlie Creek, Williston, and Neset substations and the newly proposed Judson and Tande 345-kV substations. In addition to the approximately 190 miles of new 345-kV transmission line, the project would also construct two new 345 kV substations (Judson Substation west of Williston and Tande Substation southeast of Tioga), and several miles of 230-kV transmission line to connect the 345-kV transmission line into the existing area system.

In addition to complying with all applicable federal regulations, several permits and approvals must be granted by the state of North Dakota prior to construction. The North Dakota Public Service Commission (NDPSC) must grant a Certificate of Corridor Compatibility and a Route Permit in accordance with North Dakota Century Code.

Basin Electric has requested financial assistance from RUS to construct the project. RUS has determined that its decision about whether to finance the project would constitute a major federal action that may have a significant impact on the environment, within the context of the National Environmental Policy Act of 1969 (NEPA). RUS serves as the lead federal agency for the NEPA environmental review of the project.

Basin Electric, RUS, and Western held public scoping meetings on November 15 and 16, 2011. These meetings were held in Williston and Killdeer, North Dakota.

Basin Electric and RUS will hold public hearings on the Draft EIS. These meetings will occur in Killdeer and Williston, North Dakota on January 15 and 16, 2013. The public is encouraged to provide oral comments at the public meetings and to submit written comments to RUS by January 21, 2013. This Draft EIS evaluates the environmental consequences that may result from the proposed action along two route alternatives. In addition, the EIS also analyzes the no-action alternative, under which RUS would not approve financial assistance for the project.

VOLUME I

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ACRONYMS AND ABBREVIATIONS

ADT	average daily traffic
APE	area of potential effect
AVS	Antelope Valley Station
Basin Electric	Basin Electric Power Cooperative
BLM	Bureau of Land Management
BMcD	Burns & McDonnell Engineering Company
BMP	best management practice
BNSF	BNSF Railway Company
B.P.	before present
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CH_4	methane
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
CWA	Clean Water Act
dB	decibel
dBA	A-weighted decibel
EIS	environmental impact statement
EMF	electric and magnetic field
ESA	Endangered Species Act
°F	degrees Fahrenheit
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FPA	Federal Power Act
GHG	greenhouse gases
ICES	International Committee on Electromagnetic Safety on Non-Ionizing Radiation
ICNIRP	International Commission on Non-Ionizing Radiation Protection
IS	Integrated System
kV	kilovolt

kV/m	kilovolts per meter
LMNG	Little Missouri National Grasslands
L_x	exceedance sound level
μT	microtesla
mG	milligauss
MIS	Management Indicator Species
MRO	Midwest Reliability Organization
MW	megawatts
NAAQS	National Ambient Air Quality Standards
NDDOH	North Dakota Department of Health
NDGFD	North Dakota Game and Fish Department
ND GIS	North Dakota Geographic Information System
NDGS	North Dakota Geologic Survey
NDPSC	North Dakota Public Service Commission
ND SHPO	North Dakota State Historic Preservation Office (State Historical Society of North Dakota)
NEPA	National Environmental Policy Act
NERC	North American Electric Reliability Corporation
NHPA	National Historic Preservation Act
NO_x	nitrogen oxides
NO_2	nitrogen dioxide
NPS	National Park Service
NPWRC	Northern Prairie Wildlife Research Center
NRCS	U.S. Department of Agriculture, Natural Resources Conservation Service
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
OHGW	overhead groundwire
OPGW	optical groundwire
PM_{10}	particles with a diameter less than or equal to a nominal 10 micrometers
$PM_{2.5}$	particles with a diameter less than or equal to a nominal 2.5 micrometers
PSD	Prevention of Significant Deterioration
ROW	right-of-way
RUS	U.S. Department of Agriculture, Rural Utilities Service

RV	recreational vehicle
SIL	scenic integrity levels
SIO	scenic integrity objectives
SO_2	sulfur dioxide
SUP	Special Use Permit
TMDL	Total Maximum Daily Load
TRNP	Theodore Roosevelt National Park
UGPTI	Upper Great Plains Transportation Institute
USACE	U.S. Army Corps of Engineers
U.S.C.	United States Code
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Department of Agriculture, Forest Service
USFWS	U.S. Department of the Interior, Fish and Wildlife Service
USGS	U.S. Department of the Interior, U.S. Geological Survey
Western	U.S. Department of Energy, Western Area Power Administration
WMA	wildlife management area

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EXECUTIVE SUMMARY

This executive summary provides a description of the proposed project and the alternatives evaluated. It also provides a brief summary of findings, highlighting conclusions, areas of controversy, and issues to be resolved.

PROJECT INTRODUCTION

Basin Electric Power Cooperative (Basin Electric) proposes to construct, operate, and maintain a new electrical transmission line connecting the existing Antelope Valley Station (AVS), Charlie Creek, Williston, and Neset substations and newly proposed Judson and Tande 345-kilovolt (kV) substations. Approximately 190 miles of new 345-kV transmission line, two new 345-kV substations (Judson Substation west of Williston and Tande Substation southeast of Tioga), and several miles of 230-kV line to connect the 345-kV line into the existing area system would need to be constructed. Starting from the AVS electric generation facility located near Beulah, North Dakota, the new 345-kV transmission line would connect with Basin Electric's existing Charlie Creek Substation near Grassy Butte, Basin Electric's new Judson Substation west of Williston, and will terminate at Basin Electric's new Tande Substation. Additional 230-kV lines would be constructed between the new Judson Substation and the existing Western Area Power Administration's (Western) Williston Substation, and also between the new Tande Substation and Basin Electric's existing Neset 230-kV Substation near Tioga. The new 345-kV transmission line would include new construction in a new right-of-way (ROW) as well as some double circuiting with an existing 115-kV line. The 230-kV connection between the Tande and Neset substations would also require new construction in a new ROW. The 230-kV connection between Judson and Williston substations would involve double circuiting with an existing 115-kV transmission line and no new ROW would be necessary. The overall project area identified for this project encompasses parts of Mercer, Dunn, Billings, McKenzie, Williams, and Mountrail counties in North Dakota.

LEAD AGENCY - UNITED STATES DEPARTMENT OF AGRICULTURE, RURAL UTILITIES SERVICE

Basin Electric is requesting financial assistance from the U.S. Department of Agriculture (USDA), Rural Utilities Service (RUS) to construct the project. RUS has determined that the agency's decision about whether to finance the project would constitute a major federal action that may have a significant impact upon the environment within the context of the National Environmental Policy Act of 1969 (NEPA). Therefore, RUS is serving as the lead federal agency for the NEPA environmental review of the project.

As lead agency, RUS has prepared this Draft environmental impact statement (EIS) in compliance with the requirements of NEPA and the Council on Environmental Quality (CEQ) regulations for implementing NEPA (40 Code of Federal Regulations [CFR] 1500-1508).

RUS's agency actions include the following.

- Provide engineering reviews of the purpose and need, engineering feasibility, and cost of the proposed project.
- Ensure that the proposed project meets the borrower's requirements and prudent utility practices.
- Evaluate the financial ability of the borrower to repay its potential financial obligations to RUS.
- Review and study the alternatives to mitigate and improve transmission reliability issues.
- Ensure that adequate transmission service and capacity are available to meet the proposed project needs.
- Ensure that NEPA and other environmental requirements and RUS environmental policies and procedures are satisfied prior to taking a federal action.

COOPERATING FEDERAL AGENCIES

Western and the U.S. Department of Agriculture, Forest Service (USFS) have agreed to assist RUS as cooperating agencies in preparing this EIS. The roles of these agencies are described below.

Western Area Power Administration

Basin Electric is requesting to interconnect its proposed project with Western's Williston Substation. Western must consider the interconnection request in accordance with its Open Access Transmission Service Tariff and the Federal Power Act (FPA).

Western is also serving as the lead federal agency for compliance with Section 106 of the National Historic Preservation Act (NHPA) for cultural resources and for consultation regarding Section 7 of the Endangered Species Act (ESA).

U.S. Forest Service

USFS has proposed to authorize and subsequently issue a Special Use Permit (SUP) under the Federal Land Policy Management Act, with terms and conditions for the construction, maintenance, and operation of a transmission line through lands administered by USFS on the Little Missouri Nation Grassland (LMNG).

PURPOSE AND NEED FOR ACTION

Basin Electric proposes to construct, operate, and maintain the project in order to meet projected future electric demand and to maintain electric transmission reliability standards in accordance with the requirements of the North American Reliability Council (NERC). The existing high voltage system in the Williston/Tioga region consists of 230-kV and 115-kV systems that connect to: Saskatchewan, Canada; eastern Montana; central North Dakota; and western North Dakota. Outage of any of these paths could cause low voltage criteria violations and overload adjacent transmission lines in the Williston/Tioga region and therefore be in violation of NERC reliability standards.

Basin Electric's August 2011 load forecast indicated an acceleration of growth in the northwestern North Dakota area primarily as a result of oil development of the Bakken Formation (Basin Electric, 2011). Much of the short-term load growth in this area is associated with provision of electrical service to support the rapid expansion of the number of facilities for oil and natural gas production, as well as the supporting infrastructure and services.

The Bakken shale development is currently concentrated in McKenzie, Mountrail, and Williams counties. The level of development that has occurred and is planned for the future will require an increase in electrical transmission capacity and reliability. Studies of power supply for the region and the upper Midwest indicate that a new 345-kV transmission line is needed to serve the long-term electrical needs of northwestern North Dakota (IS, 2011).

REGULATORY FRAMEWORK

The following sections summarize the primary framework that provides the regulatory basis for each federal and state agency's role in approving Basin Electric's project and guides the permitting process.

National Environmental Policy Act

NEPA requires federal agencies to integrate environmental values into their decision-making processes by considering the environmental impacts of, and reasonable alternatives to, their proposed actions. For major federal actions that have the potential to cause significant adverse impacts on the environment, NEPA requires agencies undertaking the action to prepare an EIS.

RUS has determined that providing financial assistance for the construction and operation of the project constitutes a major federal action that may significantly affect the quality of the natural and human environment. Therefore, the EIS process is underway in accordance with 7 CFR 1794 Subpart G - Procedure for Environmental Impact Statement. In addition, RUS prepared this EIS for use by decision-makers in determining whether or not to provide assistance for construction and operation of the project in the form of a loan to Basin Electric.

Clean Water Act

Clean Water Act (CWA) Section 404 authorization may be required for the project, because its construction may result in discharge of dredged and/or fill material into waters of the United States. The U.S. Army Corps of Engineers (USACE) is the agency responsible for determining whether to issue a permit for wetland impacts associated with the project. Receipt of a Section 404 permit and adherence to the terms and conditions of the permit, including any associated compensatory mitigation and best management practices (BMPs) to reduce sedimentation and erosion control, would demonstrate the project's compliance with the CWA. Specific permit conditions, including the quantity or extent of compensatory mitigation and specific BMPs, would be determined by USACE after a project alternative has been selected. Field inspections of the project would evaluate and verify compliance with permits and the CWA. The project has been designed to span waterbodies. As such, direct impacts on surface water quality standards from the placement of structures are not anticipated.

Endangered Species Act

The ESA of 1973 designates and provides for the protection of threatened and endangered plants and animals and their critical habitat. For the proposed project, Western is acting as the lead agency for Section 7 consultation of the ESA. As the lead agency, it is Western's responsibility to consult with the U.S. Department of the Interior, Fish and Wildlife Service (USFWS) to establish a list of target species; prepare a Biological Assessment of the potential for the proposed project to adversely affect listed species; provide coordination between state and federal biological resource agencies to assess impacts and propose mitigation; and develop appropriate mitigation strategies for all significant impacts on federally listed species. USFWS would ultimately issue a final Biological Opinion on whether the project would affect federally listed species. The Biological Opinion may include an incidental take statement that provides a statement of anticipated incidental take accompanied by the appropriate and reasonable mitigation measures that minimize such take.

National Historic Preservation Act

Section 106 of NHPA requires federal agencies to take into account the effects of their undertakings on historic properties and seek to accommodate historic preservation concerns with the needs of federal undertakings through consultation among the agency officials and other parties. The goal of consultation is to identify historic properties potentially affected by the undertaking; assess effects; and seek ways to avoid, minimize, or mitigate any adverse effects on historic properties. Western is acting as the lead agency in consultation with the North Dakota State Historic Preservation Office (ND SHPO), Indian tribes, federal and state permitting agencies, and other yet to be identified agencies and organizations.

Energy Policy Act

The Energy Policy Act of 2005 granted the Federal Energy Regulatory Commission (FERC) the authority to impose mandatory reliability standards on transmission systems. To accomplish this, FERC designated NERC as the Electric Reliability Organization (ERO) with the authority to establish, approve, and enforce the reliability standards. NERC then delegated the authority for proposing and enforcing the reliability standards to particular regions. For the Basin Electric service area, the Midwestern Reliability Organization (MRO) was designated. The MRO accomplishes its monitoring and enforcement obligations by designating Reliability Coordinators. For the Basin Electric service area, the designated Reliability Coordinator is the Integrated System (IS). It is the responsibility of the IS to adhere to the reliability standards by providing high-voltage transmission system grid in the region of eastern Montana, North Dakota, and South Dakota.

North Dakota Energy Conversion and Transmission Facility Siting Act

The North Dakota Energy Conversion and Transmission Facility Siting Act states that it is necessary to ensure that the location, construction, and operation of energy conversion facilities and transmission facilities will produce minimal adverse effects on the environment and on the welfare of the citizens of the state by providing that no energy conversion facility or transmission facility shall be located, constructed, and operated within North Dakota without a certificate of site compatibility or a route permit acquired pursuant to Chapter 49-22 of the North Dakota Century Code. It is state policy to site energy conversion facilities and to route transmission facilities in an orderly manner compatible with environmental preservation and the efficient use of resources. According to the Act, sites and routes shall be chosen to minimize adverse human and environmental impacts while ensuring continuing system reliability and integrity and ensuring that energy needs are met and fulfilled in an orderly and timely fashion.

PUBLIC SCOPING

Public participation activities have been conducted. The purpose of these activities was to gain input about any potential concerns and identify issues that need to be addressed in this EIS. During this public scoping process, contact was made with federal agencies, tribal representatives, state agencies, local officials, and the general public.

Letters, radio public service announcements, and newspaper advertisements announcing the proposed project and the scoping meeting locations and times were distributed prior to the public scoping meetings. One meeting was conducted in Williston, North Dakota on November 15, 2011, and a second meeting was conducted in Killdeer, North Dakota on November 16, 2011.

A total of 38 comment sheets and letters were received during the scoping comment period beginning on November 2, 2011, and ending on December 2, 2011. The key issues identified during the comment process were primarily related to the visual impacts and general disturbance to the natural areas along the alternative corridor that followed U.S. Highway 85 between the Theodore Roosevelt National Park (TRNP) and USFS properties.

Opportunities for public and agency input will occur during the duration of the project as additional coordination occurs. Public hearings and a comment period will occur in conjunction with the issuance of this Draft EIS, anticipated in late 2012.

PROPOSED ACTION, ALTERNATIVES, AND SCOPE OF THE EIS

Basin Electric proposes to construct, operate, and maintain a new 345-kV electrical transmission line connecting the existing AVS, Charlie Creek, Williston, and Neset substations and the newly proposed Judson and Tande 345-kV substations. The overall project area identified for this project encompasses parts of Mercer, Dunn, Billings, McKenzie, Williams, and Mountrail counties in North Dakota.

Project alternatives were screened to determine their ability to meet the purpose and need of the proposed project and to provide a comparison of impacts. To identify various options for the project, macro-corridors connecting the project endpoints were developed, followed by the development of network segments within the macro-corridors. The network segments within the macro-corridors were combined in various ways to form complete route alternatives between the proposed project endpoints. Two of these alternative routes and the no-action alternative were retained for full evaluation in this EIS. This section provides an overview of these alternatives as well as the potential impacts and mitigation measures. Table ES-1 includes a summary of the alternative routes, while Figure ES-1 shows their locations.

Table ES-1: Summary of Route Alternatives

	No-action Alternative	Alternative Route A	Alternative Route B
Meets Identified Purpose and Need for Project	No	Yes	Yes
Route Length (miles)	N/A	195	210
Judson Substation	N/A	Construct (12 acres)	Construct (12 acres)
Tande Substation	N/A	Construct (12 acres)	Construct (12 acres)
Killdeer Switchyard	N/A	N/A	Construct (12 acres)

No-action Alternative

Under the no-action alternative, the AVS transmission line would not be constructed. The existing environment within the project area would remain the same and no land would be used for transmission lines, facilities, or substations. The no-action alternative does not meet the identified purpose and need for the project. Under this alternative, it is expected that load growth would increase beyond the load serving capacity of the existing transmission system for the Williston/Tioga region by 2016, resulting in transmission system reliability issues and violating the criteria established by NERC for transmission reliability in the region.

Alternative Route A

Alternative Route A is approximately 195 miles long. For this route, the transmission line would begin at the AVS Substation and end at the Neset Substation. This alternative would include a 65-mile, 345-kV transmission line from the AVS Substation to the existing Charlie Creek 345-kV Substation. The Charlie Creek 345-kV Substation would be connected by a 70-mile segment to the proposed Judson 345-kV Substation near Williston. The proposed Judson 345-kV Substation would then interconnect with the proposed Tande 345-kV Substation by a 56-mile line segment, and a 2-mile, 230-kV transmission line would interconnect the proposed Judson 345-kV Substation to Western's existing Williston 230-kV Substation. Finally, the proposed Tande 345-kV Substation would interconnect with the existing Neset 230-kV Substation by a 2-mile, 230-kV line segment.

Two new substations, including the proposed Judson 345-kV Substation and the proposed Tande 345-kV Substation, would also be constructed as part of Alternative Route A. Construction would take place on approximately 12 acres of land per substation and would result in the permanent conversion of this area from agricultural land to a utility land use.

Alternative Route B

Alternative Route B is approximately 210 miles long. This route would include construction of approximately 40 miles of 345-kV transmission line from the AVS Substation to a proposed 345-kV switchyard near Killdeer. An additional 85 miles of 345-kV transmission line would extend from the proposed Killdeer switchyard to the proposed Judson 345-kV Substation and a 25-mile, 345-kV line segment would extend from the proposed Killdeer switchyard to the existing Charlie Creek 345-kV Substation, located near Grassy Butte. The proposed Judson 345-kV Substation would then interconnect with the proposed Tande 345-kV Substation by a 56-mile line segment and a 2-mile, 230-kV transmission line would interconnect the proposed Judson 345-kV Substation to Western's nearby existing Williston 230-kV Substation. Finally, the proposed Tande 345-kV Substation would interconnect with the existing Neset 230-kV Substation by a 2-mile, 230-kV line segment.

Two new substations, including the proposed Judson 345-kV Substation and the proposed Tande 345-kV Substation, would also be constructed as part of Alternative Route B. Construction would take place on approximately 12 acres of land per substation and would result in the permanent conversion of this area from agricultural land to utility land use.

Alternative Route B would also include the construction of the proposed Killdeer switchyard. This proposed switchyard would be located within a general area approximately 3.5 miles northeast of the town of Killdeer. Land use in this area is a mixture of grassland and tillable cropland. Approximately 12 acres of land would be permanently converted from agricultural to utility use for construction and operation of the switching station.

POTENTIAL IMPACTS

Potential direct and indirect impacts were identified and evaluated for each aspect of the natural and built environments potentially affected by the project. The potential impacts of the project route alternatives and the no-action alternative are summarized in Table ES-2.

Figure ES-1: Alternative Route Overview Map

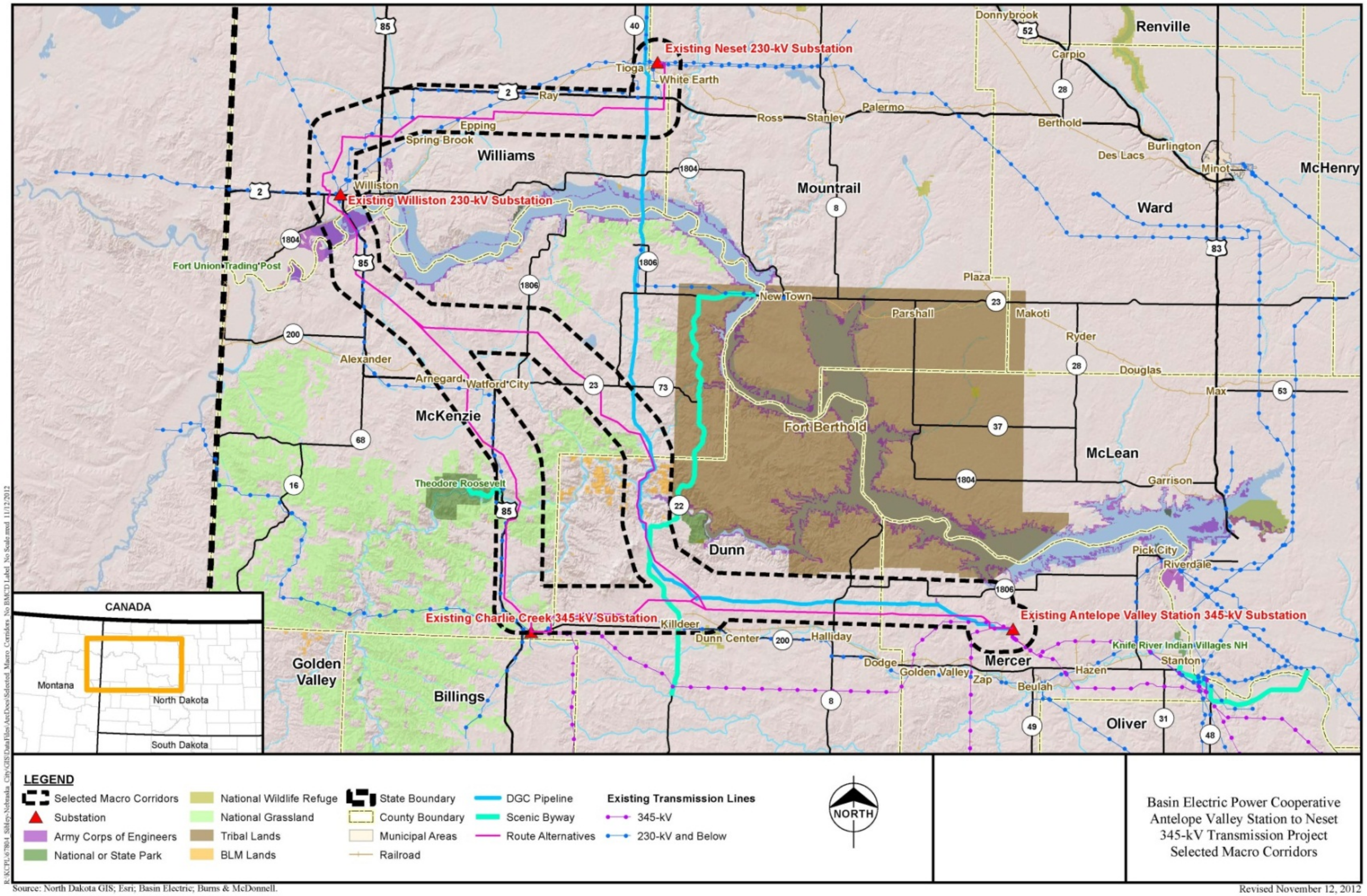


Table ES-2: Comparison of Alternatives

Resource	Route A		Route B		Substations/Switchyards		No-action Alternative
Impact	**Permanent**	**Temporary**	**Permanent**	**Temporary**	**Permanent**	**Temporary**	
Land Use	3,536 acres of ROW would be required and would be restricted from some types of future development. 24 acres of land would be required for construction of new substations and require permanent conversion from agricultural uses to a utility use. ROW would include state and federal properties. ROW would include approximately 147.4 acres of LMNG, 56.4 acres of USACE property, approximately 144.6 acres of school trust land, and cross within approximately 200 feet of Bureau of Land Management (BLM) land.	Loss of use for landowners within ROW on private lands during construction. Access restrictions and/or loss of use within ROW during construction on state or federal properties. Disturbance from heavy equipment may result in some crop loss during construction	3,807 acres of ROW would be required and would be restricted from some types of future development. ROW would include state and federal properties. 36 acres of land would be required for construction of new substations and a switchyard and would require permanent conversion from agricultural uses to a utility use. ROW would include state and federal properties. ROW would include approximately 56.6 acres of LMNG, 56.4 acres of USACE property, and approximately 138.8 acres school trust lands.	Loss of use for landowners within ROW on private lands during construction. Access restrictions and/or loss of use within ROW during construction on state or federal properties. Disturbance from heavy equipment may result in some crop loss during construction.	12 acres would be permanently converted from agriculture use to utility use for each substation and switchyard.	Construction-related impacts such as increased noise and dust on surrounding agricultural lands.	No direct effect; indirect effect if future land uses were impeded by lack of increased electrical supply necessary to meet demands of development.

Resource	Route A		Route B		Substations/Switchyards		No-action Alternative
Impact	**Permanent**	**Temporary**	**Permanent**	**Temporary**	**Permanent**	**Temporary**	
Socioeconomic Resources	Economic benefit to businesses and surrounding communities from increased electrical capacity and reliability. Potential changes in property values. Property tax revenues of $58,000 annually to study area counties.	Economic benefit to local communities during construction as a result of construction crews generating local revenue.	Economic benefit to businesses and surrounding communities from increased electrical capacity and reliability. Potential changes in property values. Property tax revenues of $63,000 annually to study area counties.	Economic benefit to local communities during construction as a result of construction crews generating local revenue.	Economic benefit to businesses and surrounding communities from increased electrical capacity and reliability. Potential changes in property values.	Minor economic benefit to local communities during construction as a result of construction crews generating local revenue.	No direct effect; indirect effect if no improved electric reliability and capacity. This would harm local communities by limiting future development opportunities.
Environmental Justice	Land use restrictions within the ROW. Visual presence. and increase in fiscal receipts to counties.	Increase in noise and potential traffic disruptions during construction.	Land use restrictions within the ROW. Visual presence and increase in fiscal receipts to counties.	Increase in noise and potential traffic disruptions during construction.	No effect.	Increase in noise and potential traffic disruptions during construction.	No effect.
Recreation and Tourism	Approximately 348 acres of state or federal land potentially open to dispersed recreational activities such as hunting would be located within the ROW. One USFS campground (Summit Campground) would be located within 0.5 mile of the ROW.	Increased noise, dust, and traffic congestion in recreational areas. Temporary access restrictions during construction on public use areas.	Approximately 252 acres of state or federal land potentially open to dispersed recreational activities such as hunting would be located within the ROW. No developed recreational facilities would be located near the ROW.	Increased noise, dust, and traffic congestion in recreational areas. Temporary access restrictions during construction on public use areas.	Conversion of land for substations or switchyard would remove it from further land use, including recreational use. Each substation or switchyard would occupy 12 acres.	Increased noise, ground disturbance, access restrictions, and human activity may impede hunting activities around the substation or switchyard sites.	No effect.

Resource	Route A		Route B		Substations/Switchyards		No-action Alternative
Impact	**Permanent**	**Temporary**	**Permanent**	**Temporary**	**Permanent**	**Temporary**	
Utility Infrastructure and Transportation	No long-term effects on utility infrastructure are anticipated. No long-term effects on transportation are anticipated. Potential impacts on airports within 10 nautical miles would be avoided through coordination with Federal Aviation Administration (FAA). Basin Electric would coordinate with BNSF Railway Company (BNSF) to minimize or avoid potential impacts on railroads in areas where the alternative route would traverse railroads at a vertical elevation.	Existing utility infrastructure would be traversed during construction activities and may be temporary taken out of service. Some temporary road closures are likely during construction activities and may result in short-term adverse impacts. Basin Electric would also coordinate with BNSF in order to string the transmission line over existing railroad tracks.	No long-term effects on utility infrastructure are anticipated. No long-term effects on transportation are anticipated. Potential impacts on airports within 10 nautical miles would be avoided through coordination with FAA. Basin Electric would coordinate with BNSF to minimize or avoid potential impacts on railroads in areas where the alternative would traverse railroads at a vertical elevation.	Existing utility infrastructure would be traversed during construction activities and may be temporary taken out of service. Some temporary road closures are likely during construction activities and may result in short-term adverse impacts. Basin Electric would coordinate with BNSF in order to string the transmission line over existing railroad tracks.	No effect.	Short-term interruption of existing transmission lines during construction activities may result minor temporary impacts. The introduction of material haul trucks and road closures during construction activities may result in short-term adverse impacts.	Significant utility system failures and damage if capacity is not increased and demand increases as projected. Electrical equipment used for oil and gas pipelines could be limited by reliability thereby causing more distribution via truck, causing road damage.
Geology and Landforms	Displacement of 1.73 million cubic feet of soil and rock during construction.	Potential for erosion on steeper slopes during construction.	Displacement of 1.9 million cubic feet of soil and rock during construction.	Potential for erosion on steeper slopes during construction.	No effect.	No effect.	No effect.

Resource	Route A		Route B		Substations/Switchyards		No-action Alternative
Impact	**Permanent**	**Temporary**	**Permanent**	**Temporary**	**Permanent**	**Temporary**	
Soils and Farmland	Approximately 1 acre of soil (0.0009-acre per structure) would be permanently removed. Farmland for crop production permanently impacted only at structure locations.	334 acres (0.29-acre per structure) of temporary soil disturbance during construction within ROW, with temporary loss of crop production.	Approximately 1.1 acres of soil (0.0009-acre per structure) would be permanently removed. Farmland for crop production permanently impacted only at structure locations.	363 acres (0.29-acre per structure) of temporary soil disturbance during construction within ROW, with temporary loss of crop production.	Any farmland within the 12-acre substation or switchyard sites would be permanently converted to utility use.	No effect.	No effect.
Water Resources	No effects anticipated. Eleven perennial waterways and 6.5 acres of Federal Emergency Management Agency (FEMA) floodplain crossed, but all would be spanned.	Potential sedimentation and runoff caused by construction.	No effects anticipated. Fifteen perennial waterways and 6.5 acres of FEMA floodplain crossed, but all would be spanned.	Potential sedimentation and runoff caused by construction.	No effect.	No effect.	No effect.
Vegetation	Approximately 95 acres of woodland potentially removed within ROW, depending on slope. One acre of vegetation permanently removed within ROW at structure locations. Potential introduction of noxious weeds within ROW to be avoided by weed mitigation measures.	Disturbance of vegetation within the ROW and along access roads during construction. Natural Heritage Inventory sensitive ecological community potentially impacted.	Approximately 100 acres of woodland potentially removed within ROW, depending on slope. About 1.1 acres of vegetation permanently removed within ROW at structure locations. Potential introduction of noxious weeds within ROW to be avoided by weed mitigation measures.	Disturbance of vegetation within the ROW and along access roads during construction.	All vegetation removed from 12 acre sites and converted to utility use.	No effect.	No effect.

Resource	Route A		Route B		Substations/Switchyards		No-action Alternative
Impact	Permanent	Temporary	Permanent	Temporary	Permanent	Temporary	
Wildlife	Loss of forested habitat due to removal of up to 95 acres of woodland within the ROW. Some mortality of small, less-mobile species. Potential avian species collisions with power lines.	Disturbance within and near the ROW during construction due to human intrusion, noise, and construction activity. Temporary loss of habitat due to vegetation clearing within ROW during construction.	Loss of forested habitat due to removal of up to 100 acres of woodland within the ROW. Some mortality of small, less-mobile species. Potential avian species collisions with power lines.	Disturbance within and near the ROW during construction due to human intrusion, noise, and construction activity. Temporary loss of habitat due to vegetation clearing within ROW during construction.	Loss of habitat within the 12 acre sites as these are converted to utility use.	Disturbance to nearby species due to construction activities.	No effect.
Aquatic Resources	Change in local aquatic habitats in areas where vegetation is cleared along shoreline.	Potential for sedimentation, runoff, and spills during construction; to be avoided by use of BMPs.	Change in local aquatic habitats in areas where vegetation is cleared along shoreline.	Potential for sedimentation, runoff, and spills during construction; to be avoided by use of BMPs.	No effect.	No effect.	No effect.
Special Status Species	No adverse effect on listed species pending outcome of consultation with USFWS and USFS.	Potential impacts on grassland habitat within ROW during construction	No adverse effect pending outcome of consultation with USFWS and USFS.	Potential impacts on grassland habitat within ROW during construction	No effect.	No effect.	No effect.
Wetlands	No effect. All 16 acres of wetland within ROW would be spanned. No structures placed in wetlands and no wetland vegetation would be cleared.	Potential sedimentation and runoff caused by construction near wetlands.	All 21 acres of wetland within ROW would be spanned. No structures placed in wetlands. Clearing of 0.02 acre of forested wetland within ROW could occur.	Potential sedimentation and runoff caused by construction near wetlands.	No effect.	Potential sedimentation and runoff caused by construction near wetlands located near substation and switchyard sites.	No effect.

Resource	Route A		Route B		Substations/Switchyards		No-action Alternative
Impact	**Permanent**	**Temporary**	**Permanent**	**Temporary**	**Permanent**	**Temporary**	
Aesthetics and Visual Resources	Change in the visual characteristics and viewshed within project area and for residents located near the transmission line (eight residences within 500 feet).	Visibility of construction vehicles and equipment along ROW.	Change in the visual characteristics and viewshed within project area and for residents located near the transmission line (seven residences within 500 feet).	Visibility of construction vehicles and equipment along ROW.	Additional visual element added to the landscape.	No effect.	No effect.
Cultural Resources	No adverse effects on National Register of Historic Places (NRHP)-eligible cultural resources. 93 cultural resources have been identified within or immediately adjacent to the 1,000-foot preliminary area of potential effects (APE).	No adverse effects on NRHP-eligible cultural resources.	No adverse effects on NRHP-eligible cultural resources. A total of 88 sites have been recorded within or immediately adjacent to the 1,000-foot preliminary APE.	No adverse effects on NRHP-eligible cultural resources.	No adverse effects on NRHP-eligible cultural resources.	No adverse effects on NRHP-eligible cultural resources.	No effect.
Noise	No effect.	Increases in noise levels along the ROW from construction vehicles and equipment.	No effect.	Increases in noise levels along the ROW from construction vehicles and equipment.	No effect.	Increases in noise levels for nearby residences during construction of the substations and switchyard.	No effect.

Resource	Route A		Route B		Substations/Switchyards		No-action Alternative
Impact	Permanent	Temporary	Permanent	Temporary	Permanent	Temporary	
Air Quality and Greenhouse Gas (GHG) Emissions	Potential increase in GHG levels as a result of the operation of the transmission line.	Increases in fugitive dust caused by construction activity, vehicles, and equipment. Increased emissions from construction vehicles and equipment.	Potential increase in GHG levels as a result of the operation of the transmission line.	Increases in fugitive dust caused by construction activity, vehicles, and equipment. Increased emissions from construction vehicles and equipment.	Potential increase in GHG levels as a result of the operation of the substations and switchyard.	Increases in fugitive dust caused by construction activity, vehicles, and equipment. Increased emissions from construction vehicles and equipment.	No effect.
Public Health and Safety	Long-term adverse effects expected to be negligible to minor. Electric and magnetic fields would be well below identified thresholds to protect the public. The operation of farm equipment near proposed structures could result in unnecessary contact and/or damage to machinery and/or operators. Standard operating and safety procedures would be employed to ensure the safe delivery of services.	Hazardous and/or potentially hazardous materials may be encountered during construction, or exposure to energized transmission lines. Theses impacts are likely to be minor with the implementation of construction plans that ensure worker safety, proper handling of hazardous materials, and spill cleanup.	Long-term adverse effects expected to be negligible to minor. Electric and magnetic fields would be well below identified thresholds to protect the public. The operation of farm equipment near proposed structures could result in unnecessary contact and/or damage to machinery and/or operators. Standard operating and safety procedures would be employed to ensure the safe delivery of services.	Hazardous and/or potentially hazardous materials may be encountered during construction, or exposure to energized transmission lines. Theses impacts are likely to be minor with the implementation of construction plans that ensure worker safety, proper handling of hazardous materials, and spill cleanup.	No long-term adverse effects are expected to be negligible to minor.	Hazardous and/or potentially hazardous materials may be encountered during construction. Impacts on public health and safety are likely to be minor with the implementation of construction plans that ensure worker and public safety, proper handling of hazardous materials, and spill cleanup.	No effect.

MITIGATION MEASURES FOR POTENTIAL IMPACTS

The route permit would require the implementation of mitigation measures to prevent or minimize both short- and long-term impacts on resources from construction and operation of the project. Additional mitigation measures will be evaluated as further information becomes available on the actual route location. Basin Electric would implement standard BMPs in the construction and operation of the proposed project. These BMPs are described in Appendix A. Mitigation measures for each resource area are summarized in Table ES-3, below.

Mitigation measures that would be required by federal agencies as permitting conditions would be included in the Record of Decision issued by each federal permitting agency.

Table ES-3: Summary of Mitigation Measures

Resource	Mitigation Measures
Aesthetics and Visual Resources	• Use weathering single pole steel structures where steel towers are utilized, to reduce visual impacts. • Work with the agencies to choose a structure type (weathering steel or galvanized) that would reduce visual impacts in highly visible or scenic areas, such as the Missouri and Little Missouri River crossings, the National Grasslands, and badland areas. • Leave (where possible) plants smaller than 8 feet in height within the 150-foot-wide ROW to help reduce the effect of the ROW of visual and aesthetic resources. • Keep the ROW free of construction debris and other litter during construction to further minimize visual intrusion to the surrounding landscape.
Air Quality and Greenhouse Gases	• Use water on roads and disturbed areas to minimize dust. • Re-seed vegetation in disturbed areas outside of the substation/switchyard to prevent wind-blown dust from areas void of vegetation. • Implement vehicle idling and equipment emissions measures, such as establishing operating policies that limit idling time and mechanical modifications to the vehicles that restrict the amount of idle time. • Encourage carpooling and the use of shuttle vans among construction workers to minimize construction-related traffic and associated emissions. • Locate staging areas as close to construction sites as practicable to minimize driving distances. • Locate, where possible, staging areas in previously disturbed or graveled areas to minimize soil and vegetation disturbance where practicable. • Encourage the use of the proper size of equipment for the job to maximize energy efficiency. • Use alternative fuels, if possible, for generators at construction sites, such as propane or solar, or use electrical power where practicable. • Recycle or salvage non-hazardous construction and demolition debris where practicable. • Dispose of wood debris (burning) in the local area where practicable. • Use local rock sources for road construction where practicable.

<table>
<tr><th>Resource</th><th>Mitigation Measures</th></tr>
<tr><td>Geology and Soils</td><td>Geology and Landforms:
Conduct geotechnical assessments at structure locations to develop a process or approach to minimize the potential development of landslides in susceptible areas during construction.
Span identified landslide areas with no structures being placed within susceptible landslide areas.
Prepare a stormwater pollution prevention plan for construction activities prior to construction.
Soils:
Confine construction activities to the ROW and around structure locations for placement of the transmission structures.
Stockpile any topsoil removed during any required leveling of structure sites nearby and replace it following construction.
Re-grade disturbed ground to as close to pre-construction condition as appropriate for stabilization and revegetated or approved for tillage depending on pre-construction land use.
Locate the construction laydown areas required for the proposed project at previously-disturbed or developed locations, such as vacant lots or agricultural lands, where feasible.
Place construction materials on pallets or cribbing within the designated laydown areas.
Return laydown areas to pre-construction condition upon completion of the project.
Compensate landowners for any crop damage that may occur as a result of construction and operation of the proposed project.
Redress any compaction or other construction-related issues that could affect soil productivity and agricultural operations.</td></tr>
<tr><td>Water Resources</td><td>Clean up any spills or equipment leaks promptly to prevent materials entering surface water.
Contain and store appropriately any materials such as fuel, lubricants, and solvents.
Schedule construction in the area of the Missouri River crossing in low water periods or during winter to minimize impacts to the geographical floodplain. Coordinate construction timing with USACE.
Span floodplains to the extent possible to avoid potential impacts.
Plant or seed non-agricultural areas that were disturbed during construction. Use native seed mixes from the indigenous plants and plant indigenous species located in the immediate disturbed soil area; ensure seeding and/or plantings are done in a time congruent with seeding and growth of the area, not during a time that would preclude germination or rooting.
Remove excavated material and other debris from flood prone areas to maintain storage volumes and prevent introduction of debris that may lead to clogged culverts or bridges, resulting in changes to water flow and flood patterns.
Locate structures and disturbed areas away from rivers and lakes, where practicable.
Install sediment control measures prior to construction in accordance with plans and permits including: mulch produced through the chipping of removed trees; soil berms; and partially burying logs along the ROW.
Use wastewater and stormwater control measures to meet the effluent limits prior to discharging from construction sites to surface waters.
Avoid the use of fertilizers, pesticides, or herbicides in or near surface waterbodies.
Fuel construction vehicles away from surface waterbodies and use appropriate spill prevention and containment procedures.</td></tr>
</table>

Resource	Mitigation Measures
Biological Resources	• Restore any new temporary access roads created during construction of the transmission line to the natural condition of the surrounding area after construction is completed. • Revegetate disturbed areas outside of the substation/switchyard and within the ROW using native vegetation and certified weed-free seed and mulch to protect native vegetation and wildlife habitat. • Inspect equipment for seeds and other vegetative material and power-wash prior to transport to new areas to prevent the spread of undesirable plants from one area to another. • Coordinate with the North Dakota Public Service Commission to determine appropriate mitigation for the vegetation removed. Typically for these types of projects, the tree and shrub vegetation is replaced at a ratio of 2:1, reducing the overall loss of these vegetation types over time. • Avoid the Natural Heritage Inventory-listed significant ecological community (western little bluestem prairie) in Dunn County. If the significant ecological community cannot be avoided, Basin Electric would coordinate with North Dakota Game and Fish Department (NDGFD) to minimize impacts and implement mitigation measures. • Coordinate with USACE and the state of North Dakota to obtain the necessary permits if impacts on wetlands, streams, or other waterbodies are unavoidable. • Avoid wetland areas while accessing the ROW during construction. Design and install temporary low-water crossings or culverts, if needed, so as not to inhibit fish passage, or create upstream or downstream habitat changes. • Coordinate with NDGFD and USFS to avoid construction during bighorn sheep lambing season (April 1st thru July 1st; and other important times for game species) in the Little Missouri Badlands area and LMNG. • Conduct raptor and migratory bird surveys along and adjacent to the proposed transmission line route prior to construction. Coordinate with USFWS, USFS, and NDGFD to develop and implement a plan to protect any identified nests from adverse effects during construction. Coordinate with USFWS to develop an Avian Protection Plan for operation of the transmission line. • Design the proposed project to meet the requirements for the protection of avian species from electrocution and line strikes according to the guidelines in the Avian Power Line Interaction Committee's "Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006" (APLIC, 2006). • Coordinate with USFWS, USFS, and NDGFD regarding greater prairie chicken, greater sage-grouse, and Plain's sharp-tailed grouse habitat. Structures will not be placed within 0.25 mile of active lek sites. In addition, consult with USFWS, USFS, and NDGFD prior to construction within a 2-mile radius of an active lek during the period of March 1st through June 15th. • Coordinate with USFWS to avoid construction in designated critical habitat during the piping plover nesting season (mid-April to mid-August) and in interior least tern nesting habitat during the nesting season. • Comply with all conditions issued by USFS in conjunction with the SUP. • Include the results of the ESA Section 7 consultation in the Final EIS and implement any measures required.

Resource	Mitigation Measures
Cultural Resources	• If necessary, develop a Memorandum of Agreement that would establish procedures to guide the identification and evaluation of historic properties, the assessment of adverse effects on them, and the development of appropriate mitigation of any adverse effects for cultural resources within the ROW. • Conduct a Class III cultural survey within the ROW and the site boundaries of all proposed substations and switchyards prior to construction and develop mitigation measures where required. • Span and protect known archaeological sites within the ROW from disturbance during construction. • Prevent construction workers from collecting or disturbing discovered cultural resources. • Develop a Project's Unanticipated Discovery Plan to provide guidance on how to proceed if a previously unknown archaeological or historic resource is encountered during construction or operation of the proposed transmission line, including contact of the SHPO and RUS-designated Federal Preservation Officer for further evaluation.
Land Use	• Provide a schedule of construction activities to all landowners who could be affected by construction. • Coordinate with landowners for potential measures to minimize project impacts on uses on specific properties. • Coordinate with appropriate federal and state land management agencies to obtain appropriate permits and easements for portions of the ROW traversing public lands. • Obtain the appropriate permits as necessary to comply with county and township zoning ordinances. • Plan and conduct construction activities to minimize temporary disturbance, displacement of crops, and interference with agricultural activities. • Restore compacted cropland soils as close as possible to pre-construction conditions using tillage. • Compensate landowners for any new land rights required for ROW or access road easements. • Compensate landowners at market value for any new land rights required for ROW easements or acquired for new temporary or permanent access roads on private lands. This should include compensation for agricultural production and market values lost during the construction period.
Socioeconomics	• The construction contractor, after assessing utilization of existing housing availability, should plan to establish its own housing in the form of man-camps and/or recreational vehicles (RVs) brought in from outside of the region to a number of locations secured by the contractor. • Work with agricultural producers to minimize disruptions during the harvest season and to limit the impact on the farmers' ability to maneuver equipment in the vicinity of the immediately affected area. • Work with individual landowners to try to coordinate the timing of construction to minimize short-term impacts on agriculture. • Initiate discussions with local fire and police districts prior to construction and work with the districts and other appropriate emergency response providers to develop fire and emergency response plans.
Environmental Justice	• No mitigation measures specific to environmental justice communities are described, as these communities would not be subject disproportionately to any high and adverse impacts.

Resource	Mitigation Measures
Recreation and Tourism	• Impacts on recreation would largely be associated with changes in viewsheds and general recreational experiences from the presence of the proposed transmission line. Mitigation measures for viewsheds are described under Aesthetics and Visual Resources. • Recreation would also be impacted in the short term by noise and dust from construction activities, equipment, and vehicles; construction-related traffic; and the presence of construction crews. Mitigation measures for these impacts are described under Geology and Soils; Infrastructure and Transportation; and Noise.
Infrastructure and Transportation	• Time conductor stringing across U.S. Highway 85, U.S. Highway 2, ND State Highway 8, ND State Highway 22, and ND State Highway 23 to avoid peak traffic, in consultation with North Dakota Department of Transportation. • Mark a detour route, if required by North Dakota Department of Transportation, and provide traffic information to motorists in advance of the detour, consistent with the Manual on Uniform Traffic Control Devices (Federal Highway Administration, 2012). • Coordinate with townships, counties, and North Dakota Department of Transportation to redress any road damage related to construction of the project. • Coordinate with FAA to avoid or minimize impacts on local aircraft facilities. • Identify existing utilities and coordinate with the owners to implement appropriate measures to protect both facilities and construction workers during crossings.
Railroads (BNSF, 2011)	• Locate poles 50 feet out from the centerline of railroad main, branch and running tracks, CTC sidings, and heavy tonnage spurs. • Provide at least 10-foot clearance from the centerline of track for poles located adjacent to industry tracks. If located adjacent to curved track, then said clearance must be increased at a rate of 1.5 inches per degree of curved track. • Locate unguyed poles (regardless of the voltage) at a minimum distance from the centerline of any track, equal to the height of the pole above the ground-line plus 10 feet. If guying is required, place the guys in such a manner as to keep the pole from leaning/falling in the direction of the tracks. • Locate poles (including steel poles) at a minimum distance from the railroad signal and communication line equal to the height of the pole above the ground-line or else be guyed at right angles to the lines. High voltage towers (345 kV and higher) must be located off railroad ROW. • Perform (if requested by BNSF) an inductive coordination study for electrical lines paralleling the tracks. • Construct utilities that cross railroad property, to the extent feasible and practical, perpendicular to the railroad alignment and preferably at not less than 45 degrees to the centerline of the track. • Do not place utilities within culverts or under railroad bridges, buildings, or other important structures. • Do not install crossings under or within 500 feet of the end of any railroad bridge, or 300 feet from the centerline of any culvert or switch area. • Span property completely with supportive structures and appurtenances located outside railroad property. For electric supply lines, normally the crossing span shall not exceed 150 feet with adjacent span not exceeding 1.5 times the crossing span length. • Encourage joint-use construction at locations where more than one utility or type of facility is involved. However, electricity and petroleum, natural gas, or flammable materials shall not be combined. Review and approve pipe truss design and layout with BNSF Engineering. • Construct electric lines with a minimum clearance of 26.5 feet or greater above top of rail when required by the National Electric Safety Code or state and local regulations. Electric lines must have a florescent ball marker on low wire over centerline of track.

Resource	Mitigation Measures
	• Label the posts closest to the crossing with the owner's name and telephone number for emergency contact.
Public Health and Safety	• Prepare a construction plan in accordance with the National Electrical Safety Code and the Occupational Safety and Health Administration's regulations, as required by federal law, to ensure the safety of construction workers. This would also identify procedures should a spill occur or hazardous materials be discovered. • Construct the proposed project with materials designed to contain electric currents and meet the highest safety standards. • Employ standardized agency procedures should the transmission line need maintenance or repairs. The use of such can help ensure the safety of both workers and those in the surrounding area. • Additional measures such as those identified in Appendix A are designed to ensure that Basin Electric's operational procedures are adhered to the highest standard to ensure the safety of workers and others close to the construction and operation of the proposed project.
Noise	• Use equipment with sound-control devices no less effective than those provided on the original equipment. • Do not use equipment with an unmuffled exhaust. • Do not conduct noise-generating construction activity within 1,000 feet of a residential structure between the hours of 10:00 p.m. and 7:00 a.m. • Notify landowners directly impacted along the ROW prior to construction activities. • During operation, if the proposed transmission line is found to be the source of radio or television interference in areas with reasonably good previous reception, measures would be taken to restore the reception to a quality as good as or better than before the interference.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Irreversible commitment of resources refers to the loss of future options for resource development or management, especially of nonrenewable resources such as cultural resources. Construction and operation of the proposed project would require between 3,500 and 3,800 acres for the ROW, which would restrict some types of development in the future. This would include federal, state and private lands. Most of these areas are in agricultural production or natural areas. The introduction of new transmission lines would permanently change the visual landscape in some areas. The construction of the project would require the irretrievable commitment of non-recyclable building materials and fuel consumed by construction equipment.

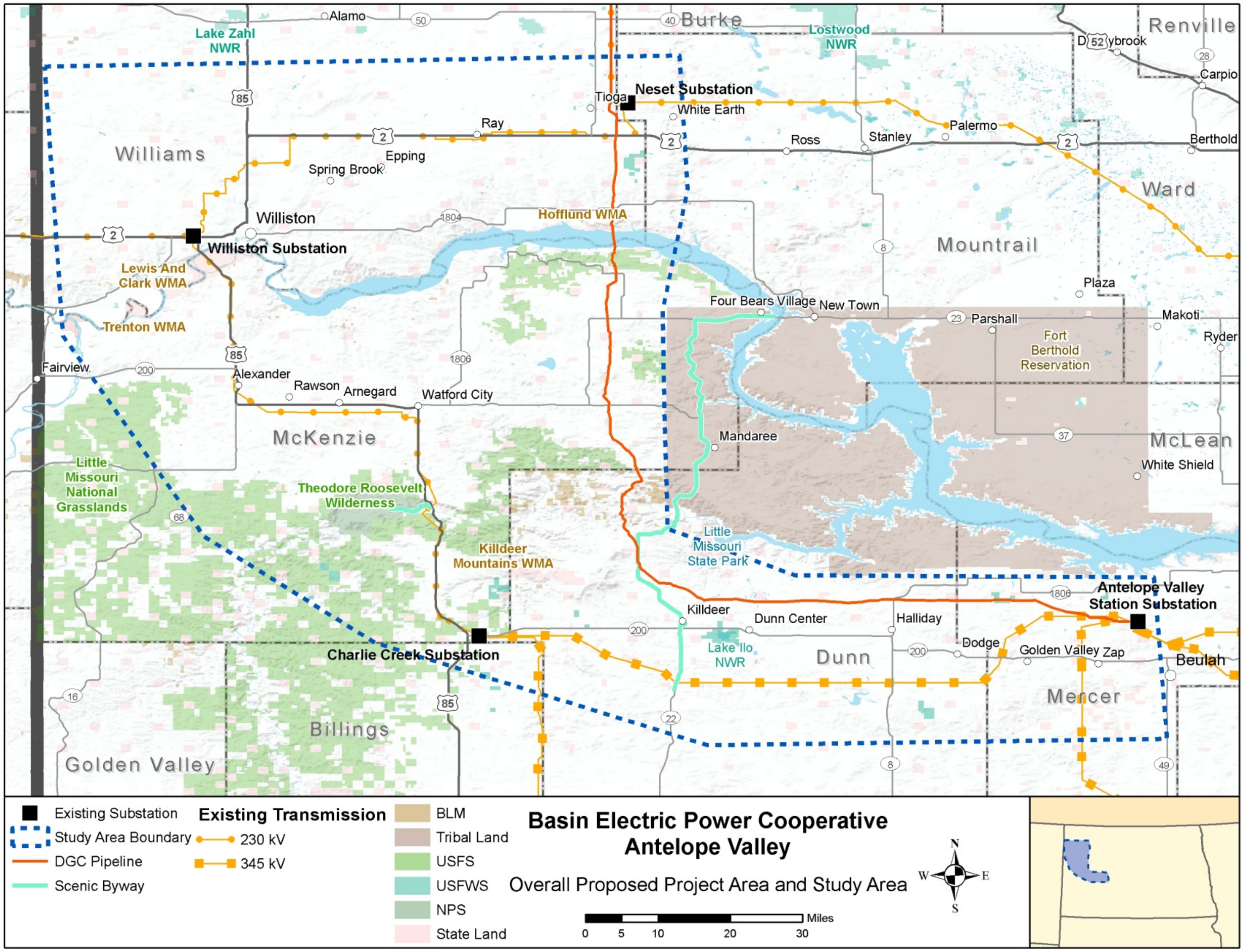
1 INTRODUCTION

Basin Electric Power Cooperative (Basin Electric) proposes to construct, operate, and maintain a new electrical transmission line in central and western North Dakota. This chapter provides a project overview and description of the Antelope Valley Station (AVS) Transmission Line (Section 1.1), purpose and need for the project (Section 1.2), and the regulatory framework and authorizing actions that are pertinent to the project (Section 1.3).

1.1 PROJECT OVERVIEW AND DESCRIPTION

Basin Electric proposes to construct, operate, and maintain a new electrical transmission line connecting the existing AVS, Charlie Creek, Williston, and Neset substations and newly proposed Judson and Tande 345-kilovolt (kV) substations. Approximately 190 miles of new 345-kV transmission line would need to be constructed, along with two new 345-kV substations (Judson Substation west of Williston and Tande Substation southeast of Tioga), and several miles of 230-kV transmission line to connect the 345-kV line into the existing area system. Starting from the AVS electric generation facility located near Beulah, North Dakota, the new 345-kV transmission line would connect with Basin Electric's existing Charlie Creek Substation near Grassy Butte, Basin Electric's new Judson Substation west of Williston, with final termination at Basin Electric's new Tande Substation. Additional 230-kV transmission lines would be constructed between the new Judson Substation and the existing Western Area Power Administration's (Western) Williston Substation, and also between the new Tande Substation and Basin Electric's existing Neset 230-kV Substation near Tioga, North Dakota. The new 345-kV transmission line would include approximately 159 miles of all new construction in new right-of-way (ROW), as would the 230-kV connection between the Tande and Neset Substations, as well as approximately 31 miles of 345-kV line double-circuited with a Mountrail-Williams Electric Cooperative 115-kV line associated with other regional improvement projects. The 230-kV connection between Judson and Williston substations would involve double circuiting with an existing 115-kV line and no new ROW would be necessary. The overall project area identified for this project encompasses parts of Mercer, Dunn, Billings, McKenzie, Williams, and Mountrail counties in North Dakota. The overall existing project elements and project area are shown on Figure 1-1.

Figure 1-1: Project Area



Basin Electric has requested financial assistance from the U.S. Department of Agriculture (USDA), Rural Utilities Service (RUS) to construct the AVS to Neset Transmission Project. RUS has determined that the agency's decision to finance the project would constitute a major federal action that may have a significant impact upon the environment within the context of the National Environmental Policy Act of 1969 (NEPA). RUS is serving as the lead federal agency for the NEPA environmental review of the project. Western and the USDA, Forest Service (USFS) are serving as cooperating agencies for the project. RUS has prepared this environmental impact statement (EIS) in compliance with the requirements of NEPA and the Council on Environmental Quality (CEQ) regulations for implementing NEPA (40 Code of Federal Regulations [CFR] 1500-1508). Western is serving as the lead federal agency for compliance with Section 106 of the National Historic Preservation Act (NHPA) for cultural resources and consultation for Section 7 of the Endangered Species Act (ESA) for threatened and endangered species.

In addition to compliance with all applicable federal regulations, permits and approvals must be granted by the state of North Dakota. The North Dakota Energy Conversion and Transmission Facility Siting Act states that it is necessary to ensure that the location, construction, and operation of energy conversion facilities and transmission facilities will produce minimal adverse effects on the environment and on the welfare of the citizens of the state by providing that no energy conversion facility or transmission facility shall be located, constructed, and operated within North Dakota without a certificate of site compatibility or a route permit acquired pursuant to Chapter 49-22 of the North Dakota Century Code. It is state policy to site energy conversion facilities and to route transmission facilities in an orderly manner compatible with environmental preservation and the efficient use of resources. To comply with the Act, sites and routes shall be chosen to minimize adverse human and environmental impacts while ensuring continuing system reliability and integrity and ensuring that energy needs are met and fulfilled in an orderly and timely fashion. The Certificate of Corridor Compatibility establishes a corridor through which the proposed facilities may be routed. The Route Permit is acquired through a pre-application route development phase, a review of completeness, a public meeting process, and finally a route approval that is contingent on adherence to other federal, state, or local permitting considerations (North Dakota Public Service Commission [NDPSC], 2012a).

It is anticipated that RUS and Western would notify and invite the North Dakota State Historical Office (ND SHPO), Indian tribes, federal and state permitting agencies, and other yet to be identified agencies and organizations to participate in Section 106 consultation. The following Indian tribes have been invited to participate in the consultation.

- Flandreau Santee Sioux
- Santee Sioux Nation
- Fort Peck Assiniboine and Sioux Tribes

- Spirit Lake Tribe
- Fort Belknap Indian Community
- Standing Rock Sioux
- Leech Lake Band of Ojibwe
- Three Affiliated Tribes
- Lower Sioux Indian Community
- Turtle Mountain Chippewa
- Minnesota Chippewa Tribe
- Upper Sioux Indian Community
- Prairie Island Indian Community
- White Earth Nation

This Draft EIS was prepared to meet the following key objectives.

- Identify and assess potential impacts on the natural and human environment that would result from the construction and operation of the AVS Transmission Line.
- Describe and evaluate reasonable alternatives, including a no-action alternative to the project that would avoid or minimize adverse effects on the environment.
- Identify specific mitigation measures to minimize environmental impacts.

1.2 PURPOSE AND NEED FOR ACTION

Several agencies will use this analysis to make decisions related to authorizing or permitting various components of the proposed transmission line. RUS, the lead agency, will determine whether or not to provide financial assistance for the project. Cooperating agencies on the EIS include Western and USFS. Western will evaluate the request by Basin Electric to interconnect the proposed project with the Williston 230-kV substation. USFS has primary responsibility to issue special use authorizations for construction, operation, and maintenance of a transmission line on National Forest System lands. USFS will use this analysis to make a decision related to the approval of the Special Use Permit (SUP) submitted by Basin Electric to construct, maintain, and operate a transmission line through lands administered by USFS on the Little Missouri National Grasslands (LMNG). The USFS Supervisor of the Dakota Prairie Grasslands will issue a decision on whether or not to authorize the SUP to Basin Electric.

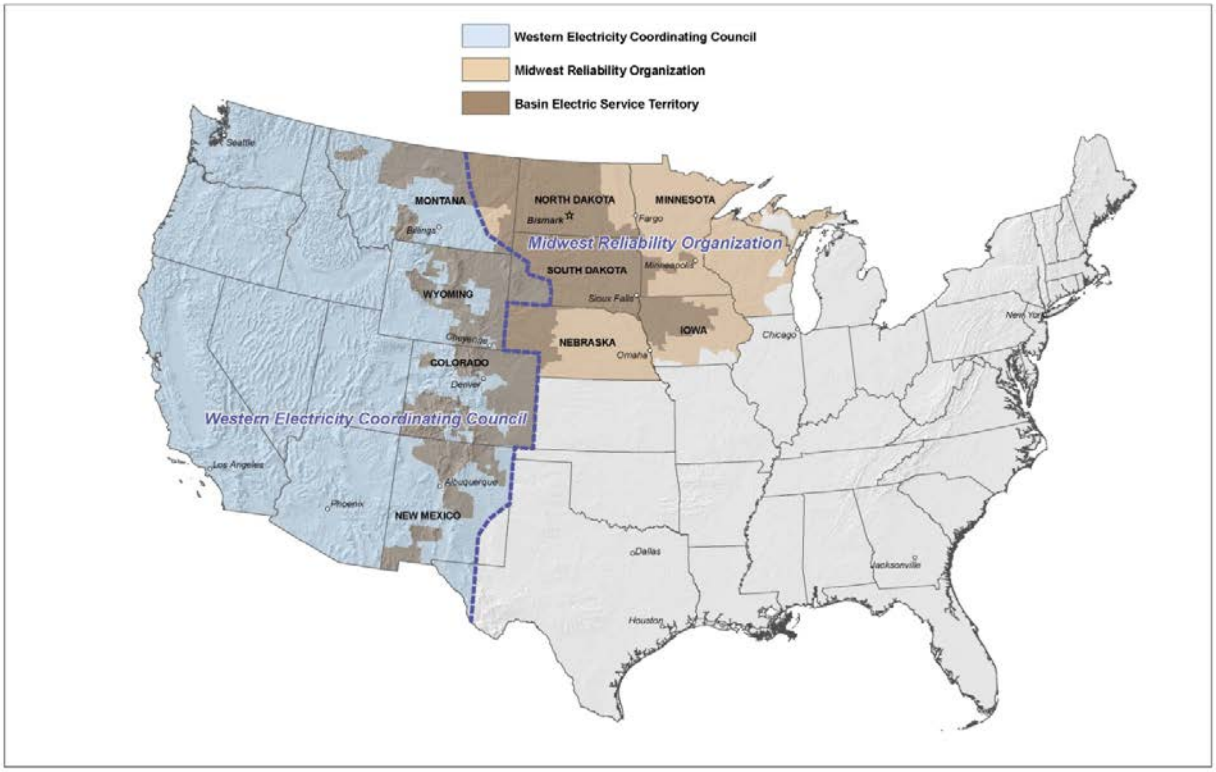
The following section describes the purpose and need for the AVS to Neset Transmission Project. The purpose and need is divided into the different perspectives of the entities involved with developing the project. This includes Basin Electric, RUS, Western, and USFS.

1.2.1 Basin Electric Purpose and Need

Basin Electric is a regional wholesale electric generation and transmission cooperative owned and controlled by the 134 member cooperatives it serves. It was created in May 1961 as a result of regional efforts by electric distribution cooperatives and the Rural Electrification Administration, now RUS. Basin Electric serves approximately 2.8 million customers in 540,000 square miles, covering portions of nine states: Colorado, Iowa, Minnesota, Montana, Nebraska, New Mexico, North Dakota, South Dakota, and Wyoming (see Figure 1-2).

Within the Basin Electric service area, northwestern North Dakota is experiencing a rapid increase in development as a result of the activities associated with the extraction of oil from the Bakken shale formation, currently concentrated in McKenzie, Mountrail and Williams counties. The level of development that has occurred and is planned for the future will require numerous infrastructure upgrades throughout the region, including an increase in electrical transmission capacity and reliability. Studies of power supply for the region and the upper Midwest (Integrated System [IS], 2011) indicate that a new 345-kV transmission line and associated substation upgrades are needed to serve the long-term needs of northwestern North Dakota by increasing the capacity to distribute electricity and enhance the reliability of the delivery system. The purpose of this project is to identify what route would be most appropriate, while minimizing the impacts of the AVS to Neset Transmission Project. The need for the project is to address system reliability issues resulting from rapid growth in the area, as detailed below.

Figure 1-2: Basin Electric Service Territory



Source: Western, 2010a

System Reliability Issues

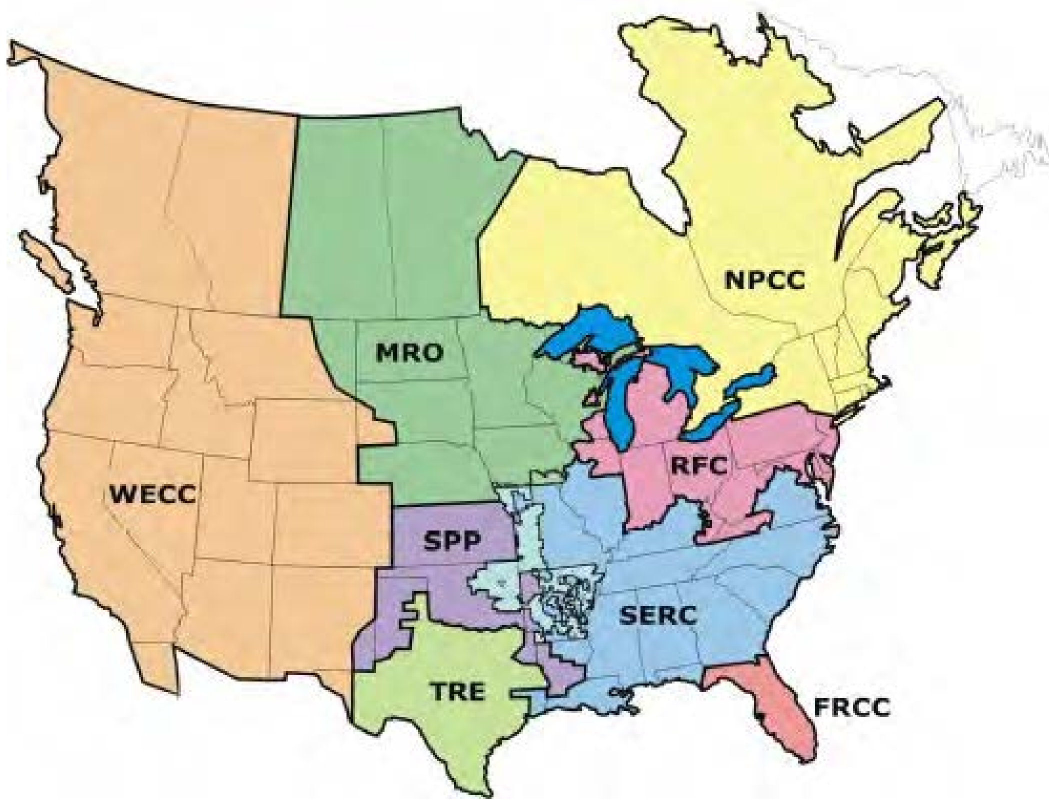
The Federal Energy Regulatory Commission (FERC) has the authority to develop and enforce reliability standards. These standards are in place to ensure system reliability, which is defined by the U.S. Department of Energy's Energy Information Administration as "a measure of the ability of the system to continue operation while some lines or generators are out of service. Reliability deals with the performance of the system under stress" (Energy Information Administration, 2012). The term "system" as it is used here refers to both generation and transmission components. It does not, however, include the low-voltage distribution lines that deliver electricity to consumers.

Section 215 of the Energy Policy Act of 2005 (Public Law 109 - 58) required the creation of an Electric Reliability Organization with authority to establish, approve, and enforce mandatory electricity reliability standards, subject to review and approval by FERC. In 2006, FERC established rules for certification of the Electric Reliability Organization and procedures for establishment, approval, and enforcement of reliability standards.

In 2006, the North American Electric Reliability Corporation (NERC), a pre-existing voluntary reliability organization, was certified as the Electric Reliability Organization in the United States.

The authority and certification granted to the NERC also included a provision for the newly-certified Electric Reliability Organization to delegate certain authority to regional entities as shown in Figure 1-3 for the purpose of proposing and enforcing reliability standards in particular regions of the country (FERC, 2006).

Figure 1-3: NERC Reliability Regions



Source: FERC, 2006.

NERC reliability standards apply to all owners, users, and operators of the bulk power system, which includes the electric generation and transmission system in North America. The reliability standards are developed by NERC and approved by FERC. Among the many reliability standards NERC has developed are sets of standards for transmission operations and transmission planning.

The Midwest Reliability Organization

The Midwest Reliability Organization's (MRO) current primary function is to monitor and enforce the NERC Reliability Standards. The MRO has delegated much of its transmission reliability responsibility to two Reliability Coordinators. NERC guidelines require that each regional reliability organization establish one or more Reliability Coordinators to "continuously assess transmission reliability and coordinate emergency operations among the operating entities within the region and across the regional boundaries" (MRO, 2010).

For the Basin Electric service area in northwestern North Dakota, the Reliability Coordinator is the IS that consists of Western, Basin Electric, and Heartland Consumers Power District. The IS provides the high-voltage transmission system grid in the region of eastern Montana, North Dakota, and South Dakota.

The IS transmission facilities consist of approximately 9,200 miles of interconnected high-voltage transmission lines, of which approximately 1,340 miles are owned by Basin Electric. The IS transmission system provides for delivery of power from federal hydroelectric facilities and thermal generation plants owned by Basin Electric and Heartland Consumers Power District. The IS provides open-access transmission service to customers in the region.

Project Area Reliability Issues

The existing high voltage system in the Williston/Tioga region consists of 230-kV and 115-kV systems that connect to: Saskatchewan, Canada; eastern Montana; central North Dakota; and western North Dakota. Outage of any of these paths could cause low voltage criteria violations and overload adjacent transmission lines in the Williston/Tioga region and therefore be in violation of NERC reliability standards. The IS study focused on the area with the most rapidly changing and increasing demand and the greatest potential for outage issues in the eastern Montana and western North Dakota area, identified as the Williston Pocket Load. In conducting the analysis and to maintain consistency, various demand and outage scenarios were used that other MRO service providers and reviewing authorities had previously approved. The scenarios included isolating local projects that are in the process of being constructed or planned for construction that would provide minor improvements to reliability over the short term. The results of the IS analysis identified short- and long-term serious overload and low voltage NERC criteria violations (IS, 2011).

Load Forecast

The August 2011 Basin Electric load forecast indicated an acceleration of growth in the northwestern North Dakota area primarily as a result of development of the Bakken Formation (Basin Electric, 2011). Much of the short-term load growth in this area is associated with provision of electrical service to support the rapid expansion of the number of facilities for oil and natural gas production, as well as the supporting infrastructure and services. This relatively rapid upswing in development activity in recent years is due to new exploration and extraction technology and the potential for oil recovery from the Bakken Formation. A follow-up third-party study will be undertaken in 2012 to confirm the load projections in northwestern North Dakota due to the rapidly expanding electrical service in this region.

The Bakken Formation is a thin, widespread geologic formation consisting of oil-generating shale and sandstone layers that extends through portions of Montana, North Dakota, and the Canadian Provinces of Saskatchewan and Manitoba (U.S. Geological Survey [USGS], 2008).

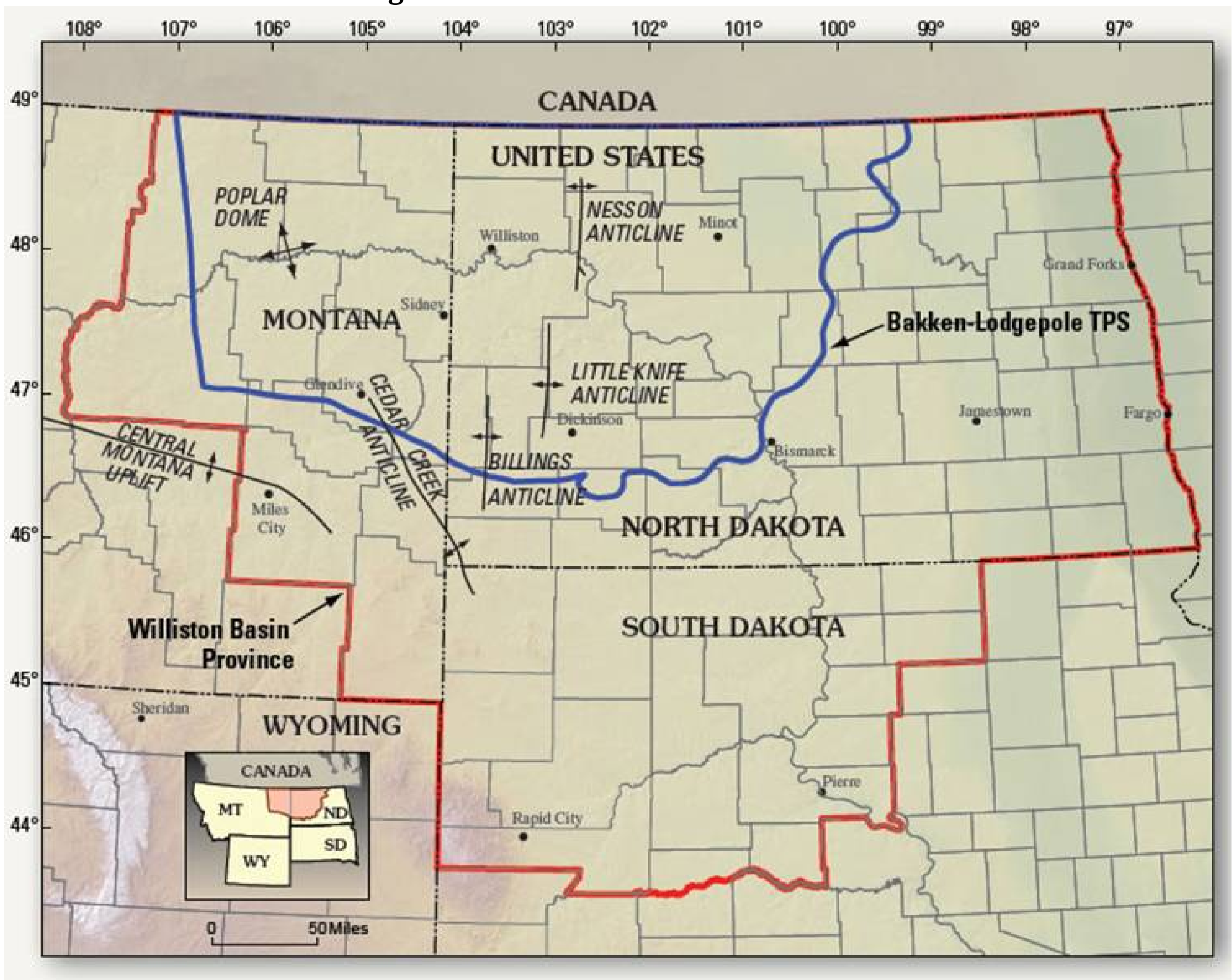
While there are 17 oil-producing counties in North Dakota, all of which are located in the western third of the state, the top producing counties in 2011 included Mountrail, McKenzie, Dunn, and Williams in northwestern North Dakota. Oil production in North Dakota increased from 62.8 million barrels of oil in 2008 to 152.9 million barrels in 2011 (a 143 percent increase) (North Dakota Industrial Commission, 2012). Production is expected to continue to increase with the development of an estimated 1,100 to 2,700 new wells per year in western North Dakota and 26,000 new wells over the next 10 to 20 years (NDDMR, 2011).

The Bakken shale development is currently concentrated in McKenzie, Mountrail, and Williams counties, as shown in Figure 1-4. The level of development that has occurred and is planned for the future will require an increase in electrical transmission capacity and reliability. Studies of power supply for the region and the upper Midwest indicate that a new 345-kV transmission line is needed to serve the long-term electrical needs of northwestern North Dakota (IS, 2011).

Infrastructure development related to the expanding oil and gas industry activity in the region includes pipelines, rail, natural gas plants, homes, businesses, roads, and transmission/distribution line development. Pipeline infrastructure is being developed to transport crude oil produced in the region to refinery and marketing hubs, such as the U.S. Gulf Coast, as well as to transport natural gas, hydraulic fracturing water, and salt water. Crude oil is also being transported by rail; expansion of rail infrastructure and associated loading and unloading facilities is under development. Natural gas plants are expanding to process natural gas for consumer use. Electric transmission lines have recently been constructed or are in development in western North Dakota to support expanding development and supporting infrastructure.

Table 1-1 shows the preliminary load forecast for northwestern North Dakota in the Williston/Tioga region. It is projected that the load is increasing in the regions adjacent to Williston/Tioga in a similar manner.

Figure 1-4: Bakken Formation



Note: TPS=Total Petroleum System

Source: Pollastro, R.M., et. al, 2012.

Table 1-1: Basin Electric Member Load Forecast for Transmission Lines in the Williston/Tioga Region

Year	Load (Megawatts)	% Increase
2011	280	--
2012	390	39
2013	454	16
2014	481	6
2015	509	6
2016	538	6

Source: Basin Electric, 2011.

An analysis of transmission line capacity indicated that by the year 2016 the load will have increased beyond the capacity of the existing system for the Williston/Tioga region and a new transmission line will be required to provide additional capacity. The closest strong transmission system support is the transmission infrastructure associated with the electrical power generation at AVS, located near Beulah. This system is operated at 345-kV and 230-kV and extends west, south, and east from Beulah across several state boundaries. This IS transmission infrastructure is the inter-tie between the numerous electric generation facilities and the federal hydroelectric generation associated with the main-stem Missouri River. A new 345-kV transmission line from the Beulah area to the northwest that connects directly to the 230-kV system in the Williston/Tioga area would provide an increase in the load serving capacity to accommodate the projected load growth and maintain acceptable reliability of the regional transmission system. If this new 345-kV transmission line is not added, load growth will be capped at the projected 2015 load level; no new load growth could be accommodated; and transmission system reliability would be severely impacted. This would limit the future development activities, impact the existing infrastructure in the Bakken oil field and any other load requirements in this service region, and violate NERC reliability standards.

The AVS to Neset Transmission Project’s design capacity is anticipated to be adequate for the load growth identified and originating from the points of delivery selected to bring power to the region. Should additional load growth or system integrity issues be identified in the future that require additional transmission infrastructure, this additional infrastructure would not be located within the same ROW in order to protect the regional transmission system’s integrity.

1.2.2 Rural Utilities Service Purpose and Need

RUS is authorized to make loans and loan guarantees to finance the construction of electric distribution, transmission, and generation facilities including system improvements and replacements required to furnish and improve electric service in rural areas, as well as demand side management, energy conservation programs, and on-grid and off-grid renewable energy systems. Basin Electric is requesting financing assistance from RUS for the proposed 345-kV transmission line in Mercer, Dunn, McKenzie, Williams, and Mountrail counties. RUS's proposed federal action is to decide whether to provide financing assistance for the project; accordingly completing the NEPA process is one requirement, along with other technical and financial considerations in processing Basin Electric's application.

The Rural Electrification Act of 1936, as amended, (7 United States Code [U.S.C.] 901 et seq.) generally authorizes the Secretary of Agriculture to make rural electrification and telecommunication loans, including specifying eligible borrowers, references, purposes, terms and conditions, and security requirements.

RUS' agency actions include the following.

- Provide engineering reviews of the purpose and need, engineering feasibility, and cost of the proposed project.
- Ensure that the proposed project meets the borrower's requirements and prudent utility practices.
- Evaluate the financial ability of the borrower to repay its potential financial obligations to RUS.
- Review and study the alternatives to mitigate and improve transmission reliability issues.
- Ensure that adequate transmission service and capacity are available to meet the proposed project needs.
- Ensure that NEPA and other environmental requirements and RUS environmental policies and procedures are satisfied prior to taking a federal action.

1.2.3 Western Area Power Administration Purpose and Need

Pursuant to its obligations under Federal Power Act (FPA), Western must consider and respond to Basin Electric's proposal for interconnection with the Williston Substation/Transmission Line. Western's purpose and need is to consider the interconnection in accordance with Western's General Requirements for Interconnection. Western evaluates the interconnection and whether it meets the reasonable needs of the entity proposing the interconnection to its system. Western generally assumes responsibility to operate and maintain transmission facilities interconnected to its transmission system pursuant to the terms of an Interconnection Agreement or associated contracts.

1.2.4 U.S. Forest Service

USFS has primary responsibility to issue special use authorizations for ROWs on National Forest System lands under the Federal Land Policy Management Act. USFS will use this analysis to make a decision related to the approval of the SUP submitted by Basin Electric to construct, maintain, and operate a transmission line through lands administered by USFS on the LMNG. The USFS Supervisor of the Dakota Prairie Grasslands will issue a decision on whether or not to authorize the SUP to Basin Electric.

The USFS proposed action is to authorize and subsequently issue a SUP with terms and conditions for the construction, maintenance, and operation of a transmission line through lands administered by USFS on the LMNG.

1.3 REGULATORY FRAMEWORK/AUTHORIZING ACTIONS

This section summarizes federal, state, and local laws, regulations, associated permits, approvals, and coordination that are applicable to the project. Table 1-2 summarizes the permits, regulations, or consultations and other required actions that would be necessary for the project. See Chapter 6 of this document for a more details.

Table 1-2: Permits, Regulations or Consultations Needed for Listed Agencies and Required Actions Necessary for the Project

Agency	Law or Regulation	Agency Action
Federal Agencies		
Rural Utilities Service	National Environmental Policy Act	-Review and approve NEPA documentation. -Ensure that all actions associated with the project are in compliance with all applicable federal, state, and local regulations. -Decide whether to approve financing assistance for the project. -Sign Record of Decision.
	RUS Environmental Policies and Procedures	-Consult with appropriate agencies to provide decisionmakers with information to ensure that decisions and actions are based on an understanding of environmental consequences.
	Executive Order 11988 Floodplain Management	-Avoid, to the extent possible, the long- and short-term adverse impacts associated with the occupancy and modification of flood plains.
	Executive Order 11990 Protection of Wetlands	-Ensure that short- and long-term impacts on wetlands are avoided where practical alternatives exist.

Agency	Law or Regulation	Agency Action
	Executive Order 13112 Invasive Species	-Do not authorize, fund, or carry out actions that are likely to cause or promote the introduction or spread of invasive species in the United States. -Implement all feasible and prudent measures to minimize risk of harm from introduction or spread of invasive species.
Western Area Power Administration	National Environmental Policy Act	-Provide input to the NEPA process. -Prepare Record of Decision.
	National Historic Preservation Act, Section 106	-Act as lead agency in considering the effects of the project on properties listed in or eligible for listing in the National Register of Historic Places (NRHP). -Conduct consultation with the ND SHPO. -Notify and invite ND SHPO, Indian tribes, and federal and state permitting agencies to participate in consultation.
	Endangered Species Act, Section 7	-Ensure that the project will not jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of critical habitat of such species. -Act as lead agency in considerations under the ESA. -Prepare Biological Assessment. -If it is determined that the project may result in incidentally harming endangered or threatened species, a permit must be acquired from the U.S. Department of the Interior, Fish and Wildlife Service (USFWS).
	Federal Power Act	-Provide transmission service on a non-discriminatory basis through compliance with its Open Access Transmission Service Tariff. -Based on a review of this NEPA document, consider and respond to Basin Electric's request for an interconnection with Williston Substation.
	Executive Order 11593 Enhancement, Protection, & Management of the Cultural Environment	-Where applicable, act as steward to nation's heritage resources. -Inventory historic and prehistoric sites.
	Executive Order 13175 Consultation and Coordination with Indian Tribal Governments	-Establish meaningful consultation and collaboration with tribal governments.

Agency	Law or Regulation	Agency Action
U.S. Army Corps of Engineers	Clean Water Act Section 404	-Regulate and provide permits for the discharge of dredged or fill material in jurisdictional wetlands of waters of the United States.
	Section 10 of the Rivers and Harbors Act	-Requires permit from the USACE for the construction of any structure in or over any navigable water of the United States.
	10 U.S.C. 2668, Easements for Rights-of-Way	-Easement will be required to cross lands owned and managed by USACE located near the Missouri River.
U.S. Fish and Wildlife Service	Endangered Species Act, Section 7	-Avoid/minimize impacts to threatened and endangered species and critical habitat. -Provide Section 7 consultation. -Review the Biological Assessment. -Provide a Biological Opinion, if necessary. -Provide an Incidental Take Permit, if necessary.
	Migratory Bird Treaty Act	-Avoid/minimize impacts to migratory birds and habitat. -Provide a Special Purpose Permit, if necessary.
	Executive Order 13186 Responsibilities of Federal Agencies to Protect Migratory Birds	-Avoid/minimize impacts on migratory birds. -Ensure that mitigation measures protect birds and their habitats.
	Bald and Golden Eagle Protection Act	-In accordance with the permitting program established by the USFWS Division of Migratory Bird Management, if activities require the removal or relocation of an eagle nest, a permit is required from the Regional Bird Permitting Office.
	Fish and Wildlife Conservation Act	-Ensure that mitigation measures conserve wildlife and wildlife habitat.
	Fish and Wildlife Coordination Act	-In coordination with North Dakota Game and Fish Department (NDGFD), provide consultation if it is determined that the proposed project would affect water resources.
	Clean Water Act Section 404	-Work with USACE and the U.S. Environmental Protection Agency (USEPA) to ensure regulation of discharge of dredged or fill material in jurisdictional wetlands of water of the United States.
	National Invasive Species Act	-Prevent the introduction and spread of non-native invasive species as a result of project activities.

Agency	Law or Regulation	Agency Action
USDA-Natural Resources Conservation Service	Farmland Protection Policy Act	-Identify and quantify adverse impacts that the project may have on farmlands. -Minimize contribution to the unnecessary and irreversible conversion of agricultural land to non-agricultural uses.
	Farmland Conversion Impact Rating	-Provide consultation to minimize farmland conversion impacts. -Issue an Impact Rating.
USDA-Farm Services Agency, North Dakota Office	Conservation Reserve Program	-Provide consultation regarding crossing of lands enrolled in the Conservation Reserve Program.
Federal Aviation Administration	Determination of No Hazard to Air Navigation	-Issue a determination stating whether the proposed project would be a hazard to air navigation.
National Park Service	National Wild and Scenic Rivers Act	-Provide consultation regarding potential impacts to national wild, scenic and recreational river areas in project planning.
	National River Inventory	-Provide consultation regarding potential impacts to the Missouri and Little Missouri rivers.
	Viewshed Impacts Consultation	-Provide consultation regarding viewshed impacts to Theodore Roosevelt National Park.
	National Trails System Act	-Provide consultation regarding Lewis & Clark National Historic Trail.
U.S. Environmental Protection Agency	National Environmental Policy Act	-Provide NEPA document review and rating.
	Pollution Prevention Act	-Ensure that the project is designed to comply with national policies for waste management and pollution control.
	Noise Control Act	-Ensure that the project is designed in a manner that furthers the national policy of promoting an environment free from noise that may jeopardize health and welfare.
	Executive Order 12898 Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations	-Identify and address disproportionately high and adverse human health or environmental effects on minority populations and low-income populations.
U.S. Forest Service	Federal Land Policy Management Act	-Implement plant control agreements. -Grant easement for ROW across lands within the LMNG.
	National Forest Management Act	-Grant a SUP for location of transmission line under the Land Resource Management Plan for LMNG. -Complete a Biological Evaluation and Management of Indicator Species Review.
	Executive Order 13007 Indian Sacred Sites on Federal Lands	-Avoid adverse effects to sacred sites. -Provide access to sacred sites to Native Americans for religions practices.

Agency	Law or Regulation	Agency Action
U.S. Department of Labor	Occupational Safety and Health Act	-Ensure that Occupational Health and Safety Administration standards are met during the construction, operation, and maintenance of the proposed project.
Department of Transportation, Federal Highway Administration	Encroachment Permits	-Issue permits for crossing federally funded highways.
State Agency or Other Permits, Regulation or Consultation		
North Dakota Department of Transportation	Encroachment Permits	-Issue road crossing permits. -Issue state highway crossing permits. -Issue state utility occupancy permits.
North Dakota Parks and Recreation Department	Killdeer Mountain Four Bears Scenic Byway	-Provide consultation regarding visual impacts to Killdeer Mountain Four Bears Scenic Byway.
North Dakota State Land Department	North Dakota School Trust Lands	-Issue permit for easements where transmission line will cross Trust Lands.
North Dakota Public Service Commission	North Dakota Energy Conversion and Transmission Facility Siting Act	-Issue Certificate of Corridor Compatibility. -Issue Route Permit.
North Dakota State Historic Preservation Office	National Historic Properties Act, Section 106	-Section 106 consultation.
	North Dakota Indian Burial Laws	-If prehistoric and historic human burials, human remains and burial goods are inadvertently discovered during the construction of the project, construction would stop until the ND SHPO examined the site.
	Archaeological Resources Protection Act	-Secure the protection of archaeological resources and sites on public lands.
North Dakota Game and Fish Department	Special Use Permit	-Issue permit for crossing state wildlife management areas.
	State-Listed Species of Concern	-Provide consultation and approval regarding state-listed species of concern.
	Noxious Weeds	-Provide consultation regarding noxious weeds.
	Fish and Wildlife Coordination Act	-In coordination with USFWS, provide consultation if it is determined that the proposed project would affect water resources.

Agency	Law or Regulation	Agency Action
North Dakota Department of Health – Division of Water Quality	North Dakota Water Pollution Control Act	-Ensure that the applicant has a Storm Water Pollution Prevention Plan as required under the North Dakota Pollutant Discharge Elimination System.
	Clean Water Act, Section 401	-Provide certification for any permit or license issued for any activity that may result in a discharge into waters of the state. -Ensure that the proposed project will not violate state water standards. -Issue pertinent permits.
	Little Missouri Scenic River Act	-Ensure that the construction and operation of the project preserves the Little Missouri River as nearly as possible to its present state.
North Dakota Department of Health – Division of Air Quality	Clean Air Act	-Implement any pertinent permitting requirements as delegated by USEPA's established National Ambient Air Quality Standards.
North Dakota State Water Commission	Encroachment Permits	-Issue permits for crossing navigable waterways.
BNSF Railway Company	Railroad Crossing Authorization	-Provide authorization to construct and operate a transmission line across railroad ROW.
Dunn, McKenzie, Mercer, Mountrail, Williams Counties	Conditional Use permits	-Issue Conditional Use permits.
	County Floodplain Encroachment Permits	-Issue floodplain encroachment permits.
	County Road Encroachment Permits	-Issue road encroachment permits.

1.4 SCOPE OF THE EIS

NEPA and the North Dakota Energy Conversion and Transmission Facility Siting Act require that agencies responsible for preparing environmental review documents involve the public in environmental review of projects (North Dakota Century Code, 2011a; NDPSC, 2012b). Prior to development of the EIS, the responsible agencies determine what information is to be evaluated in the EIS. A "scope" is a determination of what issues need to be assessed in the environmental review in order to fully inform decision makers and the public about the possible impacts of a project or potential alternatives. In part, these issues are identified during the scoping process for the project. Through the scoping process, RUS invited federal, state, and local units of government; Native American tribes; organizations; and individuals interested in the project to comment on the project and to identify issues and concerns to be addressed in the EIS. This section summarizes the scoping process and issues raised that will be addressed in the EIS. Chapter 2 of this document describes the alternatives analyzed in the EIS as well as alternatives considered, but not evaluated.

1.4.1 Agency Consultation

Initial Project Coordination

During the early stages of defining the proposed project, Basin Electric made informal contact with various local, state, and federal officials. Letters were sent to various local, state, and federal agencies that described the proposed project and requested that any issues or concerns be identified. The Notice of Intent informing the public that RUS was intending to prepare an EIS for the proposed project was published in the Federal Register on November 2, 2011.

Agency Scoping

A second set of letters went out from RUS to federal, state, and local agencies; tribal representatives; and organizations and persons that had requested to be on the mailing list for Western or Basin Electric. The agency scoping meeting was conducted on November 14, 2011, in Bismarck, North Dakota, with 12 agencies having representatives in attendance. The agencies represented included:

- Little Missouri Scenic River Commission
- National Park Service (NPS)
- North Dakota Department of Health (NDDOH)
- North Dakota State Historic Preservation Office
- North Dakota Department of Trust Lands
- North Dakota Transmission Authority
- U.S. Army Corps of Engineers (USACE)
- RUS
- USDA Natural Resources Conservation Service (NRCS)
- USFS
- U.S. Department of the Interior, Fish and Wildlife Service (USFWS)
- Western

1.4.2 Public Scoping

Several public participation activities were conducted. These activities included:

- Informing agencies and the public about the proposed project.
- Making public announcements about the proposed project in the Federal Register, in the local newspapers, on local radio stations, and through mailings to project stakeholders.
- Conducting information scoping meetings for agencies and the general public.
- Collecting comments from the several agencies and the public.

The purpose of the public participation process was to gain input about any potential concerns and identify issues that need to be addressed in the EIS. During this public participation scoping process, contact was made with federal agencies, tribal representatives, state agencies, local officials, and the general public. More detail about public participation can be found in the AVS to Neset 345-kV Transmission Line Project Scoping Report (RUS, 2011).

Public Scoping Meetings

Letters, radio public service announcements, and newspaper advertisements announcing the proposed project and the scoping meeting location and times were distributed prior to the public scoping meetings. One meeting was conducted in Williston, North Dakota on November 15, 2011, and a second meeting was conducted in Killdeer, North Dakota on November 16, 2011.

Comments

A total of 38 comment sheets and letters were received during the scoping comment period beginning on November 2, 2011, and ending on December 2, 2011. Several of the comment sheets and letters identified multiple topics that resulted in the 62 comments in the categories identified below. The number of comments each category received is noted in parenthesis.

- Air Quality (2)
- Aesthetics (4)
- Conservation in the area of the proposed project, particularly in the area of Lone Butte within the LMNG, Theodore Roosevelt National Park (TRNP), and Lewis and Clark National Historic Trail (21)
- Environmental justice impact assessment to screen for potential health and monetary effects to low income or minority populations (1)

- Project Information/Communication (5)
- Need for the Project (2)
- Noise (1)
- Property Values (2)
- Alternative Routes (10)
- Vegetation (2)
- Water (3)
- Wildlife (9)

The key issues identified during the comment process were primarily related to the visual impacts and general disturbance to the natural areas along the alternative corridor that followed U.S. Highway 85 between the TRNP and USFS properties. The comment sheets and issues to be addressed in the EIS are included in the AVS to Neset 345-kV Transmission Line Project Scoping Report (RUS, 2011).

Additional Public Participation

Opportunities for public and agency input will occur during the duration of the project as additional coordination occurs. A second round of public meetings and a comment period will occur in conjunction with the issuance of the Draft EIS, anticipated in late 2012.

1.4.3 Issues Considered but Dismissed from Further Evaluation

Numerous issues and potential concerns covering a wide range of natural and human resources for the proposed project were identified and discussed, as summarized in the Project Scoping Report (RUS, 2011). Upon review and consideration of the comments received and resources identified, all issues were deemed appropriate for consideration and evaluation as part of the EIS process. Therefore, none of the issues and concerned raised during the scoping process were dismissed from further evaluation. This EIS contains a comprehensive review of the issues raised during scoping, as well as others not raised but typical for a project of this nature.

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2 PROPOSED ACTION AND ALTERNATIVES

Chapter 2 describes the alternatives considered for the construction and operation of the AVS Transmission Line. Project alternatives were screened to determine their ability to meet the purpose and need of the proposed project and to provide a comparison of impacts. To identify various options for the project, macro-corridors connecting the project endpoints were developed, followed by the development of network segments within the macro-corridors. The network segments within the macro-corridors were combined in various ways to form complete route alternatives between the proposed project endpoints. Two of these alternative routes and the no-action alternative were retained for full evaluation in this EIS.

2.1 ALTERNATIVES CONSIDERED AND ELIMINATED FROM FURTHER CONSIDERATION

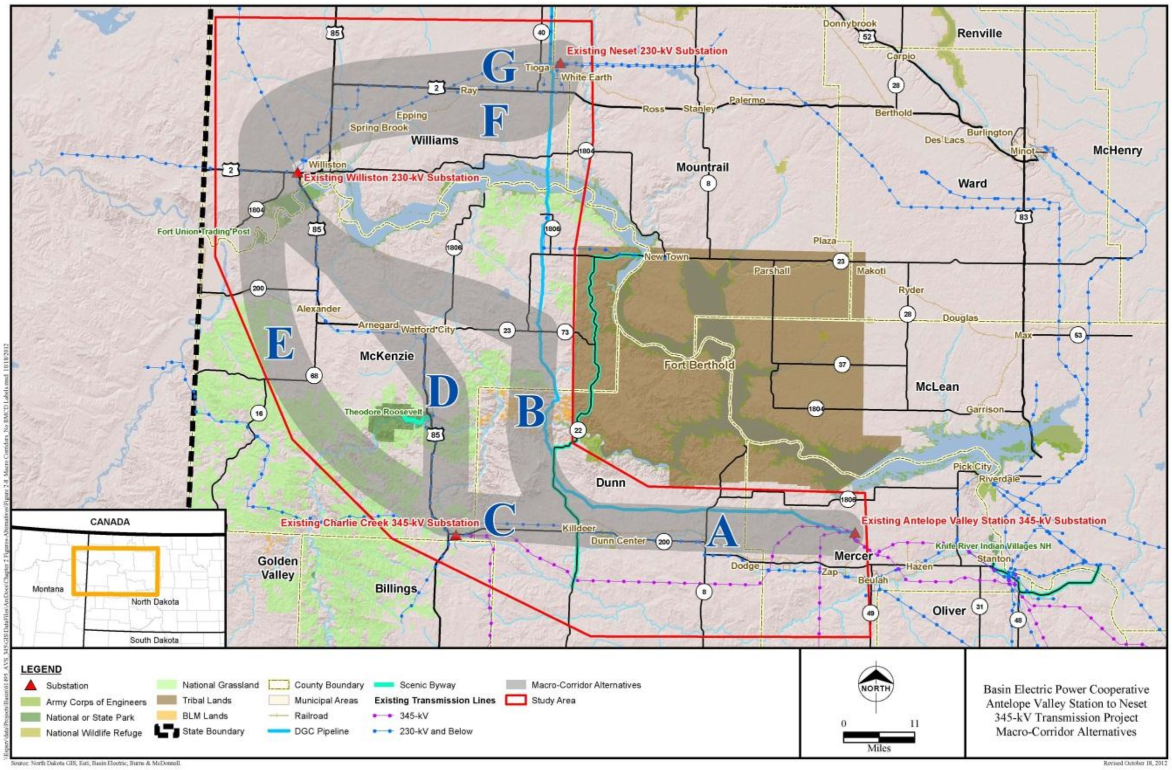
This section discusses the alternatives that were considered early on the in the planning process, but eliminated for various reasons from further consideration. These alternatives are summarized in Table 2-1. A full discussion of all system upgrades, corridors, route segments, and optional routes that were considered but not brought forward in the EIS are provided in the Macro-Corridor Study (Burns & McDonnell Engineering Company [BMcD], 2011), and the Environmental Report (BMcD, 2012).

Table 2-1. Alternatives Considered and Eliminated from Further Consideration

Alternative	Description	Rationale for Dismissal
System Upgrades	As an alternative to new line construction, numerous operating scenarios and system facility upgrades were developed and evaluated for the IS system. These scenarios were modeled with different line ratings, line carrying capacities, and system contingencies. Modeling of the facility upgrades included replacement of existing transformers with higher-capacity units and the installation of capacitors at various locations throughout the system.	Under all scenarios investigated, system reliability on some lines would be only temporarily improved and, even with implementation of all investigated upgrades, significant system failures, including considerable voltage drops or even voltage collapse, would result in numerous lines throughout the system exceeding their emergency ratings.
Additional 115-kV Lines	The construction of several new alternatives for 115-kV lines was investigated in a study that took into account predicted load growth. The new lines were identified by Basin Electric member cooperatives to serve specific loads and would not be operated as part of the overall electricity transmission network and are needed with or without the proposed project.	Construction and operation by the member cooperatives of these 115-kV facilities was found to mitigate many of the system limitations identified through 2014. It was predicted, however, that by as early as 2015 many of the current system limitations would again result. These projects were not found to fully meet the need of the proposed project.

Alternative	Description	Rationale for Dismissal
Additional 345-kV Lines	Long-term analysis was undertaken to identify potential solutions to the inability of the system to meet projected load forecasts beyond the 2014 to 2016 time period. These alternatives included construction of various 345-kV lines in addition to the 115-kV lines previously noted. Initial project development efforts identified the region north of the existing AVS 345-kV Substation as providing a direct path towards a connection to the existing Neset 230-kV Substation near Tioga.	The two big impediments to developing a new transmission line directly from AVS to Tioga are the Fort Berthold Reservation and Lake Sakakawea. Crossing Fort Berthold would involve complications and delay the approval process beyond 2016, which would result in declines in electricity reliability throughout the region. Crossing Lake Sakakawea was determined infeasible on the basis of logistics and costs associated with placement of a submarine cable in the lake.
Alternative Corridors/ substation alternatives	Two additional 345-kV line corridor segments were also considered (Figure 2-1). One of these segments would have extended westward from the existing Charlie Creek 345-kV Substation (Corridor E). The other would have extended north from Williston and turned east toward the proposed Neset 345-kV Substation, while remaining north of U.S. Highway 2 (Corridor G). Power delivery to the Judson/Williston/Neset substations without a Charlie Creek 345-kV Substation connection was also considered.	These corridors were dismissed from further consideration due to rough terrain and limited opportunities for placement within existing ROWs. The construction and operation of the AVS-to-Charlie Creek-to-Judson-to-Tande-to-Neset by a 345-kV transmission line, with associated substation interconnections, best satisfied the project's purpose and need.
Charlie Creek 345-kV Substation Connection	Initial consideration was given to delivering power to the Judson/Williston/Neset substations without a Charlie Creek 345-kV Substation connection.	A alternative that includes the Charlie Creek 345-kV Substation connection provides a more robust support of the Western IS system and better supports future planning for growth in western North Dakota. The construction and operation of the AVS-to-Charlie Creek-to-Judson-to-Tande-to-Neset by a 345-kV transmission line, with associated substation interconnections, better satisfied the project's purpose and need (BMcD, 2012).

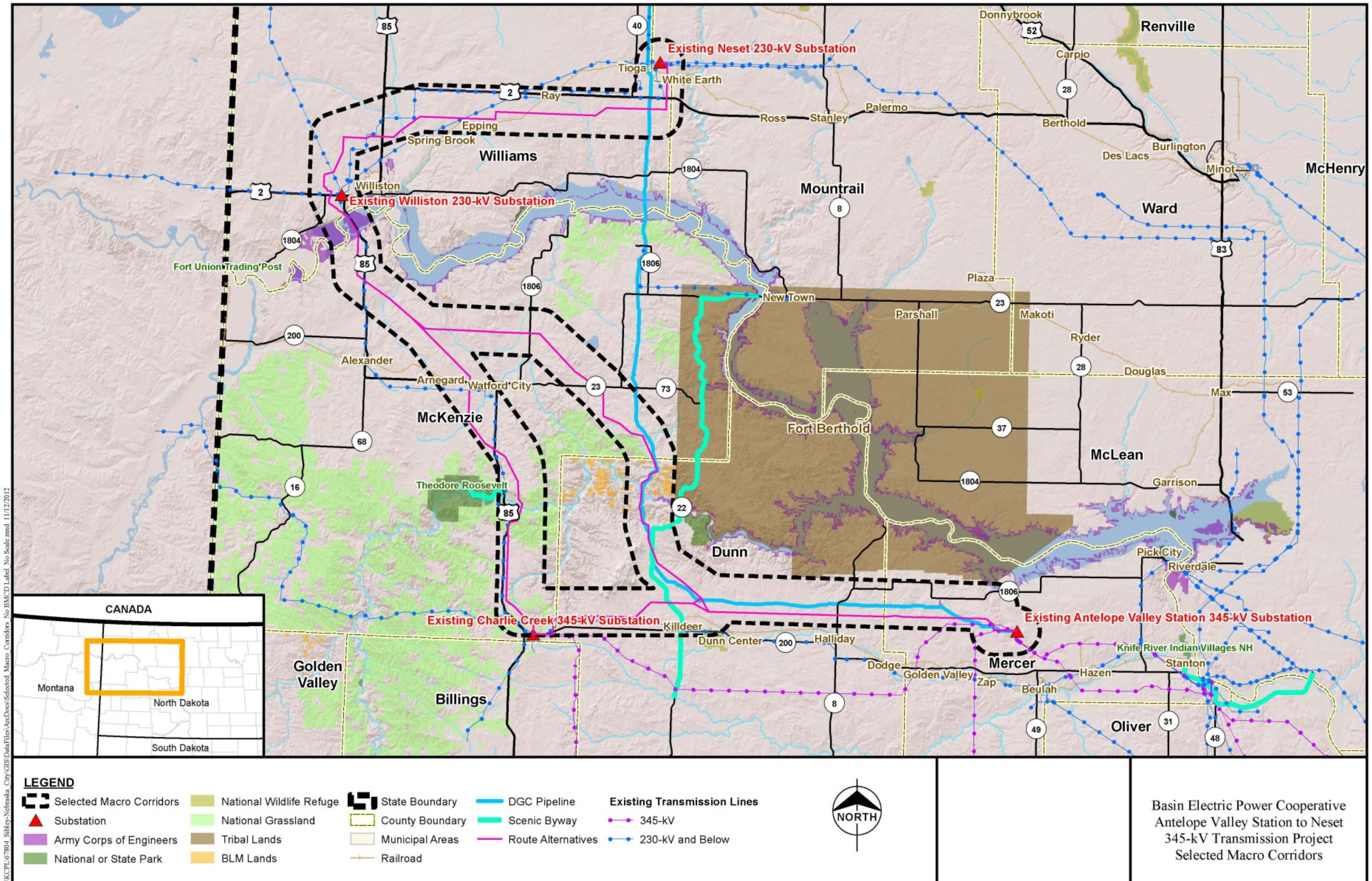
Figure 2-1: Alternative Corridors Considered



2.2 SELECTION OF PROJECT ALTERNATIVES

NEPA requires that an EIS consider a full range of alternatives to the proposed action and fully evaluate all reasonable alternatives. In addition, the EIS must also consider the no-action alternative. For the AVS Transmission Line, alternatives consist of individual route segments that, when combined, form a complete route between the proposed endpoints. This section describes the individual, 1,000-foot-wide alternative route corridors located within the 6-mile-wide macro-corridors identified for the proposed project. See Figure 2-2.

Figure 2-2: Macro-corridors Identified for the Proposed Project



Source: North Dakota GIS; Esri; Basin Electric; Burns & McDonnell.

Revised November 12, 2012

Macro-corridors identified for the proposed project contain a variety of resources. However, land use patterns, topography, and natural and socioeconomic resources (Chapter 3, Affected Environment and Environmental Effects) for any particular portion of each macro-corridor are similar. As such, while there are various opportunities and constraints within each macro-corridor, any 1,000-foot-wide route corridor developed within each macro-corridor extends across largely the same land use and topography, encountering similar types and quantities of natural and socioeconomic resources. Additionally, macro-corridors contain few impediments to transmission line routes and are generally undeveloped and favorable for transmission line construction should the line need to be adjusted or revised for various reasons. Therefore, it was determined to be unnecessary to develop an extensive number of routes, although multiple routes were developed within the macro-corridors to provide options for the project and geographic diversity between options.

Route corridors consist of approximately 1,000-foot-wide corridors extending between the end points and intermediate connection locations. The objective was to identify potential route corridors that minimize impacts on natural and human resources and provide cost-effective project options. The following routing principles were used to develop the route corridors.

- Minimize length.
- Minimize angles.
- Follow existing ROWs and land divisions (electric lines, roads, property boundaries, fence rows, and field borders), as appropriate.
- Minimize visual contrast with natural landscape.
- Minimize conflict with current and planned uses of land.
- Minimize impacts on natural resources such as wetlands, woodlands, and wildlife.
- Minimize impacts on socioeconomic resources such as residences and cultural resources.
- Avoid densely populated residential areas and maintain as much distance as practicable from individual homes and public facilities (churches, schools, etc.).
- Avoid crossing back and forth across waterways and roads.
- Maximize distance from airports, landing strips, and other aviation facilities.
- Avoid crossing major roads in the vicinity of intersections and interchanges.

A network of 46 individual, 1,000-foot-wide route corridor segments was initially developed within the 6-mile-wide macro-corridors to avoid constraints and take advantage of opportunity areas while simultaneously taking public and agency comments under consideration. These individual route segments are described in more detail in the Macro-Corridor Report (BMcD, 2011) and summarized in Appendix A of the Environmental Report (BMcD, 2012).

Following public and agency review of the Macro-Corridor Report (BMcD, 2011), RUS held public and agency scoping meetings in several locations throughout the project area to gain input about opportunities and constraints within the project area, and particularly within the identified macro-corridors. Public scoping meetings were held to provide the public with information regarding the proposed project, and to identify concerns regarding potential impacts from the proposed project. The agency scoping meeting was held to provide federal, state, and local agencies with information about the proposed project, and to identify compliance, permitting, and other issues related to the proposed project.

Agency and public comments on the possible route alignments for the project resulted in revisions to the preliminary alternatives under consideration. Specifically, agencies and the public expressed concerns about the transmission line crossing areas of the Lone Butte Management Area within the LMNG, located south of the Little Missouri River. Concerns over visual resource impacts and access across areas of the National Grassland that are currently valued due to their roadless characteristics resulted in moving alternative routes in this area further west to parallel U.S. Highway 85 and to be located within an existing utility corridor in this area. Alternative project alignments were relocated to better comply with the location of this proposed utility corridor and avoid crossing the Lone Butte Management Area.

Additionally, two alignments were presented for crossing the Missouri River, one alignment within the U.S. Highway 85 corridor and parallel to an existing transmission line and a second alignment several miles west, avoiding residential and commercial development along the U.S. Highway 85 corridor. Both USACE, the agency that owns much of the land adjacent to this portion of the Missouri River, and the North Dakota Game and Fish Department (NDGFD), the agency that manages these lands, expressed strong preference for the route to be located in the U.S. Highway 85 corridor. Such routing would confine the new corridor to an existing corridor, minimizing impacts on wildlife habitat and habitat for the federally threatened piping plover. Based on this feedback, potential alternatives west of the U.S. Highway 85 corridor were dropped from further consideration.

Basin Electric identified two alternative routes, one within each macro-corridor. Each alternative route is defined as a 150-foot-wide ROW within a larger 1,000-foot-wide route corridor. These alternative routes are used in the evaluation of potential impacts of the proposed transmission line and its supporting infrastructure. It is likely that as the project continues to be developed, conditions will be identified or encountered during survey, engineering, ROW acquisition, and (should the project be approved) construction that may require Basin Electric to make adjustments to this route. These adjustments would be to address specific, localized conditions, circumstances, and landowner requests not readily apparent as part of the route development and environmental review process and would not be anticipated to result in substantial (if any) additional or different impacts. Any adjustments would generally be intended to reduce overall environmental impacts, reduce project inconvenience to landowners, and/or protect public safety. To the extent these adjustments are identified during the environmental review process and vary from the alignment considered in this Draft EIS, the revised alignment and its characteristics and potential impacts will be assessed in the Final EIS. A detailed description of the alternative routes is provided below.

2.3 ALTERNATIVES CONSIDERED IN THE EIS

2.3.1 No-action Alternative

Under the no-action alternative, the AVS Transmission Line would not be constructed. The existing environment within the project area would remain the same and no land would be used for transmission lines, facilities, or substations. The no-action alternative does not meet the identified purpose and need for the project. Under this alternative, it is expected that load growth will increase beyond the load serving capacity of the existing transmission system for the Williston/Tioga region by 2016, resulting in transmission system reliability issues and violating the criteria established by NERC for transmission reliability in the region.

2.3.2 Alternative Route A

Alternative Route A is approximately 195 miles in length (see Figure 2-3). For this route, the transmission line would run from east to west beginning at the AVS Substation and ending at the Neset Substation. This alternative would include a 65-mile, 345-kV line from the AVS Substation to the existing Charlie Creek 345-kV Substation. The Charlie Creek 345-kV Substation would be connected by a 70-mile segment to the proposed Judson 345-kV Substation near Williston. The proposed Judson 345-kV Substation would then interconnect with the proposed Tande 345-kV Substation by a 56-mile line segment (including approximately 31 miles of double circuit with Mountrail-Williams Electric Cooperative 115-kV line) and a 2-mile, 230-kV transmission line would interconnect the proposed Judson 345-kV Substation to Western's existing Williston 230-kV Substation. Finally, the proposed Tande 345-kV Substation would interconnect with the existing Neset 230-kV Substation by a 2-mile, 230-kV line segment.

Judson and Tande 345-kV Substations

Two new substations, including the proposed Judson 345-kV Substation and the proposed Tande 345-kV Substation, would also be constructed as part of Alternative Route A. Construction would take place on approximately 12 acres of land per substation.

Route Alignment

Alternative Route A is shown on Figure 2-3. Appendix B provides a segment by segment description of this alternative and detailed maps of the alternative are provided in Volume II.

2.3.3 Alternative Route B

Alternative Route B would include construction of approximately 40 miles of 345-kV transmission line from the AVS Substation to a proposed 345-kV switchyard near Killdeer. An additional 85 miles of 345-kV transmission line would extend from the proposed Killdeer switchyard to the proposed Judson 345-kV Substation and a 25-mile, 345-kV line segment would extend from the proposed Killdeer switchyard to the existing Charlie Creek 345-kV Substation, located near Grassy Butte. The proposed Judson 345-kV Substation would then interconnect with the proposed Tande 345-kV Substation by a 56-mile line segment (including approximately 31 miles of double circuit with Mountrail-Williams Electric Cooperative 115-kV line) and a 2-mile, 230-kV transmission line would interconnect the proposed Judson 345-kV Substation to Western's nearby existing Williston 230-kV Substation. Finally, the proposed Tande 345-kV Substation would interconnect with the existing Neset 230-kV Substation by a 2-mile, 230-kV line segment.

Judson and Tande 345-kV Substations

Two new substations, including the proposed Judson 345-kV Substation and the proposed Tande 345-kV Substation, would also be constructed as part of Alternative Route B. Construction would take place on approximately 12 acres of land per substation and would result in the permanent conversion of this area from agricultural land to utility land use.

Killdeer 345-kV Switchyard

Alternative Route B would also include the construction of the proposed Killdeer switchyard. This proposed switchyard would be located within a general area approximately 3.5 miles northeast of the town of Killdeer. Land use in this area is a mixture of grassland and tillable cropland. Approximately 12 acres of land would be permanently converted from agricultural to utility use for construction and operation of the switching station.

Route Alignment

Alternative Route B is shown on Figure 2-4. Appendix B provides a segment by segment description of this alternative and detailed maps of the alternative are provided in Volume II.

Figure 2-3: Proposed Alternative Route A

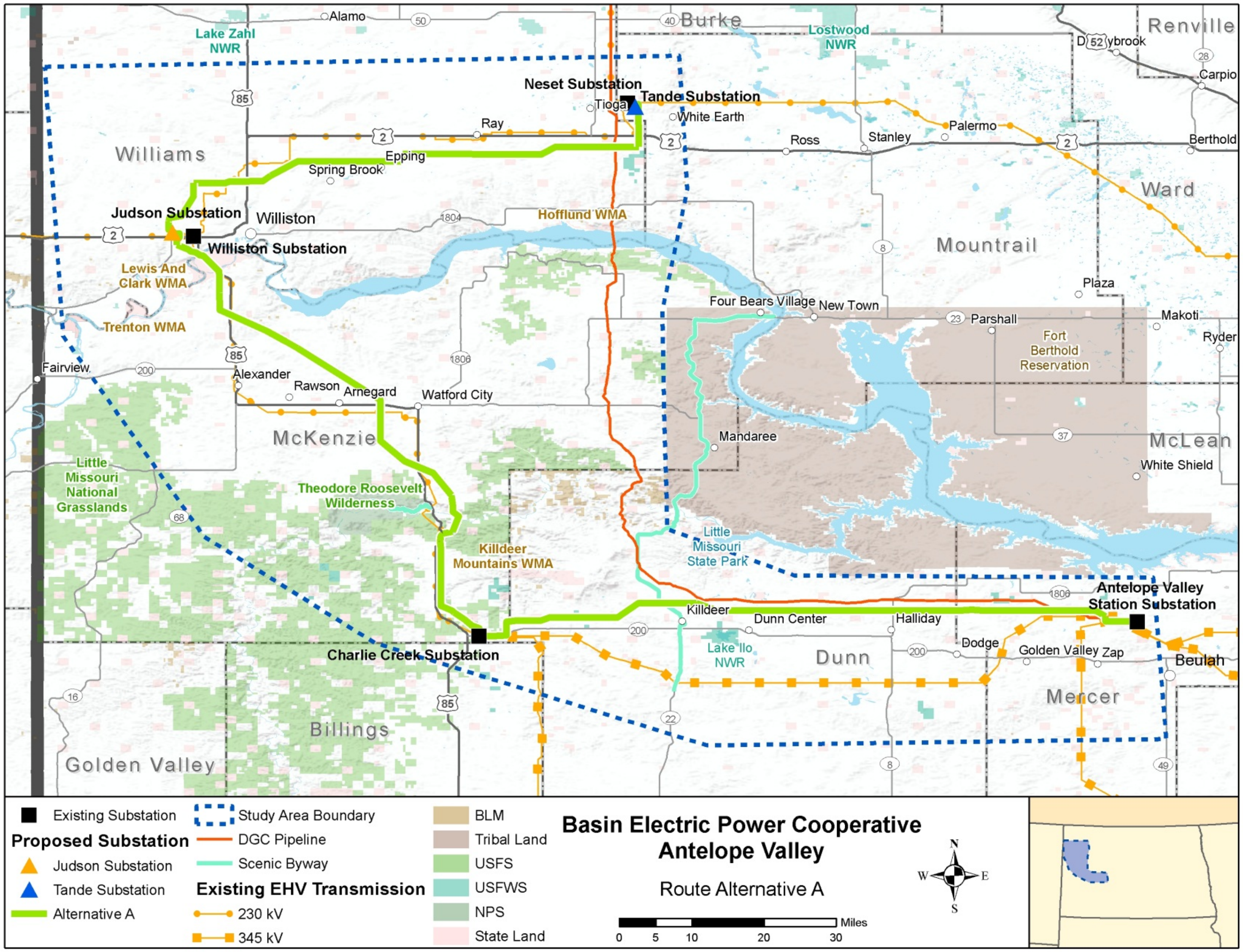
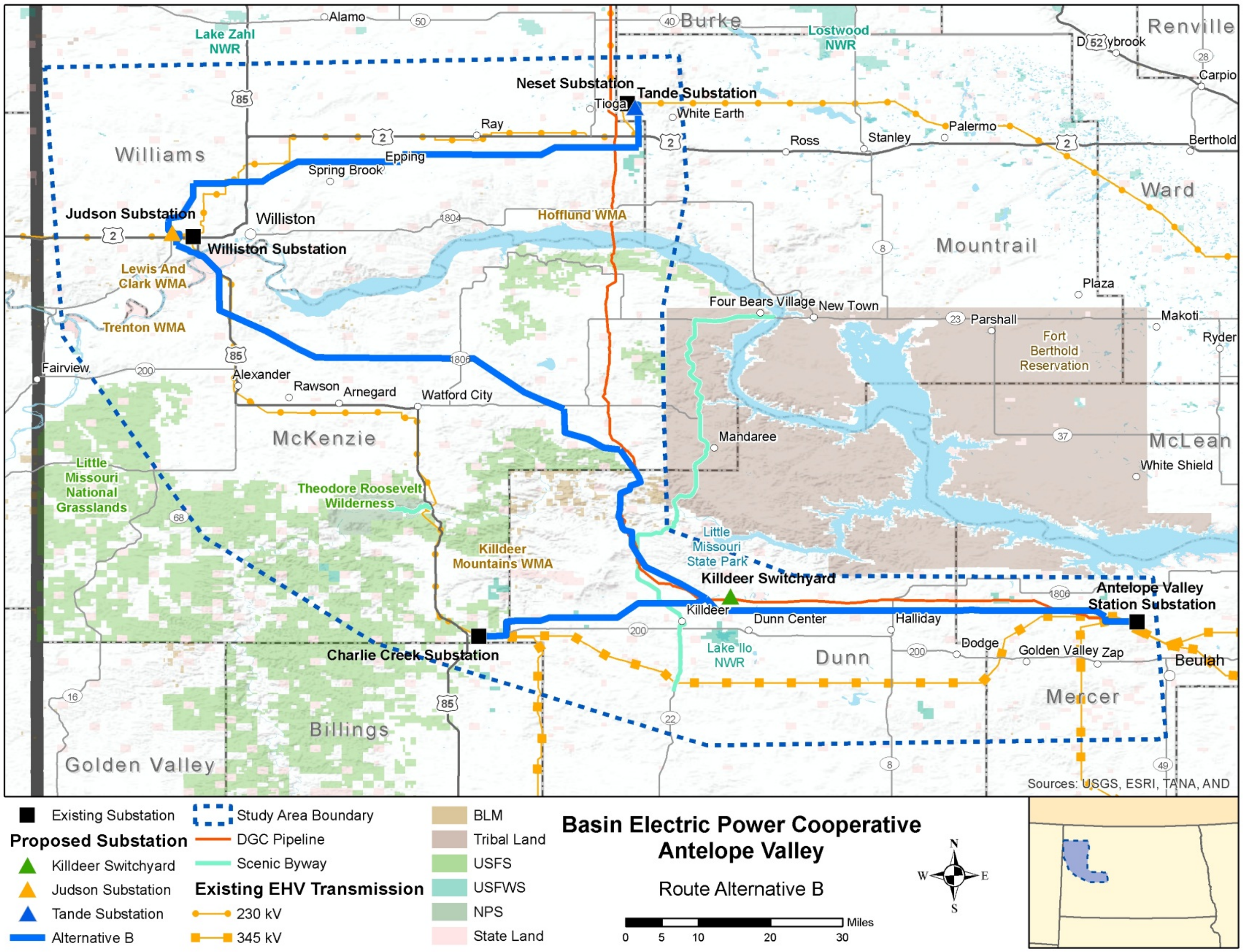


Figure 2-4: Proposed Alternative Route B



2.4 ELEMENTS COMMON TO BOTH ALTERNATIVE ROUTES

There are several elements common to each of the alternative routes. This includes various transmission line components, substation components, construction techniques, and operation and maintenance procedures. These items are discussed in more detail below.

2.4.1 Transmission Line Characteristics

For both alternative routes, the transmission line would include the following characteristics:

- a 345-kV transmission line connection from AVS Substation to Charlie Creek Substation to the proposed Judson Substation;
- a 230/115-kV double-circuit transmission line connection from the proposed Judson 345-kV Substation to Williston 230-kV Substation;
- a 345-kV transmission line connection from the proposed Judson 345-kV Substation to the proposed Tande 345-kV Substation, approximately 31 miles of which would be double-circuited with a Mountrail-Williams Electric Cooperative 115-kV line associated with other regional improvement projects; and
- a 230-kV transmission line connection from the proposed Tande 345-kV Substation to the Neset 230-kV Substation.

The proposed 345-kV, single-circuit transmission line would be constructed using single-pole or H-frame self-supporting structures within a 150-foot-wide ROW. Double-circuit 345/115-kV and 230/115-kV lines would be constructed using single-pole, self-supporting structures. Detailed construction access considerations and construction techniques are described further in the following sections. Several transmission line structure types would be necessary to address the various voltages, terrain, and connector scenarios included as part of different components of the proposed project. Structures proposed for this project by Basin Electric are shown in Figures 2-5 through 2-9. A summary of Basin Electric's proposed structure characteristics for each of these structure types is provided in Table 2-2.

Project construction and design would meet the requirements of the National Electrical Safety Code-Heavy Loading District, RUS design criteria (USDA, 2009a), and other applicable local or national building codes (Institute of Electrical and Electronics Engineers Standards Association. 2012). The Heavy Loading District refers to those areas (including North Dakota) that are subject to severe ice and wind loading. Minimum conductor clearance is measured at the point where conductor sag is in closest proximity to the ground. The proposed transmission line would be constructed with clearances that exceed standards set by the National Electrical Safety Code.

Table 2-2: AVS to Neset Transmission Project Typical Structure Design Characteristics

Description of Design Component[3]	345-kV (Fig 2-3)	230/115-kV (Fig 2-4)	345/115-kV (Fig 2-5)	230-kV (Fig 2-6)	345-kV H-Frame (Fig 2-7)
Conductor Size (inches)	1.8	1.345/1.108	1.8/1.108	1.345	1.800
ROW Width (feet)	150	100	150	100	150
Typical Minimum and Maximum Span Distance between Structures (feet)[1]	650-1,100	700-900	650-1,000	650-950	900-1,000
Average Span (feet)	900	800	800	800	1,000
Minimum and Maximum Structure Height (feet)	100-130	97-127	115-145	70-110	80-100
Average Height of Structures (feet)	115	112	130	95	90
Average Number of Structures per Mile	6	6.5	6.5	6.5	5.5
Temporary Disturbance per Structure (acre)[2]	0.0003	0.0002	0.0003	0.0002	0.0004
Minimum Conductor-to-Ground Clearance to agricultural lands, rural roads, and paved highways at100° Celsius (feet)	30	26	30	26	30
Minimum Conductor-to-Ground Clearance to Railroads at100 degrees Celsius (feet)	As required by specific railroad				

[1]Actual span distance will vary depending on topography.

[2]Angle and dead-end structures (for longitudinal stability) would be constructed with concrete foundations. Guy wires would not typically be required.

[3]Single pole tangent structures would be freestanding on concrete foundations. H-frame tangent structures would likely be directly embedded into the ground.

Figure 2-5: 345-kV Single Circuit Structure

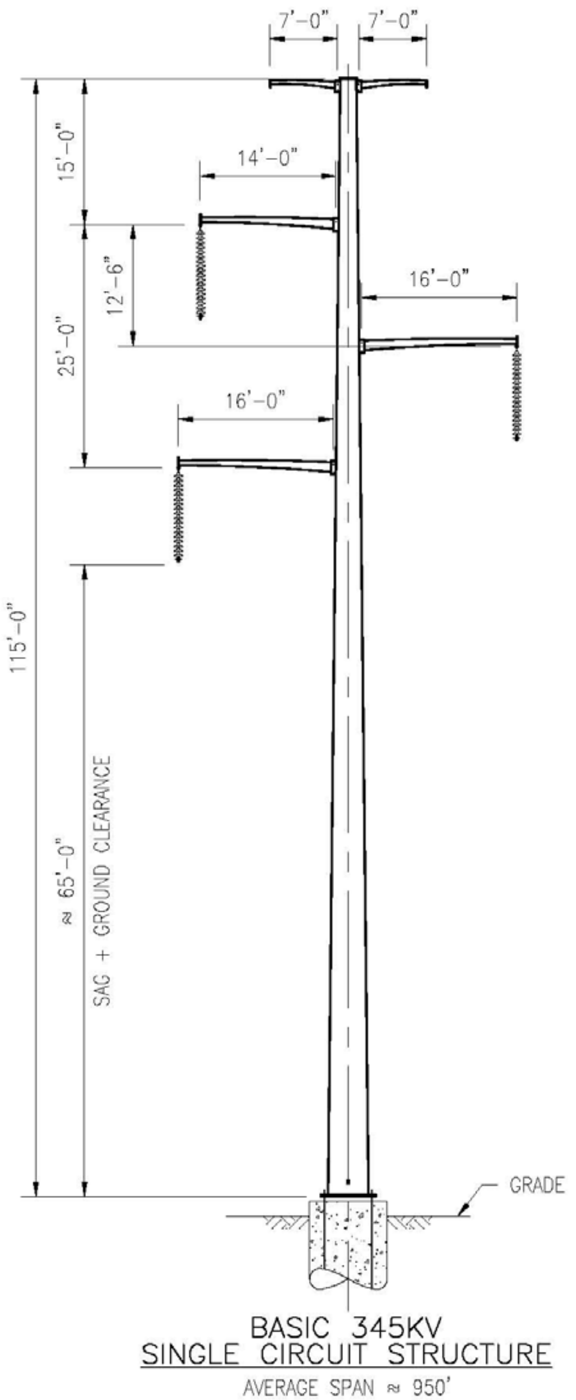


Figure 2-6: 230/115-kV Double Circuit Structure

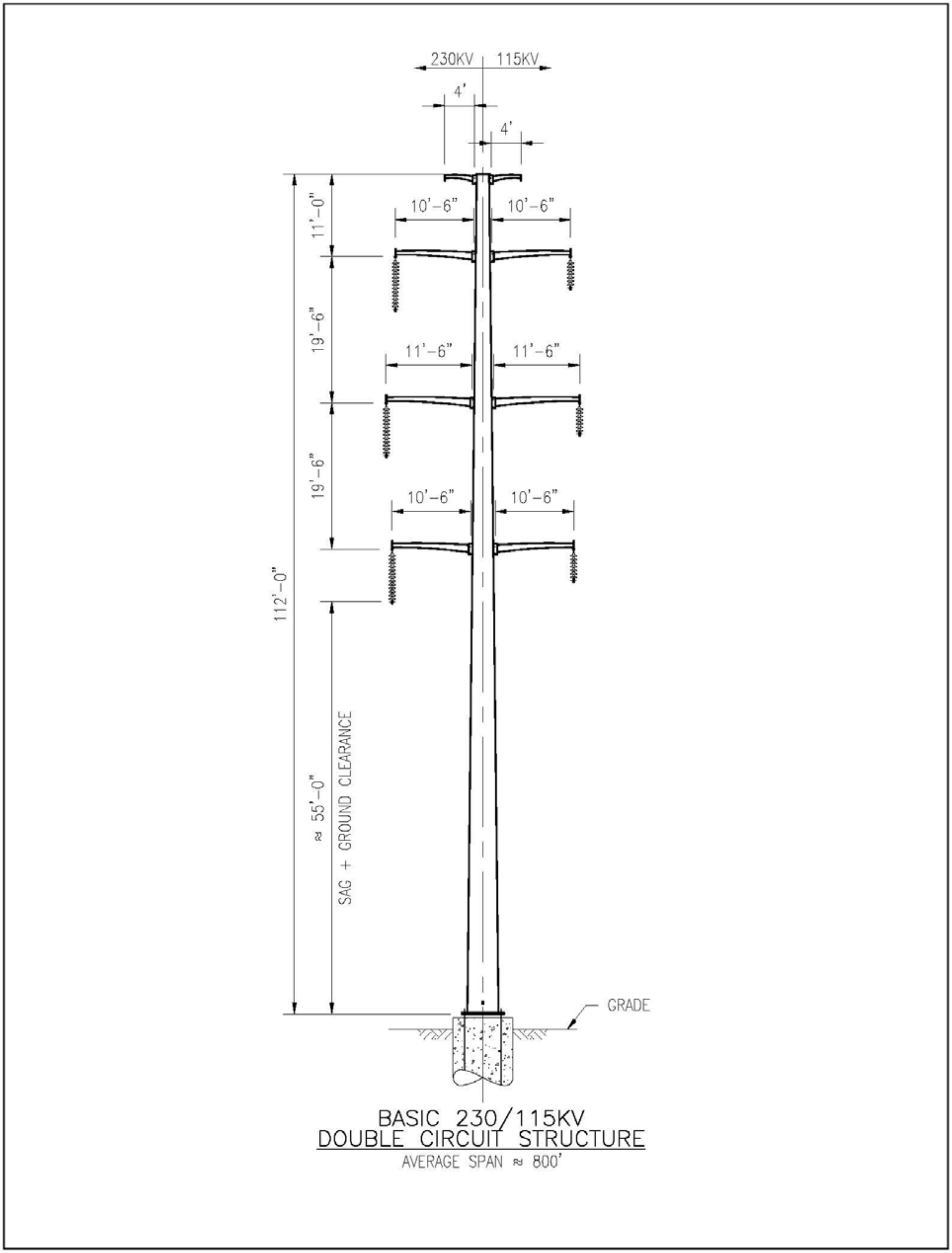


Figure 2-7: 345/115-kV Double Circuit Structure

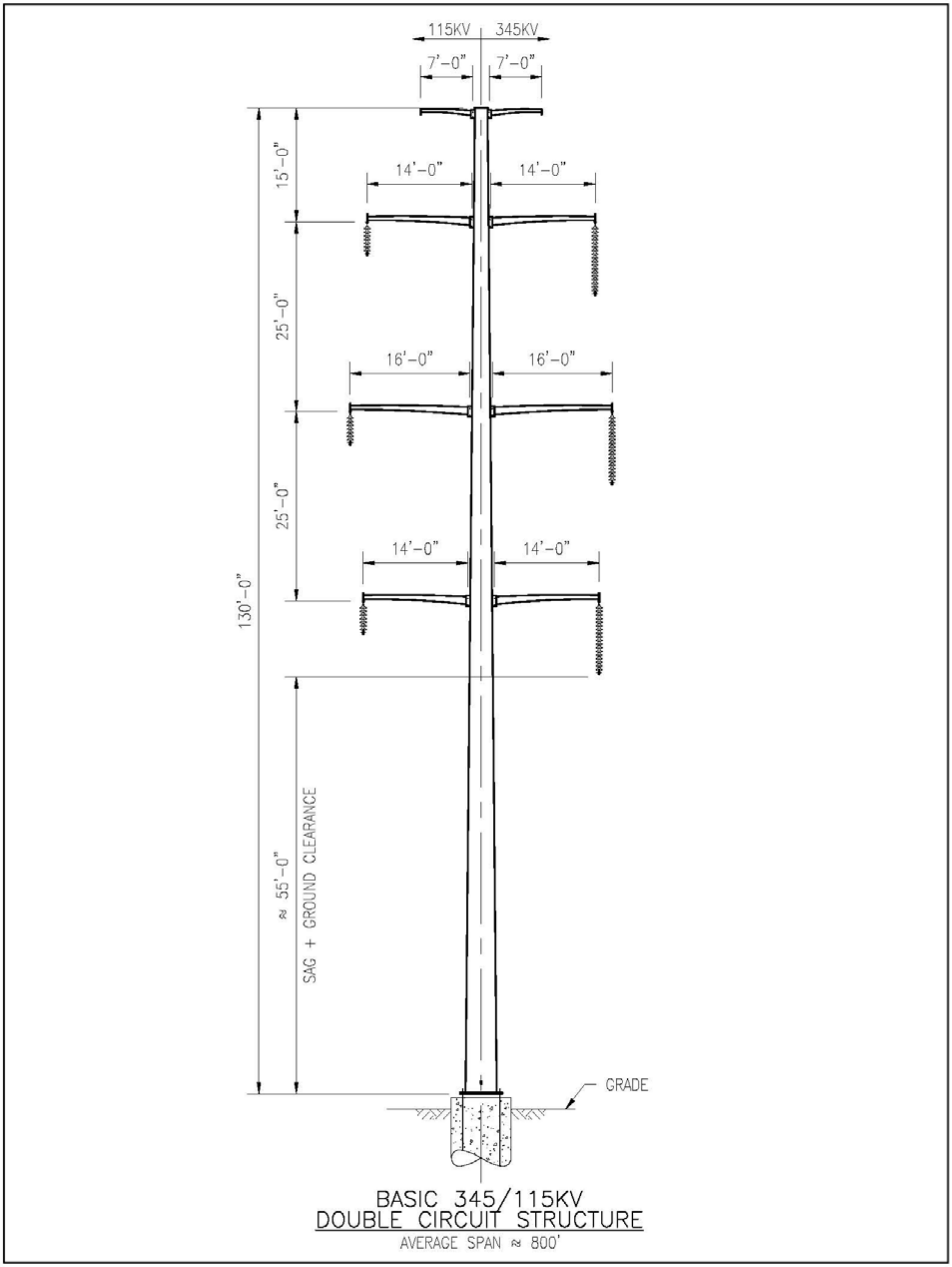


Figure 2-8: 230-kV Single Circuit Structure

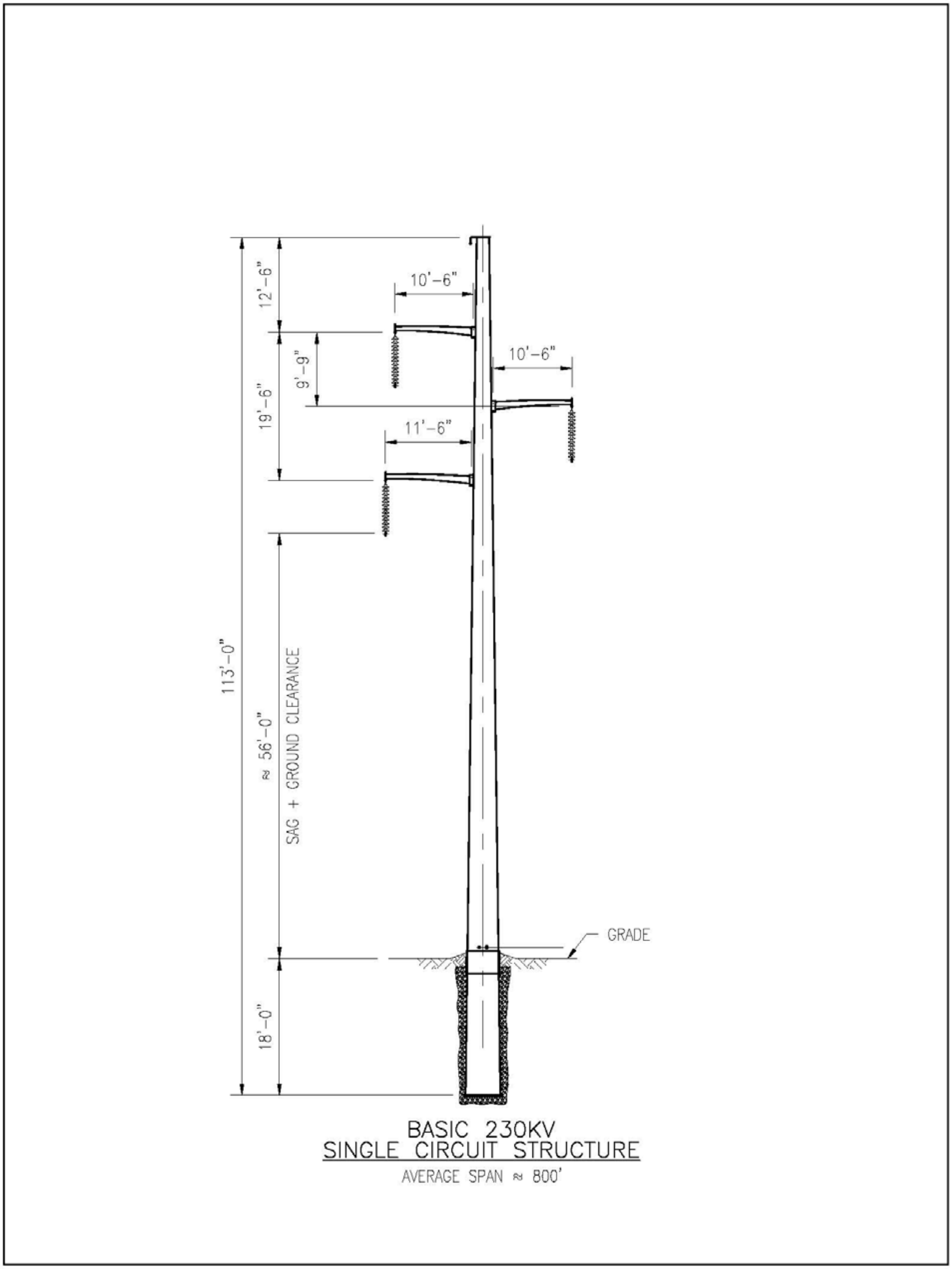
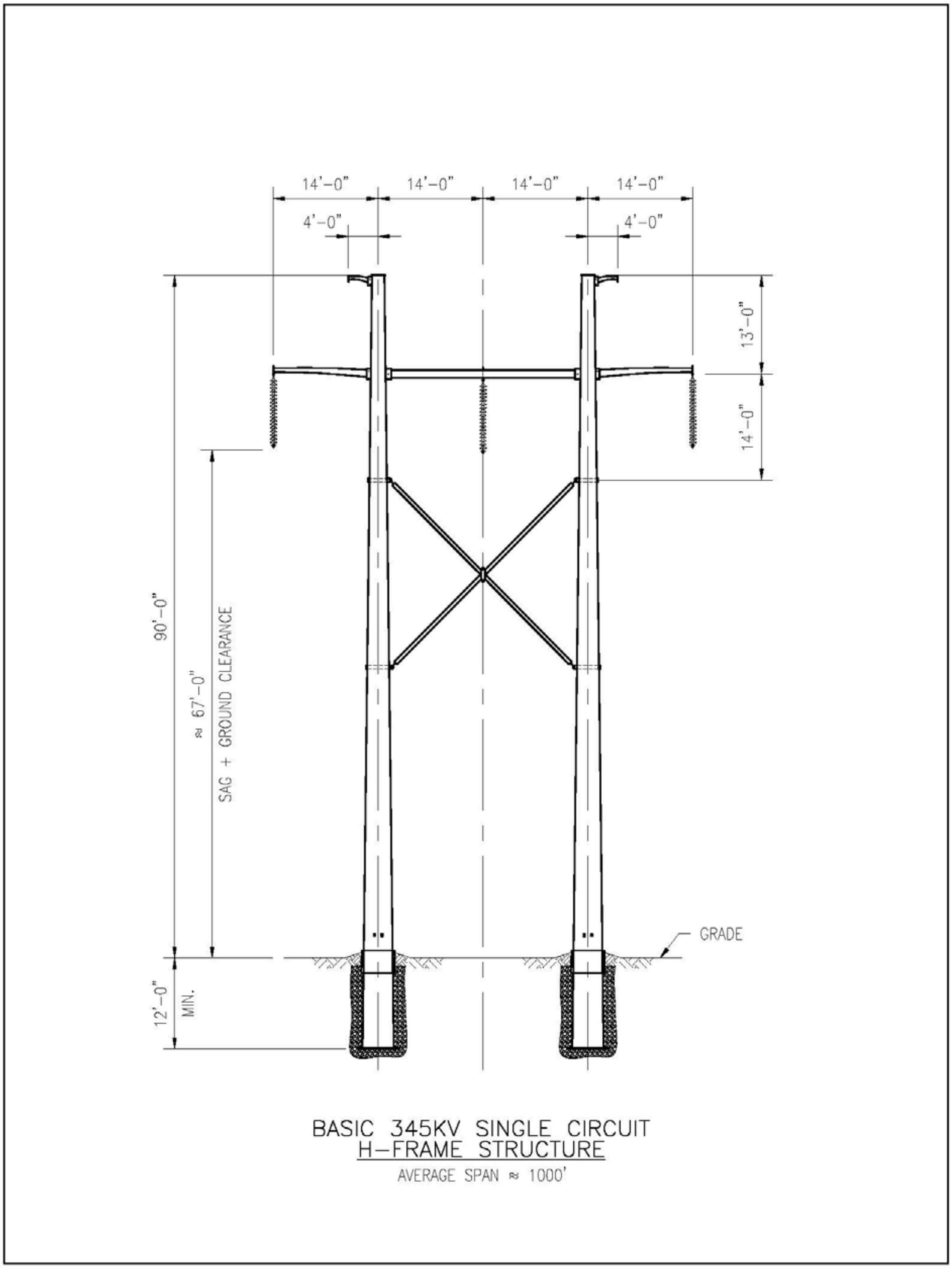


Figure 2-9: 345-kV Single Circuit H-Frame Structure



2.4.2 Pre-construction Activities

Basin Electric and/or its contractors would perform engineering surveys prior to construction of the transmission line. These surveys would consist of centerline location, profile, and access surveys. Pre-construction surveys would likely coincide with other pre-construction activities.

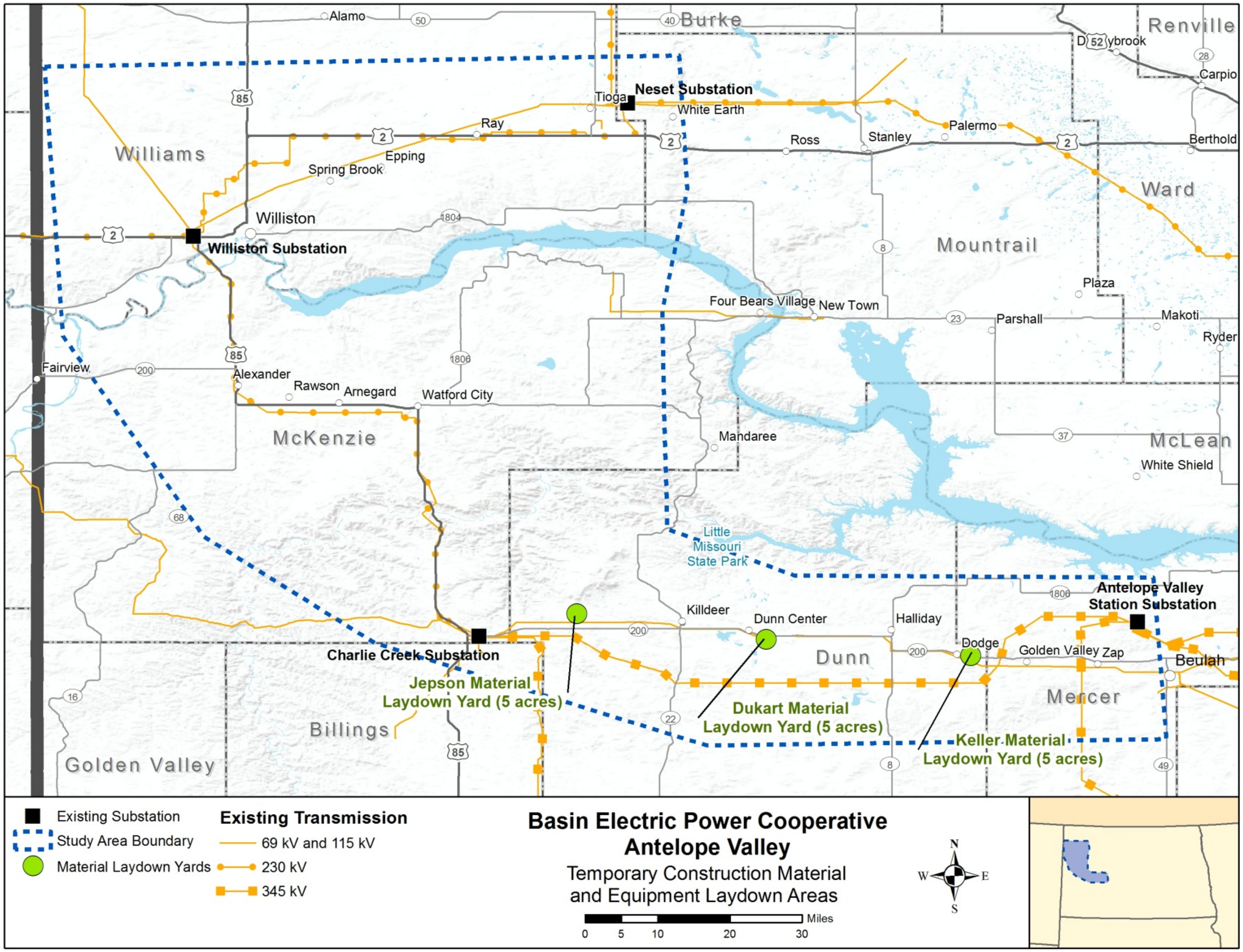
Geotechnical studies would be conducted along the transmission line route to determine engineering requirements for structures and foundations. Truck-mounted augers would be transported to selected locations to drill small-diameter boreholes, and borehole cuttings would be analyzed to determine specific soil characteristics. These activities would be conducted after harvest to minimize impacts on agricultural fields. Minimal land disturbance (approximately 400 square feet) would be anticipated for each geotechnical boring site. Additionally, small access trails may be required for some of the boring locations.

Approximately ten temporary construction material and equipment laydown areas would be used for the duration of construction. Figure 2-10 shows the location of three of the laydown areas that have been identified; the remaining areas will be determined and evaluated in the Final EIS. These laydown areas would be approximately 5 acres in size.

Where feasible, construction laydown areas are typically located at previously disturbed or developed locations such as vacant lots, existing utility yards, or parking lots to avoid or minimize impacts on sensitive resources. If existing yard locations are not available, preferred locations for yards would be undeveloped areas, such as grazing or cropland that are cleared and flat; have all-weather access; and do not contain streams, wetlands, or other environmentally sensitive resources. Laydown yards would typically consist of flat or gently sloping lands where construction material would be placed on pallets or cribbing. No topsoil would be removed and minimal if any re-grading is expected to take place at these facilities. Laydown areas would be returned to pre-construction conditions upon completion of the project.

Vegetation removal within the ROW is anticipated to be minimal throughout a large portion of the project, especially in rangeland and cropland areas. In more forested portions of the ROW, trees and shrubs would be removed if they would interfere with construction activities or the safe and reliable operation of the transmission line. Vegetation would be removed at ground level to provide access to the ROW. Disposal of trees and shrubs would be consistent with the landowner's wishes and all state waste management regulations. It is expected that the woody species removed will be replaced at a 2:1 ratio. Final replacement requirements will be dependent on the final regulatory requirements stipulated for the project through the NDPSC's siting process.

Figure 2-10: Temporary Construction Material and Equipment Laydown Areas



2.4.3 Transmission Line Construction

Transmission Structure Site Preparation

Transmission structure site clearing is expected to be minimal over a large portion of the project, due to much of the ROW being located across rangeland, grasslands, or agricultural areas. In these areas, site leveling is expected to be minimal. In areas of difficult terrain, structure location sites may require more extensive leveling using bulldozers or front-end loaders to ensure the safe operation of equipment. In areas where access is extremely difficult, structure placement would be performed through the use of helicopters. All blading and leveling would occur within the boundary of the ROW throughout the length of the project. Soil removed during leveling of structure sites would be stockpiled nearby and replaced following construction. Disturbed ground would be re-graded to as close to pre-construction condition as appropriate for stabilization and revegetated or approved for tillage depending on pre-construction land use.

Structure holes would be drilled by truck-mounted auger or power auger at identified structure locations along the length of the ROW. Total land disturbance at each structure location would vary depending on location (i.e. level terrain versus steep, rugged terrain) and structure type. All disturbances related to the boring of structure holes would be confined to the ROW.

Structures used for the project would be either directly imbedded into the ground or would be bolted on reinforced poured concrete foundations. Determinations on whether a structure would be directly imbedded into the hole or would require a foundation would be based on access, terrain, and soil conditions. An estimated 1,150 structures would be used for the proposed project, with an average of approximately six structures per mile.

Structure Assembly and Erection

Structure components such as pole segments, davit arms, hardware, and insulators would be brought to the structure site via truck and assembled on-site. Davit arms, insulators, and other components would be attached to the structure while on the ground. The bottom section of the structure would be placed into the boreholes and backfilled or bolted onto reinforced foundations using cranes or large boom trucks. In areas of very rough terrain that have limited accessibility or are even inaccessible, such as those areas around the Little Missouri River or Missouri River Badlands, some aerial placement of structures by helicopter may be required. The upper sections of the structure would then be bolted onto the lower section. Structure setting activities would be done within the boundaries of the ROW. Conductor pulling may require some work outside of the permanent ROW but within the area of the construction easement.

Stringing and Tensioning of Conductors

Following structure erection, crews would install the conductor wires, overhead groundwire (OHGW), and an optical groundwire (OPGW) using conductor stringing sheave blocks and line pulling and tensioning equipment. The conductor, OHGW, and OPGW are kept under tension during the stringing process to keep the conductor clear of energized circuits, the ground, and obstacles that could damage the conductor, OHGW, and OPGW surfaces.

Pulling and tensioning sites are typically located at 8,000 to 9,000-foot intervals or at angle point structures. Sites along tangent structures are located within the construction ROW; those at angle points typically are located partially outside of the normal ROW. Stringing equipment consists of wire pullers, tensioners, conductor OHGW and OPGW reels, and sheave blocks. After the conductors, OHGW, and OPGW are pulled for a section of line, they are tightened or sagged to the required design tension in compliance with the National Electrical Safety Code. The process would be repeated until the OPGW and conductors are pulled through all sheaves. Conductor stringing also would require access to each structure for securing the conductor to the insulators, OHGW, or OPGW to each structure, once final line sag is established.

For public safety and property protection, temporary wooden guard structures would be used to provide temporary support when stringing conductors, OHGW, and OPGW across existing power lines, roads, highways, railroads, and other linear obstacles. The structures would be removed when stringing is complete; the guard structure holes would be backfilled and the sites would be reclaimed. All temporary wooden guard structures would be installed within the transmission line ROW. Pipelines crossing will be identified on construction plans and may be visibly marked in the field. Matting will be installed across pipeline rights-of-way as necessary to allow equipment to safely cross these areas. Following construction, matting will be removed and the area restored.

Structure Site Access and Traffic

Construction crews would gain access to the ROW from public roads and section line trails, as well as within the transmission ROW itself in areas with no public access. Access for line construction would be by truck within the ROW. Structures located along section lines would be accessed from section line roads and trails where possible. The exception would be on the LMNG where permission would need to be obtained from USFS to access any trails or roads that exist along section lines. For most existing access roads and trails, no additional widening, surfacing, or improvements, including culverts would be necessary. New surface access roads are not anticipated for a majority of the line; however, they may be required in certain areas with no access. Access in areas with steep or rugged terrain, particularly near the Little Missouri River and associated tributaries would likely be gained using helicopters and would not require additional new roads. Existing roads and trails used for construction access would be rehabilitated after construction to comparable or better conditions than they were prior to construction activities. New roads would be restored to the natural condition of the surrounding area. Gates installed to facilitate access and to keep livestock from roaming on-site during the construction process would be left in place, with landowner concurrence, following construction of the line. Fences and gates removed during the construction process would be replaced or rebuilt following completion of construction.

Temporary overland access would be used in areas not accessible by local roadways or section line trails with the exception of the LMNG. If possible, access through cultivated fields would be done during the non-growing season. If crop damage occurs, landowners would be compensated for loss of crops.

Temporary overland access routes would result in temporary disturbance and compaction of soil and vegetation. Vegetation along these routes would recover quickly, as no grading would be required. Landowners would be compensated for temporary overland access routes.

2.4.4 Substation Construction Procedures

Construction procedures for the Judson and Tande 345-kV Substations and Killdeer switchyard would be essentially the same, except for the specific equipment installed. Each site would be approximately 12 acres, although additional area around the substation would be acquired for buffer with adjacent lands and to provide space for transmission line connections. Following survey and staking of the site, erosion control best management practices (BMPs) would be installed. Site access would be prepared, including installation of culverts in adjacent road drainage to install a gravel driveway. No clearing of forested areas is anticipated for any of the substation or switching station locations. The site would be graded and fenced. Concrete pads and footing for equipment would be installed. Aggregate would be spread throughout the fenced area. Equipment would be delivered to the site and generally stored inside the fenced area, although some materials may need to be stored on the property outside the fence due to size or safety considerations. Equipment such as circuit breakers, bus work, capacitors, and dead-ends would be assembled and installed. Transformers would be delivered to the site and installed. Substation control house and supervisory control and data acquisition equipment would be installed. Upon completion of construction activities, disturbed areas outside the fence would be restored and erosion control measures removed.

2.4.5 Transmission Line Maintenance and Operation

Continued access to the transmission line ROW would be needed following construction to conduct periodic inspections, perform routine maintenance, and repair any damage to the transmission line or structures. Maintenance activities would be limited to the ROW where possible, and would be in accordance with all local, state, and federal regulations and permits.

Landowners would be compensated for any damages occurring during routine maintenance, inspections, or repairs.

2.4.6 Substation Maintenance

Substations and switching stations would be subject to regular inspections to ensure equipment is in good working order and the area is neat and tidy. Faulty or worn equipment would be repaired or replaced. Trash would be collected and properly disposed of off-site. Fluid levels in transformers are monitored remotely by system operators and would be regularly checked and transformers would be inspected for leaks. Batteries for emergency back-up operations would be inspected, fluid levels checked, and replaced as necessary. In the event of system disturbances, equipment would be inspected and reset as necessary. Any potential security concerns such as damage to the fence, exterior lighting, or locks would be addressed. The control house would be kept clean and in good structural and visual condition. All maintenance and operations activities would occur within the fenced area of the substation.

2.4.7 Construction Schedule and Projected Workforce

Although construction would occur over 2 years, individual crews may be required for only a few months in a particular construction area before moving out to another area on a subsequent phase of the project. Additionally, construction would not be confined to one area or community, but workers would be spread out over nearly 200 miles in three crews of approximately 50 workers each, for a total of 150 workers.

2.4.8 Procedures for Minimizing Environmental Impact during Construction

Numerous BMPs and mitigation measures have been incorporated into the development and construction of the proposed project to protect environmental and human resources. These measures are varied and may be intended to address specific resource concerns, be more general in nature, or address multiple areas of concern for different resources. Minimizing measures range from avoiding sensitive resources during project and route development to conditions for restoring the project ROW following construction. BMPs that would be implemented as part of the project are discussed in Appendix A. Other mitigation measures specific to each resource are discussed throughout Chapter 4 in conjunction with the analysis of project-related impact to the various human and natural resources.

Waste Management

Waste materials resulting from project construction would be removed from the sites and disposed of in appropriate landfills. Sanitary waste would be removed from the site and disposed of according to local sanitary waste ordinances. Hazardous waste such as oil, gasoline, solvents, paint, and cleaning chemicals would be stored and disposed of in accordance with local, state, and federal regulations.

Reclamation

Following construction, disturbed areas would be graded and/or leveled to their approximate pre-construction condition to minimize erosion. Compacted agricultural soils would be disced or plowed to loosen the soil. Disturbed areas include temporary overland access trails, staging areas, the transmission ROW, and any other areas disturbed by project construction activities. Reclamation activities include the removal of all temporary facilities and construction debris, completion and removal of proper erosion control measures, and re-seeding of disturbed ground. Grassland areas would be re-seeded with native species based on county NRCS and USFS recommendations.

2.4.9 Right-of-way and Property Issues

Basin Electric Lands and Right-of-Way Division would be responsible for acquiring easements for the project. Initially landowners would be contacted to request their permission for property boundary, biological, terrain mapping and archeological surveys. The survey permit form is not an easement and not all properties would require all types of surveys.

When a final route is approved, land values would be determined and landowners would be contacted to start the easement process. Basin Electric staff would give the landowners ample time to review and comment on the easement location. Landowners would be compensated for the easement and any damages to existing crops or other property features and for potential future years of agricultural impacts from the transmission ROW and transmission structures on the property.

2.4.10 Mitigation Measures

The route permit would require the implementation of mitigation measures to prevent or minimize both short- and long-term impacts on resources from construction and operation of the project. Additional mitigation measures will be evaluated as further information becomes available on the actual route location. Basin Electric would implement Standard BMPs in the construction and operation of the proposed project. These BMPs are described in Appendix A. Mitigation measures for each resource area are summarized in Table 2-3, below.

Mitigation measures that would be required by federal agencies as permitting conditions would be included in the Record of Decision issued by each federal permitting agency.

Table 2-3: Summary of Mitigation Measures

Resource	Mitigation Measures
Aesthetics and Visual Resources	• Use weathering single pole steel structures where steel towers are utilized, to reduce visual impacts. • Work with the agencies to choose a structure type (weathering steel or galvanized) that would reduce visual impacts in highly visible or scenic areas, such as the Missouri and Little Missouri River crossings, the National Grasslands, and badland areas. • Leave (where possible) plants smaller than 8 feet in height within the 150-foot-wide ROW to help reduce the effect of the ROW of visual and aesthetic resources. • Keep the ROW free of construction debris and other litter during construction to further minimize visual intrusion to the surrounding landscape.
Air Quality and Greenhouse Gases	• Use water on roads and disturbed areas to minimize dust. • Re-seed vegetation in disturbed areas outside of the substation/switchyard to prevent wind-blown dust from areas void of vegetation. • Implement vehicle idling and equipment emissions measures, such as establishing operating policies that limit idling time and mechanical modifications to the vehicles that restrict the amount of idle time. • Encourage carpooling and the use of shuttle vans among construction workers to minimize construction-related traffic and associated emissions. • Locate staging areas as close to construction sites as practicable to minimize driving distances. • Locate, where possible, staging areas in previously disturbed or graveled areas to minimize soil and vegetation disturbance where practicable. • Encourage the use of the proper size of equipment for the job to maximize energy efficiency. • Use alternative fuels, if possible, for generators at construction sites, such as propane or solar, or use electrical power where practicable. • Recycle or salvage non-hazardous construction and demolition debris where practicable. • Dispose of wood debris (burning) in the local area where practicable. • Use local rock sources for road construction where practicable.
Geology and Soils	Geology and Landforms: • Conduct geotechnical assessments at structure locations to develop a process or approach to minimize the potential development of landslides in susceptible areas during construction. • Span identified landslide areas with no structures being placed within susceptible landslide areas. • Prepare a stormwater pollution prevention plan for construction activities prior to construction. Soils: • Confine construction activities to the ROW and around structure locations for placement of the transmission structures. • Stockpile any topsoil removed during any required leveling of structure sites nearby and replace it following construction. • Re-grade disturbed ground to as close to pre-construction condition as appropriate for stabilization and revegetated or approved for tillage depending on pre-construction land use. • Locate the construction laydown areas required for the proposed project at previously-disturbed or developed locations, such as vacant lots or agricultural lands, where feasible.

Resource	Mitigation Measures
	• Place construction materials on pallets or cribbing within the designated laydown areas. • Return laydown areas to pre-construction condition upon completion of the project. • Compensate landowners for any crop damage that may occur as a result of construction and operation of the proposed project. • Redress any compaction or other construction-related issues that could affect soil productivity and agricultural operations.
Water Resources	• Clean up any spills or equipment leaks promptly to prevent materials entering surface water. • Contain and store appropriately any materials such as fuel, lubricants, and solvents. • Schedule construction in the area of the Missouri River crossing in low water periods or during winter to minimize impacts to the geographical floodplain. Coordinate construction timing with USACE. • Span floodplains to the extent possible to avoid potential impacts. • Plant or seed non-agricultural areas that were disturbed during construction. Use native seed mixes from the indigenous plants and plant indigenous species located in the immediate disturbed soil area; ensure seeding and/or plantings are done in a time congruent with seeding and growth of the area, not during a time that would preclude germination or rooting. • Remove excavated material and other debris from flood prone areas to maintain storage volumes and prevent introduction of debris that may lead to clogged culverts or bridges, resulting in changes to water flow and flood patterns. • Locate structures and disturbed areas away from rivers and lakes, where practicable. • Install sediment control measures prior to construction in accordance with plans and permits including: mulch produced through the chipping of removed trees; soil berms; and partially burying logs along the ROW. • Use wastewater and stormwater control measures to meet the effluent limits prior to discharging from construction sites to surface waters. • Avoid the use of fertilizers, pesticides, or herbicides in or near surface waterbodies. • Fuel construction vehicles away from surface waterbodies and use appropriate spill prevention and containment procedures.
Biological Resources	• Restore any new temporary access roads created during construction of the transmission line to the natural condition of the surrounding area after construction is completed. • Revegetate disturbed areas outside of the substation/switchyard and within the ROW using native vegetation and certified weed-free seed and mulch to protect native vegetation and wildlife habitat. • Inspect equipment for seeds and other vegetative material and power-wash prior to transport to new areas to prevent the spread of undesirable plants from one area to another. • Coordinate with NDPSC to determine appropriate mitigation for the vegetation removed. Typically for these types of projects, the tree and shrub vegetation is replaced at a ratio of 2:1, reducing the overall loss of these vegetation types over time. • Avoid the Natural Heritage Inventory-listed significant ecological community (western little bluestem prairie) in Dunn County. If the significant ecological community cannot be avoided, Basin Electric would coordinate with NDGFD to minimize impacts and implement mitigation measures. • Coordinate with USACE and the state of North Dakota to obtain the necessary permits if impacts on wetlands, streams, or other waterbodies are unavoidable. • Avoid wetland areas while accessing the ROW during construction. Design and install temporary low-water crossings or culverts, if needed, so as not to inhibit fish

Resource	Mitigation Measures
	passage, or create upstream or downstream habitat changes. • Coordinate with NDGFD and USFS to avoid construction during bighorn sheep lambing season (April 1st thru July 1st; and other important times for game species) in the Little Missouri Badlands area and LMNG. • Conduct raptor and migratory bird surveys along and adjacent to the proposed transmission line route prior to construction. Coordinate with USFWS, USFS, and NDGFD to develop and implement a plan to protect any identified nests from adverse effects during construction. Coordinate with USFWS to develop an Avian Protection Plan for operation of the transmission line. • Design the proposed project to meet the requirements for the protection of avian species from electrocution and line strikes according to the guidelines in the Avian Power Line Interaction Committee's "Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006" (APLIC, 2006). • Coordinate with USFWS, USFS, and NDGFD regarding greater prairie chicken, greater sage-grouse, and Plain's sharp-tailed grouse habitat. Structures will not be placed within 0.25 mile of active lek sites. In addition, consult with USFWS, USFS, and NDGFD prior to construction within a 2-mile radius of an active lek during the period of March 1st through June 15th. • Coordinate with USFWS to avoid construction in designated critical habitat during the piping plover nesting season (mid-April to mid-August) and in interior least tern nesting habitat during the nesting season. • Comply with all conditions issued by USFS in conjunction with the SUP. • Include the results of the ESA Section 7 consultation in the Final EIS and implement any measures required.
Cultural Resources	• If necessary, develop a Memorandum of Agreement that would establish procedures to guide the identification and evaluation of historic properties, the assessment of adverse effects on them, and the development of appropriate mitigation of any adverse effects for cultural resources within the ROW. • Conduct a Class III cultural survey within the ROW and the site boundaries of all proposed substations and switchyards prior to construction and develop mitigation measures where required. • Span and protect known archaeological sites within the ROW from disturbance during construction. • Prevent construction workers from collecting or disturbing discovered cultural resources. • Develop a Project's Unanticipated Discovery Plan to provide guidance on how to proceed if a previously unknown archaeological or historic resource is encountered during construction or operation of the proposed transmission line, including contact of the SHPO and RUS-designated Federal Preservation Officer for further evaluation.
Land Use	• Provide a schedule of construction activities to all landowners who could be affected by construction. • Coordinate with landowners for potential measures to minimize project impacts on uses on specific properties. • Coordinate with appropriate federal and state land management agencies to obtain appropriate permits and easements for portions of the ROW traversing public lands. • Obtain the appropriate permits, as necessary to comply with county and township zoning ordinances. • Plan and conduct construction activities to minimize temporary disturbance, displacement of crops, and interference with agricultural activities. • Restore compacted cropland soils as close as possible to pre-construction conditions using tillage. • Compensate landowners for any new land rights required for ROW or access road easements.

Resource	Mitigation Measures
	• Compensate landowners at market value for any new land rights required for ROW easements or acquired for new temporary or permanent access roads on private lands. This should include compensation for agricultural production and market values lost during the construction period.
Socioeconomics	• The construction contractor, after assessing utilization of existing housing availability, should plan to establish its own housing in the form of man-camps and/or recreational vehicles (RVs) brought in from outside of the region to a number of locations secured by the contractor. • Work with agricultural producers to minimize disruptions during the harvest season and to limit the impact on the farmers' ability to maneuver equipment in the vicinity of the immediately affected area. • Work with individual landowners to try to coordinate the timing of construction to minimize short-term impacts on agriculture. • Initiate discussions with local fire and police districts prior to construction and work with the districts and other appropriate emergency response providers to develop fire and emergency response plans.
Environmental Justice	• No mitigation measures specific to environmental justice communities are described, as these communities would not be subject disproportionately to any high and adverse impacts.
Recreation and Tourism	• Impacts on recreation would largely be associated with changes in viewsheds and general recreational experiences from the presence of the proposed transmission line. Mitigation measures for viewsheds are described under Aesthetics and Visual Resources. • Recreation would also be impacted in the short term by noise and dust from construction activities, equipment, and vehicles; construction-related traffic; and the presence of construction crews. Mitigation measures for these impacts are described under Geology and Soils; Infrastructure and Transportation; and Noise.
Infrastructure and Transportation	• Time conductor stringing across U.S. Highway 85, U.S. Highway 2, ND State Highway 8, ND State Highway 22, and ND State Highway 23 to avoid peak traffic, in consultation with North Dakota Department of Transportation. • Mark a detour route, if required by North Dakota Department of Transportation, and provide traffic information to motorists in advance of the detour, consistent with the Manual on Uniform Traffic Control Devices (Federal Highway Administration, 2012). • Coordinate with townships, counties, and North Dakota Department of Transportation to redress any road damage related to construction of the project. • Coordinate with FAA to avoid or minimize impacts on local aircraft facilities. • Identify existing utilities and coordinate with the owners to implement appropriate measures to protect both facilities and construction workers during crossings.
Railroads (BNSF, 2011)	• Locate poles 50 feet out from the centerline of railroad main, branch and running tracks, CTC sidings, and heavy tonnage spurs. • Provide at least 10-foot clearance from the centerline of track for poles located adjacent to industry tracks. If located adjacent to curved track, then said clearance must be increased at a rate of 1.5 inches per degree of curved track. • Locate unguyed poles (regardless of the voltage) at a minimum distance from the centerline of any track, equal to the height of the pole above the ground-line plus 10 feet. If guying is required, place the guys in such a manner as to keep the pole from leaning/falling in the direction of the tracks. • Locate poles (including steel poles) at a minimum distance from the railroad signal and communication line equal to the height of the pole above the ground-line or else be guyed at right angles to the lines. High voltage towers (345 kV and higher) must be located off railroad ROW.

Resource	Mitigation Measures
	• Perform (if requested by BNSF) an inductive coordination study for electrical lines paralleling the tracks. • Construct utilities that cross railroad property, to the extent feasible and practical, perpendicular to the railroad alignment and preferably at not less than 45 degrees to the centerline of the track. • Do not place utilities within culverts or under railroad bridges, buildings, or other important structures. • Do not install crossings under or within 500 feet of the end of any railroad bridge, or 300 feet from the centerline of any culvert or switch area. • Span property completely with supportive structures and appurtenances located outside railroad property. For electric supply lines, normally the crossing span shall not exceed 150 feet with adjacent span not exceeding 1.5 times the crossing span length. • Encourage joint-use construction at locations where more than one utility or type of facility is involved. However, electricity and petroleum, natural gas, or flammable materials shall not be combined. Review and approve pipe truss design and layout with BNSF Engineering. • Construct electric lines with a minimum clearance of 26.5 feet or greater above top of rail when required by the National Electric Safety Code or state and local regulations. Electric lines must have a florescent ball marker on low wire over centerline of track. • Label the posts closest to the crossing with the owner's name and telephone number for emergency contact.
Public Health and Safety	• Prepare a construction plan in accordance with the National Electrical Safety Code and the Occupational Safety and Health Administration's regulations, as required by federal law, to ensure the safety of construction workers. This would also identify procedures should a spill occur or hazardous materials be discovered. • Construct the proposed project with materials designed to contain electric currents and meet the highest safety standards. • Employ standardized agency procedures should the transmission line need maintenance or repairs. The use of such can help ensure the safety of both workers and those in the surrounding area. • Additional measures such as those identified in Appendix A are designed to ensure that Basin Electric's operational procedures are adhered to the highest standard to ensure the safety of workers and others close to the construction and operation of the proposed project.
Noise	• Use equipment with sound-control devices no less effective than those provided on the original equipment. • Do not use equipment with an unmuffled exhaust. • Do not conduct noise-generating construction activity within 1,000 feet of a residential structure between the hours of 10:00 p.m. and 7:00 a.m. • Notify landowners directly impacted along the ROW prior to construction activities. • During operation, if the proposed transmission line is found to be the source of radio or television interference in areas with reasonably good previous reception, measures would be taken to restore the reception to a quality as good as or better than before the interference.

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3 AFFECTED ENVIRONMENT AND ENVIRONMENTAL EFFECTS

Overview

This chapter describes the existing environmental resources that could be affected by the project and the potential impacts that the project alternatives would have on those resources. Generally, the proposed action defines the project area considered; however, that area may change based on specific affected resource conditions—these resource-specific areas are referred to as study areas. The affected environment and potential impacts are determined through research and field observations along the proposed transmission line routes and at the substation sites by environmental specialists and from information provided in agency and public comments. Desktop analyses and field surveys of the proposed action were conducted during the fall of 2011 and spring of 2012. For each resource, potential mitigation measures to reduce or avoid impacts are also identified as well as those impacts that are unavoidable even after implementation of mitigation. Finally, this chapter describes irreversible or irretrievable commitment of resources, and the relationship between short-term uses of the environment and long-term productivity.

Affected Environment

NEPA requires that the environment of the area to be affected or created by the alternatives under consideration is sufficiently described (40 CFR 1502.15). The Affected Environment section describes the resources that could be affected by the implementation of the proposed action. The resource descriptions provided in this section serve as the baseline from which to evaluate the potential impacts of the proposed action.

The resources that could be affected by the project include the following:

- Aesthetics and Visual Resources
- Air Quality and Greenhouse Gases (GHGs)
- Geology and Soils
- Water Resources, including groundwater, surface water, and floodplains
- Biological Resources, including vegetation, wildlife, wetlands, and threatened and endangered species
- Cultural Resources
- Land Use
- Socioeconomics

- Environmental Justice Populations
- Recreation and Tourism
- Infrastructure and Transportation
- Public Health and Safety
- Noise

Environmental Effects

The Environmental Effects section analyzes both beneficial and adverse impacts that would result from implementing any of the alternatives. NEPA requires agencies to assess the direct, indirect, and cumulative impacts of its proposed action. Direct impacts are those that are caused by the proposed action and happen at the same location and time. Indirect impacts are those impacts that happen later in time and/or further removed from the proposed action, but are still reasonably foreseeable. Cumulative impacts are defined as the "impact on the environment, which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions" (40 CFR 1508.7). Cumulative impacts are discussed in Chapter 4 of this document.

In order to determine whether an action has the potential to result in significant impacts, the context and intensity of the action must be considered. Context refers to area of impacts, timing, and the duration. Intensity refers to the severity of the impact. Intensity definitions have been developed to assess the magnitude of effects for all of the affected resource categories resulting from implementing the proposed action. Context in terms of duration of impact are estimated as either short term or long term. The definitions of intensity and duration are specific to each resource evaluated. Each affected resource impact analysis briefly describes the methodology used for analysis.

For purposes of this Draft EIS, impacts resulting from the project have been quantified to the extent possible based on a proposed route alignments and 150-foot-wide ROW associated with Alternative Routes A and B. As the route alignments become finalized, minor adjustments would be made based on constructability. These adjustments would include the locations for the placement of double pole structures to cross steep terrain and the location for turn angles to provide a change in direction of the transmission line that would require temporary construction easements outside of the 150-foot-wide ROW in order to pull the conductor through at an angle. The impacts analysis will be revised during the preparation of the Final EIS.

3.1 AESTHETICS AND VISUAL RESOURCES

3.1.1 Affected Environment

Aesthetics can be defined as a mix of landscape character, the context in which the landscape is being viewed, and the scenic integrity of the landscape. Landscape character encompasses the patterns of landform (topography), vegetation, land use, and aquatic resources (i.e., lakes, streams, and wetlands). The visual character is influenced by natural systems as well as by human interactions and use of land. In natural settings, visual character attributes are natural elements, whereas in rural or pastoral/agricultural settings, attributes may include manmade elements such as fences, walls, barns and outbuildings, and occasional residences. In a more developed setting, the visual character may include buildings, groomed lawns and landscaping, pavement (sidewalks and roads), and utility infrastructure. Scenic integrity is the degree from which the landscape character deviates from a natural, natural-appearing landscape in line, form, color, and texture of the landscape. In general, natural and natural-appearing landscapes have the greatest scenic integrity. As manmade incongruities are added to the landscape, the scenic integrity is considered diminished.

Regional Setting

The project area is located in the northwest corner of North Dakota and contains portions of two ecoregions: the Northwestern Glaciated Plains Ecoregion and the Northwestern Great Plains Ecoregion. Within these major ecoregions there are numerous smaller physiographic ecoregions (see Section 3.3, Geology and Soils for further descriptions). The Northwestern Glaciated Plains Ecoregion is located north of Lake Sakakawea and the Northwestern Great Plains Ecoregion encompasses the area south of Lake Sakakawea (Bryce et al., 1998). Different ecoregions inherently means the project area contains a diversity of topographic features and associated visual landscapes.

Description of the Natural Setting

Within the project area, there are two state parks, one national grassland (consisting of numerous tracts), and one national park offering designated scenic areas within their boundaries. TRNP, LMNG (owned by USFS), Lewis and Clark State Park, and Little Missouri State Park offer scenic trails and views within their boundaries. Killdeer Mountain Four Bears Scenic Byway (ND State Highway 22) and TRNP-North Unit Scenic Byway (located off of U.S. Highway 85) provide scenic views of the rural landscape in the central section of the project area.

The project area can generally be divided into three regions based on similar visual characteristics and geographic reference to Lake Sakakawea. These regions are referred to as the southern (areas south of Lake Sakakawea), central (areas west of Lake Sakakawea), and northern (areas north of Lake Sakakawea) portions of the project area. Lake Sakakawea, an impoundment of the Missouri River, extends east-west through the central portion of the project area. It provides a good reference point to separate the different characteristics of the project area.

Topography in the southern part of the project area is gently rolling to level, with few trees and sparse wetlands. The landscape can be described as a mosaic of agricultural fields and rolling prairie, with areas of grazing along steeper slopes. Although lack of woody vegetation tends to enable long and wide views, topographical features and elevation changes provide screening and visual barriers throughout the landscape. Rural homesteads and human influences are scattered throughout the area (see Figures 3-1 and 3-2). Figure 3-2 is located near the southwest corner of Lake Sakakawea, where the transition to high elevations can be seen in the background.

Figure 3-1: Cropland and Rolling Prairie Topography South of Lake Sakakawea

Figure 3-2: Area Southwest of Lake Sakakawea (Killdeer Mountains in Background)

The central portion of the project area is approximately 20 to 25 miles west of Lake Sakakawea and is located in the "bend" of the project area. Areas around the Little Missouri River and west of Lake Sakakawea consist of deep, highly-eroded canyons and badlands with heavily-wooded draws (Figure 3-3), compared with the eastern portion of the project area, which exhibits more rolling agricultural terrain. Typical of a badlands landscape, this area includes grassy ridgelines or butte-like hills and color-banded mounds (USFS, 2001).

The central portion of the project area contains a section of the North Dakota Badlands, TRNP (including a scenic road), LMNG (part of the Dakota Prairie National Grasslands), and Little Missouri State Park. The badlands geographic area includes approximately 573,700 acres of National Forest System lands of the LMNG (USFS, 2001).

Figure 3-3: Central Project Area: West of Lake Sakakawea (Little Missouri Badlands)

U.S. Forest Service Scenery Management System

The USFS Scenery Management System provides a tool for managing scenic resources and is incorporated into forest plans to determine the relative value and importance of scenery on National Forest System lands. The process involves classifying landscapes, and setting goals and objectives for maintaining, enhancing, restoring, and monitoring scenic integrity. Under the administration of USFS, discrete units of the National Grasslands have been assigned scenic integrity objectives (SIOs) under the Northern Great Plains Management Plans Revision. SIOs guide the amount, degree, intensity, and distribution of management activities needed to achieve desired scenic conditions. SIO classifications range from very high to unacceptably low. These SIOs are the management objectives adopted through the approval of the Forest Land and Resource Management Plan.[1] The LMNG areas within the project area are mostly classified as

[1] Scenic integrity levels (SILs) are the proposed management objectives presented in the alternatives development of the EIS. SILs become SIOs when the preferred alternative is selected. The SILs define the degrees of acceptable deviation in form, line, color, and texture that may occur at any given time. SILs ranging from high to low are assigned to all management areas. Usually they are described at the management prescription level. A high SIL means human activity is not scenically evident, a moderate SIL describes a valued landscape character that is slightly altered, and a low SIL indicates that a landscape is moderately altered.

having low SIOs; although there are areas with both moderate and high SIOs (USFS, 2001). National Grassland areas within the project area with moderate and high SIOs are primarily found adjacent to or near TRNP-North Unit.

The northern portion of the project area transitions back to a rural agricultural setting similar to the southern project area. Particularly north of the Little Missouri River and the Lewis and Clark State Park, the landscape begins to flatten out and human influences become more abundant on the landscape (Figure 3-4).

Figure 3-4: Northern Project Area: North of the Little Missouri River

Description of the Built Environment

Rural homesteads are visible throughout much of the eastern and northern portions of the project area, with fewer residences occurring in the more rugged, badlands areas around the Little Missouri River and its tributaries. Incorporated towns and unincorporated communities also occur as part of the manmade environment within the project area. Many of these towns and small communities are experiencing rapid residential and commercial growth to support oil and gas development activities in the region.

U.S. and state highways, county roads, and unpaved roads traverse the project area as part of the built environment. Numerous overhead transmission and distribution lines also occur within the project area. Western's 230-kV transmission line that originates at Charlie Creek Substation crosses the eastern boundary of the TRNP and scenic byway, as well as a tributary to the Little Missouri River and U.S. Highway 85. The line continues to roughly parallel U.S. Highway 85 north for approximately 11 miles, before turning west to parallel U.S. Highway 200 and several other roads throughout the project area, crosses the Missouri River near Williston and interconnects with the Williston 230-kV Substation.

Recent increases in oil and gas production in the project area have led to an increase in the number of oil and gas wells, drill rigs, and associated equipment that are visible on the landscape (Figure 3-5) and on local roads (Figure 3-6). The northwest corner of North Dakota is particularly heavy in oil and gas production and has the highest concentration of sites in the state. Due to the abundance of drilling, oil and gas sites frequent the landscape within the project area.

Figure 3-5: Typical Oil and Gas Development Activities Visible on the Landscape within the Project Area

Figure 3-6 Traffic on Local Roads near Oil and Gas Development

Each oil well pad site incorporates as much as 10 acres of surrounding land and includes a drill rig, pump jack, storage tanks, and gas flaring equipment on a gravel pad and containment berms (Figure 3-7). Based on available data from the North Dakota Industrial Commission, Department of Mineral Resources, Oil and Gas Division, there are approximately 5 gas plants, 90 oil rigs, and 5,500 oil wells within the project area. New oil well storage tank facilities, oil and natural gas pipelines, gas processing facilities and associated industrial facilities have also been recently constructed within the project area, with more of these currently under construction and projected to be built in the future to support the expanding oil and gas industry in the Bakken oil field. Oil and gas production activities have also led to the widespread development of temporary employee housing, which generally consist of clusters of mobile home or trailer units (Figure 3-8). These housing clusters are increasingly visible on the landscape, mainly on the outskirts of established communities. Temporary housing is currently giving way to more permanent apartment and other multi-family type housing, particularly in and around rural communities where access to utilities is available. Such growth and development is expanding into more rural areas, converting the visual character from undeveloped landscapes to a more suburban-type environment.

Figure 3-7: Typical Oil Well Pad Site

Figure 3-8: Typical Temporary Employee Housing within the Project Area

3.1.2 Direct and Indirect Effects

The visual resources assessment will focus primarily on sensitive viewpoints that fall within the viewshed of the proposed project facilities, and secondarily, on the general visual impacts of the project on the visual character of the project area. Visual impact assessments consider the current visual character of the area, the intrusive effect that project actions may have on that visual character, and the ability of certain areas to absorb the changes in scenery without altering the visual character of the area. The level of visual intrusion created by the project facilities will be described with respect to the different distance zones, types of observers, and observation points. Additionally, thresholds were used to assess the level of impacts each alternative would have on visual resources. The context and intensity definitions established for this project are listed in Table 3-1.

Table 3-1: Visual Resources Impact Context and Intensity Definitions

Context (Duration)	Low Intensity	Moderate Intensity	High Intensity
Short term: During construction period Long term: Life of the line (50 years.)	Proposed changes could attract attention but would not dominate the view or detract from current user activities	Proposed changes would attract attention, and contribute to the landscape, but would not dominate. User activities would remain unaffected.	Changes to the characteristic landscape would be considered significant when those changes dominate the landscape and detract from current user activities.

Potential Viewers and Sensitivities

Many factors influence the visual impact of any project. It is important to consider the viewer, including their expectations, activities, and frequency of viewing the line. Three types of viewers were identified within the project area. These include: local residents; employees, and recreational users. These three groups are discussed in more detail below.

<u>Local Residents</u>

Local residents are people who live in the project area of the proposed transmission line. Most residents within the project area live on rural farmsteads with large viewshed and may view the line from their yards or homes, while driving on local roads, or during other activities in their daily lives. The sensitivity of local residents to the visual impact of the line may be mitigated by exposure to existing transmission lines and other dissonant features already within the viewshed. Local residents can be highly sensitive to changes in the landscape that can be viewed from their homes and neighborhoods.

Employees

Employees, the majority of which work in the project area, primarily in the oil and gas or agricultural industry, would experience the line as they commute and potentially from their place of employment. Since many employees in the area live in temporary housing near oil or gas wells, they are likely surrounded by industrial influences. Due to the employment industry and focus, employees are not anticipated to have high sensitivity to a new transmission line near their place of work.

Recreational Users

Recreational users include local residents and tourists involved in recreational activities at North Dakota Badlands, TRNP, LMNG, Lewis and Clark State Park and Little Missouri State Park, scenic by-ways, historic and cultural sites, and natural areas. Scenery and visual quality may or may not be an important recreational experience for these viewers. For some recreational users, scenery may be an important part of their experience as their activities may include attentiveness to views of the landscape for a long period of time. Such viewers also may have a high appreciation for visual quality and high sensitivity to visual change. However, changes to the visual landscape would only be recognized by repeat visitors to the area.

Scenic Integrity and Visual Absorption

Scenic integrity is the degree from which the landscape character deviates from a natural, natural-appearing landscape in line, form, color, and texture of the landscape. In general, natural and natural-appearing landscapes have the greatest scenic integrity. As manmade incongruities are added to the landscape the scenic integrity diminishes.

Furthermore, some landscapes have a greater ability to absorb alterations with limited reduction in scenic integrity. The character and complexity, as well as environmental factors, influence the ability of a landscape to absorb changes in landscape. A new transmission line next to an existing line provides less contrast, and therefore can be absorbed into that landscape better than introducing a transmission line as a new feature in an undeveloped area.

No-action Alternative

Under the no-action alternative, the project would not be constructed. The existing environment within the project area would remain the same and no land would be used for transmission lines, facilities, or substations. Since no construction would occur, there would be no impacts on the visual resources or aesthetics in the area.

Proposed Action

Under the action alternatives the transmission line would be built. As discussed in Chapter 2, several tower types would be required for the construction of either alternative. Table 3-2 below shows the different structure types and the associated structure height. Additionally, diagrams of what the towers would look like are shown in Chapter 2.

Table 3-2: Tower Structure Types and Heights

Description of Design Component	345kV	230/115kV	345/115kV	230kV	345kV (H-Frame)
Minimum and Maximum Structure Height (feet)	100-130	97-127	115-145	70-110	80-100
Average Height of Structures (feet)	115	112	130	95	90

Construction and operation of the transmission line would introduce another manmade feature to the visual landscape and would change the existing viewshed throughout the project area. Potential visual impacts to individuals or resources as a result of the proposed project could include the following:

- changes to the viewshed from residences and residential areas as a result of the introduction and proximity of the transmission line and/or structures;
- changes to the visual landscape with respect to the Little Missouri River, a state-designated scenic river;
- changes to the visual landscape within or near recreational areas such as state and national parks; including the National Grasslands, TRNP, the North Dakota Badlands, Lewis and Clark State Park, and Little Missouri State Park; and
- reduction in the visual quality of scenic byways or trails crossed or paralleled by the proposed project.

The proposed project includes clearing a 150-foot ROW to construct a new transmission line and associated structures, and conductors. Based on the visual integrity objectives identified in the Northern Great Plains Management Plans Revision (USFS, 2001), the majority of the LMNG tracts within the project area have a low SIO. Areas within the national grasslands typically would contain less disturbance and development than private lands surrounding these areas. As a result, with the exception of small areas around the TRNP-North Unit, most of the project area would have a low SIO on federal lands. A low SIO is described as a landscape appearing heavily fragmented, with human activities strongly dominating the natural landscape. The majority of the private land is heavily developed for oil and gas or is used for agricultural purposes, also giving it a low scenic integrity. The proposed project would be consistent with the definition of a low SIO and would not likely contribute to adverse changes in the visual setting in the majority of the project area because the transmission line would be located within an already visually altered setting, characterized by development and existing infrastructure.

Alternative Route A

Alternative Route A is approximately 195 miles long and comprises three main segments. The first segment is between the AVS to the Charlie Creek Substation (65 miles); the second segment is between Charlie Creek Substation and the proposed Judson 345-kV Substation (70 miles), and the third segment is between Judson 345-kV Substation and Williston Substation (56 miles). Alternative Route A would be constructed through varying types of terrain. Distance from the line, terrain, topographical features in the area, differences in elevation, manmade features, and natural features such as forest cover would all influence the level of potential impact at specific locations throughout the project area.

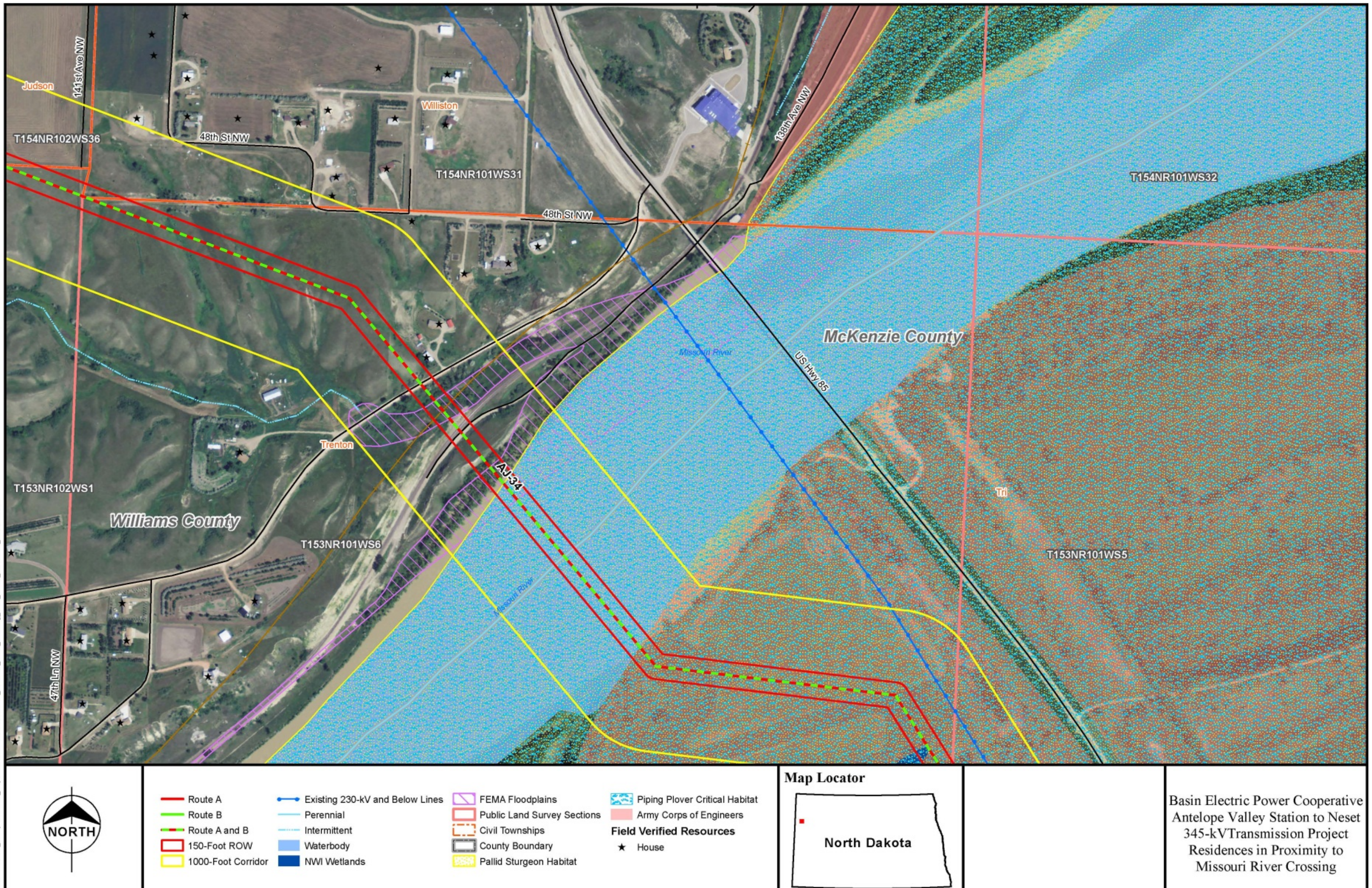
Overall, Alternative Route A would have approximately 101 road crossings along the length of the route. Many of these roads are county section-line gravel roads that receive only very light local traffic. Alternative Route A would introduce a new visual element to the surrounding area for motorists and local landowners at each road crossing. The addition of a transmission line would be noticed by more users at road crossings of larger, well-traveled roads or at crossings; these would be particularly noticeable where there are no existing transmission lines within view of the road.

Alternative Route A would be located within 500 feet of eight residences, two of which occur where Alternative Routes A and B cross the Missouri River (Visual Simulations 1 and 4 in Appendix C). Homes in the area of the Missouri River crossing (Figure 3-9) may experience elevated visual concerns. However, throughout the majority of the project area, visual changes around residences would be minimal because the transmission line is located along existing transmission lines, roads, or in areas that contain other manmade visual elements such as oil and gas facilities or communications towers. Moreover, the precise placement of the transmission line within the proposed corridor is at this time not known. Minimum set-back requirements from residences as mandated under existing requirements would further mitigate visual impacts. These requirements would be followed during site-specific planning, engineering, and construction phases of the project. A detailed discussion of visual impacts along the route is provided below.

Both Alternative Routes A and B are the same for about 115 miles of their total length; they diverge from each other around Killdeer, North Dakota and come back together north of Arnegard, North Dakota. Exiting the AVS Substation in Mercer County, Alternative Routes A and B are in the same location and run directly west, roughly paralleling the carbon dioxide (CO_2) gas line, 1.5 miles to the south. The landscape in this area has dispersed rural and agricultural development, with rolling to flat topography and little intervening vegetation. After approximately 40 miles, the two alternatives diverge; Alternative Route A continues west and Alternative Route B turns north crossing the gas line.

Continuing west, Alternative Route A crosses the Killdeer Mountain Four Bears Scenic Byway (ND State Highway 22), a state-designated scenic byway, north of the town of Killdeer in western Dunn County. Along with Alternative Route A in proximity to the town, the crossing of ND State Highway 22 is in the vicinity of service facilities (gas stations, convenience stores, restaurants) and other human influences. The route would cross the scenic highway adjacent to a large oil well, and other manmade features, including a recently constructed 115-kV transmission line (directly parallel to the byway), oil and gas development, rural farmsteads, and communications structures. Topography and the winding nature of portions of the highway would limit views of the line to generally short sections where motorists would only have momentary view of the line. Alternative Route A would not be anticipated to adversely change the scenic designation of ND State Highway 22 or the overall scenic integrity along the roadway.

Figure 3-9: Homes in the Area of the Missouri River Crossing



Source: USDA NAIP 2010 Aerial Photography; North Dakota GIS; USFWS NWI Wetlands; Burns & McDonnell.

November 12, 2012

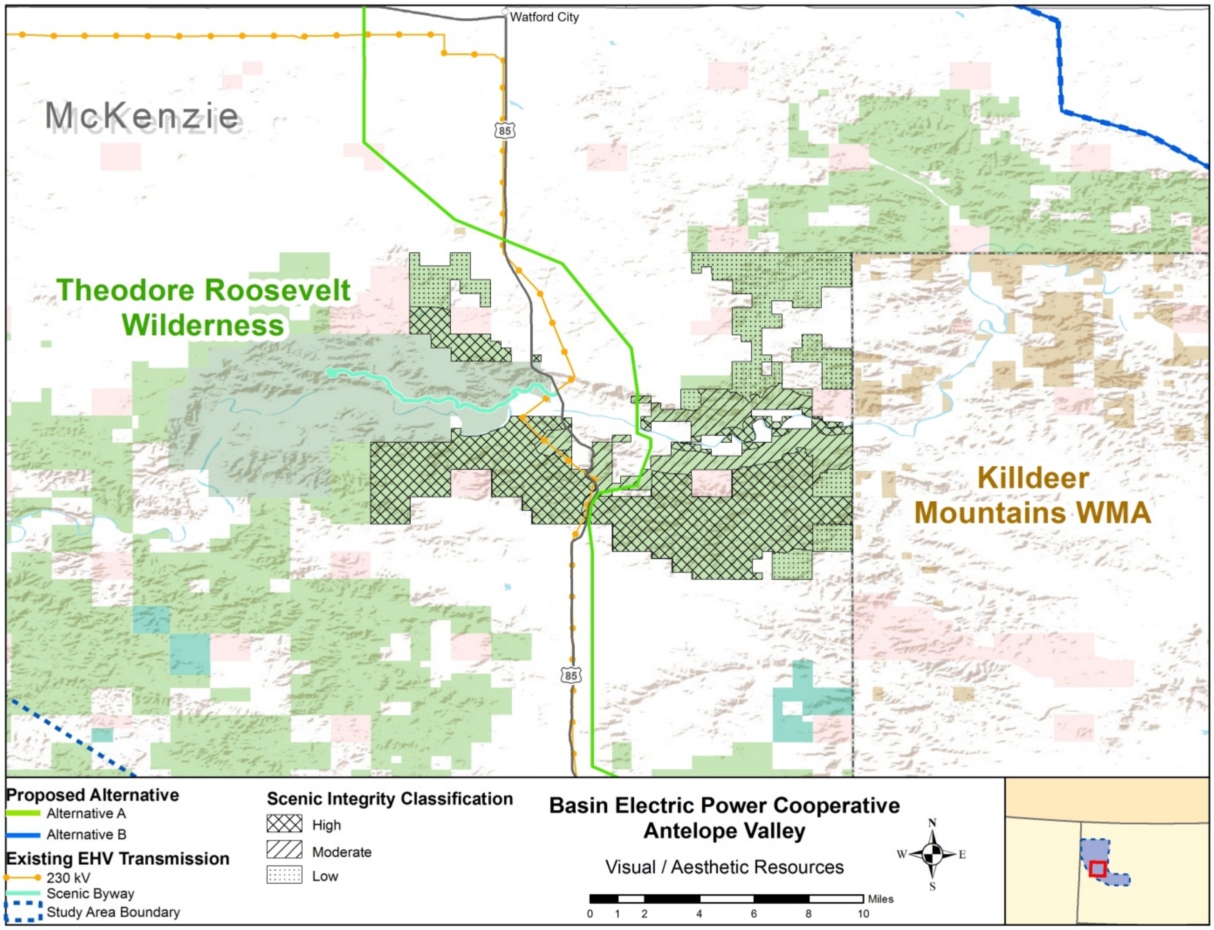
After crossing ND State Highway 22, Alternative Route A shifts slightly south to generally parallel an existing 115-kV transmission line on the north side of North 3rd Street, before turning south and west into the Charlie Creek Substation. A large portion of the area along U.S. Highway 85 is part of LMNG. This alternative route would be highly visible to drivers along U.S. Highway 85 and would introduce a new manmade feature through portions of the USFS-controlled LMNG in McKenzie County. However, as previously noted, most of these areas are classified as having a low SIO and while the route would visually change the existing viewshed for area users and motorists traveling on U.S. Highway 85 as it passes through or in proximity to the grassland areas, the scenic integrity of these areas would not be adversely affected by the introduction of a new manmade feature. The portion of Alternative Route A along U.S. Highway 85 through the badland areas associated with the Little Missouri River would potentially contribute to visual impacts, as certain vantage points along U.S. Highway 85 offer commanding views of the area that would be interrupted by the presence of a utility line. However, the presence of an existing transmission line parallel to U.S. Highway 85 already presents some degree of visual contrast. Further, LMNG lands adjacent to portions of U.S. Highway 85 have been specifically identified for the development of utility corridors to mitigate adverse visual effects on the natural landscape and contain infrastructure and associated facilities to an existing corridor rather than allowing disturbances to be scattered across the LMNG.

Alternative Route A would pass within 3.8 miles of Lone Butte (Visual Simulation 2 in Appendix C), which is within a portion of LMNG designated as “Roadless” and offers a scenic view of LMNG and associated badland areas. The transmission line would be visible to the southwest from high elevation vantage points in the Lone Butte designated roadless area. These southwestern facing views of the project from Lone Butte (at a 2,749 feet elevation) would also include the agricultural lands, roadways, other infrastructure, and other generally low intensity development within which the transmission line would be situated. As a result, the project would not present a comparably greater contrast to the existing setting. The transmission line would not be visible to the west and northwest of vantage points near Lone Butte due to the numerous ridges ranging from 2,400 to 2,600 feet in elevation, which would obstruct any views of the corridor.

An existing 230-kV transmission line, several communications towers, rural residences, and oil development facilities are currently visible along U.S. Highway 85 (Visual Simulation 2 in Appendix C) from the Lone Butte area. As can be seen in the visual simulation prepared for this location, the visibility of Alternative Route A would be considerably limited due to the distance, topography, and vegetation in this area.

There are more than 28,500 acres of lands in the LMNG that are classified by USFS as having a moderate or high SIO. Portions of Alternative Route A would cross through lands classified as having moderate scenic integrity east of U.S. Highway 85, as illustrated in Figure 3-10.

Figure 3-10: Proximity of Route A to Areas with Scenic Integrity on USFS Lands



SIO levels of moderate scenic integrity do allow for some level of human intrusion, ranging from those that dominate the landscape (moderate SIO) to those that must repeat common attributes in the landscape but not be readily evident (high SIO). In portions of the project area where the proposed transmission line transects areas with moderate scenic integrity levels (SILs), special mitigation strategies would be employed to reduce impacts on visual and aesthetic resources. These strategies could include the following.

- Camouflage–Employing the application of natural colors and patterns of color from the surrounding landscape or visible background that may conceal the structures or reduce their visual effect.

- Maintenance/Decommissioning–Maintaining the structures to reduce visual impacts resulting from neglect over the duration of their useful life, and removing objects from the landscape once they have been deemed obsolete.

- Offsets–Correcting an existing aesthetic problem identified within the viewshed of a proposed project may qualify as an offset or compensation for project impacts. A decline in the landscape quality associated with a proposed project can, at least partially, be offset by the correction. In some circumstances a net improvement may be realized.

Alternative Route A would also pass approximately 1.5 miles east of TRNP and the TRNP-North Unit Scenic Byway, and would cross the state-designated scenic Little Missouri River. TRNP is a federal Class I Area airshed, which is a sensitive area to be protected from air pollutants that can cause visibility impairment within the airshed, such as those found in vehicle emissions and fugitive dust. Although Alternative Route A would pass close to TRNP, any air impacts resulting in reduced visibility would be limited to the short duration of construction near the park. Air emissions would be controlled as much as is practicable during construction phases through the incorporation of BMPs such as the use of water to suppress fugitive dust during ground disturbance and excavation activities. A transmission line already exists across the eastern edge of TRNP, the Byway, and the Little Missouri River just west of U.S. Highway 85, so an additional transmission line to the east of this area (and not in the park) may not appear as intrusive as it might otherwise if a line was not already present. Many portions of the TRNP viewshed are experiencing manmade visual intrusions to the natural landscape such as oil and gas pumps, wells, and drill rigs. Television and radio communication towers are also visible. As illustrated in Visual Simulation 3 (Appendix C), Alternative Route A would result in only minimal new visual contrast being introduced into the landscape. The distance of the line from the boundaries of TRNP, as well as the existing topography, vegetation, and human features in the landscape, all contribute to minimize any additional visual contrast resulting from the placement of Alternative Route A into the existing landscape.

Alternative Route A would cross the Missouri River adjacent to U.S. Highway 85 in an area with wide, flat, and generally open views on the south side of the river, giving way to a steep bluff on the north side. No designated scenic areas occur in this area. Numerous residences have been constructed along the ridge north of the river, most oriented to provide a wide view of the river valley below. The current viewshed provides impeded views of the river, adjacent woodlands, and natural topographic features to the south. The setting also includes a view of U.S. Highway 85 and an existing transmission line adjacent to the highway. Oil and gas facilities are also visible within the river valley and adjacent areas above the valley to the south. Construction of the proposed project would introduce a new manmade element to the viewshed. However, the additional visual element would not be unlike those already present in the landscape, and it would be located near these existing features (Visual Simulations 1 and 4 in Appendix C). Consequently, adverse impacts on the visual setting of this area are not anticipated.

Alternative Route A heads north from the Little Missouri River, crossing over U.S. Highway 85 two more times before meeting Alternative Route B north of Arnegard. From this point, until the terminus at the Neset 345-kV Substation, the two routes are the same. Alternative Routes A and

B would also cross the Lewis and Clark National Historic Trail and an auto tour route. The Lewis and Clark National Historic Trail itself follows the Missouri River; Alternative Routes A and B would cross the trail at its crossing of the Missouri River near Williston adjacent to an existing transmission line and U.S. Highway 85. Thus, views from or of the Lewis and Clark National Trail in this area are not expected to be significantly altered as a result of the construction. The auto tour route provides motorists with an opportunity to view some of the more scenic areas in the general vicinity of the trail although the entire trail is not particularly scenic. Alternative Route A would cross the auto tour route three times between the AVS and Judson substations. The crossings would include the Killdeer Mountain Four Bears Scenic Byway (ND State Highway 22, discussed previously), U.S. Highway 85 west of Watford City, and U.S. Highway 2 west of Williston. All of these crossings would occur in primarily rural areas where manmade features such as oil wells and existing transmission and distribution lines are present. Agricultural uses are also present in these areas, but represent primarily grazing lands or croplands with little scenic value.

New access roads may be required in certain areas with no access and steep, rugged terrain, particularly near the Little Missouri River and associated tributaries. Alternative Route A crosses part of the LMNG and the Little Missouri River in an area with developed recreational areas and the roads may be seen as visitors pass through the area. New access roads needed in steep or rugged terrain would have a low to moderate visual impact. However, many of these areas are remote and would not be visible to a large number of individuals traveling or recreating in the area. In addition, any new roads would be reclaimed after construction and would thus have a temporary visual impact. They would likely go relatively unnoticed by visitors to the area and would mend back into the environment following cessation of construction activities. Short-term visual impacts would be expected to occur due to the presence of heavy machinery, equipment, and material staging during construction; once construction has been completed the equipment would be removed from the site.

Due to the human influence and existing infrastructure (transmission and distribution lines, oil and gas development, agricultural operations, and gas lines) in the area and the proximity to federally recognized visually sensitive areas and parks, it is likely that the construction of the transmission line would have a low to moderate, long-term impact on aesthetics and visual resources, and a short-term impact due to construction equipment.

<u>Alternative Route B</u>

Visual impacts associated with the construction and operation of Alternative Route B would be similar to those of Alternative Route A. Alternative Route B, is currently located within 500 feet of seven residences, and would have 100 road crossings along the length of the route. Like Alternative Route A, a majority of these roads are county section-line gravel roads with very light traffic, likely only from the local residents. Alternative Route B is the same as Alternative

Route A until the town of Killdeer, where Alternative Route B turns north, continuing to roughly parallel the CO_2 gas transmission pipeline. Alternative Route B would cross the Killdeer Mountain Four Bears Scenic Byway at a different location than Alternative Route A. Alternative Route B crosses the scenic byway in an area where a 115-kV transmission line and the CO_2 pipeline are directly parallel to the road and also through a North Dakota state lands parcel. Like Alternative Route A, the crossing of the byway is near many manmade features including an existing transmission line, oil and gas development, rural farmsteads, and distribution lines. These manmade elements along open grassland and cropland surrounding the crossings would not offer increased scenic value along the byway in these areas (see Visual Simulations 5 and 6 in Appendix C for northern crossing of byway). Alternative Route B continues to parallel the road approximately 0.5 mile west of the scenic byway; however, there is an existing 115-kV line between the road and the proposed route, causing viewers to have to look through an existing transmission line to notice Alternative Route B. Topography and the twisting nature of portions of the highway also limit views of the line to generally short sections where motorists would only have momentary view of the line. In areas adjacent to or near the crossing, the line may be visible to motorists for slightly longer periods of time while on the byway.

Continuing north, Alternative Route B enters the scenic area of the North Dakota Badlands and the Little Missouri River. Alternative Route B would cross the Little Missouri River west of the Killdeer Mountain Four Bears Scenic Byway. The crossing area contains considerable badlands topography, vegetation and river valley features, and opportunities for wide picturesque viewsheds. This area is not part of LMNG, and therefore has not been assigned a SIO. Additionally, the area is located in a remote setting and therefore limits opportunities for both development and viewing by visitors. The general location for Alternative Route B to cross the Little Missouri River (state-designated as scenic) is in the corridor of an existing CO_2 pipeline and 0.8 mile west of a 115-kV transmission line. This corridor currently contains manmade visual elements and access for construction and maintenance. While Alternative Route B may change the viewshed of this area, any changes would be localized by co-locating in an existing utility corridor, preserving the natural and relatively undisturbed viewsheds throughout other sections of the Little Missouri River Valley. The co-location of similar visual disturbances would result in less of an adverse impact than if those disturbances were distributed throughout the landscape. However, the placement of an additional transmission line into the landscape, even if co-located with an existing line, would result in an incremental increase in visual disturbance when compared with the existing conditions. This is particularly true given that the additional structural component could be located as much as a mile from the existing transmission line.

Alternative Route B continues to parallel the CO_2 gas pipeline for approximately 8.5 miles after the river crossing and passes within 0.1 mile of several tracts of LMNG in McKenzie County. As these areas are classified as having low scenic integrity, no adverse concerns for the visual landscape of these areas would be anticipated in these areas. Alternative Route B diverts northwest from the gas line going cross-country and not parallel to any existing linear features. The topography through this area is indicative of the scenic badlands of the area. As mentioned previously, there are few roads through this area, thus limiting access to view these vistas and the proposed project.

Continuing west, Alternative Route B meets back with Alternative Route A and would cross the Lewis and Clark National Historic Trail, auto tour route, and Missouri River at the same location as described under Alternative Route A. Like Alternative Route A's crossings of the auto tour route, Alternative Route B's crossings would occur in primarily rural areas where manmade features such as oil wells and existing transmission and distribution lines are present. Agricultural uses are also present in these areas, but represent primarily grazing lands or croplands with little scenic value.

North of the Missouri River, the landscape completely changes. The topography flattens out and is mainly cropped-based agricultural operations heavily interspersed with oil and gas production and agricultural operations. The northern part of the project area is heavily influenced by human activity and contains two existing transmission lines. Depending on the exact placement of the transmission line within the landscape, the introduction of a new transmission line may impact the scenic value of the landscape. However, impacts would be minor in level of severity and represent only incremental changes to existing conditions.

New access roads may be required in certain areas with no access and steep, rugged terrain, particularly near the Little Missouri River and associated tributaries. New access roads needed in steep or rugged terrain would have a low to moderate visual impact. However, many of these areas are remote and would not be visible to a large number of individuals traveling or recreating in the area. In addition, any new roads would be reclaimed after construction and would thus have a temporary visual impact. They would likely go relatively unnoticed by visitors to the area and would mend back into the environment following cessation of construction activities.

Alternative Route B crosses the Little Missouri River in areas paralleling major thoroughfares (State Highway 22 and U.S Highway 85). It is likely that the visual impacts associated with any new access roads for this alternative would have a low to moderate, temporary impact on visual resources. Short-term visual impacts would be expected to occur due to the presence of heavy machinery, equipment, and material staging during construction; once construction has been completed the equipment will be removed from the site.

Overall, due to the human influence and existing infrastructure (transmission and distribution lines, oil and gas development, agricultural operations, and gas pipelines) in the area and the distance from federally recognized visually sensitive areas and parks, it is likely that the construction of the transmission line would have a low to moderate, long-term impact on aesthetics and visual resources and short-term, low impacts during construction.

3.2 AIR QUALITY AND GREENHOUSE GAS EMISSIONS

3.2.1 Affected Environment

Air Quality Conditions

Regional Setting

The proposed project is in western North Dakota traveling from the west-central portion of the state to the northwest portion. Major existing contributing sources of air emissions/criteria pollutants in the project area stem from oil and gas activities coming from manufacturing, construction, operation, and maintenance. Emissions from these sources have increased in recent years from the dramatic increase in oil and natural gas production that the hydraulic fracturing process provides for the industry to unlock previously inaccessible areas. There are a number of these oil and gas processing plants, gas flares and production wells in the project area as well as a coal-fired electrical generating unit (AVS) and a synthetic natural gas production facility (Great Plains Synfuels Plant).

Other existing sources of air emissions result from infrastructure and include all transportation associated with the oil and gas industry; individual automobiles, trucks, and farm equipment; and residential emissions primarily from wood burning stoves. Vehicles are responsible for tailpipe emissions including nitrogen oxides (NO_x), carbon monoxide (CO), and sulfur dioxide (SO_2). The primary pollutant produced by farm equipment is NO_x from the combustion of fuel. In addition to existing contributors to air emissions, the prevalence of farming and ranching activities and vehicles using unpaved roads are sources of fugitive dust.

National Ambient Air Quality Standards/Attainment

The U.S. Environmental Protection Agency (USEPA) defines ambient air in 40 CFR 50 as "that portion of the atmosphere, external to buildings, to which the general public has access." In compliance with the 1970 Clean Air Act and the 1977 and 1990 Clean Air Act Amendments, USEPA has promulgated National Ambient Air Quality Standards (NAAQS). NAAQS were enacted for the protection of public health and welfare, allowing for an adequate margin of safety. The Clean Air Act established two types of national air quality standards. Primary standards set limits to protect public health, including the health of "sensitive" populations such as children, the elderly, and those suffering from asthma. Secondary standards set limits to protect public welfare, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings. To date, USEPA has issued NAAQS for seven criteria pollutants: CO, SO_2, particles with a diameter less than or equal to a nominal 10 micrometers (PM_{10}), particles with a diameter less than or equal to a nominal 2.5 micrometers ($PM_{2.5}$), ozone, nitrogen dioxide (NO_2), and lead. Areas that do not meet NAAQS are called non-attainment areas. While ozone is monitored for ambient air quality levels, regulations limit NO_x and volatile organic compound emissions, which are ozone precursors. Table 3-3 displays the primary NAAQS for each criteria pollutant as well as state standards for ambient air quality. All counties in North Dakota are currently in attainment for all criteria pollutants. In 2010, USEPA established 1-hour standards for NO_2 and SO_2 and both USEPA and NDDOH recommended that North Dakota be classified as in attainment or unclassifiable by these standards.

Table 3-3: State and Federal Ambient Standards for Criteria Air Pollutants

Pollutant	Averaging Period	Federal Primary Standard	North Dakota State Standard
Ozone	8-hour	0.075 ppm	Same as federal
	1-hour (daily max.)	0.12 ppm	Same as federal
$PM_{2.5}$	Annual (arithmetic mean)	15.0 µg/m^3	Same as federal
	24-hour	35 µg/m^3	Same as federal
PM_{10}	Annual (arithmetic mean)	NA	Same as federal
	24-hour	150 µg/m^3	Same as federal
CO	8-hour (less that 5,000' above mean sea level	9 ppm	Same as federal
	8-hour (greater than 5,000' above mean sea level	9 ppm	N/A
	1-hour	35 ppm	Same as federal
NO_2	Annual (arithmetic mean)	0.053 ppm	Same as federal
	1-hour	0.100 ppm	Same as federal
SO_2	Annual (arithmetic mean)	0.03 ppm	Same as federal
	24-hour	0.14 ppm	Same as federal
	3-hour	NA	0.50 ppm
	1-hour	75 ppm	Same as federal
Lead	Rolling 3-month average	0.15 µg/m^3	Same as federal
	Quarterly average	1.5 µg/m^3	Same as federal

Sources: USEPA, 2012; North Dakota Century Code, 2011b.
ppm = parts per million
µg/m^3 = micrograms per cubic meter

Ambient air quality is monitored throughout North Dakota by stations meeting USEPA's design criteria for State and Local Air Monitoring Stations and National Air Monitoring Stations. There are five monitoring stations near the project area and yearly monitoring data for the different pollutants is presented by the NDDOH. For 2010, all monitoring sites presented air quality data that was within federal and North Dakota state standards (NDDOH, 2010a).

To regulate the emission levels resulting from a project, federal actions located in non-attainment areas are required to demonstrate compliance with the general conformity guidelines established in Determining Conformity of Federal Actions to State or Federal Implementation Plans (40 CFR 93). Section 93.153 of this rule sets the applicability requirements for projects subject to it through the establishment of *de minimis* levels for annual criteria pollutant emissions. These *de minimis* levels are set according to criteria pollutant non-attainment area designations. Projects below the *de minimis* levels are not subject to the rule. Those at or above the levels are required to perform a conformity analysis as established in the rule. The *de minimis* levels apply to direct and indirect sources of emissions that can occur during the construction and operational phases of the action.

The proposed action is not located within a non-attainment area; therefore, a General Conformity Rule applicability analysis is not warranted.

Outside of the nonattainment areas, the Clean Air Act includes programs to maintain the air quality in attainment areas and ensure that new sources of criteria pollutants do not detrimentally affect the air quality. Programs established include: New Source Performance Standards, National Emission Standards for Hazardous Air Pollutants, Prevention of Significant Deterioration (PSD), and Title V Operating Permits. Of these programs, the only potential program applicable to this project is PSD. To determine the applicability of PSD, Congress set aside special land classifications where existing good air quality is especially important. These areas include but are not limited to national forests, national parks, and wilderness areas, all of which are defined as Class I areas. All other areas are designated as Class II areas. There are two Class I areas in North Dakota: TRNP and Lostwood Wildlife Area. TRNP is located within the project area and Lostwood Wildlife Area is located approximately 18 miles to the northeast.

PSD increments were established for Class I and Class II areas to ensure that air quality is maintained in attainment areas. If it is determined that a project is subject to PSD, the ground level air concentrations from the project must be below these increment values in attainment areas. In addition, all facilities must meet NAAQS with an appropriate background value added to the source impact concentration.

<u>Greenhouse Gases</u>

There is broad scientific consensus that humans are changing the chemical composition of Earth’s atmosphere. Human activities such as fossil fuel combustion, deforestation, and other changes in land use are resulting in the increase in GHG emission rates above background levels and the accumulation of additional GHGs, such as CO_2, in our atmosphere above pre-industrial natural levels of those gases. An increase in human GHG emissions is said to result in an increase in the Earth's average surface temperature, commonly referred to as global warming or climate change. Climate change is expected, in turn to affect weather patterns, average sea level, ocean acidification, chemical reaction rates, and precipitation rates. The Intergovernmental Panel on Climate Change estimates that the average global temperature rise between 2000 and 2100 could range from 1.1 degree Fahrenheit (°F) (with no increase in GHG emissions above year 2000 levels) to 9.2°F (with a substantial increase in GHG emissions). Even small increases in global temperatures could have considerable detrimental impacts on natural and human environments (IPCC, 2007).

GHGs include water vapor, CO_2, methane (CH_4), nitrous oxide, ozone, and several hydrocarbons and chlorofluorocarbons. Each GHG has an estimated Global Warming Potential, which is a function of its atmospheric lifetime and its ability to absorb and radiate infrared energy emitted from the Earth's surface. A gas's Global Warming Potential provides a relative basis for calculating its carbon dioxide equivalent (CO_2e), which is a metric measure used to compare the emissions from various GHGs based upon their Global Warming Potential. CO_2 has been assigned a Global Warming Potential of 1, and is therefore the standard to which all other GHGs are measured (IPCC, 2007).

Water vapor is a naturally occurring GHG and accounts for the largest percentage of the greenhouse effect. Next to water vapor, CO_2 is the second-most abundant GHG. Uncontrolled CO_2 emissions from power plants, heating sources, and mobile sources are a function of the power rating of each source, the feedstock (fuel) consumed, and the source's net efficiency at converting the energy in the feedstock into other useful forms of energy (e.g., electricity, heat, and kinetic). Because CO_2 and the other GHGs are relatively stable in the atmosphere and essentially uniformly mixed throughout the troposphere and stratosphere, the climatic impact of these emissions does not depend upon the source location on the earth (i.e., regional climatic impacts/changes will be a function of global emissions) (IPCC, 2007; USEPA 2006a).

Other major human emissions contributing to increased global levels of GHGs include CH_4 and nitrous oxide and fluorocarbons. CH_4 is emitted during the production and transport of coal, natural gas, and oil; CH_4 is also emitted from livestock, agricultural processes, and organic waste decay and amounts to about 24 billion metric tons annually in the United States. Natural CH_4 emissions globally are from wetlands, oceans, hydrates, and fires. CH_4 accounts for approximately 15 percent of global manmade GHG emissions (USEPA, 2006b).

Nitrous oxide emissions are emitted during the combustion of fossil fuels and solid wastes, as well as during agricultural and industrial activities. Nitrous oxide accounts for approximately 8 percent of global manmade GHG emissions (USEPA, 2006b).

Fluorocarbon gases are unnatural and emitted from a variety of industrial process and include: perfluorocarbons, hydrofluorocarbons, and sulfur hexafluoride. Combined, these gases comprise 7 percent of GHG emissions (USEPA, 2006b). Although they are emitted in small quantities, fluorinated gases have the ability to trap more heat than CO_2 and are considered gases with high global warming potential (USEPA, 2006a).

While models predict that atmospheric concentrations of all GHG emissions will increase over the next century due to human activity, the extent and rate of change is difficult to predict, especially on a global scale. As a response to concerns over the predicted increase of global GHG levels, various federal and state laws address the need to reduce GHG emissions, including those described below.

- USEPA is in the process of establishing regulations to control emissions from large generation sources such as power plants under the federal Clean Air Act for new sources emitting 100,000 CO_2e tons or more of GHGs. Other limited regulation of GHG emissions occurs through a review of new sources and regulatory requirements related to mobile sources.
- USEPA has issued the Final Mandatory Reporting of Greenhouse Gases Rule that requires reporting of GHG emissions from large sources. Under the rule, suppliers of fossil fuels or industrial GHGs, manufacturers of vehicles or engines, and facilities that emit 25,000 metric tons or more per year of GHGs are required to submit annual reports to USEPA (USEPA, 2010); although no other action is required (40 CFR 86, 87, 89.).
- Executive Orders 13423 and 13514 require federal agencies to measure, manage, and reduce GHG emissions by agency-defined target amounts and dates.

The state of North Dakota currently does not cap GHG emissions nor is it part of a regional GHG emission cap agreement (IFER, 2012). The state has primacy over the PSD program, including its GHG provisions.

<u>Regional Haze</u>

The Regional Haze Rule (Clean Air Act 169A and 169B, 40 CFR 51, subpart P) was intended to protect and improve visibility in areas of the country known as federal Class I areas (primarily National Parks and National Wilderness areas). Several facilities in North Dakota were subject to a regional haze analysis per 40 CFR 51.308, known as the Best Available Retrofit Technology analyses. These analyses applied to facilities in 26 source categories (mainly power plants) that were constructed between approximately 1962 and 1977 (years prior to the Clean Air Act Amendments of 1977). Utilities are the most common facilities that met the requirements under the Best Available Retrofit Technology rules. Facilities constructed before or after the 1962 through 1977 period may be subject to Reasonable Progress requirements. North Dakota is in the process of updating its State Implementation Plan to include controls and emission limits required by the Best Available Retrofit Technology and Reasonable Progress analyses to improve visibility in Class I areas.

There is currently only one Class I area within the vicinity of the project area, TRNP-North Unit. During construction, the proposed transmission line and substations have the potential to contribute to haze in this area. However, based on USEPA memo, construction emissions are not a consideration in determining if PSD requirements apply to a source. Since the construction of the proposed transmission line and associated structures is not a major stationary source this project does not come under PSD review. In addition, it is expected that all emission limits established will be followed and that any contribution to visual haze will not be significant based on the proposed project (NDDOH, 2010b).

3.2.2 Direct and Indirect Effects

This section discusses potential impacts, their duration, and intensity on air quality and GHGs resulting from construction and operation of the proposed project, including the no-action alternative. Definitions for context and intensity are described in Table 3-4.

Table 3-4: Air Quality Impact Context and Intensity Thresholds

Context (Duration)	Low Intensity	Moderate Intensity	High Intensity
Short term: During construction period Long term: Life of the line (50 years.)	The impact on air quality associated with emissions from the operation, maintenance and construction is measureable, but localized and small such that emissions do not exceed USEPA's de minimis criteria for a general conformity analysis, or the USEPA mandatory reporting threshold for GHG emissions.	The impact on air quality would be measurable and primarily localized, but have the potential to result in regional impacts. Emissions of criteria pollutants associated with operation, maintenance and construction would be at the USEPA's de minimis criteria levels for general conformity analysis and the USEPA mandatory reporting threshold for GHG emissions.	The impact on air quality would be measurable on a local and regional scale. Emissions from operation, maintenance and construction are high, such that they would exceed USEPA's de minimis criteria levels for a general conformity analysis and the USEPA mandatory reporting threshold for GHG emissions.

No-action Alternative

Under the no-action alternative, the proposed project would not be constructed, and current air quality conditions would remain. There would be no impacts on air quality or any contribution to GHGs as a result of this alternative.

Alternative Route A

Under Alternative Route A, the proposed transmission line and substations would be constructed and operated. Impacts on air quality would occur as a result of construction activities and operations. Potential impacts on air quality as a result of construction include increases in fugitive dust caused by construction activity, vehicles, and equipment and emissions from construction vehicles and equipment. The primary construction impact on air quality comes from fugitive dust. The footprint of the proposed project occurs primarily on open ranges, undeveloped, or agricultural land, with transportation occurring primarily on dirt or gravel roads. Increases in traffic on these roads from construction-related workers, equipment, earthmoving activities, and wind action on disturbed areas would all lead to increases in the production of fugitive dust. Site-preparation for the proposed transmission line and associated projects would require earthmoving and grading activities, exposing soils and increasing the potential for wind erosion. In addition, as a result of grading activities the transportation of soil and other construction debris in uncovered trucks could also contribute to fugitive dust. The primary concern over fugitive dust would occur during the warmer, drier months when soils are not as compacted and are more prone to dust generation. Impacts from fugitive dust would be expected to be short-term and only occurring during the construction period. Based on the relatively small size of the affected area and current air quality conditions, it is expected that this alternative will result in low impacts on air quality.

Other impacts on air quality as a result of construction activities come from emissions from construction vehicles and heavy equipment used in the construction process. Emissions stemming from these vehicles and equipment would emit hydrocarbons, particulate matter, and CO_2. Emissions resulting from the construction activities would be highly localized in the immediate project area and ROW and would be similar or less than to those created as a result of agricultural activities taking place in a majority of the project area. Air emissions as a result of construction are expected to be minimal as these activities are not excessive in nature. Estimated emissions are listed in Table 3-5. Therefore emissions stemming from the construction of this alternative would not reduce air quality in the project area and would not exceed USEPA *de minimis* thresholds and would not affect the current attainment status of North Dakota; resulting in short-term, low impacts.

Emissions potentially impacting air quality during operation of the transmission line, substation, and switchyard would only occur as a result of atmospheric interactions with the energized conductors. These minor emissions consist of ozone and NO_x and occur near the conductor due to the development of a corona. These emissions relative to NAAQS would be negligible and not approach current *de minimis* standards, resulting in low impacts on air quality.

Table 3-5: Alternative A: Transmission Line and Substations Construction Emissions Estimates and General Conformity De Minimis Thresholds

Pollutant	Emissions (tons)	Emissions (tons/year)	General Conformity De Minimis Threshold
NOx	3.76	1.88	100
Volatile organic compounds	0.28	0.14	100
$PM_{2.5}$	0.49	0.25	100
SO_2	0.11	0.06	100
CO	1.14	0.57	100

A potential area of concern regarding proposed air quality impacts associated with this alternative is the proximity of the proposed transmission line to the TRNP-North Unit, a federal Class I airshed. The proposed transmission line would be approximately 5 miles from the TRNP. Class I areas are sensitive areas with determined important visual qualities and are protected from air pollutants that can potentially cause visibility impairments. Visibility can be affected by several air pollutants including PM_{10}, $PM_{2.5}$, sulfates, nitrates, and sulfuric acid mist. Potential pollutants occurring as a result of construction activities resulting from this alternative with the potential to impact visibility are both particulate matters. However, based on the limited amount of emissions resulting from construction activities, its highly localized short-term nature, and the implementation of management practices to control emissions and fugitive dust, construction emissions would not cause visibility impairments to the Class I area.

GHG emissions resulting from Alternative Route A were calculated for two types of activities that produce GHG emissions: construction of the transmission line and ongoing annual operations and maintenance for its estimated 50-year-long operational life. GHG emissions associated with construction activities would occur over a period of approximately 2 years. Based on existing data, it was assumed that an average of 150 workers (50 per three crews) located throughout the project area would work on the project daily during peak construction (including road and structure installation) and non-peak construction(including installing and removing BMP measures and staging areas, site preparation and restoration work, and equipment and materials moving). The transportation components of GHG emissions were estimated based on the approximate number of vehicles that would be used during project construction and the approximate distance those vehicles would travel. The number of round trips was conservatively estimated using the following assumptions.

- All workers would travel in separate vehicles to and within the project area each day.
- A maximum number of workers (150) would be required to construct the project.

- The round trip distance in the project area is approximately 100 miles, depending on the exact location of workers within the project area.

- Fuel consumption is based on the average fuel economy for standard pickup trucks of 18 miles per gallon. This is likely an overestimate as more efficient vehicles may be occasionally used. Average helicopter fuel mileage is anticipated to be around 1 mile per gallon.

Fuel consumption and GHG emissions would also result from operation of on-site heavy construction equipment. Heavy construction equipment may include augers, bulldozers, excavators, graders, heavy-duty trucks, and front-end loaders. It is also expected that the majority of heavy construction equipment use would occur during peak construction. Assumptions included a maximum of 50 equipment machines would be in operation during peak construction and 25 equipment machines during off-peak. It was also assumed that the average size of equipment would not exceed 250 horsepower and would operate at max power for 8 hours per day 5 days a week, which is a significant overestimation because equipment commonly operate in idle or reduced power.

The implementation of this alternative would require the permanent removal of trees and other vegetation as a result of road construction of ROW clearing. Although permanent tree removal would not immediately emit GHGs, it would reduce the level of solid carbon storage in the area. Tree growth and future carbon sequestration rates are highly variable and dependent on several factors, including, the species of the tree, the age of the tree, climate, forest density, and soil conditions. In the North Central Region, the average carbon storage associated with forest is 160,000 pounds per carbon acre (USFS, 1992). As a result of this alternative, a total of approximately 45 acres of forested area would be removed.

During operation and maintenance of the transmission line it is expected that routine patrols, maintenance of roads and structures, and aerial inspections by helicopter would occur once per year and emergency maintenance and natural resource review would occur on average once every 4 years, with all activities estimated to incur 100 miles round trip. Operation and maintenance emissions are estimated for the 50-year life span of the transmission line.

Based on the above assumptions this alternative would result in an estimated total of 18,480 metric tons of CO_2e emissions during construction and a total of an estimated 50 metric tons of CO_2e emissions for ongoing operations and maintenance activities over the 50-year lifespan of the line. To provide context for this level of emissions, the USEPA mandatory reporting threshold for large sources of GHGs is 25,000 metric tons of CO_2e emitted annually (74 Federal Register 56260). This threshold is approximately the amount of CO_2e generated by 4,400 passenger vehicles per year. Comparatively, the emissions during project construction would be equivalent to the emissions generated by about 3,252 passenger vehicles per year. Operation and maintenance activities would translate into CO_2e emissions about equal to that of nine passenger vehicles per year. Overall, the contributions of construction, operation, and maintenance of Alternative Route A on GHG concentrations would be low.

Under Alternative Route A, it is expected that approximately 95 forested acres would be removed. Assuming each affected acre contains the average carbon content for the North Central Region, the net carbon footprint associated with the removal of forested area would be an estimated 6,897 metric tons of CO_2e. Given this estimate, the impact of vegetation removal on GHG emissions would be low.

Alternative Route B

Impacts on air quality as a result of Alternative Route B would be similar, albeit slightly greater due to the greater length of this alternative and the additional Killdeer switchyard, to those presented in Alternative Route A. Construction-related emissions and fugitive dust would occur in a different geographic area in the location of the proposed route and impacts would be short-term, localized, and less than significant. Emission estimates from construction are detailed in Table 3-6. Emissions from operations would be localized and less than significant. This alternative would not cross or be near any Class I airsheds.

Table 3-6: Alternative B: Transmission Line and Substations Construction Emissions Estimates and General Conformity De Minimis Thresholds

Pollutant	Emissions (tons)	Emissions (tons/year)	General Conformity De Minimis Threshold
NOx	4.25	2.13	100
Volatile organic compounds	.31	.16	100
$PM_{2.5}$	.55	.28	100
SO_2	.13	.07	100
CO	1.34	.67	100

The construction assumptions for Alternative Route A were used to calculate GHG emissions for Alternative Route B. Because these assumptions are the same for both alternative routes, Alternative Route B would result in the same GHG emissions as the Alternative Route A for construction of 18,480 metric tons of CO_2e emissions. Similarly, Alternative Route B would likely produce the same amount of GHG emissions as Alternative Route A, resulting in 50 metric tons of CO_2e. Alternative Route B would likely impact a greater amount of forested area, with approximately 100 acres to be removed. Assuming each affected acre contains the average carbon content for the North Central Region, the net carbon footprint associated with the removal of forested area would be an estimated 7,260 metric tons of CO_2e. Given this estimate, the impact of vegetation removal on GHG emissions from Alternative Route B would be low.

3.3 GEOLOGY AND SOILS

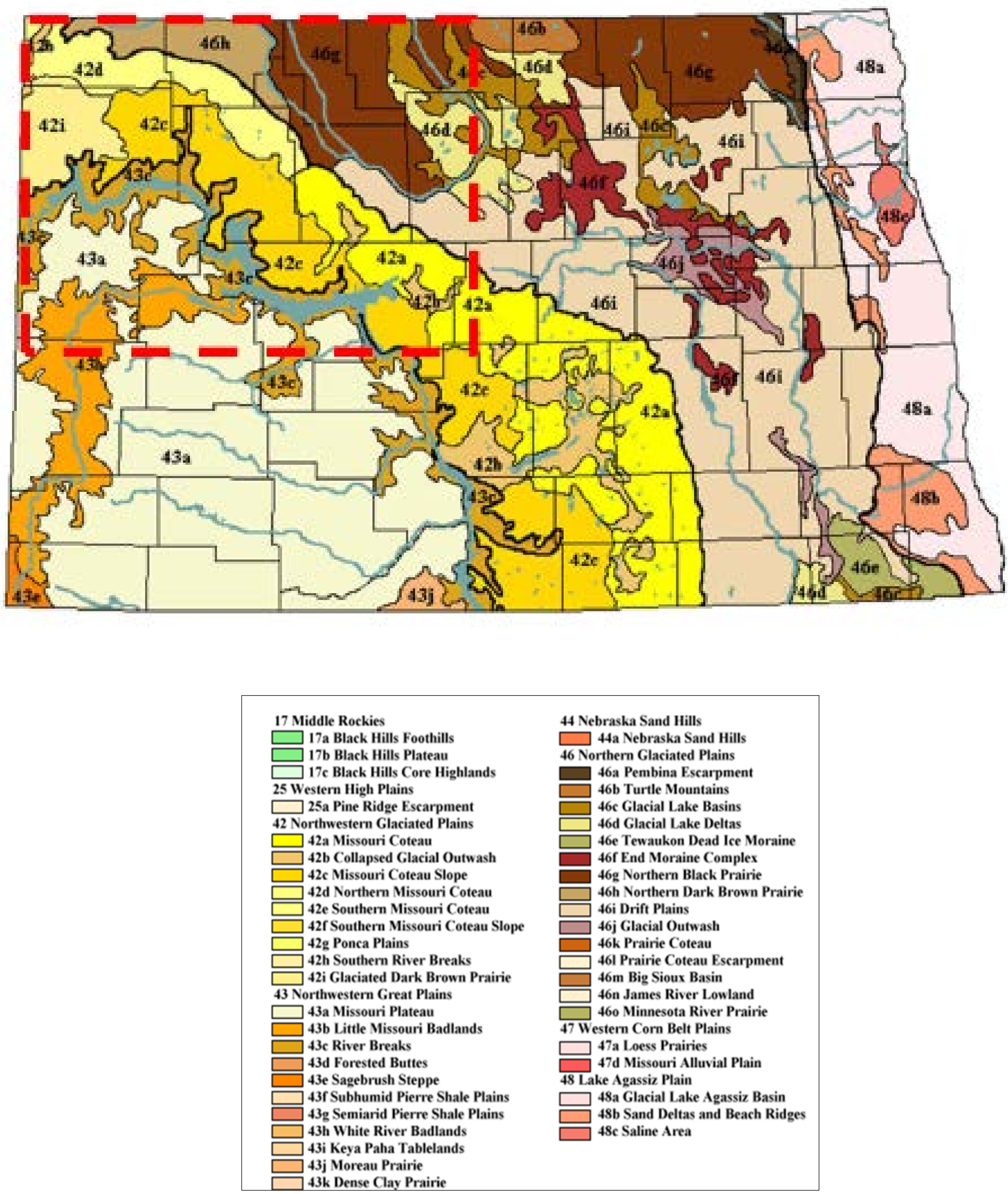
3.3.1 Affected Environment

Regional Geology

The project area is within the Northwestern Glaciated Plains and Northwestern Great Plains ecoregions within the Great Plains Province. The Northwestern Glaciated Plains encompasses the westernmost extent of continental glaciation, with high concentrations of wetlands. The Northwestern Great Plains encompasses the Missouri Plateau section of the Great Plains, and is a semi-arid region with rolling plains, buttes, and badlands. The Northwestern Glaciated Plains and Northwestern Great Plains are further divided into smaller ecoregions with specific geologic, topographic, or soil features. The northwestern portion of North Dakota, within which the project area is located (Figure 3-11) contains many of these unique ecoregions. North of Lake Sakakawea the region contains the Glaciated Dark Brown Prairie along with the River Breaks adjacent to Lake Sakakawea. The Glaciated Dark Brown Prairie consists primarily of glacial till over Tertiary sandstone and shale. The River Breaks, located adjacent to Lake Sakakawea, the Missouri River, and its tributaries contain broken terraces and uplands with dissected topography. These areas are unglaciated and consist of Tertiary sandstone and shale. South of Lake Sakakawea, not including the River Breaks, is the Little Missouri Badlands and Missouri Plateau. The Little Missouri Badlands are similar to the River Breaks, with highly-dissected topography prone to erosion. This area is also unglaciated, with Paleocene sediments of the Bullion Creek and Sentinel Butte Formations. The Missouri Plateau is unglaciated and consists of Tertiary sandstone, shale, and coal. The project area is also located within a region of the state where the Fox Hill and Hell Creek units of the Union Formation are underlain by calcareous shales, siltstones, and sandstones that are nearly all covered in glacial till plains. Kettle holes, kames, moraines, and small glacial lakes occur there as well. Alluvial deposits lie along the Missouri River **(**Bryce et al., 1998; USGS-Northern Prairie Wildlife Research Center [NPWRC], 2012**)**.

A majority of the project area location is unglaciated, with the exception of the eastern and northern edges. These areas are on an old, moderately dissected, rolling plain with badlands, buttes, and isolated hills. Terraces are adjacent to broad floodplains along most of the major drainages. Elevation in the eastern portion of the region is approximately 1,650 feet and sloping gradually to approximately 3,600 feet in the western portion.

Figure 3-11: Ecoregions in Northwestern North Dakota



Source: USGS-NPWRC, 2012.

Study Area Setting

For the purposes of describing the existing environmental setting, the area contained within the 6-mile-wide corridor distance for either of the proposed alternative routes has been selected to provide the context of the local study area. Figure 3-12 illustrates the extent of the study area for soils. This area comprises approximately 1.8 million acres in Williams, Mountrail, McKenzie, Billings, Dunn, and Mercer counties. Presenting the description of existing conditions as they relate to soils and geology within this more localized area, rather than a more generalized regional scale, creates a discrete unit of geographic interest that is more suited to the analysis of potential impacts stemming from construction and operation of the proposed transmission line. The information presented below—the description of bedrock geology, the location of landslide-prone areas, soil characterization, and farmland suitability—is constrained by the geographic boundaries of the study area as defined by these parameters. Similarly, soils and geologic conditions are detailed in the following maps as they occur within this study area.

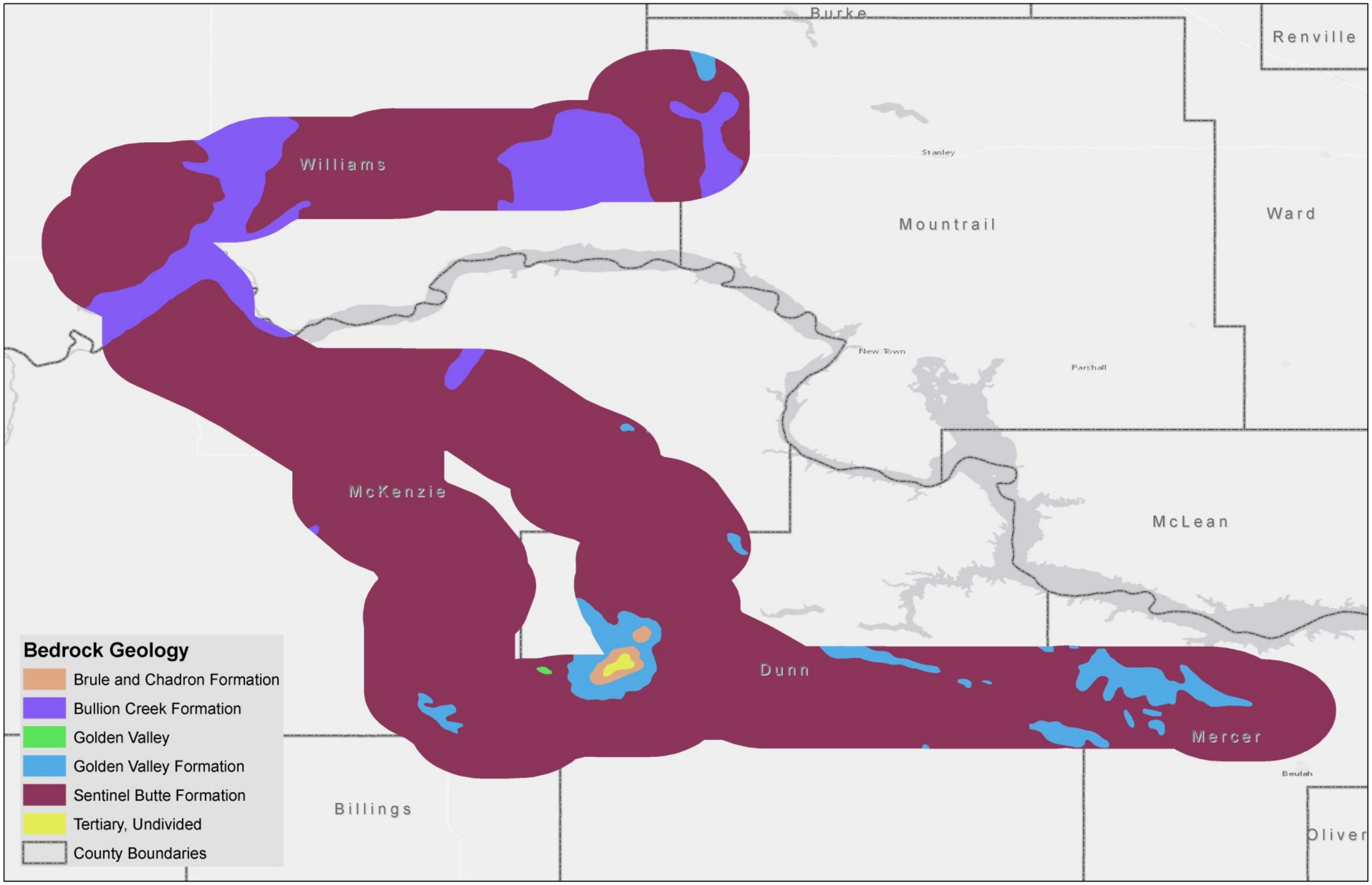
Geology

The bedrock geography of the study area is of the tertiary period and comprises the Sentinel Butte, Bullion Creek, Golden Valley and Brule and Chadron formations. Primarily silt, sand, clay, sandstone, and lignite, with small areas of siltstone and limestone occur throughout the study area. Butte caprock also occurs in the study area northeast of the Killdeer. Bedrock geology of the study area is presented in Figure 3-12.

<u>Terrain</u>

The maximum local relief is about 330 feet, but relief is considerably lower in most of the area (NRCS, 2012b).

Figure 3-12: Bedrock Geology within the Macro-corridors



Source: NRCS, 2012a.

Landslides

The North Dakota Geologic Survey (NDGS) has identified landslide areas within the study area. These areas have experienced landslides in the past, or may be subject to landslide activity due to geologic shifting or unstable soils. Within the study area, landslide-prone areas are primarily confined to the badland areas and river breaks areas surrounding the Missouri River and Little Missouri River. These areas exhibit steep terrain and exposed soils, which contribute to landslide activity. Figure 3-13 displays the occurrences of landslides within the study area.

Landslides are masses of rocks and sediment that have tumbled or slid down a slope under their own weight. They constitute geologic hazards that can damage buildings, roads, railroad tracks, pipelines, transmission lines, and other types of infrastructure. Landslides are generally characterized in the field by steep, near-vertical slopes (the scarp) that are upslope from a mound of displaced rock (the body). The body of the slide may be relatively intact or it may be severely fragmented. Recent or relatively new landslides are generally characterized by a fresh (well-exposed rock) scarp and a sparsely vegetated body. Older slides are typically more difficult to identify in the field because the scarps may be covered with vegetation and the landslide bodies are often well-vegetated and covered by mature trees.

Most landslides in western North Dakota are rotational slumps that have a well-defined head and toe. Typically, the part of the slope that breaks apart slides down the slope as a single unit and the beds tilt back in the direction of the slope. The failed mass of rock is, however, almost never a cohesive unit; tension cracks generally cause the failed material to splinter into smaller portions. Successive landslides may occur at the same location. Over time, the accumulated material from multiple, adjacent landslides can cover an area that is several thousand feet wide and several miles long (Murphy, 2003).

The potential for landslides exists at various locations throughout the study area, but landslide conditions predominate in southern McKenzie County. Most of this area is underlain by the Sentinel Butte Formation (Paleocene), which consists of alternating beds of sandstone, siltstone, mudstone, claystone, clinker, and lignite. A veneer of glacial deposits covers much of the upland areas. Landslides in this portion of the study area are most prevalent within the Little Missouri Badlands and in badlands topography north of Arnegard. The rock types in these two areas are no different than those outside of these landslide-prone areas. In contrast to the slow erosive processes that have carved most of the landforms in this map sheet, the buttes, valleys, coulees, and ravines within the Little Missouri Badlands were carved relatively quickly (in geologic terms) when glacial ice diverted the ancestral Little Missouri River into this area (Murphy, 2004). The Sentinel Butte Formation also occurs within Dunn County, where landslide potential exists on lands near the western extent of Lake Sakakawea in an area known as the Parshall Sheet. In the area covered by the Parshall Sheet, landslides are most prevalent within the Little

Missouri Badlands and the drainages along the west side of the Missouri River Valley between New Town and Independence Point (Murphy, 2003).

Regional Mineral Resources

Several mineral resources are mined within the study area. Bedrock clays can be found from silty clay in the lower part of the Golden Valley Formation near Hebron. Lignite coals can be found mainly in the Tertiary, Bullion Creek, and Sentinel Butte formations within the study area in western North Dakota.

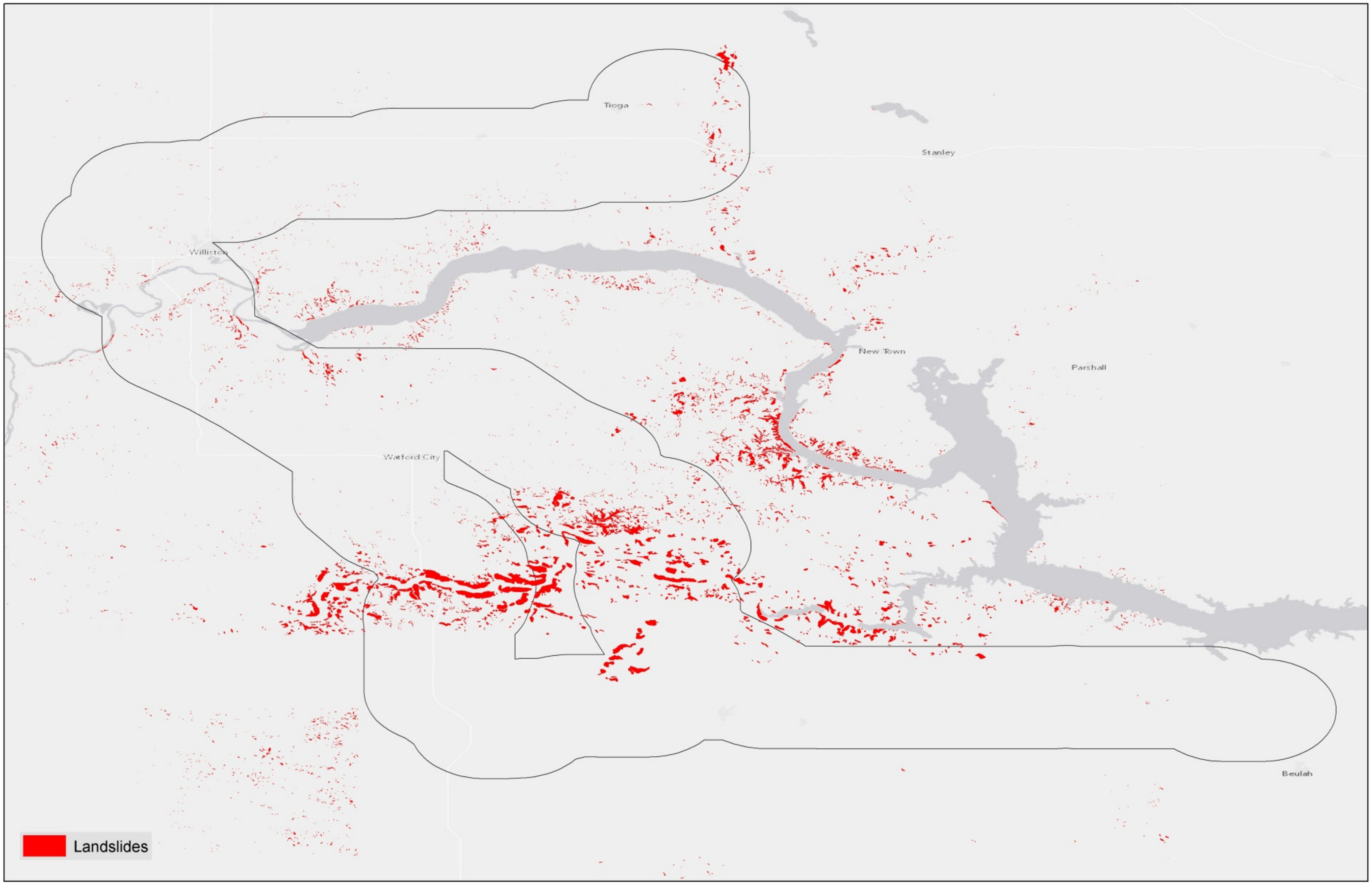
Salts in the study area consist of three main types of deposits within the Williston Basin of North Dakota: halite, potash, and Glauber salt or mirabolite. Halite (sodium chloride or table salt) and potash occur in thick deposits in the deep subsurface in the western part of the basin, while Glauber salt occurs at or within 70 feet of the surface throughout North Dakota.

Sand and gravel deposits that are formed from glacial deposits contain sand and gravel as either outwash or as isolated lenses of sand and gravel within till. Beach ridges and deltas that formed along glacial lakes Agassiz and Souris are also important sources of sand and gravel. Pliocene to Holocene-age sand and gravel deposits also occur as terrace deposits, and less commonly as pediments, in the western part of the state (NDGS, 2012a).

Soils

Within the study area, the dominant soil order (the highest level of soil taxonomy) is Mollisols. Mollisols are developed under grassland vegetation, and tend to be classified as prime farmland. The soils in the area have a soil temperature regime reflecting their northern location, a soil moisture regime reflecting a moist climate, and mixed mineralogy (NRCS, 2012b). Soil orders are composed of numerous soil series (the lowest level of soil taxonomy). Series found throughout the study area are described in greater detail in Table 3-7.

Figure 3-13: Landslide Occurrences within the Macro-corridors



Source: NDGS, 2012b.

Table 3-7: Soil Series within the Study Area

Soil Series	Description	Counties with Occurrences
Cabba	The Cabba series consists of shallow, well-drained soils that formed in residuum or colluvium derived from semiconsolidated, loamy sedimentary beds. These soils are on hills, escarpments, and sedimentary plains. Slopes are from 2 to 70 percent. Cabba soils have moderate permeability, and runoff is very low to high depending on slope. These soils are used as rangeland. The potential native vegetation occurring on these soils is mainly little bluestem, western wheatgrass, needle-and-thread, prairie sandreed, bluebunch wheatgrass, green needlegrass, plains muhly, forbs, and shrubs.	Williams, McKenzie, and Dunn
Fleak	The Fleak series consists of excessively drained, rapidly permeable soils that formed in calcareous soft sandstone. These soils are shallow to soft sandstone and occur on crests of hills and ridges, and on valley sides. Slope ranges from 2 to 70 percent. These soils are excessively drained, with slow or medium runoff and permeability is rapid. They are used mainly for range and pasture. The potential native vegetation is prairie sandreed, little bluestem, needle-and-thread, and other mid and short grasses.	McKenzie and Dunn
Golva	The Golva series consists of very deep and deep, well drained, moderately permeable soils that formed in silty alluvium. These soils occur on fans and terraces, and in shallow concave swales. Slope ranges from 0 to 15 percent. They are well drained and runoff is negligible to medium depending on slope. Permeability is moderate. These soils are used mainly for small grains; some row crops, hay, and pasture. The potential native vegetation is mid and short prairie grasses, such as blue grama, green needlegrass, western wheatgrass, and some forbs.	McKenzie and Dunn
Lakoa	The Lakoa series consists of deep and very deep, well drained soils formed in residuum weathered from interbedded sandstone and shale on uplands. Slopes range from 2 to 60 percent. Well-drained; saturated hydraulic conductivity is moderately high; medium to very high runoff, depending on slope. Lakoa soils are used for livestock grazing, wildlife habitat, recreation, and home site and urban development. Native vegetation is ponderosa pine, bur oak, with an understory of shrubs, sedges, little bluestem, and green needlegrass.	Dunn
Rhame	The Rhame series consists of moderately deep, well-drained, moderately rapidly permeable soils that formed in material weathered from soft sandstone. These soils are on uplands and have slopes ranging from 0 to 70 percent. Runoff is slow or medium. Permeability is moderately rapid. Small grains, mainly spring wheat are raised in a crop-summer fallow rotation. Grassland is used for hay and pasture. Native vegetation is medium and short prairie grasses as blue grama, needle-and-thread and upland sedges.	Dunn
Rhoades	The Rhoades series consists of deep and very deep, well or moderately well-drained, very slowly permeable soils formed in stratified loamy and clayey materials derived from soft shale, siltstone or mudstone. These soils are in swales on uplands and terraces and have slope of 0 to 25 percent. Moderately well and well drained. Runoff is medium to very high depending on slope. Permeability is very slow. Mostly in grassland used for range and pasture. Native vegetation is short- and mid-prairie grasses such as western wheatgrass, blue grama, sedges and also some legumes, prickly pear and clubmoss.	Williams, McKenzie, Billings, Mercer, and Dunn

Soil Series	Description	Counties with Occurrences
Sen	The Sen series consists of well-drained, moderately permeable soils that formed in calcareous siltstone or shale. They are moderately deep to soft bedrock. These soils are on upland plains and have slope of 0 to 25 percent. Runoff is slow, medium or rapid. Permeability is moderate. Soils are cropped to small grains in a crop-summer fallow rotation. Native vegetation is mid and short prairie grasses as green needlegrass, needle-and-thread, western wheatgrass, blue grama and a variety of forbs.	McKenzie
Shambo	The Shambo series consists of deep and very deep, well-drained, moderately permeable soils that formed in calcareous alluvium mainly from soft sandstone, mudstone and shale. These soils are on terraces and fans along stream valleys and are on fans on uplands. Slope ranges from 0 to 35 percent. Runoff is negligible to high depending on slope and surface texture. Permeability is moderate. Soils are cropped to small grains, hay and pasture. Some is irrigated and some are in native rangeland. Native vegetation was green needlegrass, needle-and-thread, western wheatgrass, prairie junegrass, blue grama and a variety of forbs.	McKenzie
Straw	The Straw series consists of very deep, moderately well and well drained soils that formed in alluvium. These soils are on floodplains, stream terraces and drainage ways. Slopes are 0 to 8 percent. Moderately well and well drained. Moderate permeability. Runoff is negligible to medium depending on slope. Straw soils are used mainly for dry land cropland, irrigated cropland, and range. Potential native vegetation is mainly rough fescue, western wheatgrass, needle-and-thread, little bluestem, bluebunch wheatgrass, green needlegrass, forbs, and shrubs.	Mountrail and Dunn
Toby	The Toby series consists of very deep, well drained, moderately rapidly permeable soils that formed in alluvium or eolian deposits. These soils are on fans, terraces, hills and ridges and have slopes of 0 to 15 percent. Well drained. Runoff is slow or medium. Permeability is moderately rapid. These soils are used for crops, hay, and pasture. Native grasses include blue grama, needle-and-thread, prairie sandreed, and western wheatgrass.	McKenzie and Dunn
Trembles	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. Well and moderately well drained; slow and very slow runoff; Moderately rapid permeability. Trembles soils are used mainly for irrigated cropland and for rangeland, The native vegetation is needle-and-tread, basin wildrye, western wheatgrass, big sagebrush, and scattered cottonwood trees.	McKenzie
Vebar	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. Well drained. Runoff is negligible to medium depending on slope. Permeability is moderately rapid above paralithic beds. Soils are cropped to corn and small grains. Some is used for hay or pasture. Native grasses are needle-and-thread and prairie sandreed.	McKenzie, Billings, and Dunn
Williams	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. Well drained. Runoff is negligible to high depending on slope and surface texture. Permeability is moderately slow or slow. Cultivated areas are used for growing small grains, flax, corn, hay or pasture. Native vegetation is western wheatgrass, needle-and-thread, blue grama, green needlegrass and prairie junegrass.	Mountrail, Mercer, and Dunn

Soil Series	Description	Counties with Occurrences
Wilton	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. Well drained. Slow or medium runoff. Permeability is moderate in the silty loess mantle and moderately slow in the underlying till. Soils are mainly cropped to small grains, flax and corn. Some areas are used for hay and pasture. Native vegetation was western wheatgrass, green needlegrass, bearded wheatgrass, prairie junegrass, needle-and-thread and a variety of forbs.	McKenzie and Mercer
Zahl	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. Well drained. Runoff is very low to high depending on slope and surface texture. Permeability is moderately slow or slow. Used mainly for range and pasture. Some areas are cropped to small grains. Native vegetation is little bluestem, western wheatgrass and needle-and-thread.	Mountrail, McKenzie, and Mercer

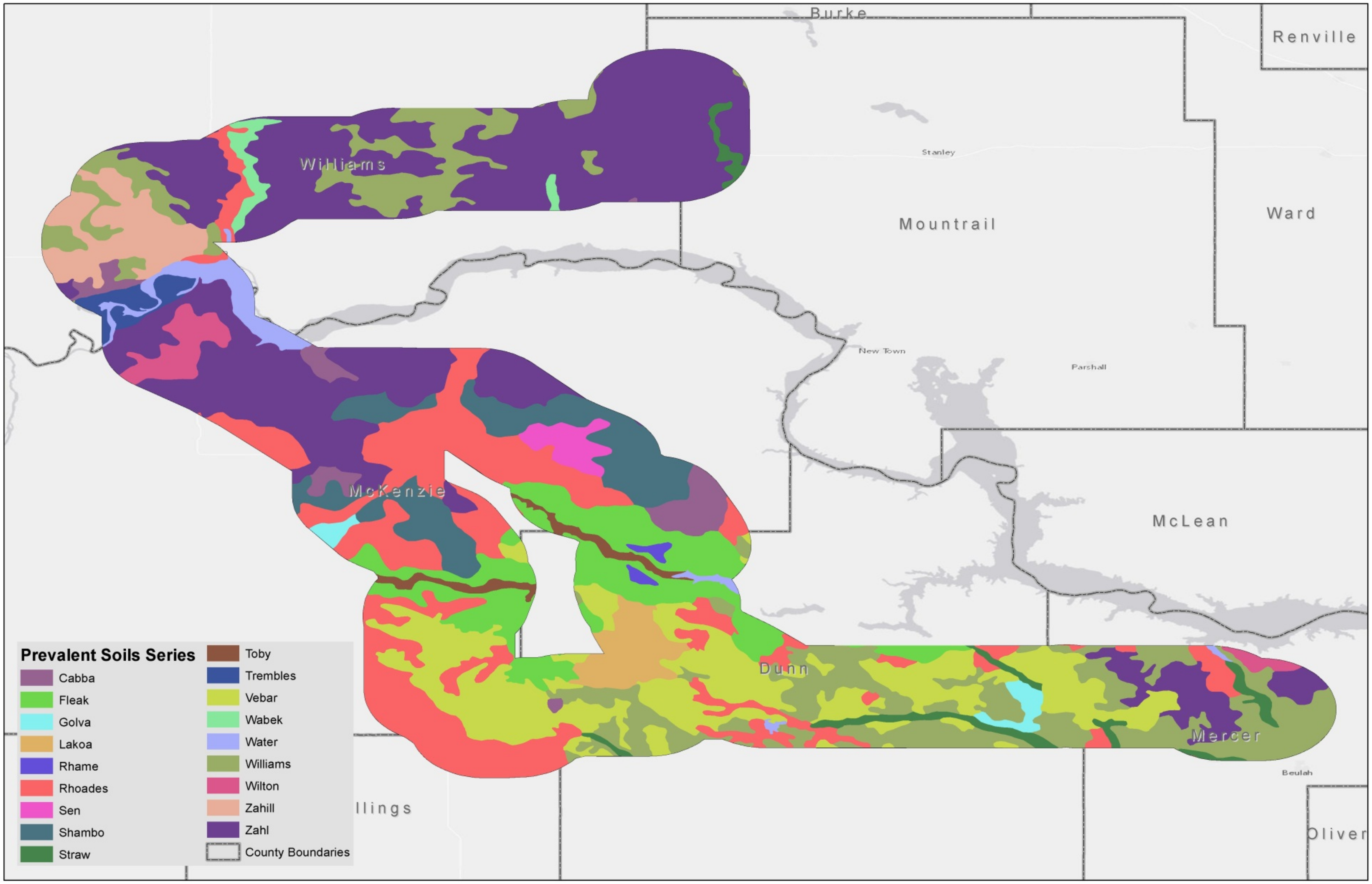
Source: NRCS, 2011e, 2012c.

A generalized map of the most prevalent soils series occurring in the study area is provided in Figure 3-14.

<u>Prime Farmland Soils</u>

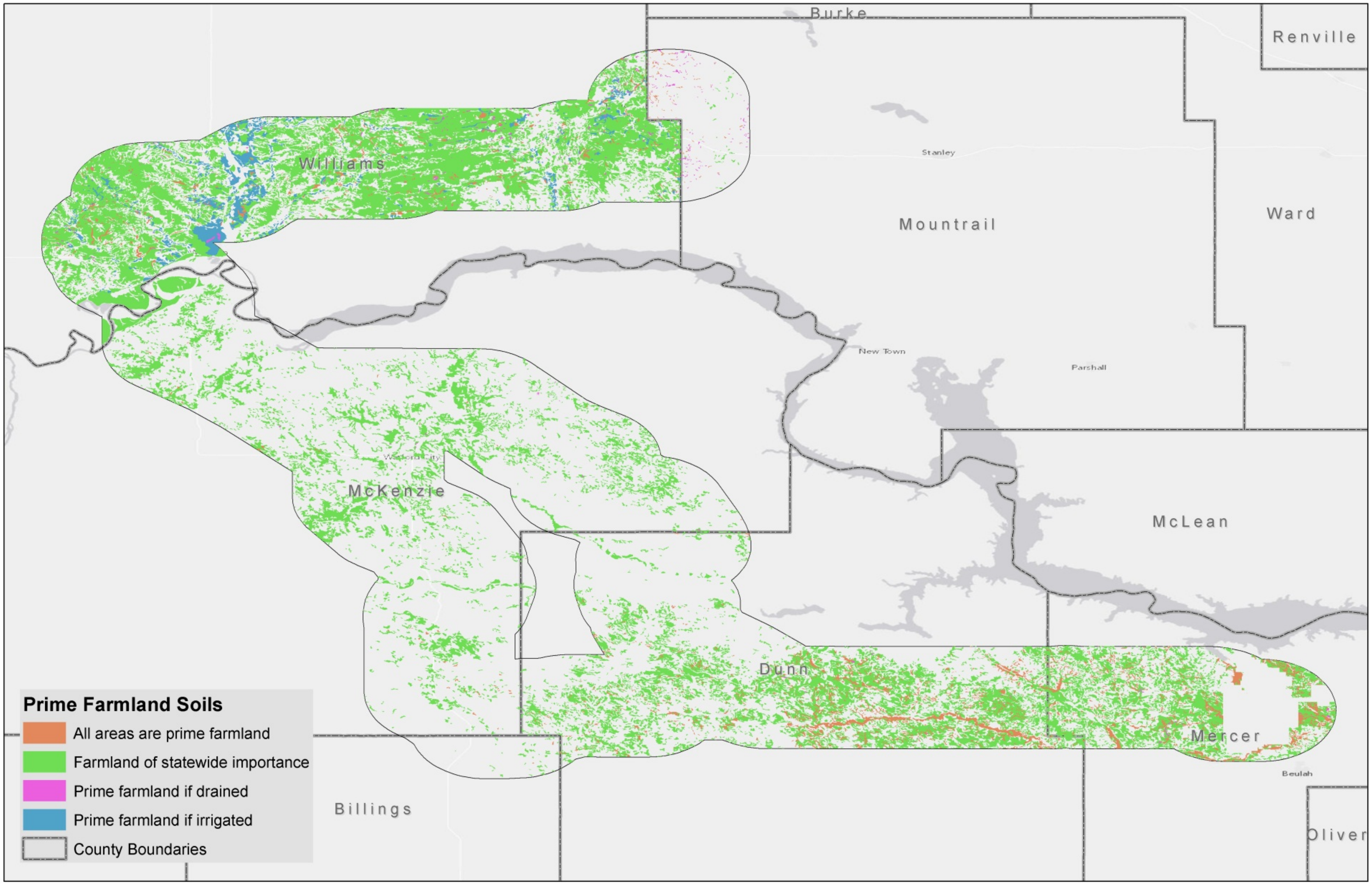
Prime farmland soils, as defined by the USDA, are soils that have been determined to have the best combination of physical and chemical properties for agricultural production (NRCS, 2011e). In addition to prime farmland, land may be classified as prime farmland if it is drained, irrigated, or of statewide importance, as determined by the state. Figure 3-15 visually illustrates important farmland soils found within the study area, while Table 3-8 shows a breakdown of the total important farmland acres by classification, by county within the study area.

Figure 3-14: Prevalent Soils Series Found within the Macro-corridors



Source: NRCS, 2012c.

Figure 3-15: Occurrences of Prime Farmland Soils within the Macro-corridors



Source: NRCS, 2012a.

Table 3-8: Prime and Important Farmland by County within the Study Area

County	Farmland Classification	Acres
Billings	All areas are prime farmland	53
Billings	Farmland of statewide importance	798
Billings County Total		851
Dunn	All areas are prime farmland	19,706
Dunn	Farmland of statewide importance	115,824
Dunn County Total		135,530
McKenzie	All areas are prime farmland	708
McKenzie	Farmland of statewide importance	106,804
McKenzie	Prime farmland if drained	162
McKenzie County Total		107,674
Mercer	All areas are prime farmland	12,472
Mercer	Farmland of statewide importance	106,804
Mercer	Prime farmland if drained	162
Mercer County Total		67,884
Montrail	All areas are prime farmland	622
Montrail	Farmland of statewide importance	6,543
Montrail	Prime farmland if drained	909
Montrail	Prime farmland if irrigated	43
Mountrail County Total		8,118
Williams	All areas are prime farmland	8,517
Williams	Farmland of statewide importance	230,837
Williams	Prime farmland if drained	2,598
Williams	Prime farmland if irrigated	24,902
Williams County Total		266,854

Source: NRCS, 2012a.

3.3.2 Direct and Indirect Effects

This section discusses potential impacts to the geology and soils and prime farmlands within the region as a direct result of the construction and operation of the proposed project, including the no-action alternative. Definitions for duration and intensity of potential impacts to the geology and soils and prime farmlands identified for this project are described in Table 3-9.

Table 3-9: Soils and Geology Impact Context and Intensity Definitions

Context (Duration)	Low Intensity	Moderate Intensity	High Intensity
Short term: During construction period Long term: Life of the line (50 years.)	Disturbance to geology or soils from construction and operation would be detectable but localized and discountable. Erosion and/or compaction would occur from construction and operation in localized areas. Landslide hazard potential would be of little consequence.	Disturbance would occur over a relatively wide area from construction and operation of the project. Impacts to geology or soils would be readily apparent and result in short-term changes to the soil character or local geologic characteristics. Erosion and compaction impacts would occur over a wide area. There would be an increased risk of increased landslides.	Disturbance would occur over a large area from construction and operation of the project. Impacts to geology or soils would be readily apparent and would result in short-term and long-term changes to the character of the geology or soils over a large area both in and out of the project boundaries. Erosion and compaction would occur over a large area. There would be a high risk landslide hazard.

Potential impacts on soils from activities proposed under the action alternatives would include soil compaction and rutting leading to accelerated soil erosion, and the introduction of noxious weeds on the soil surface. Construction activities such as vegetation clearing, excavating, grading, topsoil segregation, and back-filling may also increase erosion potential by destabilizing the soil surface. Impacts on prime farmlands would occur from the loss of potentially productive prime farmland soil acreage in the study area resulting from the above-described effects.

The area of analysis is composed of the 150-foot wide ROW. Impacts on geology and landforms from construction and operation of the action alternatives within and adjacent to this corridor are presented here and described in detail.

No-action Alternative

Under the no-action alternative the proposed project would not be constructed. Geologic features and landforms would remain undisturbed. Because no landscape changes would occur as the result of construction, surface geology would be unaffected. The underlying bedrock geology would similarly remain undisturbed given that no ground penetrating activities would occur under this alternative. Soils would remain undisturbed. Because no construction-related changes would occur, soil structure and underlying substrate would remain intact, and the suitability of prime farmland soils for agricultural uses would be unaffected. As a consequence, there would be no impacts on geology and soils resulting from the no-action alternative.

Alternative Route A

Geology and Landforms

Direct impacts resulting from the construction of Alternative Route A would consist of the displacement of soil and rock during construction of structure foundations. Borings for structure foundations would extend approximately 25 to 30 feet below the surface and would be approximately 8 feet in diameter, resulting in a typical volume of displaced soil and rock of approximately 1,500 cubic feet per structure location. With approximately 1,150 structures used for the construction of Alternative Route A, a total of approximately 1.73 million cubic feet of displaced soil and/or rock would be anticipated. This displaced soil and rock would be used for backfilling around structure foundations with excess material removed from the site to locations directed by landowner or disposed of at another location. The use of heavy duty vehicles and earth moving equipment required for structure foundations and structure placement would result in short-term minor impacts on local surface geology as a result of compaction and the potential for localized rill erosion near unimproved roadbeds and on sensitive landscapes. In particular, in badland areas where vegetation is removed within the ROW along steep slopes and rugged terrain, construction-related impacts from erosion would accrue to these landscapes. Alternative Route A would cross approximately 3,000 feet of terrain with a slope greater than 10 percent (10.1 acres within the ROW). Increased erosion could lead to increased landslide potential in these areas. These effects are discussed below.

Alternative Route A would cross approximately 19.5 acres within the ROW where landslides have occurred previously. The potential for landslide occurrence during project implementation is elevated in certain areas along the length of the Alternative Route A, such as in northwestern Dunn County and southeastern McKenzie County (see Section 3.3, Geology and Soils). Of particular note, badland areas along Alternative Route A, consisting of steep sparsely-vegetated terrain, pose a greater likelihood of landslide occurrences than other, more gently-sloped areas along the route. Landslide events are more likely to occur during heavy precipitation.

Generally, project construction would require little disturbance to surface soil and would neither be large enough or deep enough to have any type of impacts on geologic formations throughout the study area. Although linear in nature, the installation of aerial lines would result in disturbances only at intervals along the path of the transition corridor (such as for the placement of towers) or predetermined locations where the construction or installation of facilities was required (such as for the construction of substations and switchyards). Consequently, impacts on surface geology would be limited to the sites selected for the erection of structures. At these locations, geologic impacts would be limited to minimal disturbances of subsurface rock during drilling and use of augers to prepare foundation holes. Potential impacts resulting from this activity include: displacement of soil and rock during construction activities; alteration of geologic features due to earth-moving activities during construction; increased likelihood of landslides caused by construction activities in areas of steep terrain and unstable soils; and an increased potential for erosion occurring to adjacent lands from either vehicle disturbances associated with construction activities or accelerated runoff resulting from the creation of impermeable surfaces.

As a main feature of implementation, areas with high landslide susceptibility would not have structures placed within them and would instead be spanned by the transmission line, thus avoiding the potential for landslides. Additional care would be taken to minimize disturbance in these areas both to reduce landslide potential and protect construction workers and equipment from slides and falls. In some specific areas, Basin Electric may utilize helicopter-aided construction in order to minimize ground disturbance in badland areas. This would reduce the need for grading and excavation typically necessary to develop vehicle access to structure locations. As a result of incorporating these mitigation measures, impacts on geology and landforms would be reduced to less-than-significant levels.

As an overall result of the above-described short-term and low intensity disturbances, the impacts of Alternative Route A on geology and landforms would be minor.

Impacts on geologic features, resources, or surface landforms from the construction and operation of the proposed Judson and Tande 345-kV substations are anticipated to be negligible. Both the Judson and Tande 345-kV substation sites are located primarily on terrain with little slope, and impacts on geological resources related to construction and operation of these substations are not anticipated. Some surface grading, subsurface excavation, and trenching would be necessary, but would be relatively shallow and not expected to encounter significant bedrock.

Impacts associated with the construction and operations of the proposed Killdeer switchyard are expected to be negligible. The terrain in the general area where the switchyard would be located, if constructed, is comparable to that of both proposed substation sites.

<u>Soils and Prime Farmland</u>

Under Alternative Route A, construction activities along the ROW and at the substation/switchyard locations would cause disturbance to soils. Impacts would accrue from construction activities such as vegetation clearing, excavating, grading, topsoil segregation, and back-filling. These activities may increase erosion potential by destabilizing the soil surface. Additionally, soil compaction and rutting can result from the movement of heavy construction vehicles along the ROW. However, the degree of compaction and rutting would depend on the moisture content and texture of the soil, weight of equipment, and frequency of movement over the area.

Approximately 3,536 total acres of surface soil would be incorporated into the ROW for Alternative Route A. While the majority of the acreage within the ROW would not be disturbed, permanent impacts on soils would occur at locations where the approximately 1,150 transmission structures used for Alternative Route A would be placed. The total disturbance area under Alternative Route A would be approximately 1.04 acres. The removal of approximately 95 acres of woodland areas could occur within the ROW for Alternative Route A. This tree clearing activity would result in adverse impacts on soil structure and subsequent exposure of soils to erosional forces. Additionally, some portions of the ROW are located along areas of steep slopes and incorporate land that is susceptible to landslides. The development of access roads during construction would also result in short-term adverse impacts on soils through grading and compaction. These areas are anticipated to be minimal, because most access to the ROW would be provided at locations where the ROW crosses existing roads and by utilizing the ROW itself for access along the line.

Overall, impacts on soils from the construction of Alternative Route A would be minor and short- to long-term.

Prime Farmland Soils

Construction activities associated with the transmission line for Alternative Route A would have short-term effects on prime farmland soils in portions of the proposed project ROW that would be temporarily closed throughout the duration of construction activity. The temporary loss of these lands would be reversed upon completion of the construction phase, when these soils would be returned to production. Long-term (permanent) impacts on prime and important farmland soils would also occur where transmission line structures are placed within the proposed ROW. However, these losses would constitute a small fraction of total lands within the proposed project ROW.

Alternative Route A would cross about 90 acres of prime farmland, 1,337 acres of farmland of statewide importance, and 37 acres of prime farmland if drained or irrigated (see Table 3-10).

Table 3-10: Acres of Prime Farmland within Proposed 150-foot ROW

Farmland Classification	Alternative Route A (acres)	Alternative Route B (acres)
Not prime farmland	2,074.7	2,307.1
All areas are prime farmland	90.6	87.0
Farmland of statewide importance	1,336.6	1,377.6
Prime farmland if drained	7.1	7.1
Prime farmland if irrigated	29.6	29.6
Total	3,538.6	3,808.4

Only a minimal amount of prime farmland would be taken out of production permanently due to transmission line structures being placed within the ROW (approximately 1 acre). Alternatively, areas cleared within the ROW on prime farmland could be converted to agricultural use. The reduction in prime farmland availability would represent a small fraction of 1 percent of the 42,077 acres of prime farmland within the larger five county project area (Billings, Williams, Mountrail, Mercer, McKenzie, and Dunn counties). This amount of loss is not expected to be significant. As a precautionary measure, however, the Farmland Conversion Impact Rating for Corridor Type Projects documentation (Form NRCS-CPA-106) would be completed and coordinated with NRCS upon selection of the preferred alternative. As a result, adverse impacts on prime farmland soils under Alternative Route A would be minor.

Alternative Route B

Geology and Landforms

Potential impacts associated with Alternative Route B on geology and landforms within the study area are anticipated to be similar to those for Alternative Route A. With approximately 1,250 structures used for the construction of Alternative Route B, approximately 1.9 million cubic feet of displaced soil and/or rock would be anticipated to be removed for structure construction with some of this material disposed of off-site. Alternative Route B would cross approximately 10.9 acres within the ROW where landslides have occurred previously, and cross approximately 3,500 feet of terrain (12.3 acres within the ROW) with a slope greater than 10 percent, which could result in increased erosion and increased landslide potential in these areas. However, mitigation measures as described for Alternative Route A would also be incorporated into the project design and implementation under Alternative Route B. As a result, the impacts of Alternative Route B on geology and landforms would be minor.

For reasons similar to Alternative Route A, impacts on geologic features, resources, or surface landforms resulting from the construction and operation of the proposed Judson and Tande substations are also anticipated to be negligible. Similarly, impacts associated with the construction and operations of the proposed Killdeer switchyard are expected to be negligible.

Soils and Prime Farmland

Impacts on soils under Alternative Route B would be similar to those described for Alternative Route A, and would include soil disturbance and the potential for erosion resulting from construction activities and soil removal for placement of transmission line and substation structures. Alternative Route B would require approximately 1,250 structures that would permanently occupy approximately 1.13 acres within the ROW. Approximately 100 acres of woodland vegetation clearing would occur within the ROW for Alternative Route B, resulting in damage to soil structure and exposure of soils to erosional forces. The ROW would also incorporate approximately 11 acres of land that has experienced landslides in the past, indicating the increased potential for erosion in these areas. The total acreage of ROW required for Alternative Route B is slightly more than Alternative Route A; therefore, soil impacts would occur over a slightly larger area. Overall, adverse impacts on soils under Alternative Route B would be minor.

Approximately 24 acres of soils would be permanently impacted to accommodate the proposed Killdeer switchyard and Judson and Tande 345-kV substations. Increased runoff potential resulting from the additional acreage of impermeable ground cover could result in localized erosion. However, impacts to soils at these sites, while permanent, would be localized and not extend beyond the area of impact.

<u>Prime Farmland Soils</u>

The ROW for Alternative Route B would contain slightly fewer total acres of prime or other important farmland soils compared to Route A, with approximately 39 percent of the ROW containing prime or important farmland soils. Impacts on these soils would be similar for both alternatives, with short-term minor impacts during construction throughout the ROW and permanent impacts at the transmission line structure locations. It is anticipated that the placement of transmission line structures within the ROW of Alternative Route B would result in approximately 1 acre of prime or important farmland being permanently removed, which is slightly more than that of Alternative Route A, due to the increased overall length of Alternative Route B. As a result, adverse impacts on prime farmland soils under Alternative Route B would be minor.

For construction of the proposed Judson and Tande 345-kV substations, approximately 12 acres of prime farmland at each location would be permanently taken out of production. In addition to the acres of prime farmland taken out of production for the proposed substations, it is possible that up to 12 acres of prime farmland would be permanently impacted for construction of the proposed Killdeer switchyard. Because the exact location of the proposed switchyard has not been determined at the current time, an accurate assessment of the acreage of potentially-impacted prime farmland within the 12-acre site is not known. Conservative estimates assume that all of the 12 acres of the proposed Killdeer switchyard are located on prime farmland soils result in a total of 24 acres of prime farmland soils impacts would occur under Alternative Route A and 36 acres under Alternative Route B.

This loss is not expected to be significant. However, as a precautionary measure, the Farmland Conversion Impact Rating for Corridor Type Projects documentation (Form NRCS-CPA-106) would be completed and coordinated with NRCS upon selection of the preferred alternative.

3.4 WATER RESOURCES

3.4.1 Affected Environment

Hydrologic features including lakes, rivers, streams, wetlands, and floodplains perform important functions within a landscape, including attenuating floods, recharging groundwater, protecting water quality, and producing wildlife habitat. This section provides a summary of groundwater, surface water, water quality, and floodplains present in the project area.

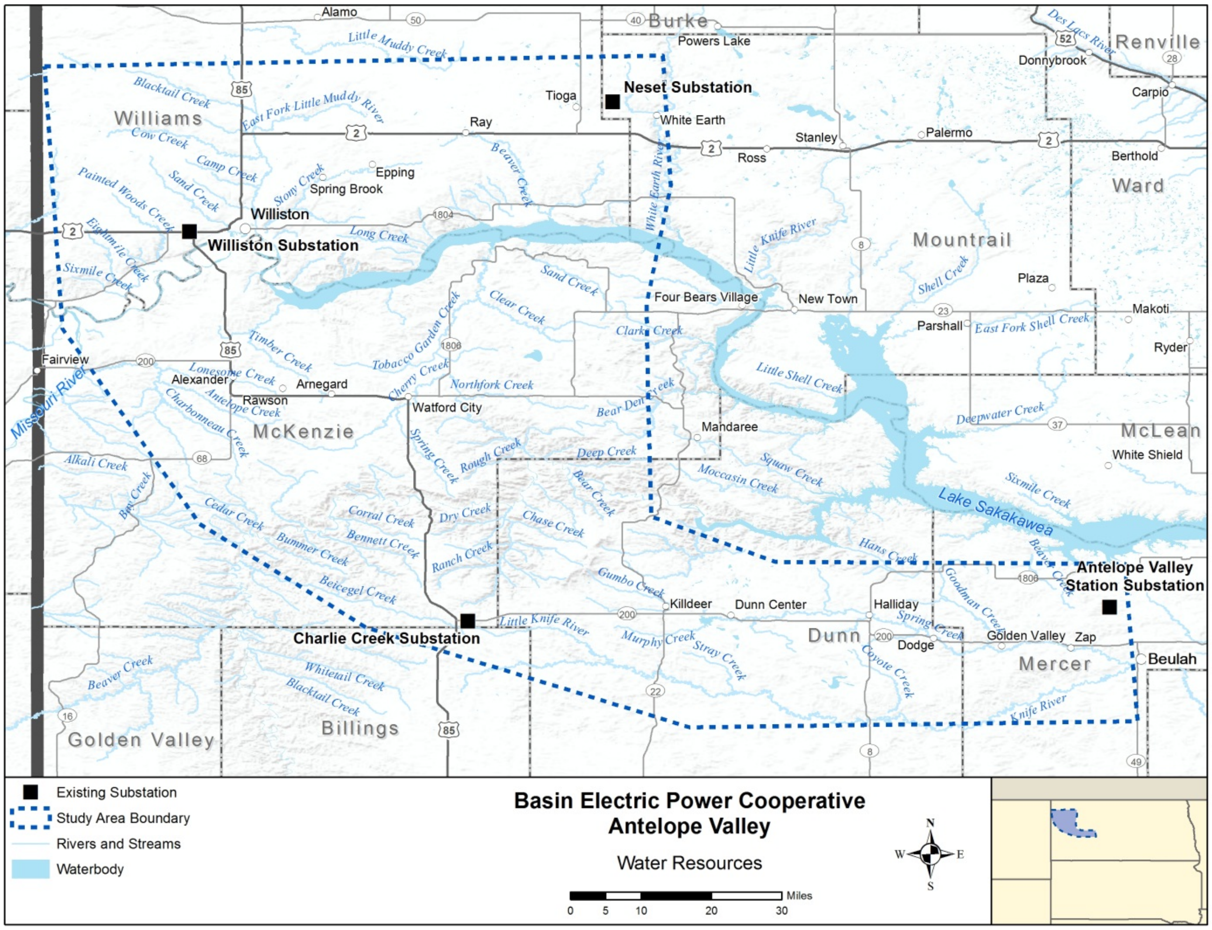
Regional Setting

The area encompassing the project contains several major surface water and groundwater features. Groundwater within the project area includes Paleozoic aquifers, lower and upper Cretaceous aquifers, lower Tertiary aquifers, and unconsolidated-deposit aquifers. Surface waters located within and adjacent to the project area include the Knife River, Spring Creek, Little Missouri River, Lake Sakakawea (Upper Missouri River), and Little Muddy River. Floodplains occur throughout the project area in areas bordering lakes, rivers and streams. Isolated wetlands, smaller creeks and tributaries, and unnamed intermittent and ephemeral streams also occur within the project area. See Figure 3-16. Wetlands are discussed further in the biological resources section.

Groundwater

Groundwater is water located below the earth's surface that accumulates in soil pore space and in fractures of rock formations. An aquifer is an area that is able to yield a usable quantity of groundwater. Deep Paleozoic aquifers extend throughout the project area, but generally contain highly-mineralized water due to their depth. Cretaceous aquifers are found throughout the project area and provide a valuable source of water for farms, ranches, and communities. Lower Tertiary aquifers are found closer to the surface, are composed primarily of sandstone and lignite, and also provide a source of water for various uses (Whitehead, 1996). Aquifers composed of unconsolidated rocks are generally productive, but are smaller and more scattered in nature throughout the project area, occurring primarily around river valleys and lakes.

Figure 3-16: Water Resources in the Project Area

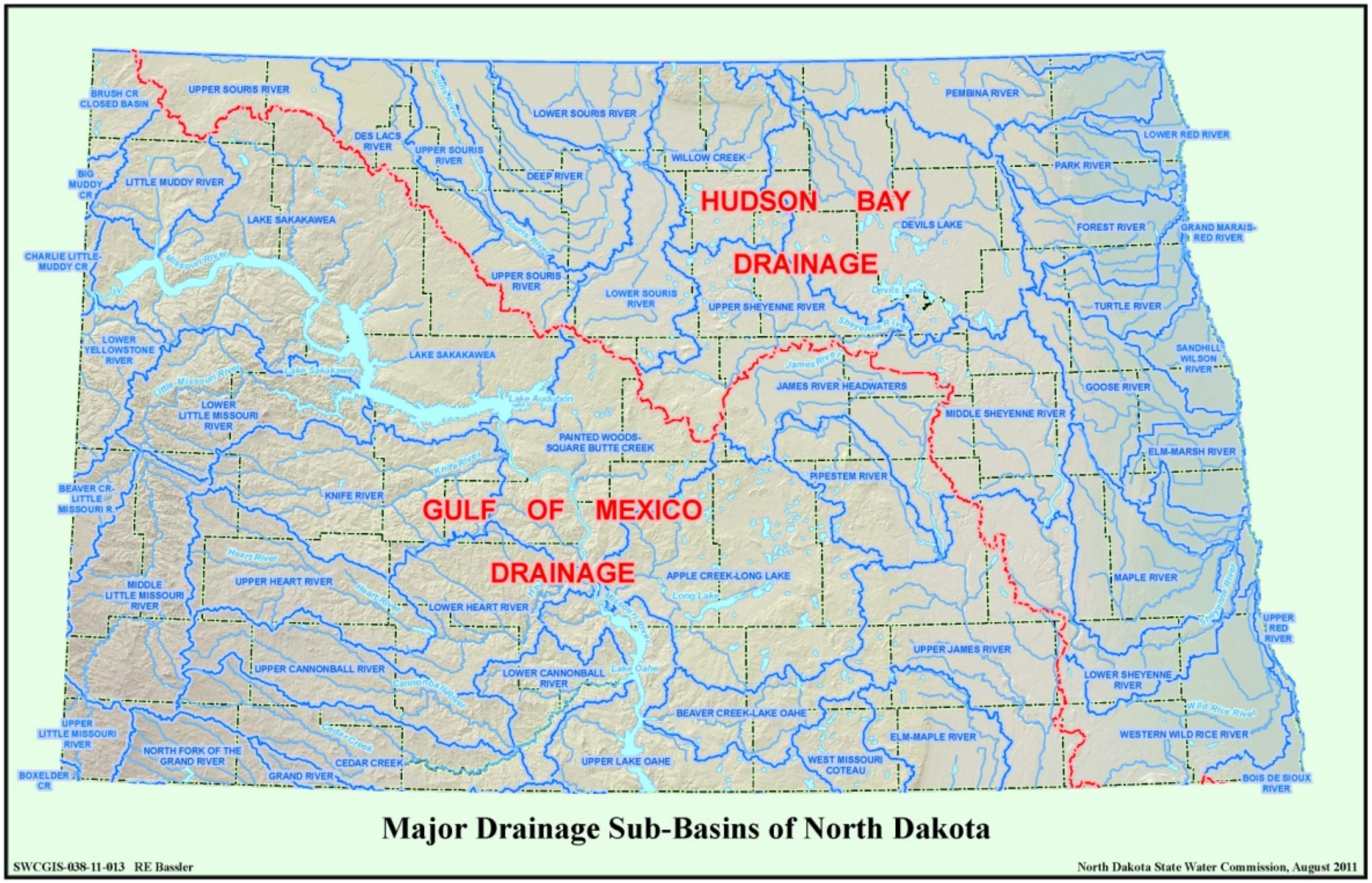


Surface Water

Lake Sakakawea is a major water feature in the area, and was formed by the construction of the Garrison Dam on the Missouri River near the community of Pick City. Lake Sakakawea spans all of the affected counties within the project area, except Billings, serving as the county boundary in many locations. Lake Sakakawea has a catchment area of approximately 122,500 square miles and generally flows from northwest to southeast. The proposed project crosses the Missouri River near the upper end of the lake, southwest of the town of Williston. Major drainage sub-basins within the project area are depicted in Figure 3-17, and are discussed in further detail below.

The Upper Missouri/Lake Sakakawea Basin drains the extreme northern portions of Mercer and Dunn counties within the project area, the northern half of McKenzie County, and all of the portions of Williams and Mountrail counties included within the project area.

Figure 3-17: Major Drainage Sub-basins within North Dakota Area



The Knife River Basin drains a majority of Mercer County and the southern portion of Dunn County within the project area. The Knife River flows generally from west to east and empties into the Missouri River below Lake Sakakawea. Spring Creek is a tributary of the Knife River, that travels in a generally west to east direction before joining the Knife River near the town of Zap. Both the Knife River and Spring Creek are located just outside the project area to the south.

The Little Missouri River Basin drains the central portion of Dunn County within the project area, and also the southern portion of McKenzie County. The Little Missouri River flows generally south to north and then turns easterly across the project area. Both alternative routes within the project area cross the Little Missouri River. Alternative Route A crosses in the eastern portion of McKenzie County just east of TRNP. Alternative Route B crosses the Little Missouri River approximately 20 miles north of the community of Killdeer. The Little Missouri River flows into Lake Sakakawea just after passing through the project area.

The Little Muddy River flows from north to south through Williams County, and empties into Lake Sakakawea on the east side of Williston (USGS, 2009). The proposed project crosses the Little Muddy River approximately 10 miles north of Williston.

USACE has regulatory jurisdiction over waters of the United States including many lakes, rivers, streams, and wetlands pursuant to Section 404 of the Clean Water Act (CWA), and jurisdiction over Navigable Waters of the United States pursuant to Section 10 of the 1899 Rivers and Harbors Act. The placement of transmission line pole structures, land clearing that involves soil disturbance, or placement of construction mats may be considered a discharge of fill material that would require a permit from USACE pursuant to CWA Section 404. Receipt of a Section 404 permit and adherence to the terms and conditions of the permit, including any associated compensatory mitigation and BMPs to reduce sedimentation and erosion control, would demonstrate the project's compliance with CWA. Field inspections of the project would evaluate and verify compliance with permits and CWA. In addition, the placement of a transmission line over a navigable waterbody would require a permit pursuant to Section 10.

Transmission lines that cross Navigable Waters of the United States, as defined by Section 10 of the 1899 Rivers and Harbors Act, must maintain a minimum height requirement above that required for bridges. For a 345-kV transmission line, the minimum height requirement is 30 feet above required bridge height for a new fixed bridge or existing bridge in the vicinity, as stated in 33 CFR 322.5.

Water Quality

NDDOH has primacy of implementation of Section 401of the CWA, and USEPA has oversight and is ultimately responsible for monitoring and enforcing water quality standards. North Dakota's Century Code describes Standards of Quality for Waters of the State (NDDOH, 2012). Pursuant to these rules, NDDOH notes that it is state and public policy to develop a classification system for waters of the state, provide standards of water quality for waters of the state, and protect existing and beneficial uses of waters of the state. The state of North Dakota accomplishes this through compliance with CWA Sections 305(b) (producing a biannual Water Quality Assessment Report), and 303(d) (listing of waters needing Total Maximum Daily Load [TMDL] limits).

As required under Section 303(d) of the CWA, NDDOH has identified and created a list of impaired waterbodies that require the development of TMDLs. A TMDL is the amount of pollution a waterbody can receive and still maintain water quality standards established by USEPA. As required by Section 305(b) of the CWA, NDDOH produced the 2012 Integrated Report that states that 83 percent (4,799 miles) of rivers and streams assessed fully support the beneficial use designated as aquatic life. Of these streams, slightly more than 50 percent (2,434 miles), including streams within the project area, are under threat of being unable to support their designated use if water quality trends continue. The primary causes of impairment were siltation/sedimentation and stream habitat loss or degradation. Other forms of impairment include trace element contamination, flow alteration, and oxygen depletion due to excess nutrient inputs (NDDOH, 2012).

The main cause of impairment within the three river basins draining the project area is fecal coliform, resulting mostly from livestock operations and grazing near riparian areas. Rivers and lakes within the Knife, Little Missouri, and Upper Missouri/Lake Sakakawea basins, which are impaired, include portions of the Knife River, Little Missouri River, and Lake Sakakawea (USEPA, 2011).

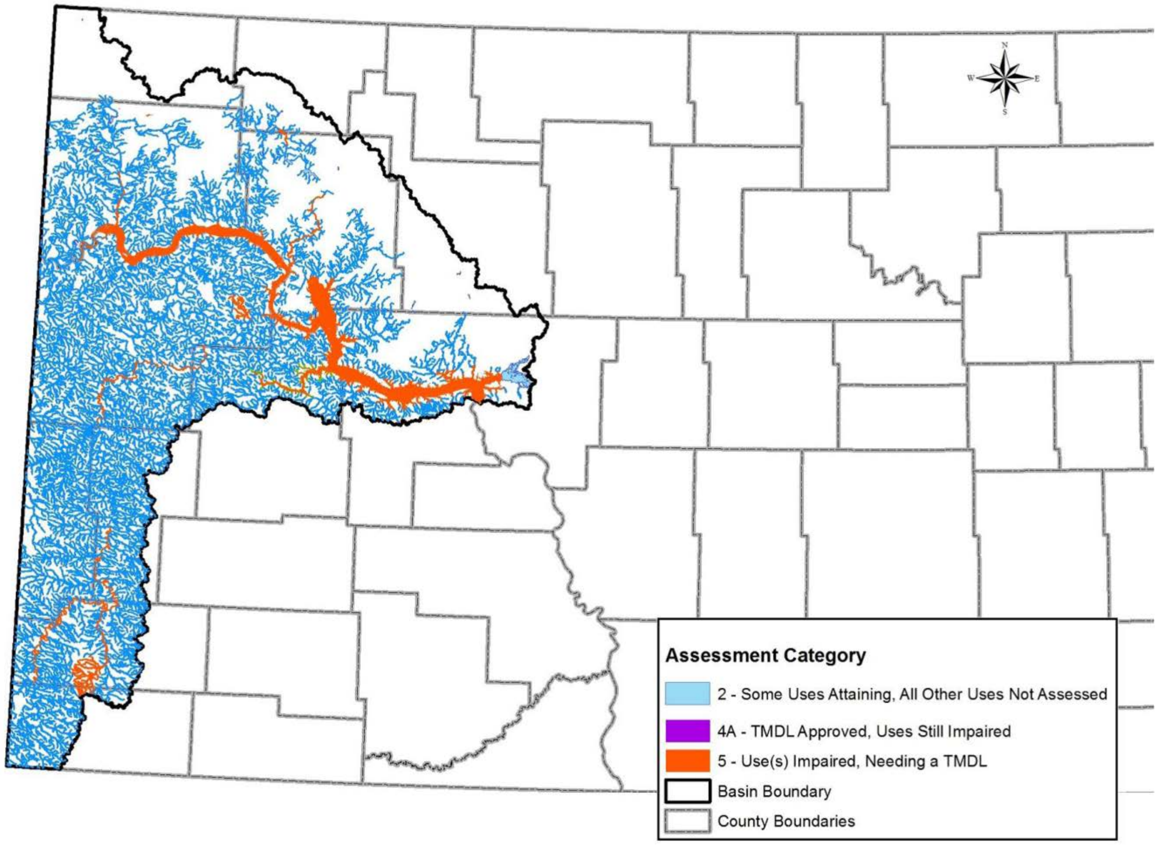
According to guidance provided by USEPA, states should report water quality based on five assessment categories outlined in Table 3-11. All waterbodies designated as category 5 must provide TMDL information (the amount of pollution a waterbody can receive while maintaining water quality standards). Within the Missouri River Basin and within the project area, there are several category 5 waterbodies that require TMDLs. Lake Sakakawea, which has the designated use of fish consumption, is impaired with methylmercury. The Little Knife River from Stanley Reservoir, downstream to Lake Sakakawea; the Little Muddy River from its confluence with East Fork Little Muddy River, downstream to Lake Sakakawea; and the Little Missouri River from its confluence with Little Beaver Creek downstream to its confluence with Deep Creek are all designated for recreational uses, and are all impaired with fecal coliforms. The Little Missouri River from its confluence with Beaver Creek downstream to U.S. Highway 85; the Little Missouri River from U.S. Highway 85 downstream to its confluence with Cherry Creek; the Knife River from its confluence with Antelope Creek downstream to its confluence with the Missouri River; the Knife River from its confluence with Spring Creek downstream to its confluence with Antelope Creek; the Knife River from its confluence with Coyote Creek downstream to its confluence with Spring Creek; and the Knife River from its confluence with Branch Knife River downstream to its confluence with Coyote Creek are also designated for recreational use and are all impaired with *Escherichia coli*. Figures 3-18 and 3-19 provide a graphical depiction of Section 303(d) Listed Waters needing TMDLs.

Table 3-11: EPA Water Quality Categories.

Category	Description
1	All designated uses are met.
2	Some designated uses are met, but there are insufficient data to determine if remaining designated uses are met.
3	There are insufficient data to determine whether any designated uses are met.
4	Water is impaired or threatened, but a TMDL is not needed for one of three reasons: (a) a TMDL already has been approved for all pollutants causing impairment; (b) the state can demonstrate that “other pollutant control requirements required by local, state or federal authority” are expected to address all waterbody-pollutant combinations and attain all water quality standards in a reasonable period of time; or (c) the impairment or threat is not due to a pollutant.
5	The waterbody is impaired or threatened for at least one designated use, and a TMDL is needed.

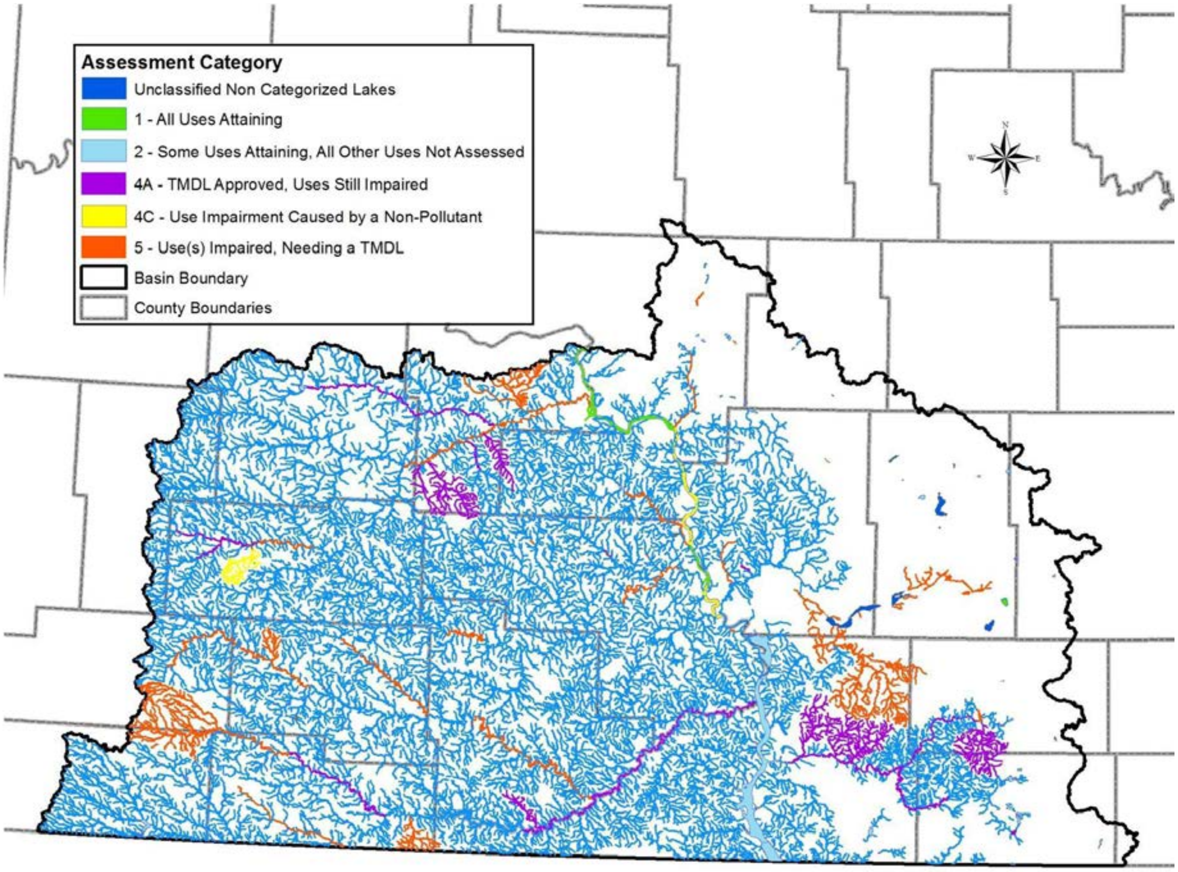
Source: NDDOH, 2012.

Figure 3-18: 2012 Section 303(d) Listed Waters Requiring TMDLs (Category 5) in the Lake Sakakawea/Missouri River Basin



Source: NDDOH, 2012.

Figure 3-19: 2012 Section 303(d) Listed Waters RequiringTMDLs (Category 5) in the Lake Oahe/Missouri River Basin



Source: NDDOH, 2012.

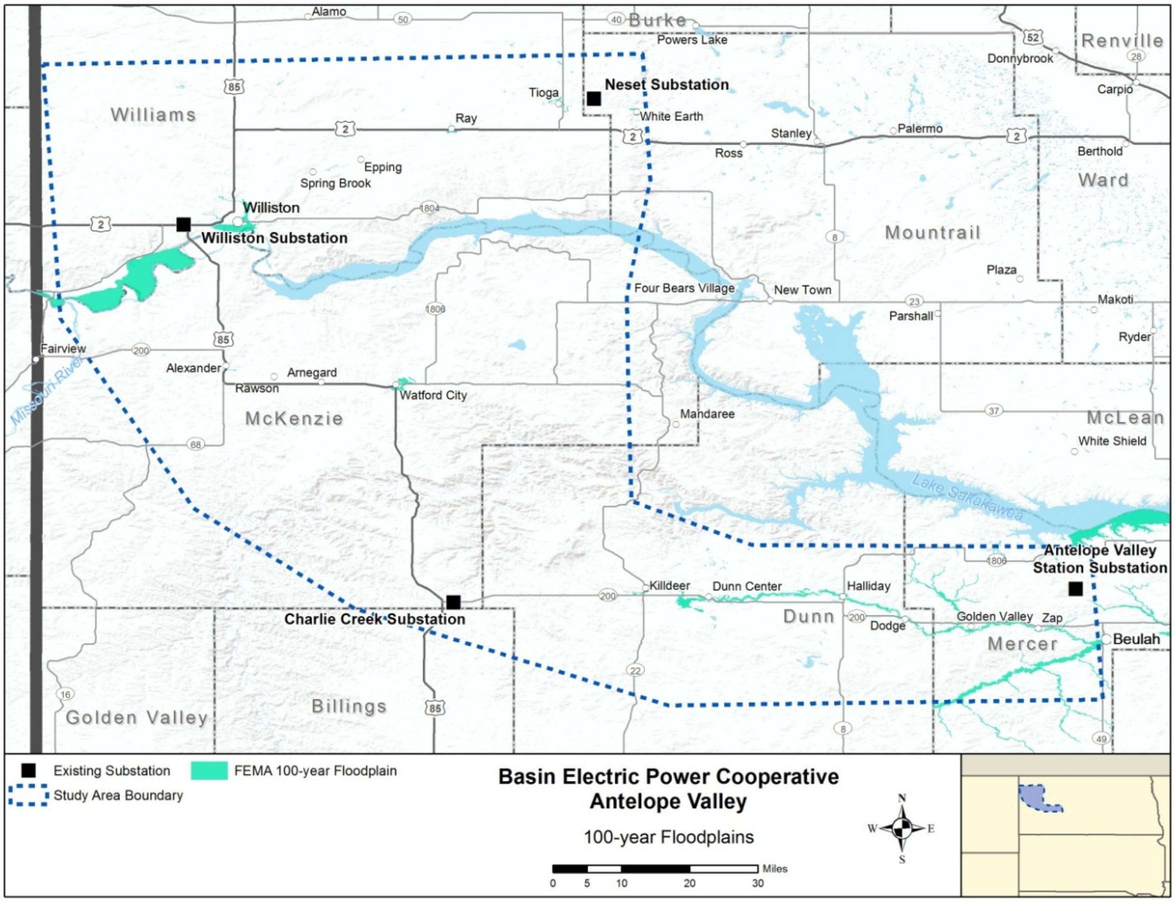
Floodplains

Floodplains are low-lying areas that are subject to periodic inundation due to heavy rains or snowmelt. These areas are generally adjacent to lakes, rivers, and streams and are necessary for temporary water storage during flooding events. The periodic flooding and drying in these areas creates unique habitat that supports a wide variety of plant and animal species.

Mercer, Dunn, Williams, and Mountrail counties participate in the Federal Emergency Management Agency's (FEMA) National Flood Insurance Program, which allows residents to purchase special insurance at subsidized rates. Flood data derived from FEMA Flood Insurance Rate Maps were used to identify areas within the project area that are designated as 100-year floodplains. Within the counties affected by the proposed project, designated 100-year floodplains are not mapped county-wide, but include those areas near communities or other populated areas. FEMA floodplains identified within the project area include several unnamed tributaries to Spring Creek, located approximately 10 miles west of AVS in Mercer County, unnamed tributaries to Lake Sakakawea located approximately 10 miles north of the community of Zap in Mercer County, and portions of Spring Creek located approximately 2 miles northeast of the community of Killdeer in Dunn County. Identified floodplains also occur along the upper regions of Lake Sakakawea, approximately 6 miles southwest of the community of Williston in Williams and McKenzie counties. Additional floodplain areas not listed on FEMA Flood Insurance Rate Maps are likely present within the project area. These areas include, but are not limited to the Knife River, Little Missouri River, Little Muddy River, and associated tributaries (North Dakota Geographic Information System [ND GIS], 2011). A floodplain map is provided in Figure 3-20.

It is FEMA's policy to provide leadership in the management of floodplains by avoiding adverse impacts associated with the occupancy and modification of floodplains (44 CFR 9). Authority for regulating this management is provided under Executive Order 11988, which established procedures to ensure that potential effects of floodplain hazards and floodplain management are considered when taking an action that may cause adverse impacts on floodplains. The proposed project would locate structures outside of floodplains to the extent practicable, such that potential impacts are expected to be minimal. Implementing mitigation measures would prevent or reduce potential impacts on floodplains.

Figure 3-20: Map of FEMA-Designated 100-year Floodplains



3.4.2 Direct and Indirect Effects

To determine whether the proposed project would have the potential to result in significant impacts to water resources, it is necessary to consider both the duration and the intensity of the impacts. Definitions for duration and intensity of water resources impacts established for this project are described in Table 3-12.

Table 3-12: Water Resources Impact Context and Intensity Definitions

Context (Duration)	Low Intensity	Moderate Intensity	High Intensity
Groundwater			
Short term: During construction period Long term: Life of the line (50 years)	Impacts would result in a detectable change to water quality, but the change would be expected to be small, of little consequence, and localized. Impacts would quickly become undetectable. State water quality standards would not be exceeded as set forth by the Standards of Quality for Waters of the State – NDAC 33-16-02.1.	Impacts would result in a change to water quality that would be readily detectable and relatively localized. Change in water quality would persist; however, it would not exceed state water quality standards as set forth by the Standards of Quality for Waters of the State – NDAC 33-16-02.1or impair designated beneficial uses of a waterbody.	Impacts would result in a change to water quality that would be readily detectable and over a large area. Impacts would result in exceedance of state water quality standards as set forth by the Standards of Quality for Waters of the State – NDAC 33-16-02.1 and/or would impair designated beneficial uses of a waterbody.
Surface Water			
Short term: During construction period Long term: Life of the line (50 years)	The effect on surface waters would be measurable or perceptible, but small and localized. The effect would not alter the physical or chemical characteristics of the surface water or aquatic influence zone resource.	The effect on surface waters would be measurable or perceptible and could alter the physical or chemical characteristics of the surface water resource to an extent requiring mitigation, but not to large areas. The functions typically provided by the surface water or aquatic influence zone would not be substantially altered.	The impact would cause a measurable effect on surface waters and would modify physical or chemical characteristics of the surface water. The impact would be substantial and highly noticeable. The character of the surface water or aquatic influence zone would be changed so that the functions typically provided by the surface water or aquatic influence zone would be substantially altered.
Floodplains			
Short term: During construction period Long term: Life of the line (50 years)	Impacts would result in a detectable change to natural and beneficial floodplain values, but the change would be expected to be small, of little consequence, and localized. There would be no appreciable increased risk of flood loss including impacts on human safety, health, and welfare.	Impacts would result in a change to natural and beneficial floodplain values that would be readily detectable and relatively localized. Location of operations in floodplains could increase risk of flood loss including impacts on human safety, health, and welfare.	Impacts would result in a change to natural and beneficial floodplain values that would have substantial consequences on a regional scale. Location of operations would increase risk of flood loss including impacts on human safety, health, and welfare.

Because construction activities would not result in any detectable change to groundwater quality, no wells would be drilled, and no groundwater would be used, no direct impacts are anticipated to groundwater resources under either the no-action alternative or the proposed action as a result of either the construction or operation of the project.

No-action Alternative

Under the no-action alternative, the proposed project would not be constructed, and there would be no impacts on surface water resources or floodplains.

Proposed Action

Under the proposed action, there would be the potential for impacts on surface water resources resulting from the construction or operation of the proposed project. These potential impacts include: increased sedimentation into surface waters from stormwater runoff, increased sedimentation into USEPA-classified impaired waters from stormwater runoff or construction activities, and the possible introduction of contaminants into surface water resources.

There would also be the potential for impacts on floodplains including: disruption of floodwaters due to structures in floodplain areas, and loss or impairment of floodplains and floodplain storage.

The project would locate structures outside of floodplains to the extent practicable, such that potential impacts are expected to be minimal. If structures were placed directly in floodplains, construction of the transmission line would not be expected to alter existing drainage patterns or floodplain elevations due to the small footprint of the poles and their relatively wide spacing. No change in floodplain functions would occur from construction of the project.

Proposed Substations and Switchyards

Minimal impacts on surface water resources resulting from the construction and operation of the proposed Judson or Tande 345-kV substations are expected because of the use of BMPs to prevent soil erosion and sedimentation(see Appendix A). No streams or other waterbodies are present within either substation site. The Tande 345-kV Substation would be located within a larger parcel of land being acquired by Basin Electric, but the actual site location is yet to be determined. An unnamed tributary to Paulsen Creek is located on the eastern portion of this property, but the substation site would be constructed on the western side of the property, and with the use of BMPs, impacts on this stream would be minimized. All construction activities would employ BMPs to prevent erosion or sediment runoff that may impact any nearby waterbodies. Minimal impacts on floodplains resulting from the construction and operation of the proposed Judson or Tande 345-kV substations are expected. The substation sites would not be located within FEMA-designated floodplains. The proposed Killdeer switchyard, if required, would also be located outside of any floodplain area, and BMPs would be employed during construction to prevent erosion or sediment runoff that may impact any nearby waterbodies.

Alternative Route A

Alternative Route A would cross 11 perennial waterways (including the Little Missouri River and Missouri River) and numerous intermittent streams. Three of the crossings would be over waterbodies classified by USEPA as impaired waters. Alternative Route A would cross Antelope Creek shortly after exiting the AVS Substation, the Little Missouri River east of TRNP, and the Little Muddy River north of Williston. All of these waters are listed as impaired due to high fecal coliform levels resulting from nearby agricultural activities. It is not anticipated that construction would contribute to further fecal coliform contamination, although access to the corridor through agricultural areas may have minor impacts. BMPs will be implemented to reduce this impact where necessary. Since there are no other major sources of impairment requiring TMDLs in areas where crossings would occur (USEPA, 2011), impacts are expected to be minor. All stream crossings, including the impaired waters, would be spanned by Alternative Route A, and no transmission structures would be placed in the streambed. Basin Electric would obtain all necessary permits for the protection of water resources including wetlands and water quality. Because of the use of standard BMPs, minimal impacts on water resources during operation of the proposed project are anticipated.

The 150-foot-wide ROW for Alternative Route A contains a total of 6.5 acres of FEMA-designated floodplain along the length of the route. These designated areas consist of many small, narrow floodplains associated with rivers and streams within the project area.

Considerable area within the Missouri River lowlands is subject to regular flooding. However, very little of this area is designated as floodplain on the FEMA Flood Insurance Rate Maps, which designate floodways and 100- and 500- year flood zones. While Alternative Route A would cross these geographical floodplain areas, all FEMA-designated floodplain areas within the ROW for Alternative Route A would be spanned and minimal impacts to these areas are expected during construction or operation of the proposed project as a result of BMPs (see Appendix A). The Missouri River floodplains are located within the bluff-to-bluff area, which is approximately 3 miles across and occurs on lands owned by USACE and managed by NDGF. The project would be constructed parallel and immediately adjacent to an existing 230-kV transmission line and a rural water pipeline within a utility corridor identified by the agencies. Construction would be timed to avoid potential flooding of these areas. Excavated material would be removed to appropriate upland areas. Any debris such as trees or brush generated during construction would be removed from the floodplain or other areas subject to flooding.

Alternative Route B

Potential impacts on surface water resources resulting from the construction of Alternative Route B would be the same as those for Alternative Route A; however, Alternative Route B would cross 15 perennial waterways compared to 11 for Alternative Route A, all of which would be spanned with the exception of the Missouri River crossing as discussed above. Alternative

Route B would cross Antelope Creek and the Little Muddy River (impaired waters) (USEPA, 2011), but would not cross the Little Missouri River in an area where it is classified as impaired. Similar to Alternative Route A, Alternative Route B would cross numerous intermittent streams. Because of the use of standard BMPs, minimal impacts to water resources during operation of the proposed project are anticipated.

Potential impacts to water resources resulting from the construction of Alternative Route B would be the same as those for Alternative Route A, as the FEMA-identified floodplain acres crossed would be the same for both alternative routes.

3.5 BIOLOGICAL RESOURCES

3.5.1 Affected Environment

The study area extends across six physiographic ecoregions: Missouri Plateau, Missouri Coteau Slope, Northern Missouri Coteau, Little Missouri Badlands, River Breaks, and Glaciated Dark Brown Prairie (Bryce et al., 1998). Physiographic regions generally characterize areas by their topography and geologic features. The Glaciated Dark Brown Prairie, Missouri Coteau Slope, and Northern Missouri Coteau ecoregions are confined to the north of the Missouri River/Lake Sakakawea. The River Breaks ecoregion encompasses the area immediately adjacent to the Missouri River/Lake Sakakawea and its tributaries. The Missouri Plateau and Little Missouri Badlands ecoregions occur south of the Missouri River/Lake Sakakawea.

The study area contains a variety of biological resources within diverse landscapes consisting of rolling prairies, badland areas, cultivated farmlands, and riparian areas. These landscapes contain diverse vegetative communities that serve as habitat to many species of wildlife (Table 3-13). Riparian areas and wetlands within the study area also provide habitat for plant and animal species dependent on these areas.

Table 3-13: Vegetation Communities within Route Corridors

Vegetation Community Type	Representative Species	Alternative Route A ROW (acres)	Alternative Route B ROW(acres)
Bluff and Badland	Sagebrush (*Artemisia* spp.), rabbitbrush (*Chrysothamnus* spp.), saltbush (*Atriplex* spp.)	0.2	2.6
Cliff, Canyon, and Talus	Few if any plants	0.1	1.1
Cultivated Cropland	Wheat (*Triticum* spp.), barley (*Hordeum vulgare* L.), corn (*Zea mays*), sunflowers (*Helianthus annuus)*	1,380.8	1,288.0
Depressional Wetland	Cattail (*Typha* spp.), three-square bulrush (*Scirpus pungens*), spikerush (*Eleocharis* spp.)	71.4	76.4
Floodplain and Riparian	Green ash, eastern cottonwood, stinging nettle (*Urtica dioica)*	39.0	35.5
Inter-Mountain Basins Big Sagebrush Shrubland	Silver sagebrush (*Artemisia cana*), big Wyoming sagebrush	0.4	0.7
Inter-Mountain Basins Big Sagebrush Steppe	Western wheatgrass (*Pascopyrum smithii)*, needleleaf sedge, big Wyoming sagebrush	1.0	2.1
Introduced Upland Vegetation – Perennial Grassland and Forbland	Smooth brome (*Bromus inermis)*, crested wheatgrass (*Agropyron cristatum)*, sweet clover (*Melilotus* spp.)	22.9	21.8
Northwestern Great Plains Mixedgrass Prairie	Green needlegrass (*Stipa viridula)*, blue grama, little bluestem	1,643.7	2,004.2
Northwestern Great Plains Shrubland	Buffaloberry (*Shepherdia argentea)*, silverberry (*Elaeagnus commutata)*, snowberry (*Symphoricarpos albus)*	24.9	27.4
Pasture/Hay	Alfalfa (*Medicago sativa)*, smooth brome, bluegrass (*Poa* spp.)	136.9	135.0
Western Great Plains Dry Bur Oak Forest and Woodland	Bur oak (*Quercus macrocarpa)*, serviceberry (*Amelanchier alnifolia)*, red cedar (*Juniperus virginiana)*	4.7	17.6
Western Great Plains Sand Prairie	Prairie sandreed (*Calamovilfa longifolia)*, blue grama, needle-and-thread (*Hesperostipa comata)*	12.3	27.3
Western Great Plains Wooded Draw and Ravine	Green ash, chokecherry, snowberry	94.8	75.8

Source: Strong, et. al., 2005.

Vegetation

Natural vegetation within areas of rolling topography in the Missouri Plateau and Little Missouri Badlands ecoregions consists of shortgrass prairie plants, including blue grama (*Bouteloua gracilis*), needleleaf sedge (*Carex duriuscula*), threadleaf sedge (*Carex filifolia*), needle-and-thread (*Hesperostipa comata*), wheatgrass (*Elymus smithii*), little bluestem (*Schizachyrium scoparium*), big sagebrush (*Artemisia tridentata*), buffalograss (*Bouteloua dactyloides*), and prairie sandreed (*Calamolvilfa longifolia*). Forbs include white wild onion (*Allium textile*), buffalo-bean (*Thermopsis* spp.), silverleaf (*Astragalus* spp.), moss phlox (*Phlox subulata*), white beardtongue (*Penstemon* spp.), and fringed sage (*Artemesia frigida*). Within the steeper slopes and draws of the Missouri Badlands and River Breaks ecoregions, Rocky Mountain juniper (*Juniperus scopulorum*) is common. Cottonwood (*Populus deltoides*), willow (*Salix* spp.), chokecherry (*Prunus virginiana* var. *interius*), buffaloberry (*Shepherdia* spp.), skunkbush (*Rhus aromatic* var. *trilobata*), and green ash (*Fraxinus pennsylvanica*) are found in riparian areas, which typically serve as transition areas between wetlands and uplands (Western, 2010b; Bryce et al., 1998). These areas are common along the banks of the Little Missouri River and Missouri River, and provide important wildlife habitat. Cultivated and irrigated areas within these regions include wheat, alfalfa, and sunflowers (Bryce et al., 1998).

North of the Missouri River/Lake Sakakawea, the topography of the Glaciated Dark Brown Prairie ecoregion is generally more gently sloping, with more acres of native grassland converted to cultivated cropland. Spring wheat, barley, alfalfa, lentils, peas, and silage corn are common crops in cultivated areas (Bryce et al., 1998). Land that is not cultivated is often managed for pasture or rangeland for grazing by cattle or horses. Most pasture forage is native, especially blue grama grass, western wheatgrass, big sagebrush, green needlegrass (*Nassella viridula*), and prairie junegrass (*Koeleria macrantha*) (Bryce et al., 1998).

North Dakota state law requires all landowners to make every effort to control the spread of noxious weeds on their property. Federal agencies are also directed to prevent the introduction of invasive species and ensure that its actions are not likely to cause or promote the introduction or spread of invasive species (USDA, 2011). Noxious weeds can be detrimental for a number of reasons. They threaten wildlife by replacing natural vegetation and nesting habitat, threaten native plant species, and reduce crop productivity and increase soil erosion (NDDOA, 2012b).

At the time of this writing, North Dakota's noxious weed list includes 11 species: absinth wormwood (*Artemisia absinthium*), Canada thistle (*Cirsium arvense*), diffuse knapweed (*Centaurea diffusa*), leafy spurge (*Euphorbia esula*), musk thistle (*Carduus nutans*), purple loosestrife (*Lythrum salicaria*), Russian knapweed (*Acroptilon repens*), spotted knapweed (*Centaurea maculosa*), yellow toadflax (*Linaria vulgaris*), dalmatian toadflax (*Linaria dalmatica*), and saltcedar (*Tamarix* spp.) (NDDOA, 2012b). North Dakota's cities and counties have the option to add weeds to their list whose eradication is enforced only within the city or county's jurisdiction. Near the study area, only Billings, McKenzie, and Mountrail counties have added their own county-specific noxious weeds: black henbane (*Hyoscyamus niger*), common burdock (*Arctium minus*), hoary cress (*Cardaria draba*), and houndstongue (*Cynoglossum officinale*) in Billings County, and common tansy (*Tanacetum vulgare*) and houndstongue in Mountrail County (NDDOA, 2012a).

Wetlands

Wetlands are scattered throughout much of northwestern North Dakota, and occur in the study area. These natural communities provide filtration of sediments and pollutants from surface water runoff, flood water retention, erosion control, resting, foraging, and nesting habitat for waterfowl and mammals, fish spawning and nursery, and amphibian habitat.

Wetlands are defined, for regulatory purposes, in the CWA. This definition is used by USEPA and USACE to administer the permit program outlined in Section 404 of the CWA. Wetlands under USACE jurisdiction are defined as follows:

> "Wetlands are those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and under normal circumstances do support a prevalence of vegetation typically adapted for life in saturated soil conditions (Environmental Laboratory, 1987). Wetlands generally include swamps, bogs and similar areas (40 CFR 230.3 and 33 CFR 328.3)."

Table 3-14 shows the types of wetlands found within 1,000 feet of either side of the ROW of each alternative route according to the USFWS National Wetlands Inventory (NWI) database.

Palustrine wetlands of various types are the most common wetlands within 1,000 feet of either side of the ROW of both alternative routes. Within these wetlands, vegetation varies. Palustrine wetlands are considered forested if they are characterized by woody vegetation that is greater than 20 feet tall (Cowardin et al., 1979). The trees that would most likely be found in forested wetlands within the study area are eastern cottonwood, Missouri River willow (*Salix eriocephala*), American elm (*Ulmus americana*), balsam poplar (*Populus balsamifera*), water birch (*Betula occidentalis*), and boxelder (*Acer negundo*) (NRCS, 2011a). Scrub-shrub wetlands are characterized by woody vegetation of less than 20 feet in height, such as shrubs and small trees (either young or stunted) (Cowardin et al., 1979). Common scrub-shrub species that would be likely to occur near the ROW of either alternative route would include Bebb willow (*Salix bebbiana*), Missouri River willow, saltcedar (*Tamarix ramosissima*), prairie willow (*Salix humilis*), Russian olive (*Elaeagnus angustifolia*), silverberry, and skunkbush sumac (*Rhus trilobata*) (NRCS, 2011a). Emergent wetlands include wet meadows, prairie potholes, and aquatic-bed wetlands (USFWS, n.d.). Species likely to occur in these wetlands would include reed canarygrass (*Phalaris arundinacea*), prairie cordgrass (*Spartina pectinata*), bald spikerush (*Eleocharis erythropoda*), American vetch (*Vicia americana*), quill sedge (*Carex tenera*), Sartwell's sedge (*Carex sartwellii*), broadleaf cattail (*Typha latifolia*), bog yellowcress (*Rorippa palustris*), and smooth horsetail (*Equisetum laevigatum*) (NRCS, 2011a).

Table 3-14: NWI-Identified Wetlands within 1,000 feet of Either Side of the ROW of Each Alternative Route

Wetland Type	Description	Acres Within 1,000 feet of Alternative Route A	Acres Within 1,000 feet of Alternative Route B
Lacustrine	Situated in a depression, dammed river channel, lacking trees, shrubs, and persistent emergents.	187.6	187.6
Palustrine, Aquatic Bed	Non-tidal wetland dominated by trees, shrubs, emergent vegetation, mosses, or lichens. Dominated by plants that grow principally on or below the surface of the water for most of the growing season in most years.	46.1	54.7
Palustrine, Emergent	Non-tidal wetland dominated by trees, shrubs, emergent vegetation, mosses, or lichens. Dominated by perennial, erect, rooted, herbaceous aquatic plants, excluding mosses and lichens.	240.4	252.6
Palustrine, Scrub-Shrub	Non-tidal wetland dominated by trees, shrubs, emergent vegetation, mosses, or lichens. Has areas dominated by woody vegetation less than 20 feet tall, such as true shrubs, young trees, or slanted trees.	0.0	3.0
Palustrine, Unconsolidated Bottom	Non-tidal wetland dominated by trees, shrubs, emergent vegetation, mosses, or lichens. Has deepwater habitat wherein the surface is covered by certain percentages of stones, with vegetative cover of less than 30 percent.	5.2	3.5
Riverine	Deepwater-habitat wetlands contained in natural or artificial channels periodically or continuously containing flowing water.	6.4	32.1
Total All Wetlands		**485.8**	**533.6**

Source: USFWS, 2012b.

Riverine wetlands are those wetlands that occur in channels of flowing water. These channels could be either artificial or natural. Lacustrine wetlands are those wetlands that occur in depressions and have deep-water habitat (Cowardin et al., 1979). Wetlands plants that would be most likely to occur in riverine and lacustrine wetlands near the ROW of the alternative routes would include milfoils (*Myriophyllum* spp.), naiads (*Najas* spp.), lilies (*Nuphar* spp.), and other submerged aquatic plants that typically occur in North Dakota (NRCS, 2011a).

NRCS oversees the Wetlands Reserve Program, which is a voluntary program that provides financial incentives and technical assistance for landowners who wish to protect, restore, and enhance wetlands on their property while helping to achieve the national goal of no net loss of wetlands. Landowners participating in the program either sell a conservation easement (30 years) or enter into a cost-share restoration agreement (10 years) with NRCS to protect and restore wetlands (NRCS, 2011c). The Wetlands Reserve Program is gaining popularity with landowners in North Dakota; this program consisted of 109 easements totaling 24,726 acres in North Dakota in 2009, increasing to 205 easements totaling 33,625 acres in North Dakota in 2010 (NRCS, 2011b). Within the study area, McKenzie County has 1,464 acres enrolled in Wetlands Reserve Program, Mountrail County has 621 acres enrolled, Mercer County has 48.2 acres enrolled, and Dunn County has no acres enrolled in the program (Hagel, 2011). However, there are no NRCS Wetlands Reserve Program easements within 1,000 feet of either side of the alternative routes' ROWs (USFWS, 2012f).

Wetland and grassland easements administered by USFWS also occur within the study area. Wetland and grassland easements are part of the National Wildlife Refuge System and are managed to protect wetlands and the grass uplands around wetlands. The only USFWS easement known to occur within 1,000 feet of the ROW of either alternative route is a 59.3-acre portion of a 311.8-acre easement in Dunn County (USFWS, 2012f).

Wildlife

The study area lies within the Great Plains-Palouse Dry Steppe Province and the Great Plains Steppe Province, which are similar to physiographic ecoregions but include biological characteristics (Bailey, 1995). These regions are characterized by rolling plains, valleys, canyons, and buttes, with the more gently rolling plains found north of the Missouri River and Lake Sakakawea. The diverse landscape is home to many species of wildlife. The primary habitat types observed in the counties within the study area during field investigations in October 2011 were short and mixed-grass prairie, badland areas, shelterbelt woodland areas, agricultural lands (rangeland and cropland), wetlands, and riparian areas (Thornhill and Beemer, 2011).

<u>Big Game</u>

Based on NDGFD's (2010) range maps for big game, the following species would occur within the study area: white-tailed deer (*Odocoileus virginianus*), mule deer (*Odocoileus hemionus*), pronghorn (*Antilocapra americana*), bighorn sheep, and elk. Of these, white-tailed deer are the most common, and have the largest range. They are found throughout the state (NDGFD, 2010b). Mule deer have a much smaller range, and are found mostly in McKenzie County within the study area (NDGFD, 2010b). Pronghorn are found in McKenzie County, and in some of the study area portion of Mercer, Billings and Dunn counties. Open prairie is their preferred habitat, with the wintering range occurring primarily south and west of the study area. The pronghorn hunting season has been closed since the 2010 hunting season due to declining populations as a result of recent harsh winters (NDGFD, 2010b). Bighorn sheep are found mostly in McKenzie County in the study area, and prefer isolated, undisturbed badland areas as habitat. They are sensitive to human disturbance during the lambing season, April 1st thru July 1st of each year (NDGFD, 2010b). Elk use similar badlands habitat in McKenzie and Dunn counties (NDGFD, 2010b).

<u>Mammals</u>

Coyote (*Canis latrans*), mountain lion (*Felis concolor*), porcupine (*Erethizon dorsatum*), badger (*Taxidea taxus*), striped skunk (*Mephitis mephitis*), and bobcat (*Felis rufus*) are some of the larger mammals known to occur within the study area. These mammals use a variety of habitats including mixed-grass prairie, pastureland, forested areas, and riparian areas (USGS-NPWRC, 2006). Mountain lions are generally found in more isolated areas, mainly within the badland areas associated with the Little Missouri River, Missouri River, and TRNP, although they have been found throughout the study area. Many smaller mammals, including several species of mice, voles, squirrels, bats, and rabbits are found within the study area (see Appendix D).

<u>Migratory and Resident Birds</u>

Typical migrant bird species that may occur within the study area include western meadowlark (*Sturnella neglecta*), yellow warbler (*Dendroica petechial*), black-headed grosbeak (*Pheucticus melanocephalus*), chipping sparrow (*Spizella passerine*), grasshopper sparrow (*Ammodramus savannarum*), northern oriole (*Icterus galbula*), loggerhead shrike (*Lanius ludovicianus*), brown thrasher (*Toxostoma rufum*), bobolink (*Dolichonyx oryziv*), upland sandpiper (*Bartramia longicauda*), western kingbird (*Tyrannus verticalis*), American robin (*Turdus migratorius*), and mourning dove (*Zenaida macroura*). Resident bird species that may occur within the study area include horned lark (*Eremophila alpestris*), black-capped chickadee (*Parus atricapillus*), white-breasted nuthatch (*Sitta carolinensis*), blue jay (*Cyanocitta cristata*), American crow (*Corvus brachyrhynchos*), and American goldfinch (*Carduelis tristis*) (NDGFD, 2010c).

USFWS and its partner agencies manage for migratory birds based on specific migratory route paths (flyways) within North America (Atlantic, Mississippi, Central, and Pacific) (USFWS, 2012a). Waterfowl and other migratory birds use these flyways to travel between nesting and wintering grounds. The study area is located within the Central Flyway, which includes Montana, Wyoming, Colorado, New Mexico, Texas, Oklahoma, Kansas, Nebraska, South

Dakota, and North Dakota, and the Canadian provinces of Alberta, Saskatchewan and the Northwest Territories (USFWS, 2012a). Migratory birds are protected by the Migratory Bird Treaty Act, which makes it illegal to kill, harass, or possess migratory birds. Executive Order 13186 was enacted to ensure that environmental evaluations of federal actions take into account the effects of those actions on migratory birds.

Raptors

Raptor species that may occur within the study area include bald eagle (*Haliaeetus leucocephalus*), golden eagle (*Aquila chrysaetos*), red-tailed hawk (*Buteo jamaicensis*), American kestrel (*Falco sparvenius*), prairie falcon (*Falco mexicanus*), great horned owl (*Bubo virginianus*), northern harrier (*Circus cyaneus*), Swainson's hawk (*Buteo swainsoni*), and sharpshinned hawk (*Accipiter striatus*), as well as other raptor-like birds including the turkey vulture (*Cathartes aura*) (NDGFD, 2011a). These species occur throughout the study area and range over large areas when foraging for food. Nests for many of these species also occur within the study area. Although raptor nests occur throughout the study area, data provided by NDGFD did not show any known raptor nests within a 1,000-foot buffer of the alternative routes (NDGFD, 2011a).

Gamebirds, Waterfowl, and Shorebirds

Common upland game birds found within the study area include ring-necked pheasant (*Phasianus colchicus*), gray partridge (*Perdix perdix*), sharp-tailed grouse (*Tympanuchus phasianellus*), and wild turkey (*Meleagris gallopavo*). Many species of waterfowl can also be found during the breeding season within the study area; these species include mallard (*Anas platyrhynchos*), gadwall (*Anas strepera*), Canada goose (*Branta canadensis*), northern shoveler (*Anas clypeata*), and blue-winged teal (*Anas discors*), among others. In addition, various species of shorebirds are found near wetland areas and riparian corridors within the study area (NDGFD, 2010c). Some common shorebirds include great blue heron (*Ardea herodias*), American bittern (*Botaurus lentiginosus*), American coot (*Fulica americana*), killdeer (*Charadrius vociferous*), common tern (*Sterna hirundo*), and spotted sandpiper (*Actitis macularia*) (see Appendix D).

Reptiles and Amphibians

Several species of reptiles and amphibians can be found within the project area. Lizards and snakes are found in various habitats in the region, while amphibians are more likely to be found in wetland areas or near riparian corridors associated with rivers, lakes, and streams. Reptiles and amphibians that may be found within the study area include common garter snake (*Thamnophis sirtalis*), plains garter snake (*Thamnophis radix*), smooth green snake (*Opheodrys vernalis*), sagebrush lizard (*Sceloporus graciosus*), short-horned lizard (*Phrynosoma douglassi*), common snapping turtle (*Chelydra serpentina*), bullsnake (*Pituophis catenifer*), prairie rattlesnake (*Crotalus viridis*), plains spadefoot toad (*Scaphiopus bombifrons*), northern leopard frog (*Rana pipiens*), and tiger salamander (*Ambystoma tigrinum*) (Hoberg and Gause, 2006).

Endangered Species Act Species and Critical Habitat

Five endangered species and one threatened species listed under ESA and two species that are candidates for listing under ESA (see Table 3-15) may be found within the project area according to USFWS' county species lists (USFWS, 2011g). All of these species are animals; no ESA special status plant species are known to exist within the project area (USFWS, 2011g). Critical habitat for the piping plover, as designated under the ESA, is found in Billings, Dunn, McKenzie, Mercer, and Mountrail counties, primarily along the Missouri River, which is crossed near Williston, North Dakota. Critical habitat is defined under the ESA as:

> (i) the specific areas within the geographical area occupied by the species, at the time it is listed in accordance with the provisions of section 4 of this Act, on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection; and
>
> (ii) specific areas outside the geographical area occupied by the species at the time it is listed in accordance with the provisions of section 4 of this Act, upon a determination by the Secretary that such areas are essential for the conservation of the species.

Information on each of these species is included in Table 3-15 and summarized below.

Table 3-15: Federally listed Threatened, Endangered, and Candidate Species and Designated Critical Habitat in the Project Area

Common Name	Scientific Name	Status	County of Occurrence	Counties with Designated Critical Habitat
Black-footed Ferret	*Mustela nigripes*	Endangered	Billings, Dunn, McKenzie, Mercer	
Dakota Skipper	*Hesperia dacotae*	Candidate	Dunn, McKenzie, Mountrail	
Gray Wolf	*Canis lupus*	Endangered	Billings, Dunn, McKenzie, Mercer, Mountrail	
Interior Least Tern	*Sterna antillarum*	Endangered	Dunn, McKenzie. Mercer, Mountrail, Williams	
Pallid Sturgeon	*Scaphirhynchus albus*	Endangered	Dunn, McKenzie, Mercer, Mountrail, Williams	
Piping Plover	*Charadrius melodus*	Threatened	Dunn, McKenzie, Mercer, Mountrail, Williams	Dunn, McKenzie, Mercer, Mountrail, Williams*
Sprague's Pipit	*Anthus spragueii*	Candidate	Billings, Dunn, McKenzie, Mercer, Mountrail, Williams	
Whooping Crane	*Grus americana*	Endangered	Billings, Dunn, McKenzie, Mercer, Mountrail, Williams	

E – Endangered, T – Threatened, C – Candidate;

Source: USFWS, 2011g.

*Piping Plover Critical Habitat Units 2, 3, and 11 (USFWS, 2012c).

Black-Footed Ferret

Black-footed ferrets are a federally listed endangered species that depend on prairie dog (*Cynomys* spp.) colonies as a source of food and shelter (USFWS, 1989). The black-footed ferret historically inhabited black-tail and white-tailed prairie dog colonies throughout the Great Plains, but was thought to be extirpated in the wild from 1987 until 1991. In 1991, 49 captive animals were reintroduced into the wild in Wyoming. Since then, ferrets have been reintroduced into Montana, South Dakota, Colorado, and Arizona and are reproducing in the wild. Unconfirmed sightings from other areas continue to be reported. In North Dakota, the majority of the reports come from the southwest part of the state (USFWS, 2011c).

The black-footed ferret inhabits short grass prairies, always within close proximity to prairie dog towns. Black-footed ferrets are sexually mature at 1 year of age, and breeding usually takes place between March and May, with three to four young per litter. Juvenile male ferret mortality rates are high as a result of their dispersing to new areas. Life expectancies for black-footed ferrets are considered to be less than 5 years. Prairie dogs comprise 90 percent of the diet of black-footed ferrets. Ferrets also utilize prairie dog burrows for shelter and raising young (USFWS, 2011c).

Black-footed ferrets are 20 to 24 inches long and weigh up to 2.5 pounds. They have a yellowish, brown body with a distinctive black mask across the face, black on the feet and the tip of the tail. The decline of black-footed ferrets has been linked to the eradication of prairie dogs, which now occupy less than 1 percent of their historic range. Black-footed ferrets are also susceptible to predation by golden eagles, great-horned owls, and coyotes (USFWS, 2011c).

<u>Dakota Skipper</u>

The Dakota skipper is a small butterfly with a 1-inch wingspan. Dakota skippers historically range from southern Saskatchewan, across the Dakotas and Minnesota to Iowa and Illinois. Dakota skippers now occur no further east than western Minnesota and are believed to be extirpated in Illinois and Iowa. They occur in scattered remnants of native prairie, with their population distribution straddling the border between tall-grass prairie ecoregions to the east and mixed-grass prairie ecoregions to the west. The most significant remaining populations of Dakota skippers occur in western Minnesota, northeastern South Dakota, and north-central and southeastern North Dakota (USFWS, 2012e). Despite native prairie conservation efforts, the species still faces many threats to its habitat including over-grazing, conversion to cultivated agriculture, inappropriate fire management and herbicide use, woody plant invasion, road construction, gravel mining, invasive plant species, and in some areas, historically high water levels (USFWS, 2012e). The Dakota skipper is a candidate species for listing under ESA. Review of the listing petition for the Dakota Skipper has been ongoing since 2003 (USFWS, 2011f). USFWS released its *Dakota Skipper Conservation Guidelines* in September 2007 (USFWS, 2007b).

Dakota skippers have four basic life stages: egg, larva, pupa, and adult. During the brief adult period in June and July, female Dakota skippers lay eggs on the underside of leaves close to the ground. These eggs take about 10 days to hatch into larvae. The larvae build shelters at or below the ground surface and emerge at night to feed on grass until late summer or early fall when they become dormant. They overwinter as mid-stage larvae in shelters at or just below ground level, typically in the bases of native bunchgrasses. The larvae emerge the following spring and continue development. Pupation occurs primarily in June and takes about 10 days. Males emerge as adults about 5 days before females. The maximum life span as adults is about 3 weeks and represents the entire reproductive period of the individual (USFWS, 2012e).

The Dakota skipper occurs in two types of habitat. The first is relatively flat and moist native bluestem prairie in which three species of wildflowers are usually present and in flower when Dakota skippers are in their adult (flight) stage: wood lily (*Lilium philadelphicum*), harebell (*Campanula rotundifolia*), and smooth camas (*Zygadenus elegans*). The second habitat type is upland (dry) prairie that is often on ridges and hillsides. Bluestem grasses and needlegrasses dominate these habitats and three wildflowers are typically present: pale purple (*Echinacea pallida*), upright (*E. angustifolia*) coneflowers, and blanketflower (*Gaillardia sp.*) (USFWS, 2002). Of the 38 existing or possibly existing sites in North Dakota, 19 occur within two complexes: Towner-Karlsruhe in McHenry County (13 sites) and Sheyenne Grasslands (6 sites) in Ransom County, over 100 miles to the southeast of AVS. The other 19 sites that are presumed existing are isolated. The largest complex in North Dakota is located within McHenry County (USFWS, 2002), approximately 70 miles west of the Tande and Neset substations. According to USFWS, Dakota skipper may be found within Dunn, McKenzie, and Mountrail counties.

<u>Gray Wolf</u>

Historically, the gray wolf occurred throughout the lower 48 states except for the Southeast and the deserts of the Southwest (USFWS, 2011d). Today, sustainable populations can be found in habitats with low road and human densities in the following states: Minnesota, Michigan, Wisconsin, Idaho, Montana, and Wyoming (USFWS, 2011d). The gray wolf was listed as endangered on March 9, 1978, in the lower 48 states (except Minnesota) (USFWS, 1987). In North Dakota, the gray wolf has been recently de-listed in the region east of the Missouri River from the South Dakota border to Lake Sakakawea and east of the center line of U.S. Highway 83 to the Canadian border. Gray wolves west of this line however are still federally endangered (USFWS, 2012d). The closest wolf pack to North Dakota is in northwestern Minnesota (Licht and Fritts, 1998). Wolves seen in North Dakota are likely animals dispersing from established populations in Minnesota and Canada (USFWS, 2012d).

Gray wolves live in packs consisting of a breeding pair, their young, and other non-breeding adults. The average size litter of five pups is born in late spring and young reach adult size in 8 months. Once reaching sexual maturity in 2 to 3 years, young wolves may leave the pack in search of a mate to establish a new pack. The average life span of the gray wolf is 10 years (USFWS, 2011d). The diet of the gray wolf consists mainly of large ungulates such as deer and elk. However, they are opportunistic and will take smaller animals and domestic livestock. They usually hunt in packs but can make kills of large prey on their own (Montana Natural Heritage Program and Montana Fish, Wildlife and Parks, n.d.).

Due to the lack of a known breeding population in North Dakota, it is unlikely that gray wolves would be encountered in the project area. Although dispersing gray wolves may be spotted anywhere in North Dakota, and therefore in the project area, they would mostly likely be seen in the forested areas of north-central (Turtle Mountains) and northeast North Dakota as these areas provide better cover and hunting (Pembina Hills) (USFWS, 2012d).

<u>Interior Least Tern</u>

Historically, the least tern was found on the Atlantic, Gulf of Mexico, and California coasts and on the Mississippi, Missouri, and Rio Grande River systems. It was found throughout the Missouri River system in North Dakota. The interior population of the least tern presently breeds in the Mississippi, Missouri, and Rio Grande river systems. The birds usually stay in close proximity to the rivers. Decline of the interior population of the least tern is due to loss of habitat from dam construction and river channelization on major rivers throughout the Mississippi, Missouri, and Rio Grande River systems. Dams allow for river flows to be managed in a fashion that is not conducive to the creation and maintenance of sandbars with sparse vegetation, which is needed by the interior least tern for nesting (USFWS, 2011e).

The interior population of least terns was listed as endangered on June 27, 1985 (USFWS, 1990). The population estimate for the interior tern at that time was approximately 5,000 individuals (USFWS, 1990). Almost 17,600 adult least terns were recorded during a 2005 range-wide census of the interior least tern population (Lott, 2006). The majority (11,281) of individuals were observed on the lower Mississippi River, while 2,044 individuals were recorded on the Missouri River (Lott, 2006). USFWS states that approximately 100 pairs breed in North Dakota (USFWS, 2012a).

Nesting least terns mainly utilize sandbars within the free flowing sections of the Missouri and Yellowstone rivers in North Dakota, and to a lesser extent islands and shorelines of both Missouri River reservoirs (Lake Sakakawea and Lake Oahe) in North Dakota (USFWS, 1990, 2012). Nests are built on the ground on a sand or small rocky substrate that is devoid of vegetation (USFWS, 1990, 2012a). Breeding least terns will utilize the river and wetlands adjacent to the nest for foraging (USFWS, 2012a).

Interior least terns begin arriving at nesting sites as early as late April with peak nesting occurring from mid-June to mid-July (USFWS, 1990, 2012a). Least terns are colonial to semi-colonial nesters, and may be found at times with piping plovers, with their nests being shallow depressions in sandy/pebbly substrate. Habitat for this species would be limited to the area of the crossing of the Missouri River west of Williston. It is not known if interior least terns have previously utilized this area for nesting.

<u>Pallid Sturgeon</u>

The historic range of the pallid sturgeon included the Missouri River from Fort Benton, Montana, to St. Louis, Missouri; the Mississippi River from above St. Louis to the Gulf; the lower reaches of other large tributaries, such as the Yellowstone, Platte, Kansas, Ohio, Arkansas, Red, and Sunflower; and the first 60 miles of the Atchafalaya River (USFWS, 2011b). The pallid sturgeon was considered uncommon and historic population estimates on the upper Missouri River were unknown (USFWS, 1993). The pallid sturgeon was listed as endangered on

September 6, 1990 (USFWS, 1993). In 2004, there was estimated to be 158 wild adult pallid sturgeon in the Fork Peck and Yellowstone reaches of the species' range (Klungle and Baxter, 2005). Due to ongoing stocking efforts, populations have been increasing on the lower Missouri River (Missouri River Recovery Program, 2010).

Adult pallid sturgeon typically utilize the bottom of large, turbid, fast flowing rivers. However, their life-cycle requires a wide array of aquatic habitats from floodplain backwaters to main river channels (USFWS, 1993). Pallid sturgeon is a long lived species (up to 40 years), with estimated sexual maturity reached in 7 to 9 years for males and 15 to 20 years for females (USFWS, 1993). Females may spawn only every 3 to 10 years (USFWS, 1993). Overall, the life history of pallid sturgeon is not well understood. Spawning is thought to occur between June and August and historically in the upper reaches of the range coinciding with an increase in river flow from mountain runoff. The feeding ecology of pallid sturgeon is not well understood. It is thought that the diet of young fish is mainly aquatic invertebrates with an increase in small fish consumption as pallid sturgeon age (USFWS, 1993). Habitat for this species is limited to the crossing of the Missouri River west of Williston in areas of open water in the main channel and floodplain backwaters.

Piping Plover

The piping plover is small shorebird that historically was widely distributed across the Great Plains. The piping plover was listed as threatened across its range in 1985, except in the Great Lakes region where it is listed as endangered (50 Federal Register 50733; December 11, 1985). In the Great Plains, piping plovers inhabit barren sand and gravel shores of rivers and lakes and the shores of alkali wetlands and lakes. Plovers avoid dense vegetation. Habitat destruction and poor breeding success are major reasons for the population decline (USFW, 2012c).

North Dakota is the most important state in the Great Plains region for nesting piping plovers. The state's population of piping plovers was 496 breeding pairs in 1991 and 399 breeding pairs in 1996. More than three-fourths of piping plovers in North Dakota nest on prairie alkali lakes, while the remainder use the Missouri River. Almost all natural lakes used by piping plovers in North Dakota are alkaline and have salt-encrusted, white beaches with sparse vegetation. Beaches used by piping plovers generally are 10 to 40 yards wide. Piping plovers also use barren river sandbars. In North Dakota, barren river sand bars are found on the Missouri and Yellowstone rivers (USFWS, 2012c).

The breeding season in North Dakota extends from mid-April through August. Pairs are territorial and defend their nest area from other piping plovers. A 4-egg clutch is laid in a shallow depression in open, sand/gravel substrate. Both sexes share in incubation, which lasts about 28 days. Plover chicks can walk and feed within hours of hatching and can fly in about 21 days. Piping plovers feed in open beach areas on insects and crustaceans (USFWS, 2012c).

Habitat for this species would include the area of the crossing of the Missouri River west of Williston and any beach areas associated with alkaline lakes. The area of the Missouri River west of U.S. Highway 85 has been designated critical habitat for the piping plover by USFWS.

<u>Sprague's Pipit</u>

The Sprague's pipit is a small, grassland bird. It migrates from breeding grounds in the northern prairies of southern Canada and northern United States to the wintering grounds in southern United States and northern Mexico. The Sprague's pipit was designated as a candidate for listing under ESA on September 15, 2010 (Federal Register, 2010). Historically, Sprague's pipit was found throughout the native prairie grasslands of North America; now they are only common in large remnant grassland patches in the northern mixed-grass native prairie of North America.

Native grassland is used extensively by Sprague's pipits throughout their life cycle. Typical nest sites are dominated by native grasses and sedges with forbs and shrubs, litter, and bare ground present in lesser amounts. Larger tracts of native grassland in landscapes dominated by grasslands are thought to influence the abundance of Sprague's pipits on their breeding grounds. Sprague's pipits have not been documented nesting in Conservation Reserve Program grasslands, dense nesting cover (waterfowl nesting habitat), or cropland (USFWS, 2010a). Large tracts of grassland are also preferred habitat of wintering Sprague's pipits but they may use non-native grasslands to a greater extent. Little if any data is available for habitat preferences during migration.

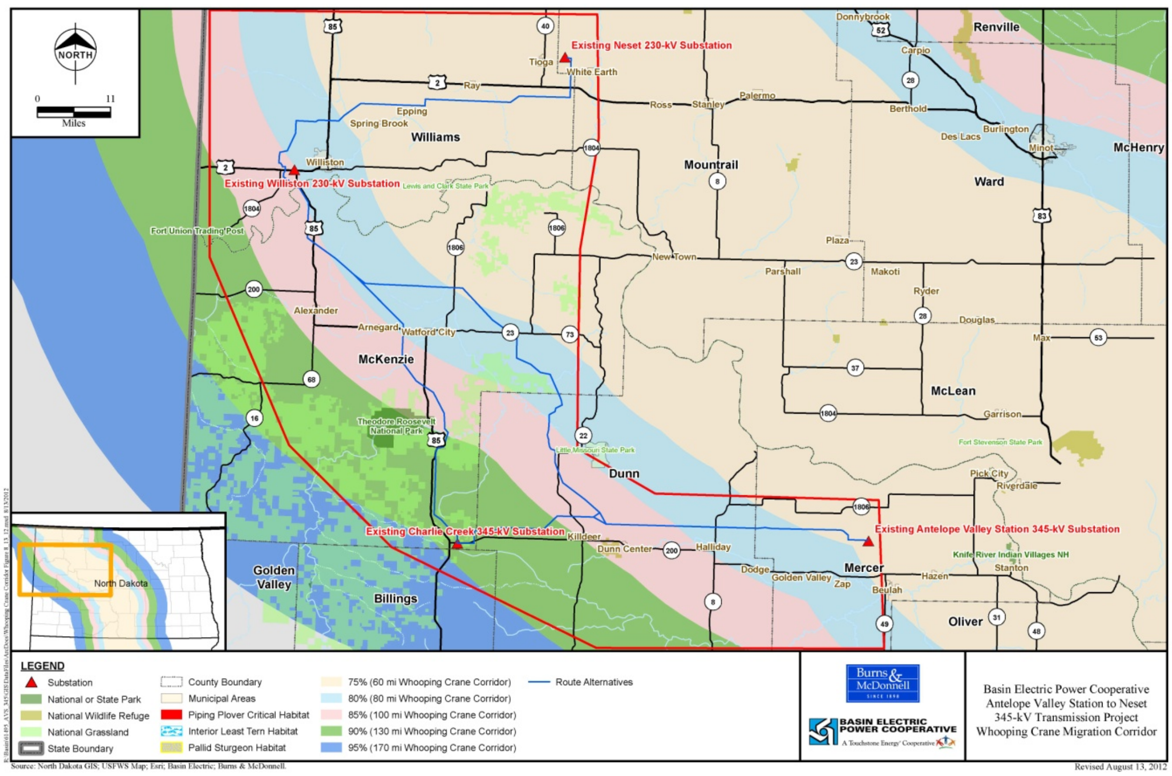
Sprague's pipits breed in the historic prairie regions of the northern United States, including central and western North Dakota, and Canada and winter from central Texas south into central Mexico. They arrive on the breeding grounds from mid-April to mid-May with nest initiation anywhere from the second week of May to early August. Four to five eggs are laid on the ground in a cup--shaped nest made of grass. The nest may also be covered with a grass canopy. Incubation is usually 12 to 14 days and mostly done by the female. Generally, Sprague's pipits leave the breeding grounds in late September and arrive on their wintering grounds by early November. The diet of Sprague's pipits consists mostly of arthropods throughout the year (Jones, 2010). Habitat for Sprague's pipit occurs within the study area in areas of native grasslands.

<u>Whooping Crane</u>

Whooping cranes are the tallest North American bird. They are omnivorous, nest in marshes, and make long winter and spring migrations from their breeding areas in and around Wood Buffalo National Park in Canada and their winter grounds in and around the Aransas National Wildlife Refuge (USFWS, 2007c). They were listed as "threatened with extinction" in 1967 and "endangered" in 1970, then listed as federally endangered after the passing ESA. They are also listed as endangered in Canada. The natural population of whooping cranes came to an all-time low of 15 individuals in 1941. Since then, the wild population of whooping cranes (of which only one is known to exist) has grown steadily to 279 individuals in 2011 (USFWS, 2012g). The total population of wild and captive whooping cranes, as of 2011, was 437 (USFWS, 2012g).

There is no designated critical habitat for whooping crane habitat in North Dakota (USFWS 2012c). Whooping cranes feed and roost in wetlands, riparian areas, and croplands (USFWS, n.d.). Habitat for whooping crane in the form of various sized wetlands for roosting and agricultural lands for foraging are found throughout much of the project area, with the exception of the badlands area north and south of the Little Missouri River crossing. The whooping crane migration corridor does traverse through North Dakota, and the ROW is within the 90 percent migration corridor (Figure 3-21).

Figure 3-21: Whooping Crane Migration Corridor



Source: Tacha, et al., 2008

U.S. Forest Service Sensitive and Management Indicator Species

There are 19 animal species known to occur in the Dakota Prairie National Grasslands (Little Missouri, Sheyenne, Cedar River, and Grand River National Grasslands) that are considered by USFS to be sensitive species in North Dakota (Appendix E). In addition, there are 38 sensitive/watch plant species identified for LMNG (Appendix F). Range, habitat, and life history information for the 19 sensitive animal species is presented below. Habitat information for the sensitive/watch plant species is contained in Appendix F. The plains sharp-tailed grouse

(*Tympanuchus phasianellus jamesii*) is identified as a Management Indicator Species (MIS) in the *Land and Resource Management Plan for the Dakota Prairie National Grasslands Northern Region 2001* (USDA, 2001) and is addressed in this EIS at the request of USFS (USFS, 2012a).

Baird's Sparrow

Baird's sparrow (*Ammodramus bairdii*) is a smallish bird that lives almost exclusively in native prairie areas within the northern Great Plains. Baird's sparrows prefer native prairie and forbs that is relatively clear of grass litter and heavy brush. They spend summers in the Great Plains region of North Dakota, Montana and the Canadian provinces of Saskatchewan, Alberta and Manitoba. Winters are spent in Arizona and Mexico, with birds arriving in October and November. Females lay one brood a year of 3 to 6 eggs that they incubate for 11 to 12 days. Young will stay in the nest for 8 to 10 days before leaving the nest (while still flightless) to forage. Young Baird's sparrows eat only spiders and insects, while adults feed on seeds and insects. Baird's sparrow numbers have declined due to loss or degradation of prairie habitat. However, portions of North Dakota continue to provide good habitat for Baird's sparrows, including the northwestern and the east-central parts of the state (Missouri Coteau) (USFWS, 2012h). Baird's sparrows can also be found nesting east of the Lake Sakakawea/Missouri River area. In addition to being a USFS sensitive species, Baird's sparrow is also a ND Level 1 Species of Conservation Priority (NDGFD, 2010e; Appendix G).

Bald Eagle

Bald eagles historically occurred throughout the United States and Canada but experienced a dramatic population decline between the 1870s and the 1970s. Populations have since rebounded and there are breeding populations in all of the lower 48 states and Alaska. Bald eagles are capable of breeding at 4 or 5 years of age, but in healthy populations they may not start breeding until much older. Breeding bald eagles occupy "territories" that they will typically defend against intrusion by other eagles. In addition to the active nest, a territory may include one or more alternate nests (nests built or maintained by the eagles but not used for nesting in a given year). Bald eagles generally nest near coastlines, rivers, large lakes or streams that support an adequate food supply. They often nest in mature or old-growth trees; snags (dead trees); cliffs; rock promontories; rarely on the ground; and with increasing frequency on manmade structures such as power poles and communication towers. In forested areas, bald eagles often select the tallest trees with limbs strong enough to support a nest that can weigh more than 1,000 pounds. Nesting activity begins several months before egg-laying. Egg-laying dates vary throughout the United States, ranging from October in Florida, to late April or even early May in the northern United States. Incubation typically lasts 33 to 35 days, but can be as long as 40 days. Eaglets make their first flights about 10 to 12 weeks after hatching, and fledge within a few days after the first flight. However, young birds usually remain in the vicinity of the nest for several weeks after fledging because they are almost completely dependent on their parents for food until they disperse from the nesting territory approximately 6 weeks later (USFWS, 2007d).

The bald eagle is also a ND Level II Species of Conservation Priority (NDGFD, 2010e; Appendix G) and was formerly listed under ESA. The first bald eagle nest in North Dakota since 1975 was documented along the Missouri River in 1988. At the time of delisting in 2007, at least 20 active bald eagle nests were located in various parts of the state (USFWS, 2012k).

<u>Burrowing Owl</u>

The western burrowing owl (*Athene cunicularia hypugaea*) is a grassland specialist distributed throughout western North America, primarily in open areas with short vegetation and bare ground in desert, grassland, and shrub-steppe environments. Burrowing owls are dependent on the presence of fossorial mammals (prairie dogs, ground squirrels), and tortoises primarily, whose burrows are used for nesting and roosting. Burrowing owls historically bred from south central and southwest Canada southward through the Great Plains and western U.S. and south to central Mexico. Courtship and pair formation occur in March and April in most areas. Incubation lasts 28 to 30 days and is performed by the female. The young begin feathering out at 2 weeks of age, run and forage by 4 weeks of age, and are capable of sustained flight by 6 weeks. Burrowing owl families often switch burrows every 10 to 15 days when the young are 3 to 4 weeks old and remain as a loose-knit group until early fall when the young may begin to disperse to nearby burrows. Burrowing owls are opportunistic feeders, primarily taking insects, small mammals, birds, amphibians and reptiles. Foraging occurs in a variety of habitats, including cropland, pasture, prairie dog colonies, fallow fields, and sparsely vegetated areas. Populations of burrowing owls are believed to have declined in several large regions, notably in the Great Plains and Canada. Primary threats across the North American range of the burrowing owl are habitat loss due to land conversions for agricultural and urban development, and habitat degradation and loss due to reductions of burrowing mammal populations (USFWS, 2003).

The burrowing owl is also a ND Level II Species of Conservation Priority (NDGFD, 2010e; Appendix G and is known to occur in the LMNG (USFS, 2002).

<u>Greater Prairie-chicken</u>

Greater prairie-chickens (*Tympanuchus cupido*) are endemic to the grassland habitats of the central and eastern United States. Prior to settlement by Europeans, populations inhabited the tallgrass prairies of the eastern states, with the core of the distribution centered near the intersection of Missouri, Illinois, and Iowa. Range expansion of greater prairie-chickens to the north and west during the 1800s shifted the distribution into suitable grasslands as far north as central Alberta, and westward to northeastern Colorado. Greater prairie-chickens are currently distributed in remnant tallgrass prairie in the eastern portions of their range, and in mixed, mid-tallgrass prairies in the western portions. Greater prairie-chickens have a lek mating system, which includes a booming display by males. Several behaviors are performed to produce the booming display; males extend their eye combs, lower their head, erect pinnae feathers on their neck, point their tail somewhat forward, stamp their feet on the ground, click their tail, stiffen, shake, and drop their wings until the tips of the primaries touch the ground, expand their esophageal air sacs, and produce a booming vocalization. Male greater prairie-chickens generally display on leks from early March to June, with peak display activity occurring from April to mid-May. Lek sites are considered to be traditional as they are often used by birds year after year. Leks are typically located on elevated sites in open areas where the vegetation is short and sparse. Female greater prairie-chickens construct shallow, bowl-shaped depressions in the substrate for nests then line their nests with small amounts of dried grass, leaves, and feathers. The average clutch size for greater prairie-chickens is 11 to 12 eggs, with females incubating clutches for 23 to 25 days. Hatching of the clutch may take 1 to 2 days, and broods leave the nest within 24 hours following hatching. Chicks become more solitary and scattered during late August and early September, and dispersal is generally completed in September and October. Composition of greater prairie-chicken diet varies among regions, seasons, and age classes, but is primarily comprised of cultivated grains, leaves, seeds, buds, and insects. Greater prairie-chicken population declines are attributed to habitat loss (USFS, 2005a).

In addition to being a USFS sensitive species, the greater prairie-chicken is also a ND Level II Species of Conservation Priority (NDGFD, 2010e; Appendix G). Breeding populations of greater prairie chicken are known from Grand Forks County and Sheyenne National Grasslands in North Dakota (USFWS, 2012i).

Plains Sharp-tailed Grouse

Sharp-tailed grouse closely resemble prairie chickens, except that sharp-tails have a pointed tail, and the air sacs on the neck of the male are purple. They are resident from Alaska east to Hudson Bay and south to Utah, northeastern New Mexico and Michigan. During the breeding season in March to June, sharp-tailed males congregate on dancing grounds or leks in the early morning to impress nearby female grouse. The male performs a dance in which the wings are extended, the tail is raised vertically, the head is lowered and the entire body is horizontal to the ground. The bird's feet move rapidly and the tail feathers make a clicking noise. As an invitation to the females, the sharp-tailed mail cackles loudly and jumps 3 to 4 feet in the air rapidly beating its wings. This display is called the flutter-jump. Female plains sharp-tailed grouse typically lay 10 to 13 buff-brown eggs in a grass-lined depression in tall grass or brush. The diet of plains sharp-tailed grouse includes a variety of forbs, grasses and insects. In winter, sharp-tailed grouse also feed on buds, catkins, or berries of deciduous trees and shrubs.

The plains sharp-tailed grouse is a MIS for high-structure grasslands in the LMNG. High structure grasslands contain scattered shrubs and diverse vegetative structure. High-structure vegetation, such as shrubs, provide nesting cover for plains sharp-tailed grouse and other bird species. High-structure vegetation also provides brood escape cover and winter food sources (buds and fruits of buffaloberry, rose, snowberry, and juniper) (USDA, 2001).

In addition to being a MIS for LMNG, the plains sharp-tailed grouse is also a ND Level II Species of Conservation Priority (NDGFD, 2010e; Appendix G).

<u>Greater Sage-grouse</u>

The greater sage-grouse (*Centrocercus urophasianus*) is a large, ground-dwelling bird. Sage-grouse depend on a variety of shrub steppe habitats throughout their life cycle, and are considered obligate users of several species of sagebrush (e.g., Wyoming big sagebrush, mountain big sagebrush [*Artemisia tridentata* ssp. *vaseyana*], and basin big sagebrush). Locally important sagebrush species, such as low sagebrush (*Artemisia arbuscula*), black sagebrush (*Artemisia nova*), fringed sagebrush (*Artemisia frigida*), and silver sagebrush can also be used by sage-grouse. Sage-grouse exhibit strong site fidelity to breeding, nesting, brood rearing, and wintering areas. Adult sage-grouse rarely move from these habitats once they have been selected, which limits their ability to adapt to change. During the spring breeding season, male sage-grouse gather together to perform courtship displays on leks, which are relatively bare areas surrounded by greater shrub steppe cover, which is used for escape, nesting and feeding cover. The proximity, configuration, and abundance of nesting habitat are key factors influencing lek location. High-quality nesting areas are typically characterized by sagebrush with an understory of native grasses and forbs, with horizontal and vertical structural diversity that provides an insect prey base, herbaceous forage for pre-laying and nesting hens, and cover for the incubating hen. Hens lay an average clutch of seven eggs. Hens and chicks use shrub and grass cover for concealment and forbs and insects are an essential dietary component for chicks. Most sage-grouse gradually move from sagebrush uplands to more mesic (moist) areas, such as streambeds or wet meadows), during the late brood-rearing period (3 weeks posthatch) as vegetation dries out in the summer. Summer use areas can include sagebrush habitats as well as riparian areas, wet meadows and alfalfa fields. As vegetation continues to dry out and die off through the late summer and fall, sage-grouse shift their diet entirely to sagebrush, eventually depending entirely on sagebrush throughout the winter for both food and cover. Many populations of sage-grouse migrate between seasonal ranges in response to habitat distribution. Migration can occur between winter and breeding and summer areas, between breeding, summer and winter areas, or not at all. Estimating an "average" home range for sage-grouse is difficult due to the large variation in sage-grouse movements both within and among populations related to the spatial availability of seasonal habitats. Annual recorded home ranges for sage-grouse have varied from 4 to 615 square kilometers (1.5 to 237.5 square miles) (USFWS, 2012l).

Prior to European settlement in the 19th century, sage-grouse inhabited 13 western states and three Canadian provinces. Sage-grouse have declined across their range and now occupy 56 percent of their historic range. They currently occur in 11 states and two Canadian provinces.

Factors implicated in sage-grouse population decline include loss of habitat due to increased surface disturbance and general fragmentation of the landscape, and the spread of the West Nile Virus. On March 23, 2010, USFWS determined that the greater sage-grouse warranted the protections of ESA. However, USFWS also found that listing was precluded due to other higher priority actions, thereby making the sage-grouse a candidate under ESA. Subsequently, USFWS entered into a court-approved settlement agreement with environmental groups that set a schedule for making listing determinations on over 200 candidate species nationwide, including the sage-grouse. The schedule indicated that a decision (proposed listing rule or withdrawal) on the sage-grouse range-wide was due by September 2015 (USFWS, 2012l).

USFWS does not report the sage-grouse as occurring in Billings, Dunn, McKenzie, Mercer, Mountrail, and Williams counties (USFWS, 2011g). Sage-grouse is only known or believed to occur in North Dakota in Bowman, Golden Valley, and Slope counties in North Dakota, but it is not reported from any of the counties crossed by the project (USFWS, 2012j). The greater sage-grouse is also a ND Level II Species of Conservation Concern (NDGFD, 2010e; Appendix G).

<u>Loggerhead Shrike</u>

Loggerhead shrikes breed throughout a large portion of central and southern North America. Although historically common in most areas of their range, shrike abundance has declined nearly continent-wide. Loggerhead shrikes winter throughout the southern portion of the United States, with the northern limits being in California, Nevada, Utah, Colorado (primarily west and south), southern Kansas, Arkansas, Tennessee, and Virginia. The migratory behavior of loggerhead shrikes has not been well studied. Some southern shrike populations are resident, while other breeding populations are migratory. Loggerhead shrikes breed in a wide variety of open habitats including native and non-native grasslands, sage scrub, and other areas with a sparse coverage of bushes and trees and bare ground. The presence of thorny trees/bushes or barbed-wire fences for impaling prey is also thought to be an important component of nesting habitat. Nests are typically placed in trees or thick shrubs within pastures and grasslands, with isolated trees or shrubs being preferred. Loggerhead shrikes lay one egg per day, with a typical clutch of five to seven eggs. Females incubate the eggs for an average of 16 days and then brood the nestling for 4 to 5 days. Fledglings typically remain in loose company. Loggerhead shrikes feed primarily on insects and small vertebrates. The availability of suitable perches is an important component of foraging habitat as shrikes are sit-and-wait predators, and thus spend the majority of their foraging time perched. Factors limiting loggerhead shrike population growth include habitat loss and degradation; lack of good nesting sites; mortality of adults and recently fledged young due to collisions with motor vehicles; and low survival on wintering grounds (USFS, 2005b).

The loggerhead shrike is also a ND Level II Species of Conservation Concern (NDGFD, 2010e; Appendix G). It is known to breed throughout North Dakota and is fairly common throughout the state, except in the Red River Valley (USGS, 1995).

Long-billed Curlew

The long-billed curlew (*Numenius americanus*) is the largest North American shorebird. The historical breeding range of the long-billed curlew was the western U.S. and the southern Canadian Prairie Provinces from California north to British Columbia and east to southern Manitoba and Wisconsin, northern Iowa and eastern Kansas. This breeding distribution has contracted and long-billed curlews have lost about 30 percent of their historical range. The eastern edge of the current breeding range is the western Great Plains from the Texas panhandle north throughout southwestern and south central Saskatchewan. Long-billed curlews currently winter along the southwestern U.S. coast from central California, southern Texas and Louisiana south along both of Mexico's coasts to Guatemala, and are casual along the Atlantic coast north to New Brunswick, the southeastern South Carolina and Florida coasts, and the West Indies. Nesting long-billed curlews typically avoid trees, tall weedy vegetation, and tall dense shrubs during the breeding season, and nest on the ground in the simplest, most open habitat available. Water availability, minimum block size, vegetation height, density, and structure and species composition are characteristics whose importance has been debated. Spring and summer crop fields are typically used during brood rearing, while coastal sandy beaches, intertidal mudflats, salt marshes, coastal and inland pastures and farmlands, freshwater wetlands, salt ponds, and agricultural pastures are used by wintering long-billed curlews (USFWS, 2009a). Wintering curlews forage on earthworms, marine worms, and shrimp, while summering curlews feed on grasshoppers, beetles, spiders, and caterpillars. Females usually lay four beige or light green eggs, densely marked with brown or purple. Both parents incubate the eggs for about 28 days. Long-billed curlew chicks are precocial and within a few hours they leave the nest for denser, taller grasses, and begin to feed themselves within a day. Both parents defend chicks from crows, coyotes, hawks, and people until the young curlews fledge in 38 to 45 days (National Audubon Society, 2012). Initial long-billed curlew population declines were attributed to over-hunting and plowing of the native prairies for agriculture. Current range-wide threats include habitat loss and destruction due to urban and energy development, grassland conversion for agricultural purposes, changes in the natural fire regime, and the spread of exotic invasive plants (USFWS, 2009a).

In addition to being a USFS sensitive species, the long-billed curlew is also a ND Level I Species of Conservation Concern (NDGFD, 2010e; Appendix G). The long-billed curlew is known to breed in southwestern North Dakota, but is considered uncommon (USGS, 2006a).

Sprague's Pipit

See the description for Sprague's pipit under Section 3.5.1, Endangered Species Act Species and Critical Habitat. In addition to being a candidate for listing under ESA and a USFS sensitive species, Sprague's pipit is also a ND Level I Species of Conservation Priority (NDGFD, 2010e; Appendix G).

Black-tailed Prairie Dog

The black-tailed prairie dog (*Cynomys ludovicianus*) is a small, stout ground squirrel with a characteristic black tail. Black-tailed prairie dogs are diurnal, burrowing animals that do not hibernate like other prairie dog species. The historic range of the black-tailed prairie dog included portions of 11 States, Canada, and Mexico. Today it occurs from extreme south-central Canada to northeastern Mexico and from approximate the 98th meridian west to the Rocky Mountains. The species is currently present in Arizona, Colorado, Kansas, Montana, Nebraska, New Mexico, North Dakota, Oklahoma, South Dakota, Texas, and Wyoming. A range-wide estimate of historically occupied habitat for the black-tailed prairie dog is 80 to 100 million acres, while current occupied habitat is estimated to be 2.1 million acres. Factors influencing black-tailed prairie dog populations range-wide include conversion of prairie grasslands to croplands, large-scale poisoning, recreational shooting, and sylvatic plague. The black-footed ferret is a federally listed endangered species that depends upon prairie dogs as a source of food and uses its burrows for shelter. Other species such as the swift fox, mountain plover, ferruginous hawk, and burrowing owl are dependent on prairie dogs to varying degrees (USFWS, 2011h).

Black-tailed prairie dogs are highly social animals. They live in colonies or towns, which cover from 1 acre to thousands of acres of grassland habitat. A family group is made up of an adult male, one to four breeding females and their offspring younger than 2 years of age. Breeding season varies with latitude, starting in January in the southern parts of its range and continuing into April in the northern part. Females normally have one litter per year that ranges in size from one to eight young. Due to mortalities, on the average, only three individuals survive and come above ground. Pups emerge at about 41 days and stay with their family group for a minimum of 2 years. Black-tailed prairie dogs are herbivores and feed on a variety of grasses and forbs, and to a lesser extent seeds and insects (USFWS, 2009b).

In addition to being a USFS sensitive species in North Dakota, the black-tailed prairie dog is also a MIS for low structure grasslands in the LMNG Northern Region (USDA, 2001), and a ND Level I Species of Conservation Priority (NDGFD, 2010e; Appendix G). Black-tailed prairie dogs are known from southwest North Dakota, including the project counties of Billings, Dunn, and McKenzie (NDGFD, 2008).

Bighorn Sheep

The bighorn sheep is one of two species of wild sheep in North America with large horns, the other being the Dall sheep (*Ovis dalli*). Bighorn sheep are actually three distinct species: Rocky Mountain bighorn sheep (*O. canadensis canadensis*); Sierra Nevada bighorn sheep (*O. canadensis sierrae*); and Desert bighorn sheep (*O. canadensis nelsonii).* Bighorn sheep live in the western mountainous regions of North America, ranging from southern Canada to Mexico. Most populations undergo seasonal movements, generally using larger upland areas in the summer and concentrating in sheltered valleys during the winter (National Wildlife Federation, 2012). The breeding season generally extends from August to November for desert bighorn sheep and October to January for Rocky Mountain and California bighorn sheep. Bighorn sheep have an approximately 6 month gestation period and most ewes give birth to one lamb per year. Lambing seasons vary by location and year. Desert bighorn lambs are usually born in January to June, with the majority of births in February-April. The lambing season for bighorn sheep in colder climates is more concentrated and most births occur in April to June. Prior to giving birth, adult ewes isolate themselves in steep rocky areas. Newborn lambs can walk within hours after birth; however they are dependent upon steep terrain for protection from predators. Lambs follow their mothers for the first year of life to learn their home range and behavior (Bighorn Institute, 2012).

Bighorn sheep are found in western North Dakota. They are a big game animal in North Dakota with a regulated hunting season. North Dakota's bighorn sheep hunting season opens October 26 and continues through November 8. In 2012, NDGFD reduced the number of sheep licenses from six to four, due to a declining number of mature rams (NDGFD, 2012a). The lambing season for bighorn sheep in the study area is April 1st thru July 1st of each year (NDGFD, 2010b).

Insects

USFS lists nine species of butterflies as sensitive in North Dakota: Arogos skipper (*Atryone arogos iowa*); broad-winged skipper (*Poanes viator*); Dakota skipper; Dion skipper (*Euphyes dion*); mulberry wing (*Poanes massasoit*); Ottoe skipper (*Hesperia ottoe*); Powesheik skipper (*Oarisma powesheik*); regal fritillary (*Speyeria idalia*); and tawny crescent (*Phycoides batessi).* The broad-winged skipper, Dion skipper, and the mulberry wing are associated with wetland habitats (Butterflies and Moths of North America, 2012). The Arogos skipper, Dakota skipper, Ottoe skipper, Powesheik skipper, regal fritillary are associated with prairie and grassland habitats (Shepherd, 2005; USGS, 2006b; USFWS, 2011i; Vaughan and Shepherd, 2005). The tawny crescent is found in wetland woods and prairie adjacent to woodlands (USGS, 2006b; Butterflies and Moths of North America, 2012).

The broad-winged skipper, Dion skipper, mulberry wing, and Powesheik skipper are known from eastern North Dakota. The Ottoe skipper, Arogos skipper, regal fritillary, Dakota skipper, and tawny crescent are known from western North Dakota (USGS, 2006c).

The Dakota skipper is a candidate for listing under ESA and is reported to occur in Dunn and McKenzie counties in North Dakota (USFWS, 2012m). The Dakota skipper is addressed in more detail in Section 3.5.1, Endangered Species Act Species and Critical Habitat. The Powesheik skipper (also known as the Powesheik skipperling) is also a candidate for listing under ESA, but it is not reported from any of the counties crossed by the project (USFWS, 2011g).

Population declines for these species are attributed primarily to habitat loss and fragmentation.

North Dakota's Species of Conservation Priority

The state of North Dakota does not have its own state-based endangered species law. However, in 2005 NDGFD published a Wildlife Action Plan that includes a list of 100 "species of conservation priority." This list describes the bird, mammal, fish, reptile, amphibian, and mussel species that the state has deemed to be of conservation concern (NDGFD, 2010e). The range information given for each species (NDGFD, 2010e) suggests that the majority of them (70 out of the 100 listed) have the potential to occur in the ROW. See Table 3-16 and Appendix G.

Table 3-16: North Dakota's Species of Conservation Priority Within the Study Area

Taxonomic Group	Species of Conservation Priority	Species With the Potential to Occur in the ROW
Birds	45	42
Reptiles and Amphibians	11	7
Mammals	15	12
Fishes	22	8
Mussels	7	1

Source: NDGFD, 2010e.

3.5.2 Direct and Indirect Effects

This section discusses potential impacts on vegetation, wildlife, wetlands, and special status species resources resulting from construction and operation of the proposed project, including the no-action alternative. Definitions for duration and intensity developed for this project are described in Table 3-17.

Table 3-17: Biological Resources Impact Context and Intensity

Context (Duration)	Low Intensity	Moderate Intensity	High Intensity
Vegetation			
Short term: Lasting less than two growing seasons. Long term: Lasting longer than two growing seasons.	Impacts on native vegetation would be detectable but discountable, and would not alter natural conditions measurably. Infrequent disturbance to individual plants could be expected, but without affecting local or range-wide population stability. Infrequent or insignificant one-time disturbance to local populations could occur, but sufficient habitat would remain functional at both the local and regional scales to maintain the viability of the species. Opportunity for increased spread of noxious weeds would be detectable but discountable. There would be some minor potential for increased spread of noxious weeds, as defined by North Dakota.	Impacts on native vegetation would be detectable and/or measurable. Occasional disturbance to individual plants could be expected. These disturbances could affect local populations negatively, but would not be expected to affect regional population stability. Some impacts might occur in key habitats, but sufficient local habitat would remain functional to maintain the viability of the species both locally and throughout its range. Opportunity for increased spread of noxious weeds would be detectable and/or measurable. There would be some moderate potential for increased spread of noxious weeds as defined by North Dakota.	Impacts on native vegetation would be measurable and extensive. Frequent disturbances of individual plants would be expected, with negative impacts to both local and regional population levels. These disturbances could negatively affect local populations, and could affect range-wide population stability. Some impacts might occur in key habitats, and habitat impacts could negatively affect the viability of the species both locally and throughout its range. Opportunity for increased spread of noxious weeds would be measurable and extensive. There would be major potential for increased spread of noxious weed as defined by North Dakota.

Context (Duration)	Low Intensity	Moderate Intensity	High Intensity
Wildlife			
Short term: Lasting one to two breeding seasons, depending on length of breeding season. Long term: Lasting beyond two breeding seasons.	Impacts on native species, their habitats, or the natural processes sustaining them would be detectable, but discountable and would not measurably alter natural conditions. Infrequent responses to disturbance by some individuals could be expected, but without interference to feeding, reproduction, resting, or other factors affecting population levels. Small changes to local population numbers, population structure, and other demographic factors could occur. Sufficient habitat would remain functional at both the local and range-wide scales to maintain the viability of the species.	Impacts on native species, their habitats, or the natural processes sustaining them would be detectable and/or measurable. Occasional responses to disturbance by some individuals could be expected, with some negative impacts to feeding, reproduction, resting, migrating, or other factors affecting local population levels. Some impacts might occur in key habitats. However, sufficient population numbers or habitat would retain function to maintain the viability of the species both locally and throughout its range.	Impacts on native species, their habitats, or the natural processes sustaining them would be detectable, and would be extensive. Frequent responses to disturbance by some individuals would be expected, with negative impacts to feeding, reproduction, or other factors resulting in a decrease in both local and range-wide population levels and habitat type. Impacts would occur during critical periods of reproduction or in key habitats and would result in direct mortality or loss of habitat that might affect the viability of a species. Local population numbers, population structure, and other demographic factors might experience large changes or declines.
Wetlands			
Short term: Lasting less than two growing seasons. Long term: Lasting longer than two growing seasons.	The effect on wetlands would be measurable or perceptible, but small in terms of area and the nature of the impact. A small effect on size, integrity, or connectivity would occur; however, wetland function would not be affected and natural restoration would occur if left alone.	The impact would cause a measurable effect on one of the three wetlands indicators (size, integrity, connectivity) or would result in a permanent loss of wetland acreage over small areas. However, wetland functions would not be adversely affected.	The impact would cause a measurable effect on two or more wetlands indicators (size, integrity, connectivity) or a permanent loss of large wetland areas. The impact would be substantial and highly noticeable. The character of the wetland would be changed so that the functions typically provided by the wetland would be substantially altered.

Context (Duration)	Low Intensity	Moderate Intensity	High Intensity
Special Status Species			
<u>Short term</u>: Lasting one breeding season <u>Long term</u>: Lasting beyond one breeding seasons.	Impacts on sensitive species, their habitats, or the natural processes sustaining them would be detectable, but discountable and would not measurably alter natural conditions. Infrequent responses to disturbance by some individuals could be expected, but without interference to feeding, reproduction, resting, or other factors affecting population levels. Small changes to local population numbers, population structure, and other demographic factors might occur. However, some impacts might occur during critical reproduction periods or migration for a species, but would not result in injury or mortality. Sufficient habitat would remain functional at both the local and range-wide scales to maintain the viability of the species. No take of federally listed species or impacts to designated critical habitat would be expected to occur. Impacts would likely result in a may affect, unlikely to adversely affect determination.	Impacts on sensitive species, their habitats, or the natural processes sustaining them would be detectable and/or measurable. Some alteration in the numbers of sensitive or candidate species, or occasional responses to disturbance by some individuals could be expected, with some negative impacts to feeding, reproduction, resting, migrating, or other factors affecting local population levels. Some impacts might occur in key habitats. However, sufficient population numbers or habitat would remain functional to maintain the viability of the species both locally and throughout its range. No mortality or injury of federally listed species would be expected; however, some disturbance to individuals or impacts to potential or designated critical habitat could occur. Impacts would likely result in a may affect, unlikely to adversely affect determination.	Impacts on sensitive species, their habitats, or the natural processes sustaining them would be detectable, and would be permanent. Substantial impacts on the population numbers of sensitive or candidate species, or an impact on the population numbers of any federally listed species, or interference with their survival, growth, or reproduction would be expected. There would be direct or indirect impacts on candidate or sensitive species populations or habitat, resulting in substantial reduction to species numbers, take of federally listed species numbers, or the destruction or adverse modification of designated critical habitat. Impacts would like result in an adverse effect determination.

No-action Alternative

Under the no-action alternative, the proposed project would not be constructed, and there would be no new impacts on biological resources.

Proposed Action

The proposed project would encompass a wide variety of terrain, vegetative communities, and habitat types used by a variety of wildlife. Construction and operation of the proposed project would have impacts on vegetation, wetlands, and wildlife. Appropriate mitigation measures would reduce the severity of these impacts. Potential impacts would include the following.

- Disturbance or change to vegetative communities as a result of construction activities within the ROW.
- Introduction and spread of noxious weeds during construction of the line.
- Sedimentation within wetland areas caused by construction activities.
- Removal of forested wetland vegetation within the ROW during construction.
- Removal of wildlife habitat within the ROW.
- Fragmentation of wildlife habitat.
- Temporary disturbance to wildlife from human presence and disruption to habitat.
- Disturbance to aquatic habitats from construction activities.
- Changes in predator-prey relationships due to habitat changes (e.g. increased predation by raptors due to the presence of transmission structures for perching).
- Impacts on special status species (ESA listed or candidate species; USFS sensitive species; and North Dakota Species of Conservation Priority) or their habitat.

Vegetation

Potential impacts on vegetation would include short-term and long-term effects varying in intensity from low to moderate to high. Impacts would include localized disturbance to vegetative communities caused by construction equipment and vehicles during site preparation, such as damage to vegetation from vehicle tires, excavation, grading, and soil stockpiling. Vegetative damage in the ROW due to construction equipment and vehicles would be considered a short-term, low impact in areas that are not being permanently developed.

Shrub vegetation would be cleared within the ROW where necessary, depending on height and terrain, and in areas where access roads are required. Clearing of shrub vegetation would have a long-term, moderate impact on vegetation. Construction through forested areas would require the removal of any trees or large shrubs that would interfere with line safety, equipment access, and operation. Vegetation would be permanently removed at each structure foundation location, and woody vegetation would be cleared within currently forested areas of the ROW. Clearing forested areas would have a long-term, high impact on vegetation as it results in a permanent conversion. Short-term, low impacts on vegetation are anticipated within the ROW in grassland, cropland, and hayland areas, as these vegetation types would be restored within the ROW upon completion of construction. Permanent impacts on vegetation would be limited to conversion of forest to non-forest habitat and any loss of vegetation resulting from permanent conversion of new, undeveloped areas, particularly for substation sites. However, Basin Electric will coordinate with NDPSC and the North Dakota Forest Service to determine appropriate mitigation for the vegetation removed. Typically for these types of projects, the tree and shrub vegetation is replaced at a ratio of 2:1, reducing the overall loss of these vegetation types over time. Mitigation measures for tree and shrub removal impacts are included in Appendix A.

During construction, off-ROW access may be necessary. Construction crews would gain access to the ROW from public roads and section line roads/trails, as well as from within the transmission ROW itself in areas with no public access. Access for line construction would be by truck within the ROW. Structures located along section lines would be accessed from section line roads and trails where possible. For most existing access roads and trails no additional widening, surfacing or improvements, including culverts, would be necessary. New surface access roads are not anticipated for a majority of the line; however, these may be required in certain areas with no access. Access in areas with steep or rugged terrain, particularly near the Little Missouri River and associated tributaries would likely be gained using helicopters and would not require additional new roads. New and existing roads and trails used for construction access would be rehabilitated after construction to comparable or better condition than they were prior to construction activities. Existing roads would be rehabilitated to a comparable or better condition than they were prior to construction activities. New roads would be restored to the natural condition of the surrounding area. Gates would be installed where fences cross the ROW, and locks would be installed at the landowner's request.

The introduction and spread of noxious weeds as a result of construction of the proposed project would be possible through ground disturbance and transfer by equipment. Precautions would be needed during construction and reclamation to prevent the introduction and spread of noxious weeds, such as re-vegetation of disturbed areas using certified seed and mulch that contains no viable noxious weed seeds, as well as the use of standard BMPs related to construction and re-vegetation practices within disturbed areas. Basin Electric would also develop a plan for post-construction noxious weed management for the life of the line.

Table 3-18 presents the potential number of acres impacted within the ROW for general vegetation types used for comparison along the entire route lengths of Alternative Route A and Alternative Route B. In addition, Table 3-19 provides a more detailed breakdown of specific vegetation communities found within the ROW for both Alternative Route A and Alternative Route B.[2] A discussion of impacts on vegetation resulting from the construction and operation of Alternative Route A or Alternative Route B is provided below.

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[2] Vegetation community data was obtained from North Dakota GAP Analysis Program compared to vegetation type data which was obtained from National Land Cover Dataset. Because impacts to vegetation are similar between vegetation types (i.e. all wooded vegetation communities would be cleared and subject the same type of impact), National Land Cover Dataset data was used for route comparison.

Table 3-18: Vegetation Types within ROW by Alternative Route

Vegetation Type	Alternative Route A ROW Acres	Alternative Route B ROW Acres
Woodland	95.3	100.6
Grassland	1,680.0	2,057.8
Pasture/Hayland	130.2	117.9
Cultivated Cropland	1,365.8	1,272.0

Source: Homer et al., 2004.

Table 3-19: Vegetation Communities within ROW

Vegetation Community	ROW A (acres)	ROW B (acres
Bluff and Badland	0.2	2.6
Cliff, Canyon and Talus	0.1	1.1
Cultivated Cropland	1380.8	1288.0
Depressional Wetland	71.4	76.4
Floodplain and Riparian	39.0	35.5
Inter-Mountain Basins Big Sagebrush Shrubland	0.4	0.7
Inter-Mountain Basins Big Sagebrush Steppe	1.0	2.1
Introduced Upland Vegetation – Perennial Grassland and Forbland	22.9	21.8
Northwestern Great Plains Mixedgrass Prairie	1643.7	2004.2
Northwestern Great Plains Shrubland	24.9	27.4
Pasture/Hay	136.9	135.0
Western Great Plains Dry Bur Oak Forest and Woodland	4.7	17.5
Western Great Plains Sand Prairie	12.3	27.3
Western Great Plains Wooded Draw and Ravine	94.8	75.8

Source: Strong, et. al. 2005.

Proposed Substations and Switchyards

The proposed Judson and Tande 345-kV substations would require the permanent removal of all vegetation within the fenced area of the site (approximately 12 acres per substation), as both sites would be converted to utility use. These substation sites would be located in grassland or cropland areas, avoiding the clearing of woodland vegetation. The proposed Killdeer switchyard would also remove all vegetation within the fenced area of the site boundary (approximately 12 acres). It is anticipated the switchyard would be located in grassland or cropland areas, avoiding the clearing of woodland vegetation. Impacts on vegetation within the switchyard boundary would be permanent. Impacts on vegetation within the substation and switchyard boundaries would be long term and moderate. Removal of vegetation in these areas is not expected to negatively impact local plant populations or population range-wide stability.

Wetlands

Executive Order 11990, Protection of Wetlands, requires federal agencies to minimize the destruction, loss, or degradation of wetlands when providing federally-undertaken, financed, or assisted construction and improvements, as well as other activities. Each agency shall avoid new construction located in wetlands unless "the agency finds (1) that there is no practicable alternative to such construction, and (2) that the Proposal includes all practicable measures to minimize harm to wetlands which may result from such use."

Impacts on wetland areas within the project area are expected to be minimal; Basin Electric would attempt to avoid impacting wetlands when practicable. When impacts on wetlands cannot be avoided, they will be minimized as much as possible. Any impacts on jurisdictional wetlands will be mitigated as appropriate in consultation with USACE.

Table 3-20 provides a comparison of potential wetland types and acreages within the ROW between Alternative Route A and Alternative Route B as identified on NWI maps. Short-term, low intensity impacts on wetland vegetation may occur if construction crews need to access ROW areas through wetlands. Following completion of construction, any disturbance to wetlands would cease, and these areas would be restored. Long-term, moderate to high intensity impacts on wetlands would only be expected to forested wetlands because trees and other woody vegetation would need to be removed within the ROW. Impacts to non-forested wetlands would be short-term and of low intensity.

After the final route, substation, and switchyard locations are chosen, wetland delineations would be conducted to identify wetlands. Any unavoidable impacts on wetlands, whether temporary or permanent, will be discussed with USACE, prior to construction, to determine the permitting requirements and conditions necessary for construction involving wetlands within the proposed project ROW.

Table 3-20: NWI-Identified Wetland Acres within the ROW of Proposed Alternative Routes

Wetland Type	Alternative Route A Wetland Acres in ROW	Alternative Route B Wetland Acres in ROW
PEM	16.21	17.45
PSS	0.0	3.57
PFO	0.0	0.02
Total	**16.21**	**21.04**

PEM = palustrine emergent, PSS = palustrine scrub/shrub, PFO = palustrine forested
Source: USFWS, 2012b.

Proposed Substations and Switchyards

No impacts on wetlands are expected from the construction of the proposed Judson or Tande 345-kV substations, or from construction of the proposed Killdeer switchyard. No NWI-identified wetlands are located within the boundaries of either substation site, and no wetlands would need to be crossed for access to either site for construction.

Wildlife

The proposed action alternatives would each cross a variety of different habitat areas used by a diverse assemblage of wildlife species. Both alternative routes would cross very similar habitat communities, resulting in similar impacts on wildlife populations. Although construction would result in minor changes in habitat composition for lands within the ROW, project-related impacts would largely be short-term, of low to moderate intensity, and typically limited to the construction period and times when workers and equipment are regularly present; except in cases of permanent conversion of habitat to a substation or switchyard, or from one habitat type to another (e.g. forest to grassland). Potential impacts on wildlife during the construction and operation phases of the proposed project may include the following.

- Temporary disturbance to wildlife within and near the transmission ROW during construction and line maintenance due to human intrusion, noise, and construction activity.
- Disturbance or removal of vegetation during ROW clearing that is used as food, shelter, or cover for wildlife species.
- Permanent loss of habitat, particularly wooded areas, shelterbelts, windbreaks, and fencerows.
- Loss of forested wetland habitat through permanent conversion to emergent wetlands via clearing.

- Habitat fragmentation.
- Introduction of sediment into aquatic ecosystems during construction.
- Changes in predator-prey relationships due to habitat changes (e.g. increased predation by raptors due to the presence of transmission structures for perching).
- Impacts on special status species (ESA listed or candidate species; USFS sensitive species; and North Dakota Species of Conservation Priority) or their habitat.
- Potential exposure to contaminants such as fuels and chemicals used during construction.

Potential impacts, both short and long term, are discussed for specific wildlife types in the following sections.

Big Game

Species such as mule and white-tailed deer, elk, pronghorn antelope, and bighorn sheep would experience a potential loss of foraging and woodland cover habitat due to the clearing and disturbance of vegetation within the proposed project ROW. This impact would be considered short term and of low to moderate intensity. In most instances, this temporary loss of foraging habitat would be insignificant, as available foraging habitat adjacent to the ROW would be sufficient to sustain these species until construction was completed and vegetation within the ROW became re-established. Clearing of woody vegetation and maintenance of a cleared ROW would reduce woodland cover. However, the minimal clearing necessary and the relatively narrow ROW cleared would not be anticipated to permanently displace big game from the area or create a barrier to movement from one area to another across the ROW.

Approximately 3,545.5 acres of land would be incorporated into the ROW as part of Alternative Route A compared with approximately 3,782 acres for Alternative Route B. The majority of this area provides some type of habitat for big game. Once construction is completed, approximately 120 and 137 acres of habitat (foraging and woodland cover) would be permanently lost as part of Alternative Routes A and B, respectively. These acreages include the area occupied by transmission structures and substations/switchyards, as well as the maximum estimate of forest clearing for each alternative route. Forest clearing would result in a loss of woodland cover, but cleared forest areas would become available foraging habitat once construction is completed. The vast majority of the ROW, once construction is completed and the area restored, would again be available as wildlife habitat. Impacts related to vegetation clearing in the ROW are considered long term and of low intensity.

Increased human activity and noise associated with the construction of the proposed project is likely to temporarily displace big game species in the area; however, during breaks in the construction efforts (such as between structure placement and conductor stringing) and upon completion of construction, these species would be expected to move back into the ROW and adjacent area. Therefore, impacts related to human activity and noise are considered short term and of moderate intensity.

Nongame Species

Potential impacts on nongame species such as small mammals, reptiles, and amphibians resulting from construction of the proposed project would include temporary loss of habitat within the ROW in grassland and agricultural areas until revegetation is completed. This impact is considered short term and of low to moderate intensity due to the availability of grasslands and agricultural areas in close proximity to the ROW. Permanent impacts on habitat would occur in areas where forest would be cleared within the ROW (conversion from one type of habitat to a different habitat type) and where habitat is converted to a substations or switchyard. These impacts are considered long term and of moderate to high intensity. Long-term impacts on non-game species habitat would be limited to forest clearing, estimated to be a maximum of approximately 95 acres for Alternative Route A and 100 acres for Alternative Route B. These impacts include those associated with switchyard and substation construction.

Although some nongame species would be temporarily displaced during construction of the transmission line, permanent displacement of these species is not anticipated, except potentially in cleared forest areas that may provide habitat for forest-dwelling species and in areas of permanent conversion to substations or switchyards. Forest habitat would be available in other areas near or adjacent to the proposed project ROW and any loss of woodland would be minimal, with adjacent woodland areas still available along the line for refuge during construction and as habitat during project operation. Habitat fragmentation is also not anticipated, due to the relatively open terrain and limited large-tract forested areas. Impacts on non-game species as a result of temporary displacement are considered short term and of low to moderate intensity.

Additionally, some mortality of less-mobile or burrowing species may occur from construction vehicles or equipment within the ROW during construction. Impacts on non-game species as a result of construction vehicles are considered short term and of low to moderate intensity.

Birds

The Migratory Bird Treaty Act (16 U.S.C. 703-712) makes it unlawful to take, kill, or possess migratory birds. The Act defines "take" as "to pursue, hunt, take, capture, kill, attempt to take, capture, or kill, possess, offer for sale, sell, offer to barter, barter, offer to purchase, purchase, deliver for shipment, ship, export, import, cause to be shipped, exported, or imported, deliver for transportation, transport or cause to be transported, carry or cause to be carried, or receive for shipment, transportation, carriage, or export, any migratory bird, any part, nest, or eggs of any such bird, or any product, whether or not manufactured, which consists, or is composed in whole or part, of any such bird or any part, nest, or egg thereof." Habitat disturbance or alteration, human disturbance, and collisions with transmission lines would result in impacts on migratory species.

Raptors, waterfowl, and other bird species may be impacted by the construction and operation of the proposed project. Potential, temporary impacts on raptors and waterfowl species may occur during construction of the proposed project. Foraging areas for these species would be temporarily disturbed during ROW clearing and general construction activities. Impacts on foraging areas due to construction activities are considered short term and of low to moderate intensity. Golden eagles, protected under the Bald and Golden Eagle Protection Act, commonly use native grassland for foraging and badland areas for nesting within the project area. According to data from NDGFD, no known golden eagle nest locations occur within 1,000 feet of the corridor for either Alternative Route A or Alternative Route B (NDGFD, 2011a), and none are expected to be impacted during construction of the transmission line. It is likely that nests for other raptor species could occur within or along the proposed project ROW. Nest surveys for golden eagles and other raptors will be conducted in an area 1 mile on both sides of the centerline of the preferred alignment during spring 2013.

During ROW clearing and preparation, habitat loss may occur for grassland and forest bird species, causing temporary displacement of local populations. When construction is completed, grassland species would be expected to return to the area as grassland is restored and construction disturbance ceases. Therefore, impacts related to temporary habitat loss and displacement for grassland species are considered short term and of low to moderate intensity. Forest-dwelling species would likely move into neighboring forested areas adjacent to the ROW during construction and operation of the line. Species dependent on woodland habitat would experience a permanent loss of habitat within the ROW. Impacts related to permanent loss of forest habitat would be long term and of moderate intensity.

Operation of the proposed project would present the potential for avian collisions with the transmission line, particularly for larger, less maneuverable species and in areas of dense bird congregations, such as migrating waterfowl staging areas in the Missouri River crossing area. Under various conditions, including high wind, fog, or poor light, avian collisions with the line (generally the overhead shield wire, which is smaller and less visible than the actual conductor) may occur. Migratory waterfowl would be especially susceptible to transmission line collisions where the proposed transmission line would be located near staging areas and at the Little Missouri River and Missouri River crossings, as these waterways would tend to concentrate waterfowl and provide natural flight corridors. Impacts on birds related to line collisions during project operation would be long term and of low intensity. Both Alternative Route A and Alternative Route B are located entirely within the whooping crane migration corridor. Specific impacts on whooping cranes are discussed further in the special status species section.

Electrocutions of large avian species, particularly raptors, have been known to occur from contact with energized lines. Electrocutions are primarily due to the close vertical or horizontal separation of conductors and other equipment often found in distribution lines. The Avian Power Line Interaction Committee (2006, p. 88) states that transmission lines rarely electrocute birds because of the larger separation distance. The separation of conductors on transmission lines is well beyond the separation found in most distribution lines. The Avian Power Line Interaction Committee (2006) recommends a separation of 60 inches on distribution and transmission lines. Electrocution impacts from operation of the line are considered to be long term and of low intensity, due to the avian protection elements that will be incorporated in the design of the line and transmission structures.

The presence of the utility line structures may also impact raptor predator-prey relationships by providing additional locations from which raptors can hunt (perches). Changes to raptor predator-prey relationships are expected to be long term and of moderate intensity.

As part of project implementation, USFWS and NDGFD would be consulted to develop and implement a plan to protect any identified nests from adverse effects during construction. Raptors and other birds may utilize the transmission line structures, switchyard, and substations for perching and nesting after construction. Basin Electric will develop an Avian Protection Plan in coordination with USFWS and NDGFD for operation of the line and associated facilities that will address, among other things, nest removal and protection, line collision, electrocution, and predation effects.

Aquatic Species

Construction-related impacts on fish and other aquatic species are not likely to occur. Placement of transmission structures in any body of water along the course of either Alternative Route A or Alternative Route B is not proposed. BMPs (Appendix A) would be employed during construction and maintenance activities to prevent soil erosion and runoff, sedimentation, water quality changes, and contamination of water from herbicides, fuels, and other spills, which could harm aquatic species.

Where necessary, temporary low-water crossings or culverts would be installed at ditches, streams, or other watercourses to provide access to the ROW for construction vehicles. Installation of low-water crossings or culverts may require a permit from USACE and/or the state of North Dakota. Basin Electric would coordinate with these entities prior to installing low-water crossings or culverts regarding permitting requirements and construction conditions. Structures would be designed and installed so as not to inhibit fish passage, or create upstream or downstream habitat changes. Impacts related to installation of these structures are considered short term and of low intensity due to their design and installation. Approximately 11 permanent streams would be crossed by Alternative Route A, and approximately 15 permanent streams would be crossed by Alternative Route B. As part of project design and constructability, these stream crossings would be evaluated to determine if culverts would be appropriate for equipment crossings. It is anticipated that numerous streams would be too large for culvert installation and would be bypassed by construction. All streams would be spanned and equipment would cross only at designated locations. Clearing of vegetation along stream banks (riparian vegetation) may cause a local increase in water temperature due to increased levels of sunlight warming the water, potentially changing the aquatic habitat in these areas. Areas of riparian vegetation may be considered wetlands under the jurisdiction of USACE and may require a permit for disturbance or clearing. Removal of woody riparian vegetation is considered a long-term impact of low to high intensity depending on the location and amount of removal. The majority of woody riparian vegetation occurs within the Missouri River and Little Missouri River valleys. Where both Alternative Routes A and B cross the Missouri River valley, woody vegetation consists only of a few randomly-scattered trees along the existing Highway 85 and Western 230-kV line corridor. Woody vegetation at the Little Missouri River crossings by these alternatives would generally be limited to a few acres within a narrow band immediately adjacent to the river, depending on the exact location of the crossing.

Proposed Substations and Switchyards

Construction of the proposed Judson and Tande 345-kV substations and the proposed Killdeer switchyard would require the removal of all vegetation within the fenced boundary of the sites. The proposed substation sites each would be 12 acres, and likely consist of grassland habitat. The proposed switchyard would also be 12 acres and would be located within a general area approximately 3.5 miles northeast of the town of Killdeer. Land use in these areas is a mixture of grassland and tillable cropland. Loss of vegetation in these fenced areas would be permanent, and any available wildlife habitat would be converted to utility use. Impacts on wildlife during construction would be similar to those incurred during construction of the transmission line. Exact impacts on available habitat would be determined upon acquisition of a site. Wildlife species using any available habitat on the proposed substation and switchyard sites would be displaced to available habitat adjacent to these sites.

Special Status Species

The project area may contain habitat for or has known occurrences of federally endangered, threatened, and candidate species; USFS sensitive and MIS species; and, North Dakota Species of Conservation Priority. These species are cumulatively referred to in this report as special status species.

USFWS reports five federally listed endangered animal species, the whooping crane, interior least tern, pallid sturgeon, black-footed ferret, and gray wolf; one federally listed threatened species, the piping plover; and two candidate species, the Sprague's pipit and Dakota skipper; from the counties crossed by the project. (USFWS, 2011g). No federally listed endangered or threatened plant species are known to occur within the project area. However, the ROW for both potential alternative routes crosses designated critical habitat for the piping plover and known habitat for the pallid sturgeon at the Missouri River crossing.

Both alternative routes contain 61.4 acres of critical habitat[3] within the ROW for the piping plover. Critical habitat crossed by the project for the piping plover includes the banks of the Missouri River and its associated islands, sandbars and floodplain of the Missouri River near Williston. Potential impacts on piping plover habitat would include the disturbance to birds and nesting areas, and placement of structures within areas of potential nesting habitat. Basin Electric will coordinate with USFWS regarding permitting requirements and construction conditions. At a minimum, it is expected that USFWS will prohibit construction in designated critical habitat during the piping plover nesting season (mid-April to mid-August). Impacts on piping plover cannot be fully identified and quantified until the final engineering analysis has determined the actual location of the structures. Additionally, both alternative routes cross the Missouri River near Williston, which is known habitat for the pallid sturgeon. Habitat for the pallid sturgeon within the project area includes the upper reaches of the Missouri River itself and backwater floodplain areas. Impacts on sturgeon habitat are not anticipated because the project is not anticipated to impact surface water habitats or the flooding characteristics of the Missouri River and the adjacent floodplain.

Although critical habitat for the whooping crane has not been designated within North Dakota, much of the project area is within the whooping crane migration corridor, as defined by USFWS, and contains habitat types that whooping cranes use for foraging (e.g. cropfields) and roosting (e.g. wetlands). This migration corridor provides the area within which whooping cranes could be expected to occur during spring and fall migration periods. The centerline of the corridor represents the core of the area followed by the cranes. The wider the migration corridor, the more likely cranes will occur within the corridor area considered. However, as the migration corridor widens out, the likelihood of crane occurrence decreases with distance from the migration corridor centerline. While the potential for crane occurrence at any particular location within the migration corridor would vary from year to year based on weather conditions and associated availability of water and wetlands and crop stages, over time, the greatest crane occurrence and use would trend toward the centerline of the migration corridor. Table 3-21 provides a comparison of the length in miles that Alternative Route A and Alternative Route B would occur within each whooping crane percent occurrence migration corridor (Figure 3-21). Although migration can be highly variable, this data provides an indication of the probability of whooping crane occurrence along each route compared to the other. Alternative Route B not

[3] Piping plover critical habitat and pallid sturgeon habitat information was obtained from USFWS maps. Acreage of piping plover critical habitat was determined by measuring the amount of critical habitat occurring within the proposed project ROW.

only has more total length within the migration corridor, it also has considerably more length within the more central area of the corridor, particularly the 75 to 85 percent occurrence areas. In contrast, Alternative Route A has less total length in these core areas, only exceeding Alternative Route B in the more fringe 90 percent occurrence area.

Table 3-21: Whooping Crane Percent Migration Corridor Comparison

Alternative Route	Length Through Whooping Crane Percent Migration Corridors (miles)					
	75%	80%	85%	90%	95%	Total
A	53.4	51.7	53.6	35.8	0	194.5
B	58.6	79.5	54.1	17.2	0	209.4

Source: BMcD, 2012, Figure 3-21.

Whooping cranes are highly dependent on wetlands during migration for roosting, resting, and feeding and have been known to use wetland areas within the project area. Wetland acres within 1 mile of the proposed route may also provide an indication of the likelihood of whooping cranes utilizing the project area. Alternative Route A would be located within 1 mile of 828.2 acres of NWI–identified wetlands for the length of the route. Alternative Route B would be located within 1 mile of 1,378.8 acres of NWI-identified wetlands. This greater density of wetlands along Alternative Route B may in part reflect why this area is more central to the overall migration corridor and contributes to a greater likelihood of whooping crane occurrence along Alternative Route B. Greater probability of occurrence would indicate greater potential for whooping crane interactions with the transmission line.

USFS has identified 19 sensitive animal species in North Dakota that are known to occur in the Dakota Plains National Grasslands, which includes the LMNG (Appendix E). These include eight birds (Baird's sparrow, bald eagle, burrowing owl, greater prairie chicken, greater sage-grouse, loggerhead shrike, long-billed curlew, and Sprague's pipit); two mammals (black-tailed prairie dog and bighorn sheep); and nine species of butterfly (Arogos skipper, broad-winged skipper, Dakota skipper, mulberry wing, Ottoe skipper, Powesheik skipper, regal fritillary, and tawny crescent. USFS has also identified 38 sensitive/watch plants species in the LMNG. In addition, USFS has requested that the EIS address two MIS species for LMNG: the black-tailed prairie dog and the plains sharp-tailed grouse.

Table 3-22 provides a comparison of project considerations for federally listed and USFS sensitive and MIS animal species between Alternative Route A and Alternative Route B. North Dakota Species of Conservation Priority and USFS sensitive/watch plant species are not specifically addressed here as the effects discussion for federally listed species and USFS sensitive species should encompass habitats utilized by North Dakota Species of Conservation Concern and USFS sensitive/watch plant species.

Table 3-22: Potential Project Considerations for Federally Listed, U.S. Forest Service Sensitive and MIS Species (Animal Only)

Species	Alternative Route A	Alternative Route B	Comment
Endangered			
Whooping crane	Approximately 195 miles (entire length of route) of new line within migration corridor (Table 3-21); 828.2 acres of NWI-identified wetlands within 1 mile of route.	Approximately 209 miles (entire length of route) of new line within migration corridor (Table 3-21); 1,378.8 acres of NWI-identified wetlands within 1 mile of route.	Collisions with transmission lines pose highest potential risk, especially where line is located between wetland roosting areas and agricultural areas used for foraging. Habitat locations will be identified in the project area (except in the badlands area, which USFWS indicated does not need to be reviewed for habitat). Project-specific mitigation measures will be developed as part of detailed species-specific evaluation in the Biological Assessment, in consultation with USFWS.
Interior least tern	None.	None.	Interior least terms may utilize sandbars in the vicinity of the Missouri River crossing. Project-specific mitigation measures will be developed as part of detailed species-specific evaluation in the Biological Assessment, in consultation with USFWS.
Pallid sturgeon	None.	None.	There will be no in-water work within the Missouri River and no work within its inundated floodplain; BMPs would be used to prevent impacts on water resources.
Black-footed ferret	None.	None.	No populations known to exist in North Dakota (USFWS, 2011b); surveys for prairie dog towns will be conducted prior to construction to identify habitat for black-footed ferret
Gray wolf	None.	None.	No populations known to exist within the study area.

Species	Alternative Route A	Alternative Route B	Comment
Threatened			
Piping plover	Approximately 61.4 acres of designated critical habitat within ROW.	Approximately 61.4 acres of designated critical habitat within ROW.	A habitat survey will be conducted 1000 feet on both sides of the centerline of the preferred route and findings included in the Biological Assessment. Project-specific mitigation measures will be developed as part of detailed species-specific evaluation in the Biological Assessment, in consultation with USFWS.
Candidate			
Sprague's pipit (also a USFS sensitive species)	Approximately 1,680 acres of grassland habitat potentially containing areas of suitable native grassland within proposed ROW (Table 3-18).	Approximately 2,058 acres of grassland habitat potentially containing areas of suitable native grassland within proposed ROW (Table 3-18).	Potential temporary disturbance to grassland habitat within ROW; grassland habitat re-established upon completion of construction. A habitat survey will be conducted 1000 feet on both sides of centerline of the preferred route and findings included in the Biological Assessment and FEIS. Project-specific mitigation measures will be developed as part of detailed species-specific evaluation in the Biological Assessment, in consultation with USFWS.
Dakota skipper (also a USFS sensitive species)	Approximately 1,680 acres of grassland habitat potentially containing areas of suitable native grassland within proposed ROW (Table 3-18).	Approximately 2,058 acres of grassland habitat potentially containing areas of suitable native grassland within proposed ROW (Table 3-18).	Potential temporary disturbance to native grassland habitat within ROW; grassland habitat to be re-established upon completion of construction. Project-specific mitigation measures will be developed as part of detailed species-specific evaluation in the Biological Assessment, in consultation with USFWS.
U.S. Forest Service Sensitive Species			
Baird's sparrow	Approximately 1,680 acres of grassland habitat potentially containing areas of suitable native grassland within proposed ROW (Table 3-18).	Approximately 2,058 acres of grassland habitat potentially containing areas of suitable native grassland within proposed ROW (Table 3-18).	Potential temporary disturbance to native grassland habitat within ROW; grassland habitat to be re-established upon completion of construction. Project-specific mitigation measures will be developed in consultation with USFS and will be included as conditions in the SUP.

Species	Alternative Route A	Alternative Route B	Comment
Bald eagle	No known nests within 1 mile of centerline of proposed ROW.	No known nests within 1 mile of centerline of proposed ROW.	Nest surveys for raptors will be conducted in an area 1 mile on both sides of the centerline of the preferred alignment during spring 2013. As part of project implementation, USFWS, USFS and NDGFD would be consulted to develop and implement a plan to protect any identified nests from adverse effects during construction. Basin Electric will develop an Avian Protection Plan for operation of the line and associated.
Burrowing owl	Approximately 1,680 acres of grassland within proposed ROW (Table 3-18).	Approximately 2,058 acres of grassland habitat within proposed ROW (Table 3-18).	Surveys for burrowing owls will be conducted prior to ROW clearing. Potential temporary disturbance to native and non-native grassland habitat within ROW; grassland habitat to be re-established upon completion of construction. Project-specific mitigation measures will be developed in consultation with USFS and will be included as conditions in the SUP.
Greater prairie chicken	None.	None.	No populations known to exist within the study area.
Greater sage-grouse	Approximately 1.4 acres of sage brush habitat within the proposed ROW (Table 3-19).	Approximately 2.8 acres of sage brush habitat within the proposed ROW (Table 3-19).	Sage grouse not reported from the study area, but are reported from adjacent counties. Potential disturbance to sage brush habitat within ROW; sage brush habitat to be re-established upon completion of construction; Project-specific mitigation measures will be developed in consultation with USFS and will be included as conditions in the SUP.
Loggerhead shrike	Approximately 1,680 acres of grassland within proposed ROW (Table 3-18). Approximately 1.4 acres of sage brush habitat within the proposed ROW (Table 3-19).	Approximately 2,058 acres of grassland habitat within proposed ROW (Table 3-18). Approximately 2.8 acres of sage brush habitat within the proposed ROW (Table 3-19).	Potential disturbance to sage brush and grassland habitat within ROW; sage brush and grassland habitat to be re-established upon completion of construction. Project-specific mitigation measures will be developed in consultation with USFS and will be included as conditions in the SUP.

Species	Alternative Route A	Alternative Route B	Comment
Long-billed curlew	Approximately 1,680 acres of grassland within proposed ROW (Table 3-18). Approximately 1,366 acres of cropland within proposed ROW (Table 3-18).	Approximately 2,058 acres of grassland habitat within proposed ROW (Table 3-18). Approximately 2,272 acres of cropland within the proposed ROW (Table 3-18).	Potential temporary disturbance to grassland habitat and cropland within ROW; grassland habitat to be re-established upon completion of construction. Project-specific mitigation measures will be developed in consultation with USFS and will be included as conditions in the SUP.
Black-tailed prairie dog (also a MIS for the LMNG)	Approximately 1,680 acres of grassland within proposed ROW (Table 3-18).	Approximately 2,058 acres of grassland habitat within proposed ROW (Table 3-18).	Surveys for prairie dog towns will be conducted prior to ROW clearing. Potential temporary disturbance to native and non-native grassland habitat within ROW; grassland habitat to be re-established upon completion of construction. Project-specific mitigation measures will be developed in consultation with USFS and will be included as conditions in the SUP.
Bighorn sheep	Approximately 1,680 acres of grassland within proposed ROW (Table 3-18). Approximately 95 acres of woodland habitat within the proposed ROW (Table 3-18)	Approximately 2,058 acres of grassland habitat within proposed ROW (Table 3-18). Approximately 100 acres of woodland habitat within the proposed ROW (Table 3-18).	Potential impacts to foraging, wintering, and lambing habitat; Basin Electric will coordinate with NDFGD and USFS to avoid construction in lambing areas during the lambing season; Project-specific mitigation measures will be developed in consultation with USFS and will be included as conditions in the SUP.
Arogos skipper	Approximately 1,680 acres of grassland habitat potentially containing areas of suitable native grassland within proposed ROW (Table 3-18).	Approximately 2,058 acres of grassland habitat potentially containing areas of suitable native grassland within proposed ROW (Table 3-18).	Potential temporary disturbance to native grassland habitat within ROW; grassland habitat to be re-established upon completion of construction. Project-specific mitigation measures will be developed in consultation with USFS and will be included as conditions in the SUP.
Broad-winged skipper	None.	None.	No populations known to exist in the study area. Species only reported from eastern North Dakota.
Dion skipper	None.	None.	No populations known to exist in the study area. Species only reported from eastern North Dakota.
Mulberry wing	None.	None.	No populations known to exist in the study area. Species only reported from eastern North Dakota.

Species	Alternative Route A	Alternative Route B	Comment
Ottoe skipper	Approximately 1,680 acres of grassland habitat potentially containing areas of suitable native grassland within proposed ROW (Table 3-18).	Approximately 2,058 acres of grassland habitat potentially containing areas of suitable native grassland within proposed ROW (Table 3-18).	Populations known to exist in western North Dakota. Potential temporary disturbance to native grassland habitat within ROW; grassland habitat to be re-established upon completion of construction (USFWS, 2011d). Project-specific mitigation measures will be developed in consultation with USFS and will be included as conditions in the SUP. .
Powesheik skipper	None.	None.	No populations known to exist in the study area. Species only reported from eastern North Dakota.
Regal fritillary	Approximately 1,680 acres of grassland habitat potentially containing areas of suitable native grassland within proposed ROW (Table 3-18).	Approximately 2,058 acres of grassland habitat potentially containing areas of suitable native grassland within proposed ROW (Table 3-18).	Populations known to exist in western North Dakota. Potential temporary disturbance to native grassland habitat within ROW; grassland habitat to be re-established upon completion of construction. Project-specific mitigation measures will be developed in consultation with USFS and will be included as conditions in the SUP.
Tawny crescent	Approximately 1,680 acres of grassland habitat potentially containing areas of suitable native grassland within proposed ROW (Table 3-18). Forested wetland not known from the proposed ROW (Table 3-20).	Approximately 2,058 acres of grassland habitat potentially containing areas of suitable native grassland within proposed ROW (Table 3-18). Approximately 0.02 acres of forested wetland within the proposed ROW (Table 3-20).	Populations known to exist in western North Dakota. Potential temporary disturbance to native grassland habitat within ROW; grassland habitat to be re-established upon completion of construction. Project-specific mitigation measures will be developed in consultation with USFS and will be included as conditions in the SUP.
U.S. Forest Service Management Indicator Species			
Plains sharp-tailed grouse	Approximately 1,680 acres of grassland habitat potentially containing areas of suitable native grassland within proposed ROW (Table 3-18).	Approximately 2,058 acres of grassland habitat potentially containing areas of suitable native grassland within proposed ROW (Table 3-18).	Potential temporary disturbance to native grassland habitat within ROW; grassland habitat to be re-established upon completion of construction. Project-specific mitigation measures will be developed in consultation with USFS and will be included as conditions in the SUP.

Surveys for Species under U.S. Forest Service Jurisdiction

Coordination has occurred with USFWS to determine the level of investigations required to provide information for the Biological Assessment being prepared for this project. As a result of that coordination and in preparation of the Biological Assessment, desktop reviews and field surveys will occur in the fall 2012 and spring 2013 for the following species:

Whooping Crane — The initial determination of whooping crane habitat within the project study area will occur using the Resource Selection Function methodology that USFWS approved. Based on discussions with USFWS, the badlands area will not be included in the review area for the Whooping Crane. The Resource Selection Function methodology will be supplemented by verification on the ground during spring 2013.

Sprague's Pipit — Beginning fall 2012, an ongoing analysis of Sprague's pipit habitat is being conducted by reviewing aerial photography to determine native prairie grasslands locations within a 2,000-foot survey corridor (1,000 feet on each side of the centerline). A presence survey for Sprague's pipit will be conducted prior to initiating construction activities in areas identified as habitat for the species.

Piping Plover — Beginning fall 2012, an analysis of piping plover habitat is being conducted by reviewing aerial photography and soils data to determine alkali wetland locations within a 2,000-foot survey corridor (1,000 feet on each side of the centerline). A presence survey for piping plover will be conducted prior to initiating construction activities in areas identified as habitat for the species.

Raptor Nest Surveys — A survey for raptor nests in within a 2-mile-wide survey corridor (1 mile on either side of the centerline) will occur in spring 2013. A second survey of the area for raptor nests will be conducted in spring 2013 to determine occupancy of the nests.

No surveys will be required for other species under the jurisdiction of USFWS.

U.S. Forest Service Sensitive and Management Indicator Species

Coordination with the USFS Dakota Prairie Grasslands office (USFS, 2012b) resulted in USFS providing a list of sensitive wildlife species. This list has been prepared by the USFS's Region 1 Forester and has identified several taxa as being of special conservation concern in the grasslands areas across Montana, Idaho, North Dakota and South Dakota. The list is included in Appendix E. In order to issue a SUP to cross USFS lands, USFS has requested that a Biological Evaluation be prepared and that field surveys be conducted for sensitive plant species that they have identified on USFS lands (Appendix F). These surveys will take place between May 15 and September 15, 2013. All surveys would be conducted in compliance with USFS protocols for the LMNG. USFS also asked that the EIS address two MIS species for the Dakota Prairie National Grasslands, the sharp-tailed grouse and the black-tailed prairie dog (USFS, 2012a).

Proposed Substations and Switchyards

No special status species or habitat for these species is known to occur within the site boundaries for either substation. Impacts on special status species resulting from construction and operation of these sites would not occur. If Alternative Route B is selected as the final route, detailed investigations and surveys of the Killdeer switchyard would be conducted to determine the presence of special status species or their habitats.

Alternative Route A

Short-term impacts associated with the construction of Alternative Route A would include the disturbance of herbaceous vegetation along temporary access roads, as well as temporary disturbance of vegetation within the ROW boundary for access during construction. Grassland vegetation comprises the largest amount of acreage within the ROW for Alternative Route A (1,680 acres), although very little of this area would actually be subject to disturbance during construction. Grassland vegetation would be temporarily impacted during construction, but due to its short height, removal of minimal grassland vegetation would be anticipated within the ROW except at structure locations, and grassland vegetation would be expected to recover in full upon the completion of construction and revegetation efforts. Vegetation used for pasture or hayland would be temporarily impacted as well, primarily during structure erection and pulling of conductors. In agricultural areas, cropland would be temporarily disturbed within the ROW during construction, but would be re-planted following completion of construction. Long-term grassland vegetation impacts associated with Alternative Route A would primarily be confined to the removal of vegetation at each structure foundation location, resulting in a permanent loss of vegetation of approximately 1.04 acres over the length of the route, assuming 0.0009 acre per structure and 1,150 structures.

Approximately 95 acres of woodland is located within the proposed ROW. Typically, trees would be cleared to maintain access to the ROW and appropriate clearance for the safe and reliable operation of the line. For this project, much of the woodland vegetation is associated with deep draws and canyons in badland areas and around drainages. It is likely that many of these areas would be spanned in such a manner that the trees would pose no hazard to the line and clearing would be unnecessary. Thus, while approximately 95 acres of woodland occurs within the ROW, considerably less woodland is likely to actually require clearing. Therefore, long-term impacts on woodland areas would be less than 95 acres. Depending on the type of vegetation adjacent to these wooded areas, cleared woodland areas would likely be converted to grassland or pasture similar to those found throughout the project area. In addition, though not categorized as woodland, numerous treed windbreaks, shelterbelts, and fencerows would be crossed by the proposed project. Trees within the ROW at these locations would be cleared, and the areas converted to similar vegetative cover that is adjacent to the cleared areas.

The North Dakota Natural Heritage Inventory database indicates that a significant ecological community is located within 1,000 feet of the centerline for Alternative Route A in Dunn County (North Dakota Parks and Recreation Department, 2011a). This significant ecological community consists of western little bluestem prairie. It is anticipated that the construction and operation of Alternative Route A would avoid this sensitive area, since it is not within the ROW for Alternative Route A. If this area would be affected based on the final route alignment for Alternative Route A, Basin Electric would coordinate closely with the Natural Heritage Inventory and NDGFD to avoid, minimize or mitigate any adverse impacts to this area. Periodic tree-trimming of the ROW would be anticipated to keep the transmission lines clear of any vegetation obstructions during line operation and to keep the line accessible for maintenance. Herbicides may be used periodically within the ROW to prevent the growth and spread of noxious weeds, control woody vegetation, and prevent stump sprouting. These activities are not anticipated to have any permanent impacts on vegetation outside of the transmission ROW along the length of the route as they will be used according to label specifications by certified applicators within the ROW only. However, it may occasionally be necessary to trim or remove trees adjacent to the ROW that pose a hazard to the safe and reliable operation of the line (danger trees). Management of danger trees would be infrequent, and would have little if any effect on adjacent vegetative communities.

Transmission structures would be located to avoid being placed within any wetlands within the ROW of Alternative Route A, and no clearing of wetland vegetation is anticipated within the ROW of Alternative Route A. Where impacts on wetland or riparian areas are unavoidable, impacts would be minimized and mitigated. BMPs, as described in Appendix A of this document, would be employed to minimize impacts on wetlands within the ROW during construction of Alternative Route A. Mitigation measures would be determined by USACE during the CWA permitting process.

Specific, sensitive areas used by certain big game species, such as lambing areas for bighorn sheep, are located within areas of the Little Missouri River Badlands within or near the LMNG. These areas would be crossed by Alternative Route A and bighorn sheep could potentially be affected if Alternative Route A, which impacts approximately 147 acres of LMNG, was to be constructed through or near these areas during the lambing season. Although not as sensitive, elk calving in these areas could also be affected depending on the timing of construction through this area. Consultation with NDGFD (2012b) determined that timing restrictions during construction would need to be adhered to within these areas in order to prevent disturbance to bighorn sheep lambing activities (April 1st thru July 1st). Should Alternative Route A ultimately be approved and constructed, Basin Electric would coordinate closely with NDGFD on the location of the line and timing of construction. Based on this coordination and development and implementation of appropriate mitigation, it is anticipated that, although habitat within the ROW may be changed or modified from its current condition, big game calving and lambing activities would not be adversely impacted by construction. Following construction, the ROW would provide foraging habitat not dissimilar to that currently present in the area and within existing utility ROWs. No long-term changes in big game use of the area would be anticipated.

Alternative Route B

Construction and operational effects on vegetation for Alternative Route B would be similar to those discussed above for Route A. Long-term impacts to herbaceous vegetation associated with Alternative Route B would primarily be confined to the removal of vegetation at each structure foundation location, resulting in a permanent loss of vegetation of approximately 1.13 acres over the length of the route, assuming 1,250 structures of 0.0009 acres each. Approximately 100 acres of woodlands would be within the ROW. Similar to Alternative Route A, much of the woodland along Alternative Route B would be spanned, and clearing would not be required. Therefore, long-term impacts on woodlands would occur to fewer than 100 acres. Any woodland clearing would result in a permanent change in vegetative cover within the ROW in these areas. The previously-mentioned Natural Heritage Inventory-identified sensitive ecological community located in Dunn County would be avoided.

Operational impacts on vegetation for Alternative Route B are anticipated to be similar to those discussed for Alternative Route A. Periodic trimming or removal of danger trees would be needed to keep the ROW clear of any vegetation obstructions that could prevent access or compromise the safe and reliable operation of the line.

Transmission structures would be located to avoid being placed within any wetlands within the ROW of Alternative Route B. Depending on the final alignment of this alternative, approximately 0.02-acre of NWI-mapped forested wetland may potentially be cleared and converted to emergent or scrub/shrub wetland or cleared. This may occur if this area is determined through wetland delineation to be a forested wetland under the jurisdiction of USACE and if the trees comprising the forested wetland require removal from the ROW during construction. If this were to occur, BMPs would be employed to minimize impacts on forested wetland areas adjacent to the ROW during tree removal within the ROW, the appropriate permit from USACE would be obtained, and any permit conditions would be followed.

3.6 CULTURAL RESOURCES

This section of the EIS identifies known cultural resources in the study area. Cultural resources will continue to be identified as consultation under Section 106 of NHPA proceeds. Consultation with all parties will continue until the project is completed and all (necessary) mitigation measures are completed.

There is no legal or generally accepted definition of "cultural resources" within the federal government; however, the term is used to refer to historic, aesthetic, and cultural aspects of the human environment. Under NEPA, the human environment includes the natural and physical (e.g., buildings) environment, and the relationships of people to that environment. Accordingly, a thorough NEPA analysis addresses the human (social and cultural) and natural aspects of the environment, and the relationships between them. In meeting its requirements as the lead agency for NEPA, RUS must consider the impact of its actions on all aspects of the human environment, including "cultural resources." An Archaeological Resources Protection Act permit must be obtained prior to conducting archaeological surveys on federal lands. The requirements of the permit must be met by the archaeologists responsible for completing the survey.

Cultural resources include archeological sites, defined as locations "that contain the physical evidence of past human behavior that allows for its interpretation;" buildings; structures; and traditional resources and use areas (NPS, 1997). Those cultural resources that qualify for listing in the National Register of Historic Places (NRHP) must meet one or more of the following criteria for evaluation.

The quality of significance in American history, architecture, archaeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling and association, and:

- that are associated with events that have made a significant contribution to the broad patterns of our history; or
- that are associated with the lives of persons significant in our past; or
- that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
- that yielded, or may be likely to yield, information important in prehistory or history (NPS, 1997).

NRHP is a commemorative listing of those resources significant to the American past. Those cultural resources listed on or eligible for listing on NRHP are designated "historic properties." Under NHPA, as amended 2006, "historic property" means "any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion on the NRHP, including artifacts, records, and material remains related to such a property or resource (16 U.S.C. 470w). In accordance with Section 106 of NHPA (16 U.S.C. 470f), RUS is required to take into account the effect of its undertakings on historic properties. The regulation, "Protection of Historic Properties" (36 CFR Part 800), implementing Section 106 establishes the process through which RUS and other federal agencies consider effects to historic properties in their decision making.

3.6.1 Affected Environment

Basin Electric approached RUS for financial assistance to construct the project, thereby making the proposed project an undertaking subject to review under Section 106 of NHPA and its implementing regulation (36 CFR Part 800). As the lead agency, RUS is coordinating compliance through Western between the Section 106 procedures and the steps taken to meet NEPA requirements. As such, studies and analyses conducted to comply with NEPA, including this EIS, would be used and expanded as appropriate by RUS to meet the requirements of Section 106. Pursuant to 36 CFR Part 800.2(d) (3), RUS has used its NEPA procedures to meet its requirements for public involvement under 36 CFR Part 800.

Geographic Scope

Pursuant to 36 CFR Part 800.16(d), the area of potential effects (APE) is defined as the area within which the proposed project that has the potential to either directly or indirectly affect historic properties that may be present. Currently, the APE includes the 1,000-foot-wide ROW for each alternative route. However, the APE also must address visual effects. Given the height of the proposed structures and the requirement to maintain an alignment cleared of vegetation, the proposed project could alter a historic property's integrity by diminishing its setting or feeling. Accordingly, the APE would be adjusted and refined as RUS learns more about the historic properties that might be present and the project's specific effects on them.

Study Area

The study area includes the entire geographic area evaluated in order to develop all of the alternatives proposed in the *Macro-corridor Study* and *Alternatives Evaluation Study*. As such it encompasses the APE, but is much broader.

Consultation

The consultation process for the proposed project is ongoing. It is anticipated that Basin Electric will notify and invite the ND SHPO, Indian tribes, federal and state permitting agencies, and other yet to be identified agencies and organizations to participate in Section 106 consultation. The following tribes will be invited to participate in the consultation.

- Flandreau Santee Sioux
- Santee Sioux Nation
- Fort Peck Assiniboine and Sioux Tribes
- Spirit Lake Tribe
- Fort Belknap Indian Community

- Standing Rock Sioux
- Leech Lake Band of Ojibwe
- Three Affiliated Tribes
- Lower Sioux Indian Community
- Turtle Mountain Chippewa
- Minnesota Chippewa Tribe
- Upper Sioux Indian Community
- Prairie Island Indian Community
- White Earth Nation

These activities will support the required NEPA/Section 106 coordination effort and provide information to assist in the selection of an alternative route to analyze in the EIS. In addition, RUS has determined the appropriate level of effort needed to identify and evaluate historic properties, and to resolve concerns about providing comparable information for analysis across alternatives. Information concerning the level of effort was developed by RUS, the SHPO, and other agencies at a scoping meeting held in Bismarck on November 14, 2011. For the purposes of NEPA it has been determined that the Class I survey of the alternatives is sufficient for the analysis of the alternatives. Once a final alternative is selected it will be subjected to either a Class II or Class III survey as detailed in the SHPO letter of May 3, 2012. Section 106 consultation will be completed prior to the construction phase of the project.

History of the Study Area

The *North Dakota Comprehensive Plan for Historic Preservation: Archaeological Component,* (ND SHPO, 2008) divides the state into a series of study units centered on the major drainages in the state. The plan summarizes the archaeological record for each study unit and the investigations that have occurred, and provides a comprehensive and concise overview of the cultural resources in each. The plan also is a tool whereby the level of inventory within a study unit can be evaluated. Both alternatives cross the Little Missouri Study Unit (Unit #1), the Knife River Study Unit (Study Unit #3), and the Garrison Study Unit (Unit #6). Of these units, the Little Missouri and Garrison study units have probably experienced more cultural resource investigations than the Knife River study unit, the primary reason being these units have been the focus of oil development.

<u>Background</u>

Although the proposed project alternatives cross three study units, the prehistory and history of the three are similar. The prehistory of the three can be divided into six chronological periods or traditions: Paleo-Indian, Plains Archaic, Plains Woodland, Plains Village, Equestrian Nomad, and Euro-American Settlement. The descriptor "Plains" intimates that developments here more closely resembled development further west and south than east. The following discussion is based primarily on *The North Dakota Comprehensive Plan for Historic Preservation: Archaeological Component* (ND SHPO, 2008); *Archeological and Bioarcheological Resources of the Northern Plains* (Frison and Mainfort, 1996); *Introduction to Middle Missouri Archaeology* (Lehmer, 1971); *Prehistoric Hunter-Gatherers of the High Plains and Rockies* (Kornfeld, et al., 2010), and *Archaeology of the Great Plains* (Wood, 1998).

In the three study units, the major drainages–the Little Missouri, Knife River, and Missouri–were the focus of both prehistoric and historic occupation and utilization. The Knife River Study Unit is also distinguished by the presence of the Knife River flint quarries. These quarries were arguably the most important source in the Northern Plains of suitable lithic material for making stone tools. Archaeological evidence indicates that Paleo-Indians first used the quarries and use extended up into the early historic period. The Crowley Flint Quarry near Golden Valley in Mercer County is a State Historic Site (Snortland, 1999). The Lynch Knife River Flint Quarry National Historic Landmark was dedicated in 2012. This 690-acre landmark is near Dunn Center in Dunn County and is distinguished by the presence of numerous pits that were dug to extract the lithic material (Hiemsta, 2008).

Paleo-Indian Tradition (11,500 - 7,500 Years before present [B.P])—The first evidence of humans occupying North America, including North Dakota, is referred to as the Paleo-Indian period. The Paleo-Indian tradition is divided into a series of complexes, each distinguished by distinctive projectile points and each temporally distinct. Claims have been made for earlier populations, often referred to as Pre-Clovis (Lepper and Bonnichsen, 2004), but the evidence has generally been considered inconclusive.

Geoarchaeological studies indicate that western North Dakota was ice-free and suitable for human occupation as early as 11,500 years B.P. The first appearance of humans in North Dakota is associated with the Clovis Complex. The complex is distinguished by a distinctive basally fluted projectile point and a highly developed bone and ivory technology. Evidence suggests that these early Paleo-Indians were highly mobile as they followed movements of and exploited now extinct Late Pleistocene megafauna such as mammoth, mastodon, bison, and camel along with locally available resources. Early Paleo-Indian sites are rare in North Dakota and no Clovis sites have been documented in the project area. A Clovis projectile point on Knife River flint from the Clovis Period was identified at a site near Beaver Creek in the Garrison Study Unit.

The Goshen Complex follows and dates to around 11,200 years B.P. Goshen style projectile points have been identified near the Knife River flint main quarry source area in Dunn County. One of the best known sites associated with this source area is located outside of Halliday.

The Folsom complex dates between 10,800 and 10,300 years B.P. Folsom points are distinguished by flutes made by removing a long channel flake that runs from the base of the point to well past the midline. Folsom people appear to have exploited now extinct species of bison along with deer, rabbit, pronghorn, and other smaller mammals. In North Dakota, Folsom components have been identified at sites on the Missouri River in Mountrail County and at Lake Ilo in Dunn County; Lake Ilo is within the Knife River flint quarry district.

Evidence for later Paleo-Indian complexes is more common throughout North Dakota. These complexes are differentiated by distinctive lanceolate projectile points, typically exhibiting parallel flaking, such as Agate Basin, Hell Gap, Alberta, and Cody. These Paleo-Indian complexes are typically associated with extinct forms of bison.

No evidence indicative of Paleo-Indian occupations have been found in any of the sites within or adjacent to either Alternative Routes A or B. Evidence of Paleo-Indians in the study area, consists of surface finds of their projectile points. The one exception is the Knife River flint quarries where intact deposits have been found.

Plains Archaic Tradition (7,500 – 2,400 Years B.P.)—By 9,000 years ago, the climate began to dry. This warm/dry period, called the Altithermal, lasted for several thousand years and peaked around 7,000 years ago. The Altithermal caused the glaciers to retreat and resulted in the extinction of 31 genera of large mammals. These changes caused a shift in subsistence patterns to hunting smaller mammals and an increased reliance on plant foods. This shift also saw changes in material culture which marked the onset of the Archaic Tradition. Excavation of deeply stratified sites has aided researchers conducting research on past climatic conditions in the northern plains. Early Archaic peoples hunted a now extinct form of bison smaller than the late Paleo-Indian form, but by the end of the Late Archaic all hunted species were essentially the modern forms. Evidence suggests that the bow and arrow was in use at least by the Late Archaic period in North Dakota. Late Archaic populations may also have practiced incipient horticulture. The use of tipis, marked by the presence of stone circles, often called “tepee rings” may have appeared during the Archaic Period.

The Plains Archaic Tradition is often divided into three periods: Early, Middle, and Late, based on changes in material culture. Evidence for Early Archaic occupations in North Dakota is more common than for the Paleo-Indian, but is still rare in comparison to subsequent periods. Early Archaic projectile point styles include Hawken and Mummy Cave Side-notched. However, some Early Archaic projectile points, like Simonsen, can be misidentified as late prehistoric Prairie Side-Notched points since they are relatively small and morphologically similar. Thus, some Early Archaic occupations may have been misidentified as later occupations. The Oxbow complex, defined by the Oxbow Side-notched point seems to fall between the Early and the Middle Archaic but is typically grouped with the Early Archaic period, although this is not always the case. The Middle Archaic is most often identified by the presence of McKean, Duncan, or Hanna points. These three projectile point types are frequently found in association with one another (e.g., at the Gant site in South Dakota). The Late Archaic in North Dakota is most often identified by the presence of Pelican Lake points. Other unnamed Late Archaic corner-notched points are similar to corner-notched points of the Early Plains Woodland so that sites containing such points but lacking pottery can easily be misidentified as Late Archaic.

The Archaic Tradition is well represented in the three study units crossed by the alternative routes. Two sites shared by both Alternative Routes A and B contain diagnostic Archaic artifacts. Two additional sites on Alternative Routes A and B also appear to date to the Archaic. Archaic sites in the project area will consist of cultural material scatters.

Plains Woodland Tradition (2,400 Years B.P. – A.D. 1000)—The Plains Woodland Tradition is also typically divided into the Early, Middle and Late Plains Woodland periods. The appearance of ceramics and the replacement of the attatl (spear thrower) with the bow and arrow are hallmarks of the tradition. The Middle Woodland Sonota complex is known for mortuary mounds and the Late Woodland is marked by the first fortified villages, the best known being the National Historic Landmark Menoken Village near Bismarck. Gardening appears to have been minor but integral aspect of subsistence by the Late Woodland period. Bison hunting and foraging were major aspect of the subsistence strategy. Archaeological evidence indicates that the Late Woodland tradition can be linked with cultural developments elsewhere in the Upper Midwest although the extent of the influence is poorly understood.

Projectile point styles and settlement-subsistence patterns of the Early Woodland are similar to those of the Late Archaic. Projectile points antecedent to Besant and ceramic variants such as Black Duck are hallmarks of the Early Woodland period. Vessels are generally thick-walled conchoidal forms with grit temper. The exteriors, and sometimes the interiors, are often cord roughened with decorations, if present, consisting of cord marking, embossing, and trailing over cord roughened surfaces.

The Middle Plains Woodland is well represented in the three study units and across the rest of North Dakota. The material culture is referred to as the Sonota-Besant and includes Besant Side-notched points, small Samantha Side-notched points, corner-notched points that resemble Pelican Lake, and ceramics that include conchoidal-shaped vessels with cord roughened exteriors, occasionally smoothed, and decorative bosses or punctuates along the rims. Middle Woodland population participated in interregional trade with Hopewell groups. Many of the stone circle sites and cairns are thought to be associated with Sonota-Besant camp sites.

The Late Plains Woodland period is represented by finely crafted side-notched arrow heads including Prairie Side-notched, Plains Side-notched, and Avonlea. Avonlea pottery is more conical in shape; often with net impressions although cord roughened pottery is still dominant. Conical mortuary mounds were still in use, but linear and effigy mounds also appear, most notable east of the Missouri River.

Plains Woodland sites are expected in the study area due to the proximity of the Knife River flint source area. More than 75 percent of the lithic artifacts recovered from the Early Woodland Naze site located along the James River were made from Knife River flint. This frequency most likely indicates direct procurement of the material rather than acquisition through trade. Several sites shared by Alternative Routes A and B appear to have Woodland components. Most sites will consist of cultural material scatters and sites with stone features such as rings and cairns, and possibly mounds.

Plains Village Period (A.D. 1000 – 1780)—The Plains Village tradition is represented by semi-sedentary hunter-gatherer-horticulturalists who lived in permanent villages for at least part of the year. The largest and most permanent of these villages were along the Middle Missouri River. The villagers practiced a mixed subsistence strategy that involved horticulture, hunting, and foraging. Hunting focused on bison augmented by other game. Horticulture involved corns, beans, squash, and tobacco.

The Northern Plains became warmer and droughts plagued the region between A.D. 1250 and 1500. This climate significantly reduced the amount of arable land, resulting in food shortages and increased warfare. These social upheavals continued on into the 1700s and are indicated by the appearance of fortification palisades and defensive ditches around village sites such as at Molander Village and Double Ditch, two state historic sites north of Bismarck (Snortland, 1999).

Stone tools available during this period include Plains and Prairie Side-notched projectile points along with unnotched triangular points, bifacially flake end scrapers, and heavy-duty bifacial cutting tools. Another hallmark was a diversity of bone tools such as the buffalo scapula hoe, which was integral to daily gardening activities. Pottery included globular jars with straight, out-curved, or braced rims and grit, as well as sand or shell temper. The exterior surfaces included smooth and unsmoothed cord, roughened or check stamps. Decorative elements like trailed lines, tool impressions and cord wrapped tool impressions were often added to each vessel. Trade is indicated by the appearance of non-local items such as obsidian, Gulf and Pacific coast marine shells, and catlinite.

Plains Village sites can be expected within the study area; sites have been identified in the three study units. Excavations at these sites have yielded ceramics dating between the 17th and 18th centuries A.D., chronologically important paleosols, and a stone circle containing temporally and culturally diagnostic artifacts. Conical timber lodges were apparently being constructed in the badlands during this time period.

Plains Village sites have been recorded in the study area. Most appear to represent temporary hunting and foraging sites, and include cultural material scatters and/or stone features that include rings, and/or cairns. Large village sites will most likely not be encountered except possibly where the alternative routes cross the Missouri River. Areas away from the drainages were mainly visited during hunting and/or foraging forays. Sites shared by both Alternative Routes A and B may have Plains Village components.

Equestrian Period (A.D. 1780 – 1880)—The Equestrian Period, sometimes referred to as the Fur Trade Period, was a time of great change among Native American peoples and their way of life. The beginning of the period is marked by the introduction of horses, followed by the rise of the Great Plains Equestrian Tradition, and culminating with the confinement of Native American groups on reservations. During this period, tribes like the Dakota Sioux that had been living to the east moved onto the Great Plains due to the encroachment of Euro-American settlement. This immigration created internal conflicts with tribes already present and later with Euro-Americans that were moving into the area. In 1864, following the Minnesota Sioux uprising of 1862, the U.S. Army under the command of General Sully engaged group of Teton, Yanktonai, and Dakota Sioux in the Killdeer Mountains. The location of that battle is now a state historic site (Snortland, 1999).

Groups that have historic ties to the study area and whose presence can be traced to this period include the Mandan, Hidatsa, Arikara, Crow, Assiniboine, Planis Cree, Chippewa, and the Lakota and Dakota Sioux (Royce, 1889; Schneider, 2002). These groups appeared at different times. For instance, the Sioux, Plains Cree, and Chippewa appeared later in the region, as they originated farther east. In contrast, the Mandan, Hidatsa, Crow, and Assiniboine appear to have been present at the time of the earliest Euro-Americans. The presence of these people is based largely on ethnographic accounts and military records.

Archaeologically, it is often difficult to identify the cultural affiliation of a particular site. Typically sites of this period can only be identified through the presence of Euro-American trade goods, especially metal objects and trade beads. Metal artifacts can rust away quickly and trade beads are generally tiny and easily overlooked during pedestrian inventory. There is only one site that may date to this period and it is shared by both alternative routes.

Euro-American/Settlement—Early Euro-American exploration in North Dakota was limited. Pierre La Verendrye and his sons traveled through the Red River area in the 1730s and journeyed along parts of the Souris and Missouri rivers in 1742-1744. More notably, Lewis and Clark traveled up the Missouri River in 1804-1806. Trappers and traders working for the Northwest and Hudson Bay companies began their work along the Red River in 1779 and the area soon became well known to trappers and traders working out of St. Paul, Minnesota, and Fort Garry, Manitoba (present day Winnipeg, Canada). Fur trappers moved down the Red River in canoes and overland on two-wheeled carts known as "Red River Carts." Several fur trade posts have been identified in western North Dakota, such as Fort Clark, a state historic site on the west bank of the Missouri River at the confluence of Chardon and Clark's creeks (Snortland, 1999) and Fort Union Trading Post, a National Historic Site southwest of Williston.

The first county in North Dakota was Pembina County, organized in 1867. The county at that time included nine present day counties. In the 1880s the counties were split up once again into roughly the present configuration. Railroads brought in the first substantial waves of settlers into eastern North Dakota in the early 1870s. Settlers acquired land from the railroads or through the Homestead and Timber Culture Acts of the 1870s. By 1883, practically all of the arable land in central and eastern North Dakota had been claimed. North Dakota gained statehood in 1889 with Bismarck established as the state capital. The railroad industry boomed from 1898 to 1915 leading to the rise in small towns across the state. Agricultural settlement followed a cyclical boom and bust pattern and in the 1930s the Great Depression made it impossible for smaller farms to succeed. Agriculture has always been the top economic force in North Dakota. The state has continued to boom and bust based on world wars, the Great Depression, and a growing dependence on federal aid. The situation has not changed appreciably in subsequent years. Recently, the state has seen a significant rise in its economy from oil exploration and alternative energy research and development.

Sites associated with Euro-American settlement are the most visible cultural resource in the study area. Site types likely to be encountered along either alternative route include farms, trash dumps, railroad crossings, town sites, churches, Western transmission lines, irrigation ditches, bridges, abandoned mines, and cultural material scatters.

Recorded Cultural Resources and Cultural Resource Investigations

Staff from Metcalf Archaeological Consultants, Inc. completed a Class I cultural resources files search of the proposed AVS to Neset 345 kV transmission line planning area in late 2011 and early 2012. The search area encompassed a 6-mile-wide corridor centered on Alternatives Routes A and B (France, 2012). The Class I search involved a search of ND SHPO site and manuscript files for the corridor. For purposes of the EIS, the search area was reduced to a corridor 1,000 feet wide and centered on the two alternatives.

The search had two objectives. One was to identify those cultural resources—buildings, structures, sites, objects, or districts—that are 50 years or older or properties of traditional religious and cultural importance to Native Americans that have been recorded within the search area. The other was to identify the cultural resource inventories that have been conducted within the search area. Identification of the cultural resources included, to the extent possible, establishing whether the resource has been determined eligible for inclusion or are already included in NRHP. Both designations are considered to be historic properties (36 CFR 800.16[l][1]) and afford the same considerations/protections under NHPA. Any resource that has been determined as eligible or is included in the NRHP would have to be avoided unless

Western and the North Dakota State Historic Preservation Officer agree that the resource no longer qualifies for inclusion. If avoidance is not possible, Western and the State Historic Preservation Officer will have to agree on a treatment plan. With respect to the inventories, once the preferred alternative has been selected, cultural resources inventories that include portions of the ROW would need to be evaluated to determine their sufficiency.

The data in the original Class I search were compiled into two tables that list all the recorded cultural resources and inventories. These tables are included in Appendix H. In addition, the data for the alternatives were extracted from the original Class I report and have been organized into similar tables, also included in Appendix I.

Alternative Routes A and B

The following summarizes the recorded cultural resources and cultural resource inventories. For the most part the two alternative routes overlap. Consequently, the resources are discussed collectively except for specific instances where the two alternative routes differ. The data sets have been organized for use in consultation with and between Basin Electric, Western, and the State Historic Preservation Officer. These consultations will address the need for a Class II and/or Class III cultural resource inventory. Some areas along the preferred alternative may only require a Level/Class II reconnaissance while others a Level/Class III intensive inventory. The consultation will also address the effects of the construction of the transmission line on cultural resources, specifically those that are included in or eligible for the NRHP or those for which eligibility has not been determined, and how to offset any adverse effects. This procedure for determining the level of effort needed to fulfill the requirements of NEPA and Section 106 were developed by the agencies at the scoping meeting held last November in Bismarck.

North Dakota recognizes three classes of cultural resources: sites, site leads, and isolated finds. Sites are defined as "…a location of past human activity that took place over 50 years ago and which left physical traces of that activity in the form of (1) an intact cultural feature, (2) five or more artifacts found within about 60 meters of each other, and/or (3) an intact subsurface cultural deposit regardless of the number of artifacts." Isolated finds are defined as " [a] location with four or fewer artifacts and identified by the archeologist(s) as representing an area of very limited past activity." Site leads consist of "…locations reported by a landowner or other non-professional as containing cultural resources" or "…when a location with four or fewer surface visible artifacts is, in the professional judgment [sic] of the archeologist(s), likely to be only a limited surface expression of a former occupation area where most of the artifacts are not visible (i.e., still buried)" (ND SHPO, 2008).

Tables summarizing the cultural resources data for the two alternatives have been placed in Appendix I. A total of 93 cultural resources, including sites, site leads, and isolated finds have been recorded within or immediately adjacent to Alternative Route A and 88 for Alternative Route B (Table 3-23). Multicomponent resources are those with an archaeological and historic component, an archaeological and historic architectural component, a historic and historic architectural component, or a combination of all three. The resources include archaeological, historic, historic architectural, and multicomponent sites, site leads and isolate finds. Of these, 70 are shared by both alternatives, 23 are unique to Alternative Route A, and 18 to Alternative Route B. Appendix I identifies the sites unique to each corridor and the resource type for each alternative by county. Information is also included in Appendix I that identifies how many cultural resources have been determined eligible or listed on the NRHP, how many have been determined not eligible, and how many are unevaluated with respect to eligibility. Resources that have been determined eligible or are listed on the NRHP are referred to as historic properties (36 CFR 800.16[l][1]) and are afforded the same protections under NHPA.

Table 3-23: Number of Cultural Resources by Alternative Route

	Alternative Route A	Alternative Route B
Multi-component	2	2
Archaeo	51	54
Archaeo IF	16	13
Archaeo SL	4	4
Historic	8	5
Historic IF	1	--
Historic SL	9	7
Architectural	2	3
Total	93	88

IF, isolate find; SL; site lead

Cultural Resource Investigations

A total of 80 cultural resource investigation have occurred within or adjacent to the Alternative Route A corridor while 81 have taken place within or adjacent to the Alternative Route B corridor. Of these, 16 are individual to Alternative Route A and 17 to Alternative Route B. Most of these investigations are cultural resource inventories, although several testing and mitigation projects have taken place within or adjacent to the alternative routes. Appendix I contains lists of the investigations for each alternative. The majority of the inventories are associated with energy development. Other inventories have been in conjunction with highway improvements, the construction of transmission lines, the construction of waterlines, the development of borrow areas, and assessment of federal lands.

Historic Properties

None of the cultural resources within or adjacent to either alternative route is included in the NRHP. However, eight resources within or adjacent to the Alternative Route A corridor and three within the Alternative Route B corridor have been determined eligible for inclusion, all of which are shared with Alternative Route A. For Alternative Route A, these include six archaeological sites, and one historic site. The archaeological sites are all cultural material scatters that contain features such as stone rings or evidence of hearths and/or temporally or functionally diagnostic artifacts. The historic site is the Lewis and Clark irrigation canal. A total of three sites are shared with Alternative Route B.

Traditional Cultural Properties

Traditional cultural properties are historic properties that are of "…traditional religious and cultural importance to an Indian tribe…" (36 CFR 800.16[l][1]). Many traditional cultural properties are associated with place (LeBeau, 2009). RUS has consulted and continues to consult with and provide information to Tribal governments concerning places of interest that may be traditional cultural properties. Currently, no known traditional cultural properties have been identified within the proposed project APE.

In addition to this work and at the request of Basin Electric, Metcalf Archaeological Consultants, Inc. conducted a Class III intensive pedestrian survey of the AVS to Neset 345 kV Substation project in Mountrail County, North Dakota (Banks, 2012). The APE for this proposed undertaking consisted of a 60 acre study area. No cultural resources were identified within the APE resulting in a No Historic Properties Affected recommendation from Metcalf Archaeological Consultants, Inc. This draft report is under review by the relevant agencies at this time.

3.6.2 Direct/Indirect Effects

The construction of new transmission line facilities could affect recorded and currently unknown cultural resources. The transmission line, with its pole installation and substation modification (excluding the substation that has already been surveyed), has/have the potential to disturb archeological sites. The proposed project could alter the setting and feeling of historic structures or landscapes, or the setting of and access to traditional cultural properties. In areas not previously disturbed and where archeological potential is assessed to be high (near large lakes and river crossings), unrecorded archeological sites or traditional cultural properties may be affected during construction of transmission structures, substations and substation modifications, or access roads. Historic buildings or other sites also may be impacted in that construction of modern transmission structures may impact the historic viewshed in which above-ground archeological and historic resources are located. Although extensive landscaping and contouring are not planned, possible impacts on archeological resources that would apply to all of the route and route segment alternatives include 1) subsurface excavations necessary to install structures; 2) disturbance to surface soils throughout the route as a result of heavy construction vehicle equipment operation; and 3) disturbance to surface soils through and site grading and preparation. Extreme care would be taken to minimize subsurface excavations that could disturb archaeologically sensitive deposits and artifacts. For example, there would be no removal of stumps from within the project corridor.

Impacts on cultural resources would be considered significant if they result in adverse effects on historic properties that are eligible for listing on the NRHP as defined by Section 106 of the NHPA. If a cultural resource is identified as an historic property, the historic significance of the property is determined by evaluating it in terms of its ability to meet the NRHP criteria (36 CFR 800.4 (c)(1)). A cultural resource that meets one or more of the criteria is considered an historic property entitled to the consideration afforded by Section 106 of the NHPA, as outlined in the Advisory Council on Historic Preservation's implementing regulations (36 CFR 800). Potential impacts on each historic property would be evaluated in terms of the specific significance of the resource, and the potential for the proposed project to detract from that significance. However, it must be kept in mind that adverse effect under Section 106 does not equate with significant impact under NEPA, and that all aspects of a cultural environment need to be considered along with historic properties.

Once the character of the traditional resources has been established, impacts would depend upon the requirements of the resource, and the proposed project alternative route. Since the nature of these resources and their relationship to the proposed alternative routes has yet to be determined, analysis of direct and indirect impacts cannot be undertaken as of this writing.

No-action Alternative

The no-action alternative would not impact existing cultural resources either directly or indirectly. This alternative would allow for existing conditions to remain as they currently are. Archeological and historic resources would neither be preserved in another manner nor damaged under the no-action alternative.

Alternative Routes A and B

A total of 93 cultural resources have been identified within or immediately adjacent to the 1,000-foot preliminary APE (see Table 3-23). The cultural resources include 2 multicomponent sites, 51 archaeological sites, 15 archaeological isolate finds, 4 archaeological site leads, 8 historic sites, 1 historic isolate find, 9 historic site leads, and 2 architectural resources.

A total of 88 sites have been recorded within or immediately adjacent to the 1,000-foot preliminary APE of Alternative Route B including 2 multicomponent sites, 54 archaeological sites, 13 archaeological isolate finds, 4 archaeological site leads, 5 historic sites, 7 historic site leads, and 3 architectural resources.

A detailed study to identify built resources, primarily those residential, recreational, commercial and industrial buildings in the APE that are NRHP listed or eligible and might be affected by either alternative route would be conducted following selection of the preferred alternative and included as a requirement of the Memorandum of Agreement once it is prepared and signed by the consulting parties. No building structures can be located within the ROW; therefore, the ROW could be sited to avoid direct impacts on historic properties.

It is possible that the vertical height of the proposed project may diminish the integrity of a historic property by altering its setting and feeling, when those aspects are applicable. New transmission lines would result in a change in the existing viewshed of a historic property or could be seen from that property. Mitigation for visual impacts is discussed in greater detail in Section 3.1, Aesthetics and Visual Resources.

3.7 LAND USE

3.7.1 Affected Environment

Regional Setting

The proposed project area includes portions of five counties in northwestern North Dakota - Dunn, McKenzie, Mercer, Mountrail, Williams and a very small section of Billings County. The region surrounding the proposed project contains large expanses of rural, undeveloped land characterized by rolling prairies, steep and rough terrain, grassland, rangeland, and shrub/scrub environments, with smaller areas of woodland and cropland near river drainages and lakes. Land use in the project area is primarily dominated by agricultural uses, such as pasture or cropland along with nearby farmsteads. Lake Sakakawea, a large impoundment of the Missouri River, is located in the northeastern portion of the project area. The lake provides irrigation, flood damage reduction, municipal and industrial water supply, and hydropower for the area.

Existing Land Use

Based on the 2007 Census of Agriculture, 89.8 percent (39,674,586 acres) of the total land area in the state of North Dakota is farmland, with an average farm size of 1,241 acres (USDA, 2009b). Compared to the state as a whole, the counties surrounding the project area have either a similar or slightly lower percentage of land in farms. Developed infrastructure in the vicinity of the proposed project includes federal, state, county, and township roads; utility ROWs; airports; railroads; and a growing number of oil and gas wells.

Williston, with a population of approximately 15,000 (U.S. Census Bureau, 2010a) is the largest city in the project area. Several small towns and unincorporated communities are scattered throughout the project area. Killdeer, Watford City, Arnegard, Epping, and Ray are the only communities whose city limits may fall within the boundaries of the project area (BMcD, 2011). The communities of Williston and Tioga lie close to the project area boundary. The project area is located west of the Fort Berthold Indian Reservation.

Land ownership and jurisdiction within the project area includes predominantly private lands used for grazing and crop cultivation, interspersed with lands administered by the Bureau of Land Management (BLM), USACE, USFS, USFWS, NPS, and the state of North Dakota. Federal and state lands within proximity to the proposed project include the LMNG, TRNP, National Wildlife Refuge lands, BLM lands, and USACE lands surrounding Lake Sakakawea, in addition to state parks, wildlife management areas (WMA), and school trust lands.

Land cover within the project area is summarized in Table 3-24.

Table 3-24: Land Use within the Project Area

LAND USE	Alternative Route A (acres)	Alternative Route B (acres)
Grassland	1,680.0	2,057.8
Cultivated Cropland	1,365.8	1,272.0
Pasture/Hay	130.2	117.9
Developed Lands	100.3	79.7
Other Lands*	260.1	279.9
TOTAL	**3,536.4**	**3,807.3**

*includes woodland, shrub/scrub, wetlands, barren lands, open water.
Acres were calculated using available National Land Cover Dataset information.

3.7.2 Direct and Indirect Effects

This section discusses potential impacts on land use within the region as a direct result of the construction and operation of the proposed project, including the no-action alternative. Definitions for duration and intensity of project impacts to land use developed for this project are described in Table 3-25.

Table 3-25: Land Use Impact Context and Intensity Definitions

Context (Duration)	Low Intensity	Moderate Intensity	High Intensity
Short term: During construction period Long term: Life of the line (50 years)	Other than at the footprint of project features (transmission tower structures, substations, access roads, etc.) previous land uses would continue without interruption. Existing land uses such as agriculture, grazing, oil and gas development, and potential CH_4 gas development may experience temporary construction-related disturbances and intermittent, infrequent interruptions due to operation and maintenance. There would be no conflicts with local zoning.	Previous land uses (e.g. agriculture, grazing, oil and gas development and potential CH_4 gas development) would be diminished or required to change on a portion of the project area in order to be compatible with the project. Only a few parcels within the project area would require zoning changes to be consistent with local plans. Some parcels within the project area (transmission ROW, substation, access roads, etc.) may require a change in land ownership through purchase or condemnation.	More than 25 percent of the project area (transmission ROW, substations, access roads, etc.) would require a change in land ownership through purchase or condemnation. All land use (e.g. agriculture, grazing, oil and gas development and potential CH_4 gas development) on these parcels would be discontinued. Most parcels of land within the project area would require zoning changes to be consistent with local plans.

No-action Alternative

Under the no-action alternative the proposed project would not be constructed, and there would be no impacts on land use as a result of the project.

Proposed Action

Private Lands

Most of the land in the project area is privately owned and used for agricultural activities. Impacts on private lands would include temporary loss of use for landowners within the ROW during construction, and the permanent loss of uses that are incompatible with the ROW, such as the location and development of new oil and gas wells. Disturbance from heavy equipment may result in some crop loss within the ROW during construction. Existing agricultural activities taking place within the transmission line ROW, including grazing and crop cultivation, are likely to experience temporary and localized interruptions during construction. Additionally, cattle would need to be restricted from grazing within the ROW after construction is completed until grass is re-established within the ROW. Indirect impacts on agriculture as a result of the proposed project could include interference with certain agricultural activities, such as the movement of machinery and equipment, obstacles for aerial spraying, or interference with the movement of cattle or other livestock for grazing. At the proposed Judson and Tande substation sites, agricultural land would be permanently converted to utility use. The proposed project would require ROW easements from private property owners, which could encumber the ROW area with land use restrictions. Each transmission line easement would specify the present and future right to clear the ROW and to keep it clear of all trees, whether natural or cultivated; all structure-supported crops; other structures; brush; vegetation; and fire and electrical hazards, with the exception of non-structure supported agricultural crops less than 10 feet in height.

As a whole, the types of agricultural use taking place within the project area are generally compatible with the presence of transmission line ROWs and would largely be allowed to continue in the long term. The relatively small amount of acreage needed for the transmission line ROW would have a long-term, low impact on agricultural productivity because of the significant acreages of agricultural land in the project area and throughout the state. Basin Electric would coordinate with landowners regarding routing the proposed transmission line ROW, and would incorporate appropriate mitigation measures. As a result, the anticipated short- or long-term impacts on land use for either alternative would be low.

U.S. Forest Service

USFS administers 1,026,000 acres of publicly owned lands on the LMNG. Within the project vicinity, portions of LMNG are located throughout McKenzie County. In addition to providing recreational opportunities, these lands also support livestock grazing and oil and gas production. The LMNG is managed as a unit of the Dakota Prairie National Grasslands under its 2001 Resource Management Plan (USFS, 2010). Development of utility ROWs is generally consistent with the stated management goals and objectives for the LMNG under the 2001 Resource Management Plan, with the obtainment of the proper permits.

U.S. Fish and Wildlife Service

Lake Ilo National Wildlife Refuge is located near Dunn Center in the southern part of the study area. Lake Ilo National Wildlife Refuge is an approximately 4,000 acre complex consisting of Lake Ilo itself, along with prairie, grassland, and numerous other wetland areas. It is located near Dunn Center in McKenzie County, along ND State Highway 200 (USFWS, 2011a). This area is a popular wildlife viewing area, with waterfowl, shorebirds, and other wildlife using the area at various times throughout the year. Upland areas on the refuge include native prairie, cropland, and tree plantings, and these areas serve as important wildlife habitat as well.

Four Waterfowl Production Areas are scattered throughout the project area in Williams County. Waterfowl Production Areas, which are part of the National Wildlife Refuge System, are lands owned by USFWS and managed to preserve high quality wetlands and protect waterfowl breeding and nesting habitat. All Waterfowl Production Areas are open to the public and provide recreational opportunities, such as hunting, bird watching, and hiking (USFWS, 2007a).

Both Alternative Route A and Alternative Route B would pass within approximately 2 miles of Lake Ilo National Wildlife Refuge in Dunn County at their closest points. In addition, both routes would be situated adjacent to a USFWS conservation easement located in Dunn County that is protected as grassland/pasture.

National Park Service

TRNP-North Unit, managed by NPS, is located in McKenzie County, south of Watford City along U.S. Highway 85 in the southwestern portion of the project area. This national park provides numerous outdoor activities such as camping, canoeing, fishing, horseback riding, and hiking (NPS, 2011). A variety of wildlife species occur within the park, making it a popular wildlife viewing area.

Bureau of Land Management

Within North Dakota, the BLM North Dakota Field Office manages approximately 58,000 acres of public land, the majority of which is located in Dunn and Bowman counties. BLM also manages more than 4.1 million acres of subsurface mineral estate, located in the western third of the state (BLM, 2011). Lands managed by BLM within the project area are located primarily in northwestern Dunn County, with scattered tracts in the other counties. These lands are leased for oil and gas production as well as grazing, and are also open to recreational opportunities such as hunting. BLM lands in the project vicinity are managed under the 1986 BLM North Dakota Resource Management Plan, which does not contain any provisions expressly prohibiting the development of utility ROWs.

U.S. Army Corps of Engineers

USACE oversees management of Lake Sakakawea and the public lands surrounding it. USACE partners with various federal, tribal, state, and local entities for management of various parks and recreational facilities and WMAs on these lands (USACE, 2007).

Both Alternative Route A and Alternative Route B would cross approximately 56.4 acres of USACE property, which is in the area of the proposed crossing of the Lewis and Clark WMA managed by NDGFD. Proposed ROW acres on property owned by USACE typically include 17.6 acres of cultivated crops, 16.3 acres of wetlands, 15.2 acres of grasslands, 5.0 acres of woodlands, 1.5 acres of pasture/hay, and 0.8 acre of open water. Because these lands are in the Missouri River floodplain, during infrequent hydrological events the entire floodplain has been inundated by waters of the Missouri River for short periods of time.

North Dakota Game and Fish Department

Several USACE lands in and around the project area include WMAs managed for fish and wildlife habitat by NDGFD. Additional NDGFD WMAs in the study area include Killdeer Mountains WMA in Dunn County; Neu's Point WMA, Och's Point WMA, and Overlook WMA in McKenzie County; Sullivan WMA in McKenzie County; Golden Valley WMA in Mercer

County; White Earth Valley WMA in Mountrail County; and Blacktail Dam WMA in Williams County (NDGFD, 2010a).

As discussed previously, both alternative routes would cross approximately 56.4 acres of USACE-owned property in the area of the proposed crossing of the Lewis and Clark WMA managed by NDGFD.

<u>State Parks</u>

North Dakota state parks found within the project vicinity include Lewis and Clark State Park, located along Lake Sakakawea in Williams County, and Little Missouri State Park located north of Dunn Center in Dunn County. Recreational opportunities at Lewis and Clark State Park include fishing, swimming, and boating in Lake Sakakawea. Little Missouri State Park is primarily a primitive park offering backpacking and horseback riding throughout the park's 47 miles of trails (North Dakota Parks and Recreation Department, 2011b).

<u>School Trust Lands</u>

School trust lands, which were granted at statehood for the support of primary and secondary education, are scattered throughout the study area. School trust lands are managed by the North Dakota State Land Department and leased for the purpose of generating income for schools and designated trust funds of the state (North Dakota State Land Department, 2011). The majority of the lands are leased for grazing. These lands are also open to the public for recreational uses such as hunting, fishing, hiking, and bird watching.

<u>Comprehensive Plans and Zoning Ordinances</u>

The Dunn County Comprehensive Plan, adopted October 12, 2011, establishes a vision for future development of the county and includes general goals and objectives for land use, transportation, housing, economic development, public services, infrastructure, natural resources, intergovernmental cooperation, and planning (Dunn County Planning Commission, 2011a). Mountrail County has a comprehensive plan; however, it has not been updated since its adoption in 1982. McKenzie, Mercer, and Williams counties do not currently have comprehensive plans.

Several of the organized townships within McKenzie County have zoning codes, and Billings, Dunn (Dunn County Planning Commission, 2011b), Mercer (Board of Mercer County Commissioners, 2009), Mountrail, and Williams counties have countywide zoning ordinances in place. Both Alternative Route A and Alternative Route B would extend through the same county and municipal jurisdictions, and would cross lands located in zoning districts where transmission line ROW development is not prohibited. Under the applicable zoning ordinances and comprehensive plans, transmission lines are either a permitted or conditional use in all jurisdictions traversed by the proposed ROW. All applicable zoning and land use approvals would need to be obtained prior to construction.

Easements

USFWS grassland and wetland easements and NRCS Conservation Reserve Program and Conservation Reserve Enhancement Program easements are present in the project area. These areas serve as wildlife habitat to protect rare natural features or to preserve water quality, and have been assigned various levels of legal protection, which generally prohibit development.

The majority of wetland and grassland easements in the vicinity of the proposed project are located in Williams and Mountrail counties in the prairie pothole region. The easements in Williams County are managed by the Crosby Wetland Management District, and the easements in Mountrail County are managed by the Lostwood Wetland Management District. There are also a few scattered easements located in Dunn, McKenzie, and Mercer counties, which are managed by the Audubon Wetland Management District.

Lands with USFWS and NRCS easements typically remain in private ownership and are generally considered confidential by these agencies. As such, information about the specific location and scope of potential impacts to these resources is limited.

Alternative Route A

Alternative Route A would incorporate approximately 147.4 acres of the LMNG into the utility ROW. These 147.4 acres consist of 107.1 acres of grassland, 16.5 acres of woodland, 12.8 acres of shrub/scrub, 5.9 developed acres, 3.5 acres of pasture/hayland, 1.2 acres of cultivated crops, and 0.4 acre of barren land. Alternative Route A would not be located within any management areas designated as Roadless. Similar to the impacts on private agricultural lands discussed above, grazing on LMNG would be generally compatible with the presence of the utility ROW; therefore, no impacts on grazing use would be expected. Given the relatively limited amount of lands traversed by the proposed ROW, the presence of existing utilities in this corridor, and the identification of this corridor for future utility development, it is expected that with the incorporation of mitigation measures as detailed below, Alternative Route A would have low to no impacts on land use on the LMNG.

Under Alternative Route A, the proposed transmission line would be constructed east of TRNP-North Unit. At its closest point, the transmission line ROW would be approximately 1.5 miles from the park. Alternative Route A would have no impacts on existing land uses on TRNP. Due to its height, the proposed transmission line may be visible from areas of TRNP.

In addition, the proposed transmission line ROW would not directly cross BLM lands. The ROW would be located within approximately 200 feet of one BLM parcel. Alternative Route A would therefore have no impacts on BLM lands. Little Missouri State Park is the park within closest proximity to the project area. Alternative Route A would be located more than 7 miles from Little Missouri State Park. Alternative Route A would have no land use impacts on Little Missouri State Park.

Alternative Route A would cross approximately 20 school trust land parcels, for a total of approximately 144.6 acres within the ROW. Of the 144.6 acres, 129.8 acres are grassland, 7.7 acres are developed, 3.5 acres are in cultivated crops, 2.4 acres are shrub/scrub, 0.9 acre is woodland, and 0.3 acre is barren land. With the incorporation of mitigation measures as detailed below, it is expected Alternative Route A would have low to no impacts to school trust lands.

Alternative Route B

Alternative Route B would incorporate approximately 56.6 acres of the LMNG into the ROW. The area within the ROW consists of 47 acres of grassland, 4 acres of woodland, 3.9 acres of shrub/scrub, 1 acre of cultivated crops, and 0.7 acre of developed land. Alternative Route B would not be located within any management areas designated as Roadless. Given the relatively limited amount of lands traversed by the Alternative Route B, and the absence of any special resource management direction for lands within the ROW, it is expected that with the incorporation of mitigation measures as detailed below, Alternative Route B would have low to no impacts on land use on the LMNG.

Under Alternative Route B, the proposed transmission line would be located more than 17 miles east of TRNP at its closest point and would have no impact on TRNP. It would not cross or pass within close proximity to BLM lands, and would be located more than 4 miles away from Little Missouri State Park. Alternative Route B would therefore have no impacts on either BLM or state park lands.

Alternative Route B would cross approximately 19 school trust land parcels, for a total of approximately 138.8 acres within the ROW, which is slightly less than Alternative Route A. Of the 138.8 acres, 130.2 acres are grassland, 3.8 acres are cultivated crops, 2.3 acres are developed, 0.9 acre is barren land, 0.9 acre is shrub/scrub, 0.6 acre is wetland, and 0.1 acre is woodland. With the incorporation of mitigation measures as detailed below, it is expected Alternative Route B would have low to no impacts on school trust lands.

3.8 SOCIOECONOMIC RESOURCES

3.8.1 Affected Environment

Regional Setting

The oil development boom in the Bakken region has heavily influenced socioeconomic trends in the region over the past several years. Oil and gas development activities have occurred in the region since the 1950s. After a brief boom in the 1970s, the region's oil and gas activity decreased dramatically. The Bakken Formation has seen relatively recent rapid development due to the implementation of hydraulic fracturing processes that can access this previously-untapped oil bearing feature in the region. As a result, after losing population between 1990 and 2000, the region experienced population growth between 2000 and 2010, especially between 2008 and the present. Additional socioeconomic effects of the rapid oil development are described in the Economic Conditions section below.

Agriculture also continues to be an important activity and component of western North Dakota's economy. Approximately 79 percent of the land area in the project area counties is in farms. Across the project area, farm employment comprises 24, 11, and 10 percent of total county employment in Dunn, Mountrail, and McKenzie counties, respectively.

The study area is consistent with the project area, extending through five counties in northwestern North Dakota, including Dunn, McKenzie, Mercer, Mountrail, and Williams counties. Socioeconomic information on the study area and the state are provided in this section.

Demographic Characteristics

<u>Population</u>

These counties are predominantly rural with small populations located in towns and communities across the study area. Williams County has the largest population of all the study area counties, hosting the largest town in the study area, Williston.

The population of all the study area counties declined between 1990 and 2000, while the population of North Dakota as a whole remained relatively constant. As a result of the oil and gas development boom in recent years, population growth trends in the study area counties have reversed. McKenzie, Mountrail, and Williams counties experienced increased rates of growth between 2000 and 2010, especially since 2008, and Dunn and Mercer counties experienced slower rates of population decline compared to the previous decade. The populations of these counties are shown in Table 3-26.

Table 3-26: Population of Study Area Counties

	1990 Population	2000 Population	2010 Population	% change 1990-2000	% change 2000-2010
North Dakota	638,800	642,200	672,591	0.5%	4.7%
Dunn	4,005	3,600	3,536	-10.1%	-1.8%
McKenzie	6,383	5,737	6,360	-10.1%	10.9%
Mercer	9,808	8,644	8,424	-11.9%	-2.5%
Mountrail	7,021	6,631	7,673	-5.6%	15.7%
Williams	21,129	19,761	22,398	-6.5%	13.3%
Study Area Counties	48,346	44,373	48,391	-8%	9%

Source: U.S. Census Bureau, 1990, 2000, and 2010.

There are several communities within the study area. The populations of communities within and near the study area are shown in Table 3-27. The largest town is Williston, followed by Beulah, Watford City, and Tioga. The remaining towns all have populations of less than 1,000.

Table 3-27: Populations of Towns within Study Area

Town	County	2010 Population
Alexander	McKenzie	223
Arnegard	McKenzie	115
Beulah	Mercer	3,121
Dodge	Dunn	87
Dunn Center	Dunn	146
Epping	Williams	100
Golden Valley	Mercer	182
Halliday	Dunn	188
Killdeer	Dunn	751
Ray	Williams	592
Springbrook	Williams	27
Tioga	Williams	1,230
Watford City	McKenzie	1,744
White Earth	Mountrail	80
Williston	Williams	14,716
Zap	Mercer	237

Source: U.S. Census Bureau, 2010a.

It is expected that the population in the Bakken region will continue to rapidly increase in the future, concurrent with the continued expansion of oil and gas development activities. Estimates indicate that the population of the state of North Dakota increased by 11,341 people between

2010 and 2011 (U.S. Census Bureau, 2011). In addition to the permanent population of the study area counties, the region also has a high transient population, which primarily includes drilling rig, well service workers, and construction workers. Official population estimates likely do not include these temporary workers who consider their home residence in another state. The increasing numbers of temporary workers moving to the region has heavily impacted the region's cities and towns, such as Williston and Watford City located within the study area. Including the transient population, the current population of Williston is likely closer to 17,000, and the current population of Watford City is likely closer to 6,500 (Smith, 2011; Ruggles, 2011). Estimates indicate that the population of Williston could reach 25,000 by 2015 and as high as 50,000 by 2030 (City of Williston, 2011).

The Fort Berthold Reservation is also located just outside of the study area boundary the northwest part of McLean County. The population of the Fort Berthold Reservation is 6,341 (U.S. Census Bureau, 2010a).

Income and Poverty

Between 2000 and 2010, median household incomes increased considerably in all the study area counties and in the state as a whole (Table 3-28). While poverty rates increased slightly in North Dakota over this period, poverty rates in the study area counties fell, with Dunn and McKenzie counties experiencing the most significant reductions in the populations living below the poverty threshold. Poverty rates in Mountrail County remained higher than the state rate in 2010.

Table 3-28: Income and Poverty in the Study Area

	Median Household Income (2000)	Median Household Income (2010)	Percent below Poverty (2000)	Percent below Poverty (2010)
North Dakota	$34,604	$46,781	11.9%	12.3%
Dunn	$30,015	$48,707	17.5%	8.6%
McKenzie	$29,342	$48,480	17.2%	10.0%
Mercer	$42,269	$60,191	7.5%	6.2%
Mountrail	$27,098	$53,912	19.3%	16.5%
Williams	$31,491	$55,396	11.9%	8.7%

Source: U.S. Census Bureau, 2000, 2010a, and 2010b.
Note: Household income values are shown in current or nominal dollars.

Earnings and Cost of Living

With the influx of workers into western North Dakota counties, both resident and transient populations have been rapidly increasing, and available resources, such as housing, retail grocery stores, and food and beverage establishments, have been slow to meet the rapid increase in demand. As a result, the region is experiencing considerable price and cost increases, consistent with an inflationary economy. Although average earnings are also increasing, so are the costs of goods and services. Prices of basic goods are also increasing, with one person noting that a gallon of milk costs $7 (McChesney, 2011). With shortages of most goods, merchants are able to charge higher prices.

Average earnings have increased by 82 and 56 percent in Mountrail and McKenzie counties, respectively between 2006 and 2010. Between May 2010 and May 2011, wages in the 11 western counties that comprise the far west non-metropolitan area, including Dunn, Williams, and McKenzie counties, grew by 16 percent (U.S. Bureau of Labor Statistics, 2012). Average earnings are summarized in Table 3-29.

Table 3-29: Average Earnings in the Study Area (Current Dollars)

	2006	2007	2008	2009	2010	% Change 2007-2010
North Dakota	$30,530	$32,827	$36,787	$35,724	$39,123	28%
Dunn	$34,623	$33,360	$31,682	$41,836	$50,222	45%
McKenzie	$28,151	$29,355	$30,948	$35,642	$44,006	56%
Mercer	$34,766	$35,141	$34,789	$38,665	$40,966	18%
Mountrail	$31,049	$36,329	$45,499	$49,406	$56,473	82%
Williams	$32,762	$36,272	$37,570	$37,969	$44,606	36%

Source: U.S. Department of Commerce, Bureau of Economic Analysis, 2012a.

<u>Racial and Ethnic Characteristics</u>

In the state of North Dakota as a whole, the majority of the population is white (Table 3-30). The largest minority group in the state is American Indian. Compared to the state, Mercer and Williams counties have higher percentages of white residents and smaller percentages of American Indian residents. In contrast, Dunn, McKenzie, and Mountrail counties have smaller percentages of white residents compared to the state and higher percentages of American Indian residents. Segments of the Fort Berthold Reservation lie in parts of McKenzie, Dunn, Mountrail Counties and to a smaller extent Mercer County, which could be a reason for the higher percentages of American Indian residents. Other minority groups, including Asian, Hawaiian or Pacific Islander, and Hispanic comprise similar percentages of the population in all of the study area counties as compared to the state as a whole.

Table 3-30: Racial Characteristics in the Study Area Counties

	2010 Population	White, not Hispanic or Latino	Black	American Indian or Alaskan Native	Asian	Hawaiian/ Pacific Islander	Other	Two or more races	Hispanic
North Dakota	672,591	90.7%	1.2%	5.4%	1.0%	0.05%	0.5%	1.8%	2.0%
Dunn	3,536	85.3%	0.2%	12.7%	0.3%	0.0	0.2%	1.7%	1.1%
McKenzie	6,360	76.3%	0.1%	22.2%	0.3%	0.03%	0.4%	1.6%	2.2%
Mercer	8,424	96.3%	0.2%	2.3%	0.3%	0.1%	0.4%	1.1%	1.4%
Mountrail	7,673	66.8%	0.2%	30.6%	0.2%	0.01%	0.8%	2.6%	3.7%
Williams	22,398	92.7%	0.3%	4.0%	0.4%	0.02%	0.3%	2.9%	1.9%

Source: U.S. Census Bureau, 2010a.

Economic Conditions

Employment

The labor force in the state of North Dakota increased slightly each year between 2001 and 2010. In the study area counties, the size of the labor force fluctuated over this time period. However, between 2009 and 2010, the size of the labor force increased dramatically in Dunn, McKenzie, Mountrail, and Williams counties, increasing by 17.4, 19.1, 25.6, and 18.0 percent, respectively. Mercer County experienced a decline in the size of its labor force between 2009 and 2010.

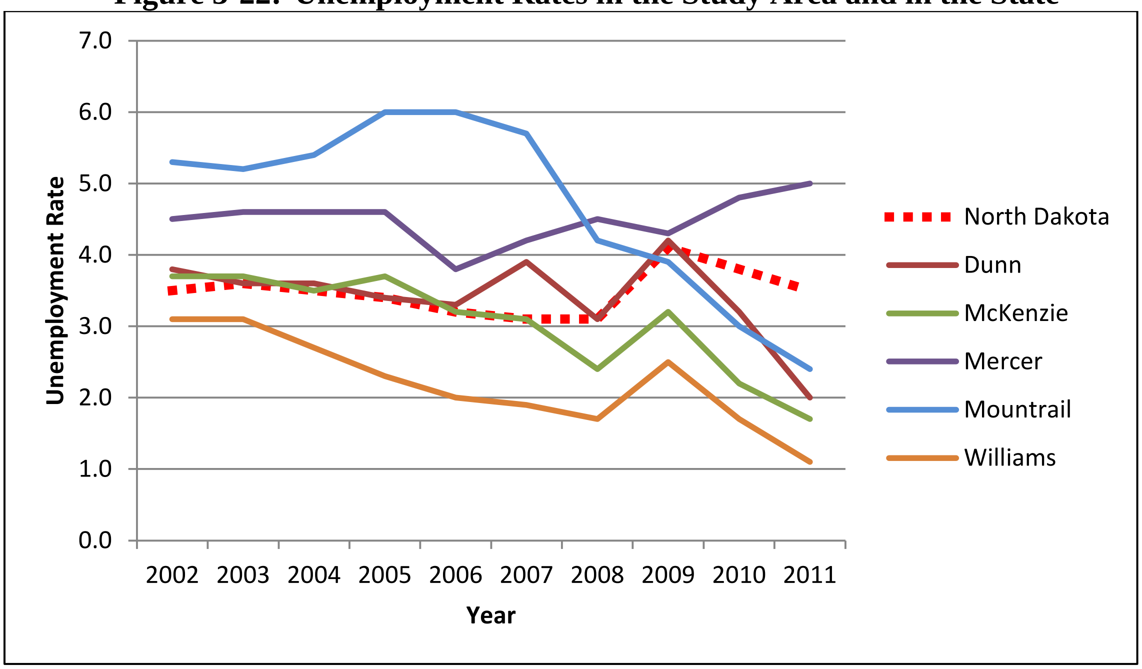
Unemployment rates in North Dakota and within the study area counties were relatively low between 2001 and 2010. The state's annual unemployment rate was below 4 percent for all years except 2009, as was also the case for Dunn County. In McKenzie County, the unemployment rate was below 4 percent for all years, and in Mercer County, it was below 5 percent for all years except 2010. Mountrail County had the highest annual unemployment rates, peaking at 6 percent in 2005 and 2006, but dropping to a low of 2.9 percent in 2010. Williams County had the lowest unemployment rates of all the study area counties, with a high of 3.1 percent in 2002 and 2003, and reaching a low of 1.7 percent in 2008 and 2010. Study area labor force and unemployment rates are summarized in Table 3-31. Unemployment rate trends are shown in Figure 3-22.

Table 3-31: Study Area Unemployment Rates (Labor Force/ Annual Unemployment Rate)

Year	North Dakota		Dunn		McKenzie		Mercer		Mountrail		Williams	
2001	345,820	2.8%	1,739	3.2%	2,708	2.6%	4,525	3.9%	2,981	4.0%	10,939	2.3%
2002	345,836	3.5%	1,775	3.8%	2,692	3.7%	4,670	4.5%	2,960	5.3%	11,042	3.1%
2003	348,929	3.6%	1,818	3.6%	2,747	3.7%	4,748	4.6%	3,014	5.2%	11,047	3.1%
2004	351,801	3.5%	1,712	3.6%	2,739	3.5%	4,738	4.6%	3,095	5.4%	11,086	2.7%
2005	355,874	3.4%	1,732	3.4%	2,694	3.7%	4,582	4.6%	2,995	6.0%	11,715	2.3%
2006	360,913	3.2%	1,730	3.3%	2,809	3.2%	4,764	3.8%	2,903	6.0%	12,634	2.0%
2007	364,573	3.1%	1,678	3.8%	2,907	3.1%	4,718	4.1%	2,950	5.7%	12,987	1.9%
2008	367,048	3.1%	1,734	3.2%	3,079	2.4%	4,789	4.5%	2,957	4.1%	14,521	1.7%
2009	368,696	4.3%	1,780	4.3%	2,910	3.4%	5,129	4.4%	3,706	4.1%	14,751	2.6%
2010	370,224	3.9%	2,089	3.4%	3,466	2.2%	4,531	5.1%	4,655	2.9%	17,402	1.7%
2011	382,944	3.5%	2,914	2.0%	4,433	1.7%	4,426	5.0%	5,500	2.4%	24,848	1.1%

Source: U.S. Bureau of Labor Statistics, 2011.

Figure 3-22: Unemployment Rates in the Study Area and in the State



Source: U.S. Bureau of Labor Statistics, 2011.

In conjunction with the increased oil and gas development activities in the region, monthly unemployment rates over the last year continued to drop in the study area counties (Table 3-32).

Table 3-32: Recent Monthly Unemployment Rates in the Study Area

Month	North Dakota	Dunn County	McKenzie County	Mercer County	Mountrail County	Williams County
Feb 2011	4.2%	2.8%	2.1%	6.4%	2.8%	1.4%
March 2011	4.1%	2.8%	2.1%	5.9%	3.0%	1.2%
April 2011	3.5%	2.0%	1.6%	4.3%	2.6%	1.0%
May 2011	3.2%	1.9%	1.6%	3.8%	2.5%	1.1%
June 2011	4.0%	2.6%	2.2%	5.9%	3.0%	1.4%
July 2011	3.4%	1.7%	1.5%	4.9%	2.6%	1.0%
Aug 2011	3.5%	1.6%	1.5%	4.5%	2.3%	1.0%
Sept 2011	2.9%	1.5%	1.4%	3.5%	2.0%	1.0%
Oct 2011	2.7%	1.5%	1.4%	3.6%	1.8%	0.9%
Nov 2011	2.9%	1.4%	1.4%	4.7%	1.9%	0.9%
Dec 2011	3.3%	1.4%	1.6%	5.6%	2.0%	0.9%
Jan 2012	3.8%	1.6%	1.5%	6.7%	2.1%	0.8%
Feb 2012	3.9%	1.6%	1.7%	6.6%	2.3%	0.9%

Source: U.S. Bureau of Labor Statistics, 2011.

For the state, the top three sectors in terms of employment in 2010 were government and government enterprises; health care; and retail trade. In contrast, McKenzie and Williams counties had a large portion of mining, which includes oil and gas employment; in fact, in Williams County almost 25 percent of the employment was in this industry. Oil and gas employment in Dunn, Mercer and Mountrail counties was not disclosed due to proprietary nature of the information. Other important employing sectors in the study area counties include construction, retail trade, government, and farming. The utilities sector in Mercer County accounts for 21 percent of the employment in the county. Table 3-33 summarizes the employment by industry for the study area.

Table 3-33: 2010 Study Area Employment by Industry

Industry	North Dakota	Dunn	McKenzie	Mercer	Mountrail	Williams
Farm employment	6.3%	24.1%	9.9%	6.4%	11.4%	3.9%
Forestry, fishing, and related activities	0.8%	N/A	N/A	N/A	N/A	0.6%
Mining	2.5%	N/A	11.7%	N/A	N/A	24.9%
Utilities	0.7%	N/A	N/A	20.7%	N/A	0.4%
Construction	6.0%	N/A	9.6%	8.7%	N/A	5.9%
Manufacturing	4.8%	N/A	1.3%	N/A	N/A	1.8%
Wholesale trade	4.4%	N/A	3.0%	1.7%	4.2%	7.0%
Retail trade	10.8%	7.3%	N/A	8.6%	7.6%	9.0%
Transportation and warehousing	3.3%	6.1%	8.2%	1.1%	N/A	4.9%
Information	1.6%	N/A	0.5%	1.6%	2.2%	0.9%
Finance and insurance	5.0%	N/A	2.3%	3.0%	3.9%	2.5%
Real estate and rental and leasing	3.1%	N/A	2.2%	2.2%	1.5%	3.9%
Professional, scientific, and technical services	3.8%	N/A	2.3%	1.8%	2.2%	2.9%
Management of companies and enterprises	0.9%	0.0%	N/A	0.0%	0.0%	N/A
Administrative and waste management services	3.3%	1.1%	N/A	3.8%	1.5%	N/A
Educational services	1.1%	0.9%	1.0%	N/A	0.5%	N/A
Health care and social assistance	11.9%	N/A	4.8%	N/A	6.3%	N/A
Arts, entertainment, and recreation	1.4%	N/A	1.0%	1.0%	0.7%	0.8%
Accommodation and food services	6.6%	N/A	3.7%	4.9%	4.3%	5.5%
Other services, except public administration	5.0%	3.5%	3.1%	4.0%	2.6%	4.2%
Government and government enterprises	16.9%	12.1%	27.2%	9.6%	14.7%	9.5%
Federal, civilian	2.0%	1.0%	1.1%	0.8%	1.2%	0.5%
Military	2.3%	1.1%	0.8%	0.9%	1.1%	0.8%
State and local	12.5%	9.9%	25.3%	7.8%	12.4%	8.2%
Total employment	**502,780**	**2,316**	**5,593**	**6,507**	**5,346**	**20,279**

Source: U.S. Department of Commerce, Bureau of Economic Analysis, 2012b, 2012c.

Note: Some employment information is not available due to the proprietary nature of this data.

Oil and Gas

After a stagnant oil production period between 1990 and 2000, the region again experienced an increase in oil and gas production in the mid-2000s, as oil companies began to take advantage of newly-developed technology advances in drilling and extraction techniques. According to the North Dakota Petroleum Council (2011), there are 17 oil-producing counties in North Dakota, all of which are located in the western third of the state. North Dakota currently is the 2nd largest oil producing state in the United States. Top-producing counties within North Dakota for 2010 were Mountrail, McKenzie, Dunn, and Williams, all of which are within the study area. Oil production in North Dakota increased from 62.8 million barrels of oil in 2008 to 79.7 million barrels in 2009 and 113 million barrels in 2010 (North Dakota Petroleum Council, 2011). Additionally, 114 billion cubic feet of natural gas was produced in 2010 in North Dakota, with 80 billion cubic feet being processed within the state.

Across the state, the number of producing wells has doubled since 2004, while Dunn, Mountrail, and Williams counties have experienced even higher growth in the number of wells in their respective counties. Mountrail County has added more than 1,000 producing wells in the past 8 years. In 2012, the five-county study area accounts for 60 percent of the producing wells in North Dakota. Production is expected to continue to increase in the region with an estimated 1,100 to 2,700 new wells expected per year and 26,000 new wells expected over the next 10 to 20 years (NDDMR, 2011). The number of producing wells between 2004 and 2010 is shown in Table 3-34.

Table 3-34: Number of Producing Wells in the Study Area

	2004	2006	2008	2010	2012	% Change 2004-2012
North Dakota	3,153	3,450	3,871	4,655	6,726	113%
Dunn	95	101	181	390	728	666%
McKenzie	619	707	765	844	1,292	109%
Mercer	0	0	0	1	1	100%
Mountrail	49	58	106	530	1,154	2255%
Williams	323	355	416	454	845	162%

Source: North Dakota Industrial Commission, 2012.
Note: Data is provided for February of each year.

In rural areas and communities, oil booms bring considerable opportunities and difficulties. The oil and gas industry has provided increasing employment opportunities, and as a result, unemployment rates have been very low, or less than 4 percent in four of the study area counties. Consistent with decreasing unemployment, poverty rates, which were close to 20 percent for several of the study area counties in 2000, and dropped below 10 percent in 2010. Increasing oil production also brings fiscal revenues to state and local governments, which are imperative as cities and counties try to accommodate the growth with increasing demands for local services and infrastructure.

Local town and county government expenditures and budgets have been increasing as these communities struggle to provide housing, public services, and infrastructure to meet the booming population driven by oil development and extraction. Municipal and county services, including public service provisions such as education, road repair and construction, police and law enforcement, judicial facilities and services, medical services and facilities, emergency services, and other social services can all be expected to increase driven by the growing workforce and population. With a rapid influx of skilled oil rig and service workers, wages and earnings are driven higher across the area, affecting the service sectors and other local jobs as they compete with typically higher-paying oil industry salaries. With the influx of population and workforce, often there are not sufficient restaurants, grocery stores, gas stations, and other retail establishments to meet the demand, so establishments can increase local prices.

The oil boom brings temporary and permanent workers to the area seeking housing and temporary accommodations, driving up housing costs, and the lack of availability makes it difficult for both seasonal oil and supporting sector workers (e.g., teachers, gas station attendants, waitresses) to move to the area. In 2010, the majority of housing consisted of owner-occupied, single family residences, although many of the study area counties have a relatively higher portion of mobile homes, reflective of the larger transient population in the region in recent years.

School enrollment is growing in the region, including seasonal demand for educational services, as both the resident and transient population swells. Williston and other smaller communities are experiencing traffic, vehicle congestion, and road construction, which can lower the quality of life for those residents and groups who value remote and less congested lifestyles. Community stability and connectedness can also be affected by the oil boom as increasing numbers of nonresidential temporary workers migrate to the area, bringing differing value systems and ways of life. Crime and substance abuse can also increase in rural areas experiencing the oil boom.

Solid Mineral Resources

Several mineral resources are mined within the study area. Bedrock clays can be found from silty clay in the lower part of the Golden Valley Formation near Hebron. Salts in the study area consist of three main types of deposits within the Williston Basin of North Dakota: halite, potash, and Glauber salt or mirabolite. Sand and gravel is the third largest mineral industry found within the study area, trailing only oil and gas and lignite (NDGS, 2011).

The largest single deposit of lignite known in the world is found in western North Dakota within the study area, at an estimated 351 billion tons. North Dakota also contains an estimated 25 billion tons of economically mineable coal found within the lower Fort Union Group in western and central North Dakota. Currently, there are six operations that mine approximately 32 million tons of coal annually within western North Dakota. Four of these operations mine coal to feed electric generating plants in North Dakota, and two operations mine lignite that is used in soil stabilization and as drilling fluid additive (NDGS, 2011).

Agriculture

Based on the 2007 Census of Agriculture, 89.8 percent (39,674,586 acres) of the total land area in North Dakota is farmland, with an average farm size of 1,241 acres (USDA, 2009b). North Dakota ranked 18th in the United States in total value of agricultural products sold ($6.1 billion), with crop sales accounting for 83 percent and livestock sales accounting for the remaining 17 percent of value. The top crops in terms of acreage in the state include wheat (8,428,462 acres), soybeans (3,073,981 acres), forage (2,525,213 acres), and corn (2,348,171 acres). The top livestock items in terms of inventory in the state include cattle and calves (1.8 million), turkeys (444,274), colonies of bees (390,421), hogs and pigs (181,679), and layers (109,344).

Compared to the state as a whole, the study area counties have either a similar or slightly lower percentage of land in farms, with McKenzie County having the lowest percentage of farmland. Average farm sizes in the study area counties were larger than the state average in all counties except Mercer County. In terms of the total value of agricultural products sold, Williams County had the highest value and Mercer County had the lowest value. In the state as a whole, crop sales comprise a majority of the total value of agricultural products sold, except in Dunn County, where crops sales accounts for 46 percent of the agricultural value. Williams County had the highest percentage of crop sales, while Dunn County had the highest percentage of livestock sales. These figures are summarized in Table 3-35.

Table 3-35: Characteristics of Agriculture in Study Area Counties

	Dunn	McKenzie	Mercer	Mountrail	Williams
Land area in farms (percentage of total land area in county)	1,043,932 acres (81.2%)	1,074,656 acres (60.8%)	509,552 acres (76.3%)	1,036,572 acres (88.7%)	1,144,868 acres (86.1%)
Average farm size	1,854 acres	1,937 acres	1,120 acres	1,573 acres	1,336 acres
Total value of agricultural products sold (crop sales / livestock sales)	$68,712,000 (46% / 54%)	$78,120,000 (64% / 36%)	$40,068,000 (61% / 39%)	$108,002,000 (86% / 14%)	$127,333,000 (91% / 9%)
Top crops in terms of acreage	wheat (135,485) forage (128,388) barley (13,005) corn (8,891)	wheat (175,989) forage (83,135) barley (20,540) peas (16,844)	wheat (81,964) forage (68,287) barley (14,612) canola (7,003)	wheat (291,590) forage (60,393) peas (56,409) canola (55,224)	wheat (379,685) peas (52,527) lentils (52,401) forage (47,181)

Source: USDA, 2009b.

Wheat was the top crop in terms of acreage in all the study area as well as in the state as a whole. Forage, peas, and barley were also top crops in several of the study area counties. The top livestock inventory item included cattle and calves in all study area counties and the state. The study area differed from the state in that horses and ponies were a top livestock inventory item in the study area but not in the state as a whole.

Housing Characteristics

The total number of housing units within the study area and the state of North Dakota as a whole are displayed in Table 3-36 along with various characteristics of the housing in the study area. The percent of housing that is owner-occupied is higher in the study area compared to the state, with Dunn and Mercer counties having the highest rates. Vacancy rates are relatively low throughout the study area and the state as a whole, with the lowest rates occurring in McKenzie and Williams counties. Housing is of similar age throughout the study area and the state.

Table 3-36: 2010 Housing Characteristics in the Study Area

	North Dakota	Dunn	McKenzie	Mercer	Mountrail	Williams
Number Housing Units	317,498	2,132	3,090	4,450	4,119	10,464
Percent Owner-Occupied	65.4%	78.3%	69.8%	80.4%	70.7%	69.3%
Vacancy Rate (homeowner/rental)	1.4%/6.5%	1.5%/9.5%	0.4%/0.0%	0.5%/11.2%	1.0%/7.1%	0.3%/1.7%
Median Year Built	1973	1972	1974	1977	1967	1972
Percent Single Family	66.5%	72.1%	81.7%	71.1%	66.4%	70.8%
Percent Multi-Family	25.9%	4.5%	7.4%	16.6%	7.7%	18.7%
Percent Mobile Homes	7.6%	23.4%	11.0%	12.3%	25.8%	10.3%
Median Value	$111,300	$73,000	$86,600	$96,100	$66,900	$93,800
Median Rent	$555	$401	$481	$398	$523	$515

Source: U.S. Census Bureau, 2010a, 2010b.

Single family housing accounts for the majority of housing in North Dakota as well as the study area, with McKenzie County having the highest percentage of single family housing. There is a higher percentage of multi-family housing in the state as a whole compared to the study area. Conversely, mobile homes comprise a smaller percentage of housing units in the state as compared to the study area. In addition to permanent housing in the study area, an increasing amount of transient housing has been constructed/utilized in the region in the last several years. Transient housing may include man camps, recreational vehicle (RV) parks, informal RV parking, and hotels. Housing construction in the region has increased in the past several years as communities struggle to keep up with demand.

Housing values are lower on average in the study area compared to the state, with median values lowest in Mountrail County and highest in Mercer and Williams counties. Rents are also lower in the study area than in the state as a whole, with the lowest median rent in Dunn County and the highest in Mountrail County. As communities within the region struggle to keep up with housing demand in recent years, however, rents have been increasing, and affordability has become an issue in heavily impacted communities, such as Williston, Tioga, and Watford City (Ondracek et al., 2010). A state report summarizing the findings of a tour of the region reports that community leaders from Williston to Bowman are voicing concerns regarding rising rents and home values, which are creating a significant shortage for low to moderate income residents (North Dakota Governor's Office, 2012).

Property Valuation and Taxation

Local and state governments generate a portion of their tax revenues by assessing and taxing certain categories of property. In North Dakota, property taxes are levied on real property owned by a corporation, partnership, individual, estate, or trust. Taxation is based on the value of the object that is taxed. Williams County provided the highest tax revenue of all of the counties in the study area, followed by Mercer County (Fong, 2010), as noted in Table 3-37.

Table 3-37: Property Tax Revenue in the Study Area and in North Dakota, Payable 2006-2010.

County	Total Property Tax Revenue, 2006	Total Property Tax Revenue, 2007	Total Property Tax Revenue, 2008	Total Property Tax Revenue, 2009	Total Property Tax Revenue, 2010
Dunn	$4,163,603	$4,213,242	$4,257,953	$4,273,671	$3,587,498
McKenzie	$3,750,757	$3,913,769	$3,808,607	$4,002,063	$3,310,266
Mercer	$6,556,798	$6,815,946	$6,992,218	$7,342,704	$6,161,729
Mountrail	$5,477,741	$6,054,008	$6,210,285	$6,281,791	$5,880,367
Williams	$16,460,801	$17,622,072	$18,263,736	$19,383,080	$17,347,646
Study Area Total	$36,409,700	$38,619,037	$39,532,799	$41,283,309	$36,287,506
North Dakota	$659,789,374	$706,427,621	$740,540,738	$776,398,475	$678,749,378

Source: Fong, 2010.

Taxation is based on the value of the object taxed. The primary laws that determine how transmission lines are taxed in North Dakota are in Chapter 57-33.2 and 57-06-17.3 of North Dakota's Century Code. Chapter 57-33.2 applies only to lines whose voltage is 40.6 kV or more, and 57-06-17.3 applies only to lines whose voltage is 230 kV or more. Transmission lines that are taxable under 57-33.2 pay a rate ranging from $50 to $600 per mile, depending on the voltage of the line. However, if the line was placed in service after January 1, 2009, it is exempt from taxes during its first year. Its taxes are reduced by 75 percent the second year, 50 percent the third year, and 25 percent the fourth year, after which the standard rates are applied.

Transmission lines that are not taxable under Chapter 57-33.2, if they were placed in service after October 1, 2002, and are of 230 kV or greater, are taxable under Chapter 57-06-17.3, at a rate of $300 per mile. These lines also are exempt from taxes during their first year, followed by a 75 percent reduction in their second, 50 percent in their third, and 25 percent in their fourth years of operation.

Transmission line tax revenues accounted for less than 1 percent of the total property tax revenue in North Dakota in 2011. Total property tax revenues levied in 2010 (payable in 2011) were $816,215,633, of which electric generation, distribution, and transmission taxes statewide accounted for 0.86 percent of this total, or $7,036,194 (Fong, 2011). The share of this figure accounted for specifically by transmission lines was not available for the taxes levied in 2010. However, this share was available for the taxes levied in 2009 (payable in 2010). In 2009, transmission line taxes accounted for $1,328,339 of $7,065,609 of total electric generation, distribution, and transmission taxes levied, or approximately 18.8 percent (Fong, 2010, 2011). Due to the similarity of the total revenue generated in each year, it is likely that transmission line taxes levied in 2010 accounted for a similar share of the total electric generation, distribution, and transmission tax revenue for that year.

Public Services

Education Services

School enrollment is growing in the region, including seasonal demand for educational services, as both the resident and transient population swells. Across the study area, there are 44 schools with total enrollment of 7,006. Williams County has the largest number of schools and had the highest total enrollment during the 2009/2010 school year, the latest year for which data was available (see Table 3-38). The schools in the study area include elementary, junior high, high, and special schools (National Center for Education Statistics, 2012).

Table 3-38: Schools in the Study Area Counties

County	Number of Schools	Total 2009/2010 Student Enrollment
Dunn County	4	401
McKenzie County	6	620
Mercer County	7	1,270
Mountrail County	8	1,478
Williams County	19	3,237
Total Study Area	44	7,006

Source: National Center for Education Statistics, 2012.

Law Enforcement

Public safety within the study area is provided by local law enforcement or emergency response agencies located in nearby communities. The Mercer County Sheriff's Office provides law enforcement for Mercer County. The Killdeer Police Department and the Dunn County Sheriff's Office provide law enforcement services to the portions of Dunn County that are within the study area. The McKenzie County Sheriff's Office and the Watford City Police Department are the law enforcement agencies located within the study area in McKenzie County. Law enforcement services for the study area within Williams County are provided by the Williston Police Department, Tioga Police Department, and the Williams County Sheriff's Office. The portion of Mountrail County within the study area is served by the Mountrail County Sheriff's Office.

The increase in oil development activities in the area has brought an influx of people to the region, resulting in the need for increased law enforcement presence in the area. With the influx of people there has been an increase in local crime rates. In 2010 the police chief in Watford City, in McKenzie County, requested the hiring of two new full-time officers, and the Williams County Sheriff asked for a substantial increase in staff to help patrol Williams County (Caldwell, 2010). The city of Williston hired five additional officers in 2010, and plans to hire six more in 2012 to help keep up with the increasing number of calls.

In 2009, Williston police received between 6,000 and 7,000 calls for police assistance, and this number increased to more than 16,000 in 2010. In 2011, 911 calls tripled in volume compared to calls received in 2010. Additionally, outlying areas of Williams County, patrolled by the Williams County Sheriff's Department, have seen an increase in the number of calls coming from all over the county, sometimes requiring up to 40 minutes for a deputy to respond (Domaskin, 2011).

Within the study area, crimes such as oil site thefts, burglary, alcohol-related offenses, prostitution, and assault are rising. In Williston, thefts at residences and retail shops have risen steadily, with police responding to approximately 40 percent more burglar alarms in 2011 compared to 2010. Assault and battery charges increased by 171 percent in Williston in a year's time, and police departments in many of the towns within the study area are encountering increases in night club violence and domestic violence (Domaskin, 2011; Ellis, 2011).

Fire Protection Services

Fire services within the study area are provided by city and community fire departments, volunteer fire departments, rural fire departments, and fire protection districts. There are a total of 33 fire stations in the study area. All of these stations are staffed by volunteer firefighters, except for the Williston Fire Department of Williams County, which is staffed by volunteers as well as by career firefighters (U.S. Fire Administration 2012). The total number of firefighters (including volunteer, career, and other firefighters) in the study area counties is 904 (U.S. Fire

Administration 2012). The oil related activity has required the fire departments to expand their staffing and services provided. These figures are summarized in Table 3-39.

Table 3-39: 2012 Fire Protection Services in the Study Area Counties

County	District Name	Number of Stations	Total Number of Firefighters (career, volunteer, civilian, active, on-call)
Dunn	Halliday Rural Fire Protection District	1	19
	West Dunn Fire District	2	67
McKenzie	Alexander Volunteer Fire Department	1	29
	Grassy Butte Fire Protection District	1	50
	McKenzie County Rural Fire Protection District	2	70
	Sioux-Yellowstone Rural Fire Protection District	1	5
	Watford City Volunteer Fire Department	1	25
Mercer	Beulah Rural Fire Protection District	1	30
	Golden Valley Rural Fire Department	1	20
	Hazen Fire and Rescue	1	34
	Pick City Fire Department	1	13
	Stanton Rural Fire Protection Department	1	25
	Zap Rural Fire Protection District	1	20
Mountrail	Parshall Rural Fire Protection District	1	23
	Plaza Fire Protection District	1	31
	Stanley Fire Department	1	25
	Three Affiliated Tribes-Fire Department	4	80
Williams	Alamo Rural Fire Protection District	2	45
	Epping Rural Fire Protection District	2	43
	Grenora Rural Fire Protection District	1	18
	Ray Fire Protection District	1	30
	Tioga City Fire Department	1	55
	Tioga Rural Fire Department	1	44
	Wildrose Fire Protection District	1	27
	Williston Fire Department	1	54
	Williston Rural Fire Protection District-Ambulance	1	22

Source: U.S. Fire Administration, 2012.

Ambulance Districts

Seven ambulance districts serve the study area. These districts provide ground-based life support services and include: Halliday Ambulance Service, Killdeer Area Ambulance Service, McKenzie County Ambulance Service, Ray Community Ambulance District, Tioga Ambulance Service, and Williston Ambulance Service (NDDOH, 2005). The increase in the oil-related activity has required the ambulance districts to expand their staffing and level of services (BMcD, 2012). The majority of the ambulance districts operate on a voluntary or part-time basis.

Medical Facilities and Hospitals

Hospitals located within the study area include the McKenzie County Memorial Hospital and Healthcare Systems, located in Watford City; Mercy Medical Center located in Williston; and Tioga Medical Center located in Tioga. McKenzie County Memorial Hospital, Tioga Medical Center, and Mercy Medical Center house 24, 25, 87 beds, respectively. Mercy Medical Center also provides a Level IV Trauma Center (UCompareHealthCare, 2011). The Mountrail County Health Center, a hospital in Stanley, Mountrail County, is the only hospital in the study area that is located outside of the study area itself. The larger cities of Dickinson, Bismarck, and Minot, located outside the study area, offer more and larger healthcare facilities.

3.8.2 Direct and Indirect Effects

Impacts on socioeconomic resources include how the proposed project could potentially affect elements of the human environment such as population, employment, income, cost of living, property values, housing, and public services. The effects from the proposed project on many of these factors are not limited to the ROW itself but would result in impacts to the wider geographic area, affecting the five county study area. However, some effects, such as property values, would likely only affect residences in very close proximity to the routes. The bulk of the impacts on social and economic conditions occur with the construction stage of the project, and therefore they are generally temporary, short-term, and low when compared to all the activities at the broader regional level.

Additionally, because the build alternatives are similar in mileage, schedule, required work force, and location, the socioeconomic impacts of both alternative routes would be similar for several criteria such as population and employment. Other impacts on socioeconomic characteristics, including property values and agricultural production, would vary between each alternative. This section discusses the potential effects of the proposed project on the various social and economic characteristics throughout the project area.

Economic impacts include impacts that individuals, groups, properties, businesses would experience from a change in business and economic activity. Social impacts are borne by individuals or groups who could experience a change in their social structure and context.

The intensity of impacts on socioeconomic conditions can be described through the thresholds described in Table 3-40.

Table 3-40: Socioeconomic Impact Context and Intensity Definitions

Context (Duration)	Low Intensity	Moderate Intensity	High Intensity
Short term: During construction period Long term: Life of the line (50 years)	A few individuals, groups, businesses, properties or institutions would be impacted. Impacts would be minor and limited to a small geographic area. These impacts are not expected to substantively alter social and/or economic conditions.	Many individuals, groups, businesses, properties or institutions would be impacted. Impacts would be readily apparent and detectable across a wider geographic area and could have a noticeable effect on social and/or economic conditions.	A large number of individuals, groups, businesses, properties or institutions would be impacted. Impacts would be readily detectable and observed, extend to a wider geographic area, possibly regionally, and would have a substantial influence on social and/or economic conditions.

No-action Alternative

Under the no-action alternative the proposed project would not be granted a ROW and the transmission lines and substations would not be constructed. The human environment would remain as is and management direction from the current management plans would continue. The advantages of the no-action alternative would be the avoidance of any of the socioeconomic impacts that would occur with the construction of the transmission lines.

However, under the no-action alternative the projected electricity demands in western North Dakota would not be met. This could lead to increased cost of energy and continued dependence on a system at capacity. Also, without the project to strengthen the electrical system, reliability of the electrical system could be jeopardized and could result in power outages. In this way, the no-action alternative would indirectly impact existing socioeconomic conditions, because local communities and the region would not benefit from the improved electric reliability and capacity anticipated from the project.

Electricity capacity shortfall would likely limit future development activities needed to accommodate the considerable population, housing, and business growth in the area associated with the current oil boom. Residential, commercial, and industrial growth and development throughout the region could begin to experience declines in electricity service reliability as early as 2015, as discussed in the Purpose and Need section under the assumed load forecasts of 2011. Should the load forecast be greater than what is anticipated the service reliability would be affected earlier. Declines in service reliability could lead to lost productivity, and declines in commercial and industrial growth. If this new 345-kV transmission line is not constructed, the load growth would be capped at the projected 2015 load level, no new load growth could be accommodated, and transmission system reliability would be decreased.

Proposed Action

Construction and operation of the proposed project would result in socioeconomic impacts. Potential socioeconomic impacts include the following.

- Improved electric reliability and increased capacity for existing, developing, and future customers.
- Temporary increase in population as a result of the influx of construction workers.
- Temporary increase in demand for temporary lodging facilities as a result of the influx of construction workers.
- Temporary increase in demand associated with spending on local goods, services, and construction materials.
- Potential changes to property values.
- Minimal reductions in agricultural production from loss of land for structure placement
- Potential limitation for siting of oil and gas facilities, although the project would provide for reliable source of electricity for oil and gas operations.

As discussed in Section 3.8.1, the regional economy of northwest North Dakota and adjoining areas of Montana is currently heavily influenced by the rapid and widespread oil development associated with the Bakken oil shale fields. The level of oil development that has occurred and is planned for the future in the Bakken region is bringing considerable jobs and businesses to the area, which requires supporting infrastructure, housing, retail stores, and public services. As population and businesses grow in the region, they are requiring increasing amounts of electrical power as well as electrical transmission capacity and reliability. The continued reliable electric service to the region is necessary to serve the needs of businesses, housing, and infrastructure to allow the economy of the area to continue to develop.

Approximately 150 annual construction jobs would occur over the 2-year life of the project, providing a short-term influx of income to the area (Basin Electric, 2012a). The majority of transmission line construction contractors and workers would temporarily relocate to the project area as transmission construction requires specialized expertise and workforce. A small number of local construction workers could be utilized for more general activities. However, due to the tight labor market in the region and low unemployment rates, it is anticipated that all of the construction workforce would come from outside of the region. Few workers would be hired locally and permanent jobs are not anticipated to be added to the area. There is no additional employment anticipated with the operation of the transmission line (Basin Electric, 2012a).

Although construction would occur over 2 years, individual crews may be required for only a few months in a particular construction area before moving to another area on a subsequent phase of the project. Additionally, construction would not be confined to one area or community. Workers would be spread out over nearly 200 miles in three crews of approximately 50 workers each, for a total of 150 workers. Earnings of 150 construction workers would be approximately $9.4 million annually, based on average earnings for construction jobs in the study area counties (U.S. Department of Commerce, Bureau of Economic Analysis, 2012b, 2012c, 2012d).[4] These earnings represent 0.4 percent of the earnings within the project counties, $2.3 billion in 2010 (U.S. Department of Commerce, Bureau of Economic Analysis, 2012d).

As construction workers spend their money in the local area, revenues would likely increase for some local businesses, such as hotels, restaurants, gas stations, and grocery stores, supporting jobs and incomes for these businesses and their employees. Since the construction workers are not anticipated to be permanent residents of the study area, induced spending would be considerably less than locally-residing employees as construction workers will send a portion of their earnings to their home area. Overall, the spending would be short term and is likely to have low socioeconomic impacts on the overall region.

The proposed project would result in increasing transmission capacity and reliability. Additional capacity would provide electricity for the expanding Bakken oil field development activities and other future potential development activities in the region. A reliable supply of electricity would continue to support the expanding economy of the region, supporting new and existing jobs in the study area.

The project region has seen a dramatic increase in population over the past several years as a result of the economic activity and availability of jobs in the area. Table 3-27 shows a population increase in the five study area counties between 2000 and 2010, amounting to more than 4,000 new permanent residents, a 9 percent increase. Over the 2 year construction period, there would be a temporarily population increase of 150 people in the study area.

The larger towns of Williston, Beulah, Watford City, and Tioga would likely be impacted the greatest by the temporary population increase, as workers would seek to take advantage of amenities offered in these towns. Temporary population changes in local communities would be low, particularly compared to the current growth in the area.

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[4] Average earnings for construction workers of $62,667 in 2010 was based on data available for McKenzie, Mercer, and Williams counties. Construction earnings or employment was not disclosed for Mountrail and Dunn counties.

Short-term impacts on nearby residents as a result of the proposed project would include temporary disruptions during construction. These would include increased noise from construction activities and equipment, the visual presence of construction equipment, and potential traffic and congestion resulting from construction trucks and equipment accessing the ROW, using local roads, and from potential short-term road closures during conductor stringing. Long-term impacts on nearby residents as a result of operation of the proposed project would include minor, infrequent disturbance during any maintenance or repair activities (property values are discussed below).

New ROWs for the construction and maintenance of the new transmission line would be required for the project. Existing access roads would be used where possible, but additional access road easements would also need to be acquired. Basin Electric would pay market value to nonfederal landowners, as established through the appraisal process, for any new land rights required for the proposed project. The appraisal process takes all factors affecting value into consideration, including the impact of transmission lines on property value.

The appraisals may reference studies conducted on similar properties to support their conclusions. The strength of any appraisal depends on the individual analysis of the property, using neighborhood-specific market data in order to determine market value.

The impact of introducing a new ROW for transmission structures and lines can vary dramatically depending on the placement of the ROW in relation to the property's size, shape, and the location of existing improvements. A transmission line may diminish the utility of a portion of property if the line effectively severs this area from the remaining property. These factors as well as any other elements unique to the property are taken into consideration to determine any loss in value within the easement area, as well as outside the easement area in cases of severance.

Whenever land uses change, the concern is often raised about the effect the change may have on property values nearby. The question of whether nearby transmission lines can affect residential property values has been studied extensively in the United States and Canada over the last 20 years or so, with mixed results. In general, the impacts are difficult to measure, vary among individual properties, and are influenced by a number of interplaying factors, including:

- Proximity of residential properties to transmission line structures.
- Type and size of high-voltage transmission line structures.
- Appearance of easement landscaping.
- Surrounding topography (Jackson and Pitts, 2010).

Jackson and Pitts (2007) summarize the following conclusions on the impacts of high-voltage transmission lines.

- When negative impacts are present, studies report an average decline of prices from 1 to 10 percent.
- Value diminution is attributable to the visual unattractiveness of the lines, potential health hazards, disturbing sounds, and safety concerns.
- Where property value impacts were present, the effect dissipated with time and distance.
- Impacts diminish as the distance between the high-voltage transmission lines and the affected properties increase, and generally disappear completely at a distance of 200 feet from the lines.
- Where views of transmission lines and towers are completely unobstructed, negative impacts can extend up to 0.25 mile.
- If high-voltage transmission-line structures are at least partially screened from view by trees, landscaping, or topography, any negative effects are reduced considerably.
- Value diminution attributed to high-voltage transmission-line proximity is temporary and usually decreases over time, disappearing completely in 4 to 10 years.

A recent study of sales of rural land parcels in central Wisconsin during the period 2002 through 2008 found small, but not statistically significant negative price effects on the sale of properties encumbered by a transmission line easement (Jackson, 2010). A study by Chalmers analyzed nearly 600 miles of a 500-kV line stretching across Montana running from Colstrip in the southeast corner, west to the state border near Taft (Chalmers, 2012a, 2012b, 2012c). Chalmers' research reports on sales dynamics involving properties within 500 feet of the centerline of the Colstrip-Bonneville Power Administration line that sold between 2000 and 2010.

With regard to the circumstances that may affect vulnerability to transmission line impacts in rural settings, Chalmers suggests three general principles based on his study of this line:

- When a property's sole use is residential, its vulnerability to price impacts from a transmission line increases.
- As property size increases, vulnerability to negative market impacts from a transmission line decreases.
- If substitutes are available, vulnerability to price impacts and marketing delays can increase.

Although extents vary, price impacts and market delays associated with the 500-kV line on small rural residential parcels are clearly noted in the Chalmers study. The same report did not find evidence of transmission line impact on sales involving production agricultural properties and based on a small number of case studies found no impact on the sales of recreationally-influenced agricultural lands due to the presence of the Colstrip-Bonneville Power Administration line.

Studies of impacts during periods of physical change, such as new transmission line construction or structural rebuilds, generally reveal greater short-term impacts than long-term effects. However, most studies have concluded that other factors (e.g., general location, size of property or structure, improvements, irrigation potential, condition, amenities, and supply and demand factors in a specific market area) are far more important criteria than the presence or absence of transmission lines in determining the value of residential real estate.

Some impacts on property values (and salability) might occur on an individual basis as a result of the new transmission line. There are an estimated seven (Alternative Route A) and eight (Alternative Route B) residences within 500 feet (1/10th of a mile), and an estimated 59 residences within 0.25 mile of the new transmission line. Therefore, there are low adverse effects expected to property values associated with the transmission line, and these impacts would be highly variable, individualized, and unpredictable. Additionally, reductions in property values associated with reduced agricultural production would be mitigated with compensation for fair market value losses. Most of these losses would be temporary in nature.

The construction, operation, and maintenance of the transmission line would generate additional property taxes to counties where the line would be located. There are approximately 195 miles of transmission lines for Alternative Route A, and 210 miles for Alternative Route B. Table 3-41 summarizes these tax receipts to local governments association with the transmission line. Additionally, there would be property taxes collected from the substation properties as well (see Table 3-42).

Table 3-41: Property Tax Revenues to Study Area Counties Associated with Alternative Route A

	Alternative Route. A (miles)	Year 2	Year 3	Year 4	Years 5-45
Dunn	45.6	$3,423	$6,845	$10,268	$13,690
McKenzie	67.5	$5,066	$10,132	$15,198	$20,264
Mercer	18.0	$1,353	$2,707	$4,060	$5,413
Mountrail	2.5	$188	$376	$563	$751
Williams	60.9	$4,564	$9,128	$13,691	$18,255
Study Area Counties	194.6	$14,593	$29,187	$43,780	$58,374

Source: Staff calculations based on North Dakota Title 57, Taxation, n.d.

Table 3-42: Property Tax Revenues to Study Area Counties Associated with Alternative Route B

	Alt. B (miles)	Year 2	Year 3	Year 4	Years 5-45
Dunn	69.7	$5,225	$10,450	$15,675	$20,900
McKenzie	58.4	$4,379	$8,758	$13,136	$17,515
Mercer	18.0	$1,353	$2,707	$4,060	$5,413
Mountrail	2.5	$188	$376	$563	$751
Williams	60.9	$4,564	$9,128	$13,691	$18,255
Study Area Counties	209.4	$15,709	$31,417	$47,126	$62,835

Source: Staff calculations based on North Dakota Title 57, Taxation, n.d.

Construction and operation of the proposed project would result in both temporary and long-term impacts on agricultural land. During construction, potential temporary impacts within the ROW would include crop damages (depending on the time of year for construction across specific fields), soil disturbance, and potential loss of production for one growing season as a result of construction activities and the transport of construction equipment and vehicles restricting or preventing planting of lands within or adjacent to the ROW.

Long-term, direct loss of agricultural land would occur as a result of transmission line structure placement. After construction is complete, however, landowners would be able to resume farming activities around the transmission line structures. Basin Electric has a policy of allowing agricultural practices within its ROW as long as they do not interfere with, or jeopardize, the operation of its lines.

Rapid oil development is currently occurring in western North Dakota with an estimated 1,100 to 2,700 new wells expected per year, and 26,000 new wells expected over the next 10 to 20 years (NDDMR, 2011). The proposed project is expected to support this development allowing for the transmission of electric power to accommodate increasing population, businesses, housing, infrastructure, retail stores, and public services. The location of the development of new wells would be constrained by the ROW, although the impacts would be low since the extraction of oil can usually occur from multiple locations within and above the oil reserves.

Impacts related to the construction phase of either Alternative Route A or B are anticipated to be temporary, and would cease once the line is in service. Existing public health and safety services such as police, fire, ambulance, and hospital services are already experiencing some deficiencies and personnel shortages due to the rapid growth in the region, especially in smaller communities unaccustomed to rapid increases in population. This coupled with the inherent potential for accidents and injuries associated with industrial development have added to the need for health services. Additional workers moving into the region during construction of the proposed project, if only temporarily, may add an additional burden on some or all of the existing public service resources. Impacts on emergency services would be expected to be low with workforce of only 150 coming into the area temporarily; however, with the current deficiencies, the impacts could be higher.

Since very few to no families are expected to accompany the construction workers, there would be negligible impacts on schools and enrollment.

Capital expenditures for improvements to electric-utility infrastructure are investments made to serve customers. Basin Electric's customers primarily include 134 member rural electric systems, located in nine states: Colorado, Iowa, Minnesota, Montana, Nebraska, New Mexico, North Dakota, South Dakota, and Wyoming. The capital expenditures can be passed on to the customers served in the form of increased rates. However, as a regulated utility, Basin Electric can increase rates only on approval by state utility commissions or FERC. FERC and state utility commissions must approve rates for sale of wholesale electricity and review rates set by the federal Power Marketing Administrations. Such rate-increase requests are subjected to rigorous analysis by regulators and others, and to public process. At this time, not all costs for development of the project are known; therefore, Basin Electric cannot project what the rate increase may be as a result of this project.

Alternative Route A

Under Alternative Route A, construction of a new 345-kV transmission line from the Beulah area to the northwest that connects directly to the 230-kV system in the Williston/Tioga area would provide an increase in the load serving capacity to accommodate the long-term electrical needs of the northwest North Dakota region. Projected load growth would be accommodated and the reliability of the regional transmission system would be maintained, continuing to serve the electricity needs of the area and make the region attractive for additional growth and development opportunities.

In addition to electrical support for the economy of the area, project construction would itself generate a certain amount of economic activity. While minimal when compared to the current sales throughout the region, the presence of approximately 150 construction workers over a 2-year period would generate additional sales of food, fuel, lodging, and services (primarily vehicle and equipment repairs). Construction activity would also require concrete, aggregate, lumber, and hardware items. Many of these materials would likely be purchased locally, contributing further to local sales. Most materials for the transmission structures and conductor would be shipped from manufacturers outside the region. However, many of these materials may be subject to sales and subsequent property taxes payable to local jurisdictions that would benefit local programs like roads and schools.

The proposed project would not influence residential employment in the project area. Non-residential construction workers would spend a portion of their earnings in the study area economy, contributing to jobs and income in the region. Since these workers will only be temporarily in the area, and are likely to primarily be from outside the region, induced employment and income is expected to be short-term and low. In addition, there are no long-term employees needed for the operation of the transmission line. The local population would increase temporarily, with low and short-term impacts on socioeconomic conditions.

Approximately 1,366 acres of cultivated cropland would be incorporated into the ROW under Alternative Route A. It is likely that impacts would not occur across the entire 1,366 acres, with most impacts being temporary and occurring during construction. Permanent impacts, requiring the removal of cropland from production, would occur only at the structure locations. Lands lost for the structure locations necessary for Alternative Route A would be approximately one acre along the entire line. Therefore, permanent loss of agricultural lands, including cropland, would be less than one acre. The remaining acreage within the ROW would be allowed to return to cropland upon completion of construction. Approximately 1,810 combined acres of grassland, pasture, or hayland occur within the ROW for Alternative Route A, and construction activities would have a temporary impact on cattle grazing activities. Cattle may need to be moved temporarily during construction in areas where the ROW would cross grass, pasture or hayland.

Alternative Route B

Alternative Route B would result in the same impacts on the regional economy and on employment as Alternative Route A.

Alternative Route B would have fewer acres of cultivated cropland within the ROW compared to Alternative Route A (1,272 acres versus 1,366 acres), but more combined acres of grassland, pasture, and hayland (2,176 acres versus 1,810 acres for Alternative Route A). Impacts on agriculture would be similar for both alternatives, with temporary disturbances during construction, permanent impacts at the transmission line structure locations, and potential interference with cattle grazing activities during construction and re-seeding of the ROW. Permanent impacts, requiring the removal of cropland from production, would occur only at the structure locations. Lands lost for the structure locations necessary for Alternative Route B would be approximately one acre along the entire line. Therefore, permanent loss of agricultural lands, including cropland, would be less than one acre.

3.9 ENVIRONMENTAL JUSTICE

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, requires each federal agency to make the achievement of environmental justice part of its mission by identifying and addressing disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low income populations. The Executive Order further stipulates that the agencies conduct their programs and activities in a manner that does not have the effect of excluding persons from participation in, denying persons the benefits of, or subjecting persons to discrimination because of their race, color, or national origin.

Evaluating whether a proposed action has the potential to have disproportionately high and adverse impacts on minority and/or low income populations typically involves: 1) identifying any potential high and adverse environmental or human health impacts, 2) identifying any minority or low income communities within the potential high and adverse impact areas, and 3) examining the spatial distribution of any minority or low income communities to determine if they would be disproportionately affected by these impacts.

Guidelines provided by CEQ (1997) and USEPA (1998) indicate that a minority community may be defined where either: 1) the minority population comprises more than 50 percent of the total population, or 2) the minority population of the affected area is meaningfully greater than the minority population in the general population of an appropriate benchmark region used for comparison. Minority communities may consist of a group of individuals living in geographic proximity to one another, or a geographically dispersed set of individuals who experience common conditions of environmental effect. Further, a minority population exists if there is “more than one minority group present and the minority percentage, as calculated by aggregating all minority persons, meets one of the above-stated thresholds” (CEQ, 1997). For the purposes of this analysis, the threshold for consideration of an area as an Environmental Justice minority area would be if the minority population comprises more than 50 percent of the total population within the evaluated area or the minority population percentage is more than 10 percent greater than the benchmark or reference region; in this case, the reference or benchmark geographic area is the county and the state.

CEQ and USEPA guidelines indicate that low income populations should be identified based on the annual statistical poverty thresholds established by the U.S. Census Bureau. Like minority populations, low income communities may consist of individuals living in geographic proximity to one another, or a geographically dispersed set of individuals who would be similarly affected by the proposed action or program. The U.S. Census Bureau defines a poverty area as a census tract or other area where at least 20 percent of residents are below the poverty level (U.S. Census Bureau, 2012).

3.9.1 Affected Environment

Presence of Minority Environmental Justice Populations

The environmental justice assessment was undertaken at both the census block and census tract levels. The presence of minority populations was evaluated on the block level, the smallest geographic area for which census information is available in 2010. The study area for the environmental justice assessment includes all those blocks for minority populations within 0.5 mile of the proposed transmission line routes.

The county and/or state in which each affected census block is located was used as the reference area to determine the presence of minority and/or low-income populations, whichever has the lower threshold level. Racial, ethnic, and poverty data have been retrieved from the U.S. Census for 2010.

Within the study area, there are six blocks that have a higher percentage of minority residents (10 percent) as compared to the counties or the state in which they reside. There are four census blocks in Williams County, one in Dunn County, and one in McKenzie County. A total of 58 people live in these six census blocks. Major minority groups within these blocks include American Indians, and those who identify as two or more races. Many of the other study area blocks have small (less than 20 percent) percentages of minority residents. Figures 3-23 and 3-24 show the location of these blocks in the study area.

Presence of Poverty Environmental Justice Populations

For 2010, the smallest geographic area for which the presence of low-income populations is identified is the census tract level. Census tracts were identified that are located within 0.5 mile of the proposed transmission line routes. There are no census tracts within the study area that constitute communities of environmental justice concern on the basis of poverty. The majority of the study area has a low percentage of residents living below the poverty level.

Figure 3-23: Blocks of Environmental Justice Concern in Alternative Route A

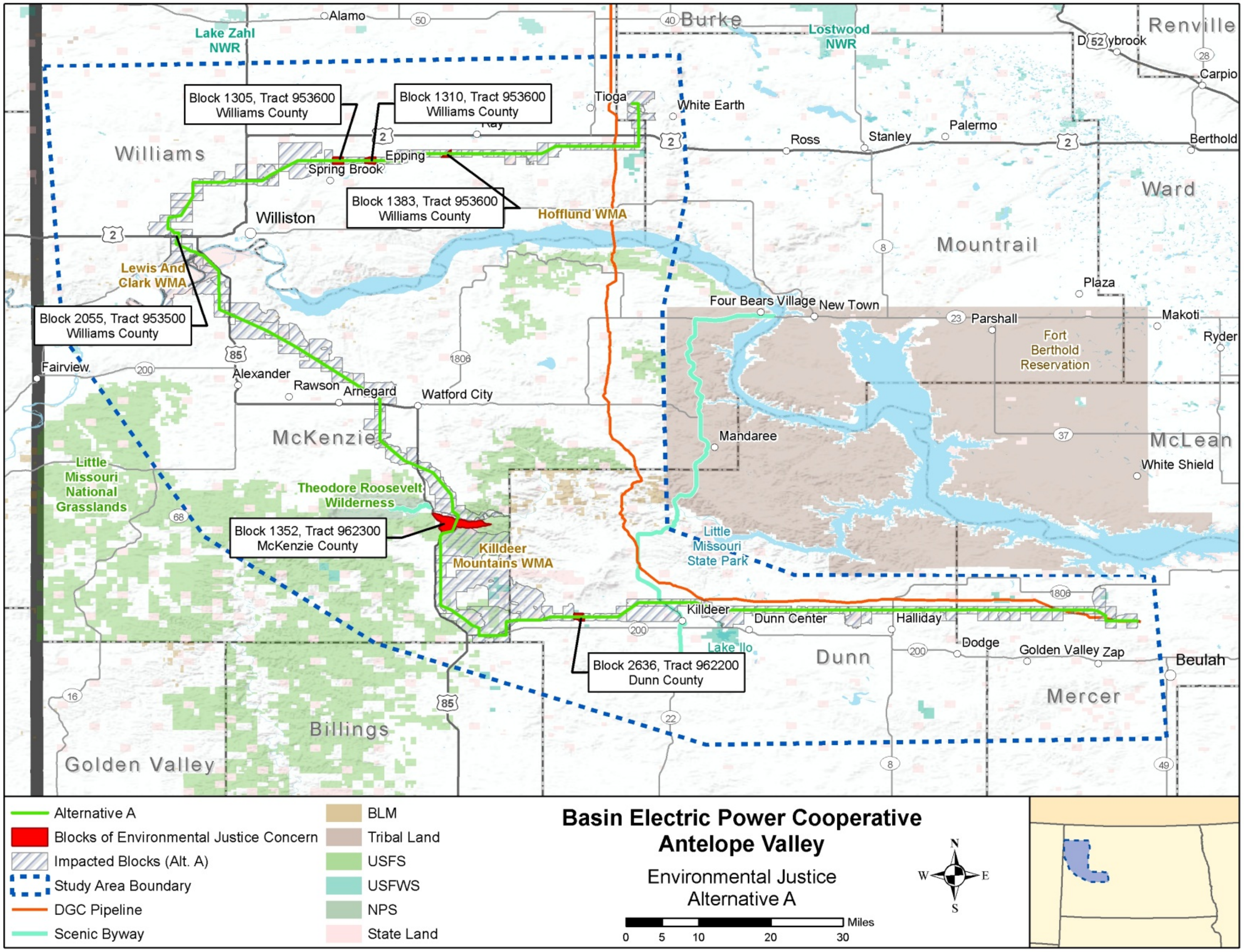
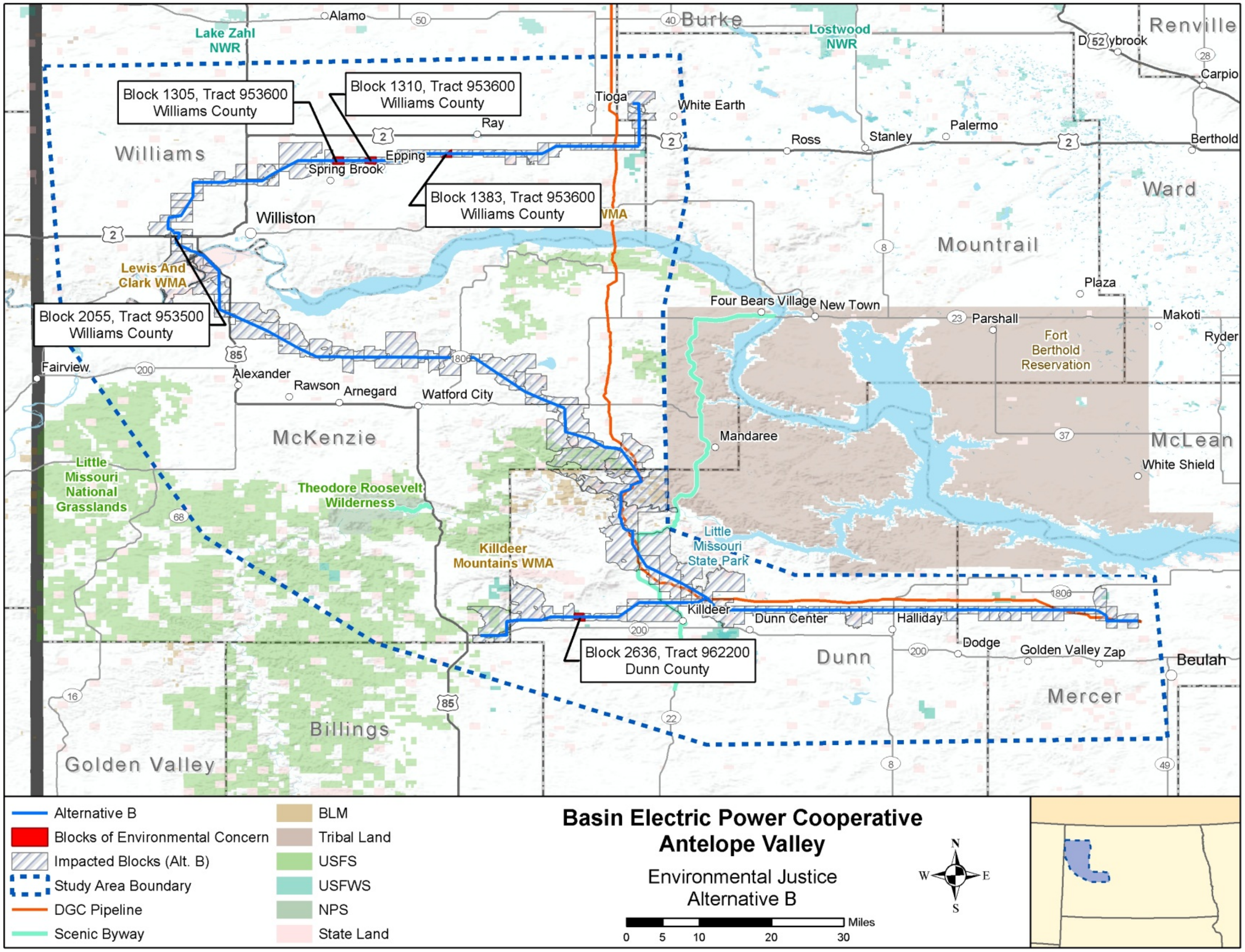


Figure 3-24: Blocks of Environmental Justice Concern in Alternative Route B



3.9.2 Direct and Indirect Effects

For the purposes of this analysis, the threshold for an environmental justice minority area is that the area under analysis comprises minority populations more than 10 percent greater than the benchmark or reference region; in this case, the reference or benchmark geographic area is the county and the state. Definitions for duration and intensity of impacts to environmental justice communities established for this project are described in Table 3-43.

The U.S. Census Bureau defines a poverty area as a census tract or other area where at least 20 percent of residents are below the poverty level (U.S. Census Bureau, 2010a).

Table 3-43. Environmental Justice Impact Context and Intensity Definition

Context (Duration)	Low Intensity	Moderate Intensity	High Intensity
Short term: During construction period Long term: Life of the line (50 years)	A few environmental justice communities would be impacted, and impacts would be limited to a small geographic area. Additionally, impacts on these communities would not be high and adverse, and would not be experienced disproportionately when compared to other communities in the study area.	Many environmental justice communities would be impacted across a wider geographic area. Impacts would be adverse, but not necessarily high. Environmental justice communities would possibly be disproportionately affected when compared to other impacted communities in the study area.	A large number of environmental justice communities would be impacted in a wider geographic area. Impacts would be high and adverse and would affect more environmental justice communities than other communities in the study area (disproportionate impact).

No-action Alternative

Under the no-action alternative the proposed project would not be constructed, and there would be no impacts on minority or low-income populations as a result of the project.

Proposed Action

Minority populations have been identified in the project area in six census blocks within 0.5 mile from the transmission line routes. However, poverty populations have not been identified in census tracks adjacent to the routes. Since potential environmental justice populations of concern exist, it is necessary to (1) identify any impacts of the proposed project and (2) examine the spatial distribution of any impact areas to determine if these impacts are likely to fall disproportionately on the minority populations.

There are an estimated 58 and 59 residences located within 0.25 mile of the transmission line for Alternative Routes A and B, respectively, of which four are located in census blocks that have been identified as a potential minority environmental justice population. Three of the houses are in Williams County; two in Block 1305 approximately 3 miles north of Springbrook, and one in

Block 2055 west of Williston. One additional house is located in Block 2636, approximately 10 miles west of Killdeer.

The proposed project is expected to contribute positively to potential environmental justice communities through additional fiscal receipts to counties. However, these populations also could be affected adversely by the proposed project's impacts on additional resource areas (e.g., traffic, air quality, visual resources, and agricultural land uses). Air-quality and traffic impacts are expected to be short term with air emission dispersion limited to the vicinity of the construction activity. Following construction, impacts would largely be limited to land use restriction in the ROW and the presence of the line and structures on properties and in the visual landscape. It is possible these residents may experience adverse visual impacts; however, there are an additional 83 to 86 residences within a 0.25-mile buffer that also would experience some adverse effects. Therefore, these potential environmental justice populations are not expected to be disproportionately affected by these impacts.

The vast majority of the land use within the ROW is rangeland and cultivated croplands. There may be some small impacts on agricultural activities, although these are mostly temporary effects and are not anticipated to fall disproportionately on environmental justice populations. Additionally, there would be negligible to minimal effects on property values as only one residential structure falls within 0.1 mile of the transmission line route within the census blocks identified with minority environmental justice populations.

The proposed project would not have any disproportionate impacts on minority and low-income communities, and therefore would not contribute to any disproportionate cumulative impacts.

3.10 RECREATION AND TOURISM

3.10.1 Affected Environment

Regional Setting

The project area is characterized by rolling prairies, agricultural lands, steep and rough terrain, lakes, rivers, and streams. Various developed and undeveloped outdoor recreational facilities exist within the vicinity of the proposed project.

Outdoor recreational opportunities such as hunting and fishing are popular in the counties surrounding the project area, and provide a substantial source of revenue for these counties. Prior to recent oil and gas development activities, hunting and fishing was a significant, if not primary, source of income for many residents of the area. Many out-of-state hunters and fishermen visit western North Dakota every year to take advantage of hunting and fishing seasons, and local communities benefit financially from these sportsmen. In 2006, there were

128,000 resident and nonresident hunters in North Dakota and these hunters spent nearly $130,000,000 related to hunting (USFWS, 2008).

Species such as deer, pronghorn[5], and elk are found within the project area and provide big game hunting opportunities. Hunting for various species of waterfowl is also popular for resident and nonresident hunters alike. Pheasant hunting is also popular throughout the area, attracting numerous non-resident hunters and providing an additional source of revenue for many landowners during the pheasant hunting season each year.

Fishing is also a popular outdoor recreational activity within the project area and provides revenue for the six counties in the project vicinity as well as the state of North Dakota. In 2006, 106,000 resident and non-resident anglers spent nearly $94,000,000 on fishing within the state. Lake Sakakawea provides opportunities for fishing for numerous species of gamefish, such as northern pike, walleye, smallmouth bass, yellow perch, and lake trout (NDGFD, 2010d). In Williams County, several small, public lakes are available to anglers. The Missouri, Little Missouri, Knife, and Little Muddy rivers also provide opportunities for fishing, as do numerous smaller lakes, ponds, and streams located throughout the region. Several of the WMAs managed by NDGFD provide opportunities for fishing as well, as do many ponds and streams located on private lands throughout the region surrounding the project.

Study Area

Lake Sakakawea

Lake Sakakawea is a large, manmade impoundment of the Missouri River located partly within the northwest portion of the project area. USACE oversees the management of the public lands and water of Lake Sakakawea, which is 178 miles long with 1,884 miles of shoreline at normal pool elevation. Lake Sakakawea is 14 miles wide at its widest point, with a normal pool storage capacity of nearly 23,000,000 acre-feet of water (USACE, 2011).

Lake Sakakawea and its surrounding public lands, which are predominantly operated by USACE, provide the public with fishing, boating, hunting, and camping opportunities. Thirty-five recreational areas are located around Lake Sakakawea to provide these outdoor recreational opportunities. Many of these recreational areas offer campsites, water, restroom facilities, boat ramps, and electricity hookups. The lake also provides irrigation, flood damage reduction, municipal and industrial water supply, and hydropower for the area. The proposed project crosses the Missouri River at the upper portion of Lake Sakakawea near the town of Williston.

[5] Although hunted in the past, pronghorn season remains closed due to declining herd size.

<u>Theodore Roosevelt National Park</u>

TRNP-North Unit, managed by NPS, is located in McKenzie County, south of Watford City and west of U.S. Highway 85. TRNP-North Unit encompasses roughly 24,000 acres, of which 19,410 acres are wilderness, and provides numerous outdoor activities such as camping, canoeing, fishing, horseback riding, and hiking (NPS, 2011). A variety of wildlife species occur within the park boundaries, making it a popular wildlife viewing area.

<u>Little Missouri National Grasslands</u>

Another popular outdoor recreational area within the vicinity of the proposed project is the LMNG, which is composed of numerous blocks of natural grasslands in McKenzie County. The LMNG is administered by USFS and consists of over a million acres of grassland, making it the largest public grassland in the United States. The LMNG provides opportunities for hiking, hunting, wildlife viewing, camping, and horseback riding (USFS, 2010). The LMNG's many tracts are broken up into smaller management planning units that are managed for a particular emphasis. These management planning areas can consist of very small to very large acreages, each containing specific guidelines and standards. Each management area is assigned a rating from one of six categories, with a Category 1 rating being the most land-use restrictive and generally assigned to Wilderness areas and backcountry settings. Category 6 ratings are the least restrictive and are managed to meet a variety of ecological and human needs (USFS, 2001).

Two sensitive LMNG management planning areas are located within the vicinity of the proposed project – the Long X Divide Area and the Lone Butte Area. The Long X Divide Area, which encompasses roughly 10,100 acres, is located immediately south of TRNP, and is listed as being suitable for recommendation for Wilderness designation. The Lone Butte Area consists of approximately 11,400 acres and is located immediately east of the Long X Divide Area, across U.S. Highway 85. This area is designated as a Roadless Area, meaning vehicular traffic is prohibited within this area of the LMNG.

<u>U.S. Fish and Wildlife Service</u>

Lake Ilo National Wildlife Refuge is an approximately 4,000-acre complex of prairie, grassland, and wetlands located near Dunn Center in McKenzie County, along ND State Highway 200 (USFWS, 2011a). This area is managed by USFWS and is a popular wildlife viewing area.

<u>Bureau of Land Management</u>

Tracts of land managed by BLM are open to the public for hunting and fishing opportunities. Several tracts of BLM land that are available to sportsmen for hunting occur within the general vicinity of the proposed project in Dunn County.

Little Missouri River

Outdoor recreational opportunities such as fishing, boating, hunting, and camping exist on and near the Little Missouri River. The Little Missouri River passes through private and public lands in the project area in McKenzie and Dunn counties and empties into Lake Sakakawea.

State Parks

Two state parks in the project vicinity, one in Dunn County and one in Williams County, provide recreational opportunities similar to those provided by TRNP and LMNG. State parks are managed by the North Dakota Parks and Recreation Department.

The Little Missouri State Park is approximately 4,600 acres and is located approximately 17 miles north of Killdeer in Dunn County, near the Little Missouri River. This state park is primitive in nature, with few amenities; however, horseback riding, wildlife viewing, and camping opportunities are available. Lewis and Clark State Park encompasses 490 acres and is located approximately 19 miles southeast of Williston in Williams County. This state park is located on the banks of Lake Sakakawea, and offers boating, fishing, swimming, and wildlife viewing opportunities (North Dakota Parks and Recreation Department, 2011b).

Wildlife Management Areas

Much of the hunting within the project vicinity takes place on private tracts of land, although numerous WMAs within the project area provide opportunities for hunting and fishing on public land. WMAs are managed by NDGFD and are generally managed for hunting, fishing, and nature viewing.

WMAs in the vicinity of the project include Killdeer Mountains WMA in Dunn County; Lewis and Clark WMA, Neu's Point WMA, Och's Point WMA, and Overlook WMA in McKenzie County; Sullivan WMA in McKenzie County; Golden Valley WMA in Mercer County; White Earth Valley WMA in Mountrail County; and Blacktail Dam WMA in Williams County (NDGFD, 2010a).

Private Lands Open to the Public

In addition to public WMAs, NDGFD manages many privately owned tracts of land open to public hunting under the PLOTS (Private Land Open to Sportsmen) program. Several of these tracts of privately-owned land occur within the general vicinity of the proposed project, and serve as walk-in hunting areas for sportsmen (NDGFD, 2011b).

Other Facilities

Other recreational opportunities exist in and around the project area. Many nearby communities offer recreational and cultural opportunities such as golfing, shopping, and dining. In addition, many of these communities maintain city parks that provide outdoor recreational opportunities, and also maintain complexes to host leagues for team sports such as softball, baseball, football, and soccer.

3.10.2 Direct and Indirect Effects

This section discusses potential impacts, their duration, and intensity on recreation and tourism resulting from construction and operation of the proposed project, including the no-action alternative. Definitions for duration and intensity are described in Table 3-44.

Table 3-44: Recreation and Tourism Impact Context and Definitions

Context (Duration)	Low	Moderate	High
Recreation—Developed and Undeveloped Recreational Facilities (only for NPS, BLM, or USFS developed recreational areas if applicable)			
Short term: During construction period Long term: Life of the line (50 years)	There would be partial site closures to protect public safety. The same site capacity and visitor experience would remain unchanged after construction.	There would be complete site closures to protect public safety. However, the sites would be reopened after activities occur. There could be slightly reduced site capacity. The visitor experience would be slightly changed but would still be available.	All developed site capacity would be eliminated because developed facilities would be closed and removed. Visitors would be displaced to facilities at other regional or local locations and the visitor experience would no longer be available at this location.
Recreation—Use			
Short term: During construction period Long term: Life of the line (50 years)	The impact would be detectable and/or would only affect some recreationalists. Users would likely be aware of the action but changes in use would be slight. There would be partial area closures to protect public safety.	The impact would be readily apparent and/or would affect many recreationalists. Users would be aware of the action. There would be complete area closures to protect public safety. However, the areas would be reopened after activities occur. Some users would choose to pursue activities in other available local or regional areas.	The impact would affect the majority of recreationalists in the area. Users would be highly aware of the action. All recreational areas would be closed or eliminated. Users would choose to pursue activities in other available local or regional areas and completely avoid the area.

No-action Alternative

Under the no-action alternative the proposed project would not be constructed, and there would be no impacts on recreation or tourism as a result of the project.

Proposed Action

The majority of the land crossed by the proposed project is privately owned. Possible impacts on recreational users on private lands would include noise from construction, construction vehicles, equipment and workers, dust from construction activities, and wildlife disruption. However, due to the length of construction-related disturbances, the alternative routes would have short-term, low impacts on recreational opportunities such as hunting, fishing, boating, hiking, OHV use, and camping on private lands. In the long term, both alternative routes would be expected to have no impacts on these recreational opportunities.

Both alternative routes would span the Missouri River at the head of Lake Sakakawea near Williston. The crossing would be adjacent to the existing U.S. Highway 85 within a utility corridor containing the existing Western transmission line and a rural water pipeline, resulting in generally limited current use of these lands for recreation.

Both alternative routes would pass within approximately 2 miles of Lake Ilo National Wildlife Refuge in Dunn County at their closest points. In addition, both alternatives would cross approximately 56.4 acres of USACE property in the area of the proposed Missouri River crossing, which is part of the Lewis and Clark WMA managed by NDGFD. This is the only WMA that is directly crossed by either alternative.

Alternative Route A

Under Alternative Route A, the proposed transmission line would be constructed east of the TRNP-North Unit. At its closest point, the transmission line ROW would be approximately 1.5 miles from the park.

Alternative Route A would incorporate approximately 147.4 acres of the LMNG into the utility ROW (See Section 3.7, Land Use). Alternative Route A would not be located within any management areas designated as Roadless, but would parallel immediately alongside the western edge of the Lone Butte Management Area and within approximately 500 feet of the Long X Divide Management Area. Alternative Route A would cross the Lewis and Clark National Historic Trail in the vicinity of U.S. Highway 85 and would also pass within close proximity to one USFS campground (Summit Campground), located adjacent to U.S. Highway 85 approximately 3.5 miles south of TRNP. Noise from construction, construction vehicles, equipment and workers, and dust from construction activities could potentially disturb recreational users at the Summit campground. The construction of the proposed transmission line could result in temporary traffic delays and road closures along U.S. Highway 85 that would temporarily diminish access to the campground. Overall, project construction would have short-term, low impacts on recreational facilities in LMNG. Following any construction-related disturbance, access to recreational facilities would return to normal. Construction-related noise could also disrupt dispersed recreational activities such as hunting in the short term. Similar to recreational facilities as described above, access to dispersed recreational opportunities would be expected to return to pre-project conditions following completion of construction. No other impacts on recreation on the LMNG are expected. Under Alternative Route A, the proposed transmission line ROW would not cross BLM lands. The ROW would be located within approximately 200 feet of one BLM parcel but would have no impacts on recreation on BLM lands. Alternative Route A would cross the Little Missouri River in McKenzie County, in the vicinity of the U.S. Highway 85 crossing approximately 19 miles west of Little Missouri State Park. The proposed project would cross the Missouri River approximately 20 miles west of Lewis and Clark State Park, and would have no impacts on recreation associated with the park.

Alternative Route B

Under Alternative Route B, the proposed transmission line would be located more than 17 miles east of TRNP at its closest point. It would incorporate approximately 56.6 acres of the LMNG into utility ROW (see Section 3.7, Land Use). Alternative Route B would not be located within any management areas designated as Roadless, nor would it pass within close proximity to any developed recreational facilities. Alternative Route B would therefore have no impacts on recreation on LMNG lands.

Under Alternative Route B, the proposed transmission line would not cross or pass near BLM lands. Alternative Route B would have no impacts on recreation on BLM lands. It would cross the Little Missouri River in Dunn County, north of Killdeer and approximately 5 miles west of Little Missouri State Park. Similar to Alternative Route A, Alternative Route B would cross the Lewis and Clark National Historic Trail in the vicinity of U.S. Highway 85. Alternative Route B would cross the Missouri River approximately 20 miles west of Lewis and Clark State Park and would have no impacts on recreation associated with the park.

3.11 INFRASTRUCTURE AND TRANSPORTATION

This section provides an overview of utility and transportation infrastructure found in the vicinity of the proposed project. This includes pipelines; water supply facilities; existing transmission lines and substations; federal, state, and county roadways; railroads; and airports and airstrips.

3.11.1 Affected Environment

The affected environment for this analysis varies by infrastructure feature and the potential for them to be affected by the proposed project. In many cases, the affected environment provides an overview of infrastructure found either in the project area counties or within 6 miles of the proposed project. The airport and airstrip analysis includes those public and private airfields within 10 miles of the proposed project.

Regional Setting

The rapid growth of the oil and gas industry in northwestern North Dakota has placed additional demand on the infrastructure and transportation networks in historically rural areas. Until recently, population in the region was steady or declining, and no new infrastructure was necessary.

As the oil and gas industry continues to grow, additional infrastructure, such as pipelines and transmission and distribution lines, is necessary to support planned growth. The transportation network has also experienced a notable increase in vehicular volumes, both private vehicles and heavy trucks, over the past 10 years.

Existing infrastructure and transportation networks found in the project area are further discussed below. Potential impacts that would result under both the no-action and action alternatives are identified later in this section.

Utility Infrastructure

<u>Pipelines</u>

The following provides an overview of pipelines located within 1,000 feet of the centerline of the proposed project. These pipelines are located in the project area and also extend well beyond the boundaries of the project area serving a larger geographic area. Each of the following pipelines traverses either or both of the proposed alternative routes.

In addition to existing pipelines, numerous additional pipelines are planned to support the growing oil and gas industry. The following information was retrieved from the ND GIS (2011).

Natural Gas—These pipelines typically consist of a network of lines that gather gas from the fields and transport it to refining plants. Natural gas pipelines transport treated natural gas to markets both within and out of state. The following natural gas pipelines are located within 1,000 feet of the centerline of the proposed project:

- Northern Border—This natural gas pipeline enters North Dakota in southwestern Williams County and travels southeast leaving the state in McIntosh County. The pipeline traverses parts of the project area in both McKenzie and Dunn counties.
- Williston Basin—This natural gas pipeline intersects the project area near Williston and runs through portions of Mountrail, McKenzie, and Dunn counties.

CO_2 Pipeline—A CO_2 pipeline generally starts at the source of capture and travels directly to a storage site. Pipelines can transport CO_2 in a gaseous, liquid, or solid state; however, they generally transport CO_2 in its gaseous state.

- The CO_2 pipeline in North Dakota extends from the Canadian border south through the eastern portion of Williams and McKenzie counties. It continues south through north central Dunn County and east into Mercer County.

Crude Oil and Refined Products Pipelines—Crude oil, which is transported from oilfields to refiners, is converted to products such as gasoline, home heating oil, jet fuel, diesel, lubricants, and the raw materials for fertilizer, chemicals, and pharmaceuticals.

- Owned by Cenex Pipeline LLC, this refined products pipeline crosses North Dakota from Cass County to the east to McKenzie County to the west. The pipeline crosses the project area in McKenzie County.
- Tesoro and Enbridge Pipelines—These crude oil pipelines cross the project area in Dunn, McKenzie, Williams, and Mountrail counties.

In addition to the numerous pipelines associated with increasing oil and gas activity, there are water and sewer pipelines in the project area. Many of these pipelines are used by smaller municipalities in the project area. Additional water lines in the project area are associated with agricultural uses such as center-pivot irrigation systems.

<u>Electrical Transmission Lines</u>

The project area for this portion of the analysis includes those areas within 6 miles of the proposed project. Many of the below-mentioned transmission lines are present in areas outside the project area providing service to areas both within and outside the project area. Electrical transmission lines in the project area are presented in Figure 1-1. The increase in the oil and gas industry (and the increase in population that has accompanied it) has resulted in the need for additional distribution lines to accommodate such activities.

Basin Electric's existing Charlie Creek to AVS 345-kV transmission line and the Charlie Creek-Squaw Gap 115-kV line are in the southern portion of the project area. Basin Electric also owns and maintains the Williston to Tioga, Logan to Tioga, and Tioga to Canadian Border 230-kV transmission lines, located in the northern part of the project area north and east of Williston.

Western also owns and maintains transmission lines in the project area. These lines include the Culbertson to Williston and Charlie Creek to Williston 115-kV transmission lines. Western's 115-kV line from Charlie Creek to Williston was recently upgraded to support 230-kV. The line was energized in August 2012 (Basin Electric, 2012b).

Montana-Dakota Utilities' Williston to Grenora and Williston to Tioga 115-kV lines, owned and maintained by Montana-Dakota Utilities, are also located in the project area.

There are numerous smaller transmission and distribution lines located throughout the project area, such as McKenzie Electric Cooperative, Roughrider Electric Cooperative, and Mountrail-Williams Electric Cooperative's 115-kV projects and smaller distribution system, which provides electrical service to communities, rural residences, and commercial establishments. These lines are generally located along the local road network. Transmission lines often extend cross country following section, quarter-section, or fence lines (ND GIS, 2011).

Electrical Substations

To support existing transmission lines, several electrical substations are located in the project area. These substations transform voltage from higher to lower, and increase or decrease current levels depending on the type of transformers installed within the substation. Substations located in the project area include: Basin Electric's existing AVS 345-kV Substation, Charlie Creek 345-kV Substation, Neset 230-kV Substation, and Williston 230-kV Substation (ND GIS, 2011).

Power Supply/Generation

Basin Electric's AVS is located in the southeastern portion of the project area. The facility is located approximately 7 miles northwest of Beulah. It has two units, each rates at 450 megawatts (MW) and began operation in the 1980s. It is located adjacent to The Coteau Properties Company's Freedom Mine, a lignite coal mine. Because of its location, AVS is often referred to as the "mine-mouth" facility. AVS is part of a $4-billion energy complex that includes the Great Plains Synfuels Plant, a coal gasification facility, and the Freedom Mine. Energy produced at AVS is delivered to the IS transmission system (Basin Electric, n.d.).

AM and FM Towers

There are currently eight AM and FM towers located within 6 miles of the proposed project alternatives. Five of these are located in Williston, two are located in Tioga, and one is located in Watford City. None of these towers are located within the proposed project ROW or within 75 feet of the ROW (ND GIS, 2011).

Water Supply and Treatment

Much of rural northwestern North Dakota, including the project area, relies primarily on groundwater for its water supply either through wells or rural water districts. There are three rural water associations in the project area. The McKenzie County Resource District is located in the northern portion of McKenzie County and extends from east to west across the 6-mile project area. The Southwest Water Pipeline Authority serves the areas southwest of Lake Sakakawea. The Williams Rural Water District is located in the southern portion of Williams County, just north of the McKenzie County Resource District.

Communities located near the Missouri River and Lake Sakakawea appropriate surface water to support their needs. Table 3-45 provides a listing of municipal and industrial water treatment plants in Dunn, Mercer, McKenzie, Mountrail, and Williams counties.

As the oil and gas industry continues to grow in northwest North Dakota, more water will be needed to support drilling efforts and the projected population and employment increases. There are currently a number of projects underway to help support this growth. The following three entities are known to be expanding their water treatment plants and/or distribution systems to support the increased demand:

- Southwest Water Authority—The latest phase of the Southwest Pipeline Project includes the Oliver, Mercer, North Dunn Regional Service Area. This includes a new water treatment plant near New Hradec, North Dakota (Southwest Water Authority, 2010).
- Western Area Water Supply—The Western Area Water Supply Project is a domestic water project using water from the Missouri River to meet municipal, rural, and industrial needs for all or part of McKenzie, Williams, Divide, Burke, and Mountrail counties. Cities in the project area that receive water from Western Area Water Supply include Williston, Watford City, Ray, and Tioga. Western Area Water Supply has three service areas that provide water to various parts of the project area. These include the McKenzie Rural Service Area, R & T Service Area, and Williams Rural Service Area (Western Area Water Supply, 2012).
- City of Williston—The city of Williston is currently expanding its water treatment plant capacity to serve the Western Area Water Supply expansion. Work began on this project in 2001 (City of Williston, 2012).

Table 3-45: Municipal and Industrial Water Treatment Plants

COUNTY	PWSNAME	CONTACT	ADDRESS 1	ADDRESS 2	CITY	STATE	ZIP
DUNN (ND)	DUNN COUNTY LODGE	KELLEY, TRAVIS	13589 57TH ST		WILLISTON	ND	58801
DUNN (ND)	KILLDEER CITY OF	MARQUARDT, DAWN	165 RR ST SE	PO BOX 270	KILLDEER	ND	58640-0270
MCKENZIE (ND)	ALEXANDER CITY OF	MRACHEK, ANNE	112 MANNING AVE W	PO BOX 336	ALEXANDER	ND	58831-0336
MCKENZIE (ND)	BADLANDS POWER FUELS TC	JORE, RICK	3711 4TH AVE NE		WATFORD CITY	ND	58854
MCKENZIE (ND)	JUNIPER CAMPGROUND	HEISER, LYNN	315 2ND AVE	PO BOX 7	MEDORA	ND	58645
MCKENZIE (ND)	LONG X SALOON	CARR, JEROME	504 MAIN ST	PO BOX 96	GRASSY BUTTE	ND	58634-0096
MCKENZIE (ND)	MCKENZIE COUNTY RURAL WATER	ROLES, KRISTY	201 5TH ST NW, SUITE 1456		WATFORD CITY	ND	58854
MCKENZIE (ND)	PRAIRIE VIEW ESTATES	KASKI, RYAN	1935 SAMCO RD STE 102		RAPID CITY	SD	57702
MCKENZIE (ND)	RIDGEVIEW PARK	KASKI, RYAN	1935 SAMCO RD STE 102		RAPID CITY	SD	57702
MCKENZIE (ND)	T ROOSEVELT NATL PK-NORTH	HEISER, LYNN	315 2ND AVE	PO BOX 7	MEDORA	ND	58645
MCKENZIE (ND)	WATFORD CITY CITY OF	ANDERSON, LAURA	213 2ND ST NE	PO BOX 494	WATFORD CITY	ND	58854
MCKENZIE (ND)	WATFORD CITY CITY OF	ANDERSON, LAURA	213 2ND ST NE	PO BOX 494	WATFORD CITY	ND	58854
MERCER (ND)	ANTELOPE VALLEY STATION	CHICK, TED	294 COUNTY ROAD 15		BEULAH	ND	58523
MERCER (ND)	BEULAH CITY OF	NEUBERGER, GARY	120 N CENTRAL	PO BOX 910	BEULAH	ND	58523
MERCER (ND)	BEULAH CITY OF	NEUBERGER, GARY	120 N CENTRAL	PO BOX 910	BEULAH	ND	58523
MERCER (ND)	COYOTE STATION	ZIMMERMAN, BRAD	6240 13TH ST SW		BEULAH	ND	58523
MERCER (ND)	DAKOTA GASIFICATION CO	NELSON, RICHARD A	420 COUNTY RD 26		BEULAH	ND	58523
MERCER (ND)	GREAT RIVER ENERGY - STANTON STATION	JOHNSON, ROBERT	4001 HIGHWAY 200A		STANTON	ND	58571
MERCER (ND)	HAZEN CITY OF	BOHRER, SANDY	146 EAST MAIN	PO BOX 717	HAZEN	ND	58545-0717
MERCER (ND)	KNIFE RIVER INDIAN VILLAGE	BUTLER, KEITH		PO BOX 7	MEDORA	ND	58645
MERCER (ND)	LELAND OLDS STATION	ALLERY, LES	3901 HIGHWAY 200A	BASIN ELECTRIC POWER COOP	STANTON	ND	58571
MERCER (ND)	STANTON CITY OF	HONEYMAN, RICHARD	109 HARMON AVE	PO BOX 156	STANTON	ND	58571-0156
MOUNTRAIL (ND)	MBI ENERGY SERVICES, INC.	WENTZ, WENDELL		PO BOX 26	ROSS	ND	58776
MOUNTRAIL (ND)	NEW TOWN CITY OF	BURNETT, KAYLA	301 SOO PLACE	PO BOX 309	NEW TOWN	ND	58763-0309
MOUNTRAIL (ND)	NEW TOWN EMPLOYEE MHP	CARTER, BEN		PO BOX 140	BAINVILLE	MT	59212
MOUNTRAIL (ND)	OMAR FARMS TC	DAVIS, BILL		PO BOX 88	RIFLE	CO	81650
MOUNTRAIL (ND)	PARSHALL CITY OF	ZIEMAN, LARRY	213 4TH ST SW	PO BOX 159	PARSHALL	ND	58770-0159
MOUNTRAIL (ND)	PARSHALL CITY OF	ZIEMAN, LARRY	213 4TH ST SW	PO BOX 159	PARSHALL	ND	58770-0159
MOUNTRAIL (ND)	PLAZA CITY OF	PROCK, DEBORAH S.	501 BERTHOLD ST	PO BOX 188	PLAZA	ND	58771-0096
MOUNTRAIL (ND)	ROSS CITY OF	SEIBEL, DIANE	2 CENTRAL AVE WEST	PO BOX 4	ROSS	ND	58776-0004
MOUNTRAIL (ND)	WHITING OIL & GAS	WURM, BRIAN	4498 HWY 8		NEW TOWN	ND	58763
WILLIAMS (ND)	GRENORA CITY OF	SCHENSTAD, JANE	#1 MAIN ST	PO BOX 296	GRENORA	ND	58845
WILLIAMS (ND)	R & T WATER SYSTEM	SUHR, LIZ	6392 114TH AVE NW	PO BOX 126	RAY	ND	58849-0126
WILLIAMS (ND)	WILLISTON CITY OF	KAUTZMAN, JOHN		PO BOX 1306	WILLISTON	ND	58801

Source: BMcD, 2012.

<u>Wastewater Treatment and Disposal</u>

Wastewater treatment and disposal in northwestern North Dakota consists of both individual disposal systems (septic tanks) and wastewater treatment plants. Rural developments, such as farms, typically use individual disposal systems. Larger communities and industries use wastewater treatment plants, which are present in different sizes and use different technologies for treating water.

Because there is a shortage of bodies of water to dispose of the treated effluent, some wastewater treatment plants are classified as zero-dischargers, in which the effluent is either evaporated or reused. Table 3-46 provides a listing of all municipal and industrial wastewater treatment plants within Dunn, Mercer, McKenzie, Mountrail and Williams counties. The table also provides information on the type of treatment at each plant facility. Both municipal publicly-owned treatment works and industrial facilities are presented.

Table 3-46: Wastewater Treatment Facilities

Facility Name	Facility Address	Facility City	Facility Zip	Facility Type	Treatment Type	County Name	Contact Company Name
Alexander City Of	Highway 85	Alexander	58831	POTW	Facultative Lagoon	McKenzie	
Arnegard City Of	Main Street	Arnegard	58835	POTW	Facultative Lagoon	McKenzie	Arnegard City Of
Basin Electric Power An Val St		Beulah	58523	Non POTW	Settling Pond	Mercer	Basin Electric Power Cooperative
Basin Electric Power Lolds	3901 Hwy 200A	Stanton	58571	Non POTW	Mech. Act. Sludge, Pretreatment, Settling Pond	Mercer	Basin Electric Power Cooperative
Beulah City Of	120 Central Ave W	Beulah	58523	POTW	Aeration Pond, Facultative Lagoon, Storage Pon	Mercer	Beulah City Of
Calfrac Well Services Corp	14049 Hwy 2	Williston	58802	Non POTW	Facultative Lagoon	Williams	Calfrac Well Services Corp
Coteau Properties Co	204 Co Rd 15	Beulah	58523	Non POTW	Facultative Lagoon, Settling pond	Mercer	Coteau Properties Co
Dakota Gasification Co	420 County Rd 26	Beulah	58523	Non POTW	Settling Pond	Mercer	Dakota Gasification Company
Dakota Trout Ranch North	3846 County Rd 18	Stanton	58571	Non POTW	Settling Pond	Mercer	Dakota Trout Ranch North
Dakota Westmoreland Corp		Beulah	58523	Non POTW	Runoff Pond	Mercer	
Dodge City Of		Dodge	58625	POTW	Facultative Lagoon	Dunn	Dodge City Of
Dunn Center City Of		Dunn Center	58626	POTW	Facultative Lagoon	Dunn	
East Fairview City Of		Fairview	59221	POTW	Facultative Lagoon	McKenzie	East Fairview City Of
Epping City Of		Epping	58843	POTW	Facultative Lagoon	Williams	Epping City Of
Fairview Mt City Of		Fairview	59221	POTW	Facultative Lagoon	McKenzie	Fairview Mt City Of
Golden Valley City Of	110 1st Ave SW	Golden Valley	58541	POTW	Facultative Lagoon	Mercer	
Great River Energy - Stanton Station	4001 Hwy 200A	Stanton	58571	Non POTW	Runoff Pond, Settling Pond	Mercer	Great River Energy
Grenora City Of	1 Main St	Grenora	58845	POTW	Facultative Lagoon	Williams	Grenora City Of
Halliday City Of		Halliday	58636	POTW	Facultative Lagoon	Dunn	
Hazen City Of		Hazen	58545	POTW	Facultative Lagoon	Mercer	Hazen City Of
Hess Corporation	10340 68th St NW	Tioga	58852	Non POTW	Settling Pond	Williams	Hess Corporation
Kaski Homes-Dore	Twp 151, R104 Sect 8	Dore	59221	Non POTW	Facultative Lagoon	McKenzie	Kaski Homes, Inc.
Kaski Homes-Watford City	Twp 150, R99 Sect 25	Watford City	57702	Non POTW	Facultative Lagoon	McKenzie	Kaski Homes, Inc.
Killdeer City Of		Killdeer	58640	POTW	Facultative Lagoon	Dunn	Killdeer City Of
Leonardite Products LLC	1415 W Dakota Pkwy	Williston	58801	Non POTW	Settling Pond	Williams	Leonardite Products, LLC
Long X MHP Badlands Development	ND Highway 23 A	Watford City	58854	Non POTW	Facultative Lagoon	McKenzie	Power Fuels
ND DOT Panger Rest Area	Highway 85 S	Williston	58801	Non POTW	Facultative Lagoon	McKenzie	ND DOT Panger Rest Area
ND DOT White Earth Rest Area	9750 62nd St NW	White Earth	58794	Non POTW	Facultative Lagoon	Mountrail	ND DOT White Earth Rest Area
ND Water Commission OMND WTP	County Road 13	Zap	58580	Non POTW	NULL	Mercer	ND State Water Commission
New Town City Of	103 Soo Place	New Town	58763	POTW	Facultative Lagoon	Mountrail	New Town City Of
New Town WTP	103 Soo Place	New Town	58763	Non POTW	Settling Pond	Mountrail	
Otter Tail Power Co	6240 13th St SW	Beulah	58523	Non POTW	Cooling Tower Blowdown, Settling Pond	Mercer	OtterTail Power Company
Parshall City Of	25 N Main	Parshall	58770	POTW	Facultative Lagoon	Mountrail	Parshall City Of
Pick City City Of	18 1st Ln SE	Pick City		POTW	Facultative Lagoon	Mercer	Pick City City of
Plaza City Of	3rd Ave	Plaza	58771	POTW	Facultative Lagoon	Mountrail	Plaza City Of
Ray City Of	101 Main St	Ray	58849	POTW	Facultative Lagoon	Williams	Ray City Of
Stanley City Of	221 S Main	Stanley	58784	POTW	Facultative Lagoon	Mountrail	Stanley City Of
Stanton City Of		Stanton	58571	POTW	Facultative Lagoon	Mercer	Stanton City Of
Susag Sand & Gravel Williston	115 10th St	Williston	58801	Non POTW	Settling Pond	Williams	Susag Sand & Gravel Inc
Tioga City Of	12 1st St NE	Tioga	58852	POTW	Facultative Lagoon	Williams	Tioga City Of
Trenton Water Users Assoc	407 3rd Ave	Trenton	58853	Non POTW	Facultative Lagoon, Wetland Area	Williams	
Watford City City Of	213 2nd Street NE	Watford City	58854	POTW	Facultative Lagoon	McKenzie	
Wildrose City Of	104 1st Ave E	Wildrose	58795	POTW	Facultative Lagoon	Williams	Wildrose City Of
Williston City Of	809 5th St. E	Williston	58802	POTW	Aeration Pond; Facultative Lagoon	Williams	Williston City Of
Williston WTP	4806 Hwy 85	Williston	58802	Non POTW	Settling Pond	Williams	Williston WTP
Zap City Of		Zap	58580	POTW	Facultative Lagoon	Mercer	Zap City Of

Source: BMcD, 2012.

Transportation Infrastructure

Roadways

The rapid expansion of the oil and gas industry in the region has introduced a notable amount of new vehicular traffic, including private vehicles and heavy trucks. Much of this traffic is concentrated on primary and secondary roadways in the project area; however, smaller, more rural roadways have also experienced an increase in vehicular traffic. This section provides an overview of primary and secondary roadways within 6 miles of the proposed project. As shown in Figure 3-25, many of these roadways are located relatively close to the proposed project. Additional information is provided for roadways that are more rural in nature.

Primary roadways within the project area include U.S. Route 2 and U.S. Route 85. U.S. Route 2 generally runs west-east in the northern portion of the project area. It runs through Williston where it then runs north along the U.S. Route 85 corridor. The route then splits and continues west-east through Ray, areas south of Tioga, and east of the project area. The existing Williston

Substation is located near U.S. Route 2 and the proposed Judson 345-kV Substation would also be near U.S. Route 2 just west of Williston. U.S. Route 2 runs south of the existing Neset Substation and the proposed Tande 345-kV Substation.

U.S. Route 85 generally runs north-south through the project area. U.S. Routes 85 and 2 run along the same corridor for approximately 20 miles in the northern portion of the project area. Where U.S. Route 2 splits to the west-east in Williston, U.S. Route 85 continues south through Alexander. The route then travels west-east to Watford City, where it travels north-south through the southern portion of the project area.

State highways in the study area that would be crossed by the proposed project include ND State Highways 200, 22, 23, 8, 73, 1804, and 1806. The following provides a summary of these routes as they cross the project area.

- ND State Highway 200—This route traverses the southern portion of the project area in a west-east direction. It runs through the cities of Killdeer, Dunn Center, Halliday, Dodge, and Golden Valley. The proposed project would be located north of ND State Highway 200 at the eastern edge of the project area.

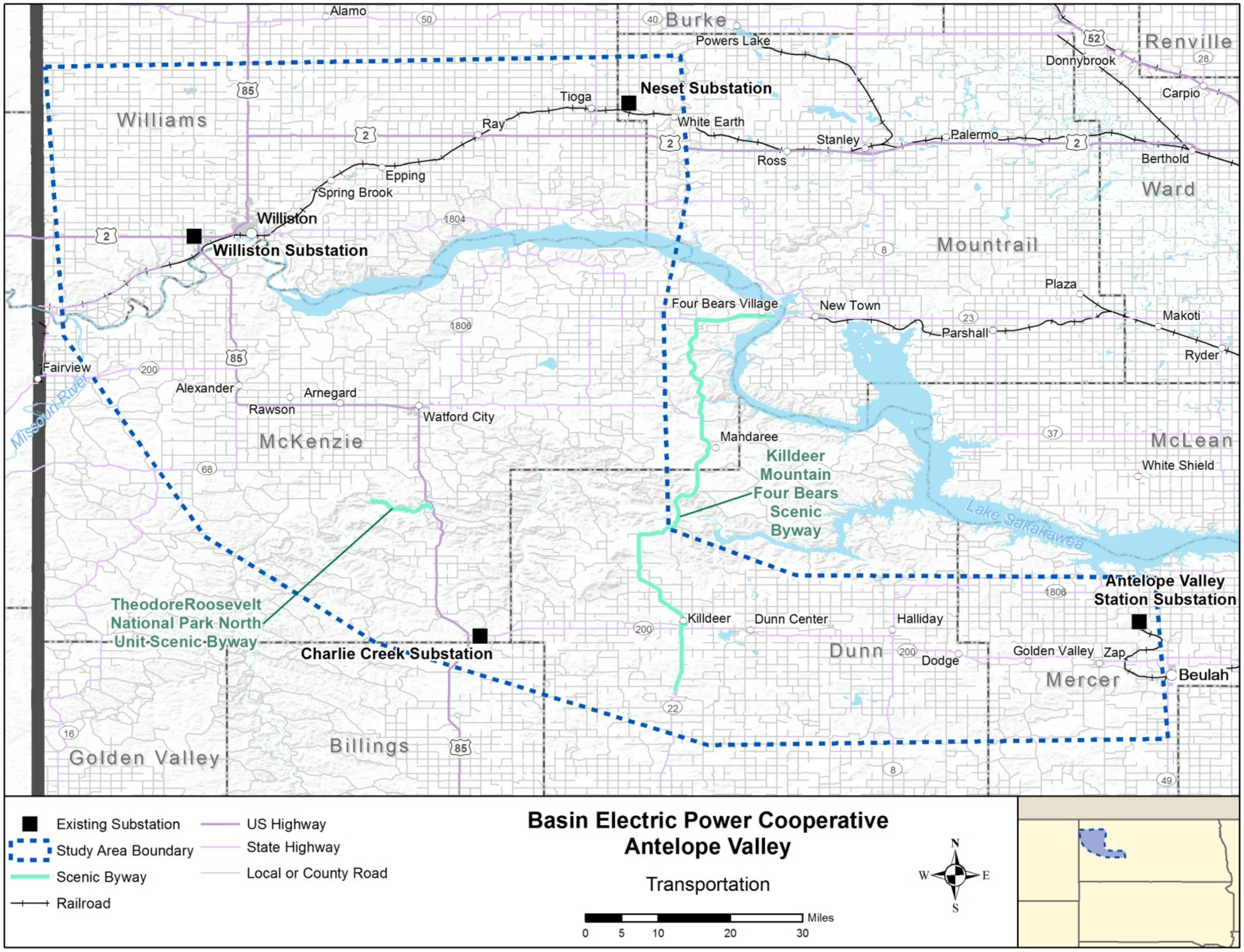
- ND State Highway 22—This route enters the project area from the east and travels north-south from its entry to the project area through Killdeer and exits the project area just south of Killdeer. From Manning (south of Killdeer) to New Town, this route is designated as a scenic byway. It also provides access to recreational areas such as Little Missouri State Park. The designated portion of this roadway is approximately 64 miles long (U.S. Department of Transportation, n.d.).

- ND State Highway 23—This route runs west-east through the central portion of the project area. The western terminus of the route is located in Watford City where it meets U.S. Route 85. It meets ND State Highway 73 where it splits north towards ND State Highway 1806, west of Fort Berthold.

- ND State Highway 73—This route travels west-east between ND State Highways 22 and 23 in the central eastern portion of the project area.

- ND State Highways 1804 and 1806—Both roadways are part of the Lewis and Clark Trail. They run along the northeast and southwest sides of the Missouri River (North Dakota Highways, 2004). ND State Highway 1804 runs from Williston to the western boundary of the project area. ND State Highway 1806 runs north-south along the eastern edge of the project area. The route ends where it meets ND State Highway 23.

Figure 3-25: Project Area Roadways



In addition to these roadways, there are a number of paved county roads and lesser used paved and unpaved roadways in the project area. Access roads to support the oil and gas industry are also present in the project area. These roadways are often private, dead-end gravel roads that terminate at an oil well or drill rig. Many areas near the proposed project, particularly areas near the Little Missouri River and Lake Sakakawea, are remote and have little to no access via public roads (BMcD, 2012).

<u>Traffic Volumes</u>

The following provides an overview of traffic volumes in the project area. Information is presented for primary and secondary corridors in the project area, where available. This information has been retrieved from the North Dakota Department of Transportation. Average annual daily traffic for rural roads is not currently available on this scale and is therefore presented for the county as a whole. This information has been retrieved from a study prepared by the Upper Great Plains Transportation Institute (UGPTI).

North Dakota Department of Transportation publishes annual traffic counts for all state-maintained highways. Historical average annual daily traffic for these routes is shown below in Table 3-47. Since 2005, many routes have seen a significant increase in traffic, most of which have nearly doubled in their average annual daily traffic volumes. However, the volume of each of these selected routes is still below the capacity of these roadways.

Table 3-47: Average Annual Daily Traffic and Percent of Commercial Vehicles on U.S. and State Routes

Year	U.S. 85 (Between Route 200 and U.S. 2)	U.S. 85 (Between U.S. 2 and State Route 50)	U.S.- (Between State Route 1804 and U.S. 85)	U.S. 2 (East of U.S.-85)	U.S. 85 (Between Route 23 and Route 200)	U.S. 85 (South of Route 200)	Route 200 (Between U.S. 85 and Route 22)	Route 200 (Between Route 22 and Route 8)
2001	1,550	1,225	3,800	1,925	2,250	1,000	550	1,025
2002	1,550	1,100	3,900	2,250	2,250	1,000	550	1,025
2003	1,525	1,100	3,900	2,250	2,075	925	550	750
2004	1,525	1,100	3,900	2,250	2,075	925	550	750
2005	1,525	1,325	4,350	2,200	2,075	925	550	750
2006	2,600	1,325	4,350	2,200	2,700	1,300	600	850
2007	2,600	1,325	4,350	2,200	2,700	1,300	600	850
2008	2,600	1,260	4,795	3,740	2,700	1,300	600	850
2009	2,670	1,435	4,450	4,235	3,295	1,310	1,340	1,320
2010	2,670	1,915	4,450	5,630	3,205	1,530	1,340	1,320
2011	6,290	2,990	9,410	8,110	7,025	2,445	2,575	2,670
% of Trucks on U.S. and State Routes								
2001	17%	9%	12%	14%	23%	25%	33%	15%
2002	26%	13%	11%	15%	23%	25%	33%	15%
2003	24%	13%	11%	15%	17%	26%	17%	13%
2004	24%	13%	11%	15%	17%	26%	17%	13%
2005	26%	17%	11%	16%	17%	26%	17%	13%
2006	22%	17%	11%	16%	16%	21%	18%	10%
2007	22%	19%	29%	16%	16%	20%	18%	10%
2008	22%	21%	14%	20%	16%	37%	18%	10%
2009	25%	17%	14%	19%	16%	36%	37%	17%
2010	25%	17%	14%	38%	22%	39%	37%	17%
2011	31%	43%	25%	35%	28%	43%	45%	38%

Source: North Dakota Department of Transportation, 2011.

UGPTI released a report in late 2010 highlighting additional roadway investments that may be necessary to support the increase in oil and gas production in north-central and north-western North Dakota, particularly the Williston area. These recommendations are based on the notable increase in vehicular traffic, particularly trucks, since 2005 when the number of drill rigs in operation began to grow (UGPTI, 2010). Information presented in the study is based on three main data sources: oil production forecasts; traffic data; and county road surveys. The study includes those roads owned or maintained by counties or municipalities but not state-owned or maintained roads. The information presented below provides an overview of existing traffic conditions on rural roads in study area counties.

At the onset of the study, county managers were asked to identify high-volume roadways across their area of jurisdiction. One hundred locations in 15 of the 17 study area counties were identified. Traffic counts were then conducted at these locations. Average daily traffic (ADT) from collection locations for study area counties are presented in Table 3-48. As illustrated below, major county roads in Williams County have an average of 133 vehicles per day with approximately 51.1 percent of those vehicles classified as trucks. Williams County has the highest percent of average daily trucks of counties in the study area. This percent is slightly higher than Billings and McKenzie counties. Under maximum daily traffic counts, Billings County, which has one of the lowest ADT of study area counties, has the highest percentage of daily truck traffic. McKenzie, Mountrail, and Williams counties report between 50.9 percent and 56.3 percent of daily traffic on major roads is associated with truck traffic.

Table 3-48: Average Daily Traffic and Percent of Truck Traffic on Major County Roads

County	N	Minimum		Mean		Maximum	
		Total Vehicles	% Trucks	Total Vehicles	% Trucks	Total Vehicles	% Trucks
Billings	9	9	44.4%	63	49.2%	135	59.3%
Mercer	3	18	5.6%	23	13.0%	28	21.4%
Dunn	10	29	41.4%	133	45.9%	491	40.3%
McKenzie	12	44	31.8%	191	50.8%	449	56.3%
Mountrail	12	40	30.0%	134	48.5%	475	53.1%
Williams	11	23	43.5%	133	51.1%	613	50.9%

N = number of locations where counts were conducted
Source: UGPTI, 2010.

It is important to note that 78 of the 100 locations where traffic data was collected are classified as graveled or unpaved roads. On graveled or unpaved roads, the mean ADT was 113 with approximately 46 percent of this attributable to trucks. Paved roads demonstrated a mean ADT of 268 vehicles with about 36.9 percent of this attributable to truck traffic (UGPTI, 2010).

The rural collector network of the North Dakota state highway system was used as a benchmark for comparison to major county roads in oil and gas-producing counties to evaluate ADT and truck volumes. ADT counts for all state collectors are estimated at 277 vehicles per day with an average of 11 percent (31 trucks) attributable to truck traffic. Study area county roads sampled for the abovementioned study report an overall ADT of 113 with approximately 54.2 percent attributable to truck traffic. While ADT is notably lower in the study area, it includes a significantly higher share of truck traffic than North Dakota state highway collectors overall (UGPTI, 2010).

UGPTI conducted a survey in 2008 to determine the extent to which oil and gas production was contributing to increased traffic, particularly truck traffic, in those counties included in the abovementioned report. The survey found that the weighted-average percent of truck traffic on collector roads in oil-producing counties that responded to the survey was 18 percent. In 2010, this percent had increased to 39 percent in the same counties (UGPTI, 2010).

Accident Data

Accident data has been compiled from the North Dakota 2010 Crash Summary prepared by the North Dakota Department of Transportation. The state uses this information as a critical consideration when planning for traffic safety and other network improvements. Data available from the report is primarily presented at the county and state level. Because information is not generally available for smaller geographic areas and county statistics are presented where available, it should be noted that areas not considered as part of the project area may also be included in these figures.

Table 3-49 provides an overview of the fatality rate for the state of North Dakota and the United States as a whole over the past 10 years. These rates are based on fatalities per 100 million vehicle miles traveled. As demonstrated below, the fatality rate in North Dakota has historically been higher than the nation overall. In 2010, there were 105 fatalities in North Dakota from traffic accidents, a decrease of 35 fatalities or 25 percent from 2009.

Table 3-49: Fatal Accident Rates for North Dakota and the United States between 2001 and 2010

Year	North Dakota	United States
2001	1.48	1.52
2002	1.37	1.52
2003	1.44	1.74
2004	1.34	1.45
2005	1.65	1.46
2006	1.45	1.42
2007	1.44	1.36
2008	1.37	1.26
2009	1.76	1.13
2010	1.26	1.09

Source: North Dakota Department of Transportation, 2010.

Table 3-50 provides a summary of fatal crashes, total fatalities, injury crashes, and property damage only crashes for project area counties in 2010. Also presented is the percent that each county represents as part of the statewide total. In 2010, there were 19 fatal crashes that resulted in 23 fatalities in project area counties. McKenzie County had the greatest number of fatalities while Billings County experienced no fatal accidents during the same period.

Table 3-50: Traffic Accident Totals for Study Area Counties, 2010

Crash Type and Percent of Statewide Total	County					
	Billings	Dunn	McKenzie	Mercer	Mountrail	Williams
# of Property Damage Only Crashes	36	126	165	146	189	701
% of North Dakota Total	0.3	0.9	1.2	1.1	1.4	5.1
# of Injury Crashes	4	16	49	29	62	179
% of North Dakota Total	0.1	0.5	1.5	0.9	1.9	5.4
# of Fatal Crashes	0	3	7	2	4	3
% of North Dakota Total	0.0	3.3	7.6	2.2	4.6	3.7
# of Total Fatalities	0	5	8	2	5	3
% of North Dakota Total	0.0	4.8	7.6	1.9	4.7	2.9

Source: North Dakota Department of Transportation, 2010.

In 2010, there were 3,329 total injury crashes in North Dakota, a slight increase from the 2009 figure of 3,175 injury crashes. As demonstrated in Table 3-50, approximately 339 injury crashes or 10.2 percent of all North Dakota injury crashes occurred in project area counties. Each project area county represents less than 2 percent of all statewide injury crashes with the exception of

Williams County which represents approximately 5.4 percent of the statewide total. A similar trend is demonstrated for property damage-only crashes.

The North Dakota accident rate, which is based on all accident types (fatal, injury, and property damage only) and vehicle miles traveled in 2010 was 2.06. Project area counties with the exception of Williams County have a rate lower than the statewide average. Williams County has an average rate of 2.96.

<u>Railroads</u>

There are four rail lines in the project area—two are active and two are no longer in service. Both active rail lines are owned and maintained by BNSF Railway Company (BNSF).

The first active rail line generally runs west to east across the northern portion of the project area, passing through the cities of Williston and Tioga. This rail line provides the only passenger rail service in North Dakota (Amtrak's Empire Builder). It travels from Chicago, Illinois to Seattle, Washington and Portland, Oregon. In North Dakota, the Empire Builder operates on the BNSF main line from Fargo to Grand Forks and Fort Buford. The train makes stops in Devils Lake, Fargo, Rugby, Minot, Stanley, and Williston. Between 2001 and 2010, annual ridership at the Williston Amtrak station increased by approximately 50.6 percent from 16,320 passengers to 24,586 passengers (UGPTI, 2007). BNSF also runs freight trains along this track.

The other BNSF rail line extends from the eastern edge of the project area and terminates at AVS, northwest of Beulah. This rail line moves freight through and in the project area.

The two abandoned rail lines in the project area are part of the former Burlington Northern network. The first extends from the eastern portion of the project area to Killdeer and the other crosses the western portion of the project area to Watford City (ND GIS, 2011).

<u>Airports and Airstrips</u>

There are numerous public and private airports and airstrips located in the project area. Because there are some airports in the area that accommodate larger aircrafts, the study area for this portion of the analysis includes those areas within 10 miles of the proposed project.

Commercial airports are defined as publically owned airports that have at least 2,500 passenger boardings per calendar year and receive scheduled passenger service. General aviation airports include privately owned and public use airports that enplane 2,500 or more passengers annually and receive scheduled airline service (Federal Aviation Administration [FAA], 2010). There are five public use airports located in the project area (FAA, 2011), including:

- Tioga Municipal Airport in Tioga, Williams County
- Weydahl Field in Killdeer, Dunn County
- Sloulin Field International Airport in Williston, Williams County
- Watford City Municipal Airport in Watford City, McKenzie County
- Beulah Airport, west of Beulah, Mercer County

An Airport Master Plan currently being prepared for the city of Williston was initiated to better understand community needs and desires regarding improvements to Sloulin Field International Airport. The study, which is ongoing, announced findings to date as of February 2012, and determined two possible options: expand the current site to accommodate larger aircraft or relocate the airport. The city of Williston and its partners in this study are currently evaluating land in the region that may be suitable for a new airport location (Sloulin Field International Airport, 2012). As of September 2012, three possible sites for the relocation of the airport have been identified. The sites are located in municipalities adjacent to Williston. It is anticipated that the FAA study will be completed in 2013, and a decision will be made regarding whether the airport will be expanded or relocated. In late July 2012, a public hearing was held to update residents on the plan and provide information about the ongoing environmental assessment (Williston Herald, 2012)

Many, but not all, public airports publish instrument approach procedures. These procedures often identify how flights should approach runways. Three airports with instrument approach procedures are located within 10 nautical miles of Alternative Route A: Tioga Municipal Airport; Sloulin Field International Airport; and Watford City Municipal Airport.

The final approach for flights generally begins at points located within 50,000 feet from the instrument approach procedures' runway end and must begin within 10 nautical miles or 60,070 feet of the runway end. This may be shorter depending on the type of plane used, i.e., smaller planes do not generally fly at such heights or need as great a distance to land safely. Only the portion of the final approach area that is between the final approach fix and the runway need to be considered as the final approach segment for obstacle clearance purposes. The minimum required obstacle clearance in the final approach area is 250 feet. The minimum descent altitude established for the final approach area is designed to ensure that no obstacles penetrate the 7:1 transitional surfaces (FAA, 1976).

Private airstrips are those not open to the public. These facilities tend to be smaller in scale and accommodate private planes. There are 10 private airstrips located in the project area (FAA, 2011), including:

- Tachenko Strip in the unincorporated community of Grassy Butte, Billings County
- Fredericks Ranch in Halliday, Dunn County
- Frei Private Airport also in Halliday, Dunn County
- Pete’s Port Airport in Killdeer, Dunn County
- Gajewski Field in Alexander, McKenzie County
- Brecht Strip in Golden Valley, Mercer County
- Lindvig Airstrip Airport in Williston, Williams County
- Ring Rock Ranch Airport in Williston, Williams County
- Wright Field in Williston, Williams County
- Moen Airport in Epping, Williams County

3.11.2 Direct and Indirect Effects

This section discusses potential impacts, their duration, and intensity on infrastructure and transportation resulting from construction and operation of the proposed project, including the no-action alternative. Definitions for duration and intensity developed for this project are described in Table 3-51.

Table 3-51: Infrastructure and Transportation Impact Context and Intensity Definitions

Context (Duration)	Low Intensity	Moderate Intensity	High Intensity
Infrastructure and Transportation -The transportation system in the project area includes state and local roadways (including rural roads and private/public off-road ones), railroads, and airports. -Waterways are not considered for this project.			
Short term: During construction period Long term: Life of the line (50 years)	Negligible increase in daily traffic volumes resulting in perceived inconvenience to drivers but no actual disruptions to traffic. Perceived inconvenience to drivers due to routine inspections by small vehicles or pickup trucks.	Detectable increase in daily traffic volumes (with slightly reduced speed of travel) resulting in slowing down traffic and delays, but no change in level of service. Short service interruptions (temporary closure for a few hours) to roadway and railroad traffic.	Extensive increase in daily traffic volumes (with reduced speed of travel) resulting in an adverse change in level of service to worsened conditions. Extensive service disruptions (temporary closure of one day or more) to roadways or railroad traffic. Permanent physical change in transportation system Permanent change in traffic patterns along primary roadways including U.S. 85, U.S. 2, ND State Highway 200 and ND State Highway 40 with an adverse change in level of service to worsened conditions. Infrequent but extensive operation delays and/or disruptions (temporary closure of one day or more) to roadways or railroad during sporadic “heavy-work” event (flatbed trucks and cranes for tower or transmission line replacement) associated with the transmission lines long-term maintenance program.

An overview of potential impacts associated with the project alternatives is presented below.

No-action Alternative

Utility Infrastructure

Under the no-action alternative, no new transmission infrastructure would be constructed. Based on previous studies, the existing transmission network in the project area is not capable of handling anticipated future load projections. The IS report *Eastern Montana/Western North*

Dakota Load Serving Study Facilities Additions Justification (IS, 2011) estimates that if improvements are not made to the existing electrical system that with the significant and projected further increase of the oil and gas industry, significant system failures, including considerable voltage drops or even voltage collapse, could occur. This would potentially result in adverse impacts, such as brownouts and other related issues.

Transportation Infrastructure

No construction activities would be associated with the no-action alternative and the proposed project would not occur. However, traffic volumes are anticipated to continue to increase in areas experiencing growth in the oil and gas industry. Without construction of the proposed project, electrical equipment used for oil and gas production could be limited by lack of reliable electrical service. Reliable electric service would be necessary for operation of equipment such as compressors and pumps for transmission of oil and gas through supply pipelines. If these transmission pipelines are not used, oil and gas would need to be transported by truck from the area, increasing heavy truck traffic on area roadways. Additional truck traffic would lead to increased wear on roads and may result in increased safety concerns for motorists.

Roadway improvements, both directly and indirectly associated with the projected increase in the oil and gas industry planned for project area counties, are discussed in more detail in Chapter 4.

Proposed Action

Utility Infrastructure

The construction of the proposed project would cross a variety of other utility infrastructure in the project area, including oil, gas, water, and other electric facilities. Prior to construction activities, Basin Electric would identify all utilities crossed by the proposed project and work with other utility companies and affected municipalities to ensure protection of these facilities during the construction period. It may be necessary to take existing utility facilities, particularly electric lines, out of service during construction of crossings. However, any service outages would be closely coordinated with the owning utility to ensure continued customer service and safety. Guard structures and matting would be used at crossing locations to protect existing facilities and worker safety. No interruptions in electric or other services are anticipated. Should any interruptions in service occur, they would be short term and timed to create minimal inconvenience, such as during cooler periods when air conditioning would not be required.

No long-term impacts on existing utility infrastructure are anticipated.

Transportation Infrastructure

During the construction of the proposed project, short-term impacts on the transportation network may result. Delivery of equipment and material along area roads and general construction traffic would increase wear and tear on area roads. Basin Electric would be responsible for any necessary improvements or repairs necessary for construction. As the proposed project is further refined, Basin Electric would work with the appropriate entities and municipal officials to minimize potential adverse impacts by identifying potential traffic routes, limitations, and improvements associated with the road network.

Long-term impacts on roadways, railroads, and airports and airstrips in the project area are not anticipated as a result of the proposed project. All crossings of linear infrastructure would be in compliance with National Electrical Safety Code clearance requirements. Basin Electric would coordinate with and obtain all necessary permits from the FAA and for road and rail line crossings. Once in operation, there would be periodic maintenance of the transmission line and supporting facilities; however, such activities are not anticipated to adversely affect roadway traffic volumes or patterns. Additionally, no long-term impacts on railroads or airports or airstrips are anticipated.

<u>Roadways</u>

At those locations where the alternative routes follow the same alignment, the potential for short-term impacts on traffic patterns would be similar. Those areas where the alternative routes would cross or come near primary roadways in the project area include:

- ND State Highway 8 just south of where it meets ND State Highway 1806
- U.S. Highway 85 south of Williston
- U.S. Highway 2 west where it meets U.S. Highway 85 in Williston
- U.S. Highway 85 north of U.S. Highway 2 and northeast of Williston
- ND State Highway 1806 just south of U.S. Highway 2 and south of Tioga

There are numerous collector roads, some of which are unpaved or graveled, that have experienced notable increases in traffic volumes as a result of growth in the oil and gas industry that would also be crossed by the alternative routes.

Construction activities associated with the alternative routes would result in short-term impacts on the roadway network in areas where road and lane closures and traffic detours may be necessary. The extent to which such impacts would be experienced would depend on the location of road, lane closures, and traffic detours and the duration they exist.

As mentioned in Section 3.11.1, some roadways in the project area have experienced a significant increase in vehicular volumes, particularly heavy trucks, with the growth of the oil and gas industry. Because of high truck volumes and private vehicle trips on certain roadways, any temporary disturbance to traffic patterns would be experienced beyond the proposed project

ROW and areas where construction activities are taking place. As the alternative routes are further refined, Basin Electric would work to ensure that closures and detours are minimized to the greatest extent possible. Basin Electric would coordinate with affected municipalities and appropriate entities (i.e., the North Dakota Department of Transportation) to develop a construction plan to minimize short-term, adverse effects.

Closures and detours may be necessary to string transmission lines across roads. Short traffic delays may occur to facilitate the movement of material haul trucks. Longer traffic delays would occur on higher volume roadways. Roadway closures would be planned in advance and timed during off-peak travel times to minimize adverse effects. Appropriate notification would be posted in and around affected areas to alert motorists of planned closures and detours. However, moderate to high short-term impacts on traffic patterns are anticipated during this time.

Once in operation, the alternative route is not anticipated to result in any long-term, adverse effects. Maintenance activities associated with the transmission line would occur primarily within the proposed project ROW and avoid disrupting traffic patterns. While maintenance vehicles would need to access locations where repairs or other activities are necessary, these movements would not occur on a regular basis and are not anticipated to adversely affect traffic patterns over the long term.

Alternative Route A

Under Alternative Route A, the proposed project alignment would split with Alternative Route B in the vicinity of ND State Highway 22, just north of ND State Highway SR 200. The proposed alignment continues west to the Charlie Creek Substation before turning north and northwest towards Williston. Roadways that the proposed alternative would cross or come within immediate proximity to and potentially impact traffic include:

- ND State Highway 22 just north of Killdeer;
- ND State Highway 200 just west of U.S. Highway 85 intersection near Charlie Creek Substation;
- U.S. Highway 85 just south of the Little Missouri River Crossing;
- U.S. Highway 85 south of Watford City;
- U.S. Highway 85 west of Watford City;
- U.S. Highway 85 south of Williston;
- U.S. Highway 2 west of Williston;
- U.S. Highway 2 north of Williston; and

- U.S. Highway 2 near Tioga.

There are also roadways more rural in nature that may be traversed by Alternative Route A. Potential short- and long-term impacts from road and lane closures and detours would be the same as those described above. Similar mitigation measures would apply.

Alternative Route B

Where Alternative Route A continues west past ND State Highway 22, Alternative Route B heads north and northwest. Alternative Route B meets Alternative Route A southeast of U.S. Highway 85, east of ND State Highway 200. Between these locations, Alternative Route B would cross or come relatively near the following primary roadways:

- ND State Highway 22 south of Little Missouri State Park and north of ND State Highway 200. This crossing is located farther north than the Alternative Route A crossing that crosses ND State Highway 22 closer to Killdeer;
- ND State Highways 23 and 73, east of ND State Highway 1806; and
- ND State Highway 1806 north of ND State Highway 23.

There are also roadways more rural in nature that may be crossed by Alternative Route B. Potential short- and long-term impacts from road and lane closures and detours would be the same as those described above. Similar mitigation measures would apply.

Railroads

Existing active railroad tracks are located in the northern and southern portion of the project area where the Alternative Routes A and B are the same. The alternative routes would cross active railroad tracks at a vertical elevation at three locations in the northern portion of the project area. These crossings would be located near Williston, Ray, and Tioga.

BNSF has developed a utility accommodation policy that addresses new utility installations that parallel or cross BNSF railroad lines. According to this policy, utility lines should be located to avoid or minimize the need for adjustments for future railroad improvements and to permit access to the utility lines for their maintenance with minimum interference to railroad traffic. For utilities that parallel BNSF railroad lines, BNSF considers any utility line greater than 500 feet in length to be a parallel line. The line then must be located on a uniform alignment within 10 feet or less of the property line.

Authorization from BNSF would be required should construction activities enter the BNSF ROW. In areas where construction of the proposed alternative routes would cross BNSF track, rail traffic may need to be temporarily stopped or rerouted resulting in a disruption to BNSF freight movements or Amtrak trains. Because this would occur at few locations and construction activities could likely be timed to avoid train movements, no short-term impacts are anticipated. Basin Electric would coordinate such activities with BNSF and Amtrak.

As the alternative routes are further refined, Basin Electric would work to ensure that project design and construction activities result in minimal or fully avoid electrical interference with the railroad. Such activities would need to be conducted in accordance with BNSF's Utility Accommodation Policy (Engineering Services, 2011).

Once in operation, maintenance activities associated with the alternative routes would be timed to avoid rail traffic. The project would be properly designed to encompass adequate structure heights at railroad crossings to minimize potential impacts on railroad maintenance activities. Railroad maintenance crews would need to conduct such activities with caution to avoid contact with the transmission line. It may be necessary to require additional safety precautions or employee training, similar to those that may already be in place, to ensure worker safety. No long-term impacts on railroad operations are anticipated.

The American Railway Engineering and Maintenance-of-Way Association has specifications in place for steady and rail-to-ground and equipment-to-ground voltage levels to ensure the safety of railroad operating personnel and the public. Such specifications would need to be followed in order to avoid electrical interference from capacitive, electric and magnetic, and conductive effects (American Railway Engineering and Maintenance-of-Way Association, 2012).

<u>Airports and Airstrips</u>

The proposed project would be located within relatively close proximity to airports and airstrips located in the project area. According to FAA regulations, any proposed structure that does not exceed the obstacle reference line will be classified as an obstacle. If the proposed structure would penetrate airspace above the obstacle reference line, it would be classified as an obstruction. Should the proposed structure be classified as an obstruction in accordance with provisions set forth in Part 77, Safe, Efficient Use, and Preservation of the Navigable Airspace of Title 14 of the CFR, a review is required to determine if it will constitute a hazard to airspace (FAA, 1993). Requirements and application procedures for making this determination are summarized in the abovementioned regulations. All applications must be submitted at least 45 days prior to the start of construction activities or alteration or the date an application for a construction permit is filed, whichever is earliest (14 CFR 77). CFR 77.19, Civil Airport Imaginary Surfaces, identifies the required obstacle clearances for airports.

Because there are airports and airstrips located relatively near the proposed project, Basin Electric would work with the FAA to ensure that the selected alternative does not result in obstructions or adverse short- or long-term impacts on airport operations. Coordination would be initiated as the proposed project design is further refined.

3.12 PUBLIC HEALTH AND SAFETY

This section provides an overview of elements of the proposed project that may result in public health and safety impacts.

3.12.1 Affected Environment

This section provides a summary of electric and magnetic fields (EMFs) and an overview of public health and safety impacts that may result from an increase in EMFs in the project area.

Regional Setting

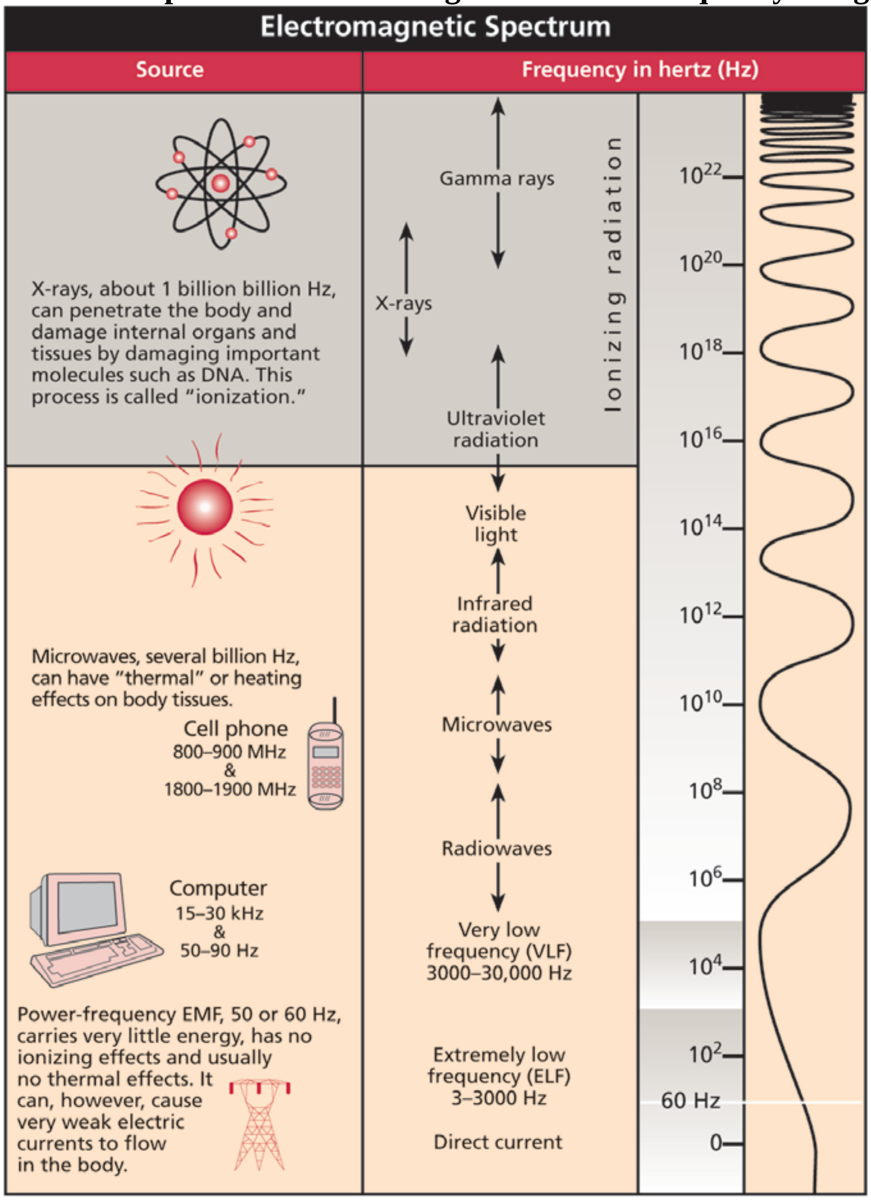
As mentioned in Section 1.2, Purpose and Need for Action, there are existing transmission lines within the immediate vicinity of the proposed project. The proposed project is necessary to support projected future loads and provide continuous electric service to nearby homes and businesses as well as to the oil and gas industry, which is expanding rapidly. Potential public health and safety impacts that may result from the construction and operation of the proposed project would likely occur in those areas immediately adjacent to the proposed alternative routes. The study area for this discussion includes those areas within the proposed ROW or 1,000 feet of either side of the alignment centerline. However, as demonstrated below, potential human health and safety impacts should they result would be limited to those areas within immediate proximity to the proposed project alignment.

Electric and Magnetic Fields

The following overview of EMFs has been retrieved from the National Institute of Environmental Health Sciences' Electric and Magnetic Fields Associated with the Use of Electric Power manual (2002).

EMFs are generated whenever electricity is generated, transmitted, or used. They are the direct effect of the presence and/or motion of electric charges. EMFs are invisible lines of force that surround any electrical device including power lines, electrical wiring, and electrical equipment. The majority of electrical equipment needs to be turned on for a magnetic field to be produced; however, electric fields are often present even when equipment is turned off as long as it is plugged into a power source. Additional sources of EMFs include X-rays, visible light, microwaves, and radio waves, as illustrated in Figure 3-26.

Figure 3-26: Examples of EMF Emitting Sources and Frequency Range



The wavy line at the right illustrates the concept that the higher the frequency, the more rapidly the field varies. The fields do not vary at 0 Hz (direct current) and vary trillions of times per second near the top of the spectrum. Note that 10^4 means 10 x 10 x 10 x 10 or 10,000 Hz. 1 kilohertz (kHz) = 1,000 Hz. 1 megahertz (MHz) = 1,000,000 Hz.

Source: NIEHS, 2002.

The difference between electric fields and magnetic fields is provided below. Similar to both however is that they decrease rapidly as they move away from the source generator.

Electric Fields

Electric fields are produced by voltage, and increase in strength as the voltage increases. The intensity of an electric field is proportional to the voltage of the transmission line. They can be easily shielded or weakened by materials that conduct electricity or even materials that conduct poorly such as trees and buildings. Electric field strength is measured in volts per meter or in kilovolts per meter (kV/m). One kV is equal to 1,000 volts.

Magnetic Fields

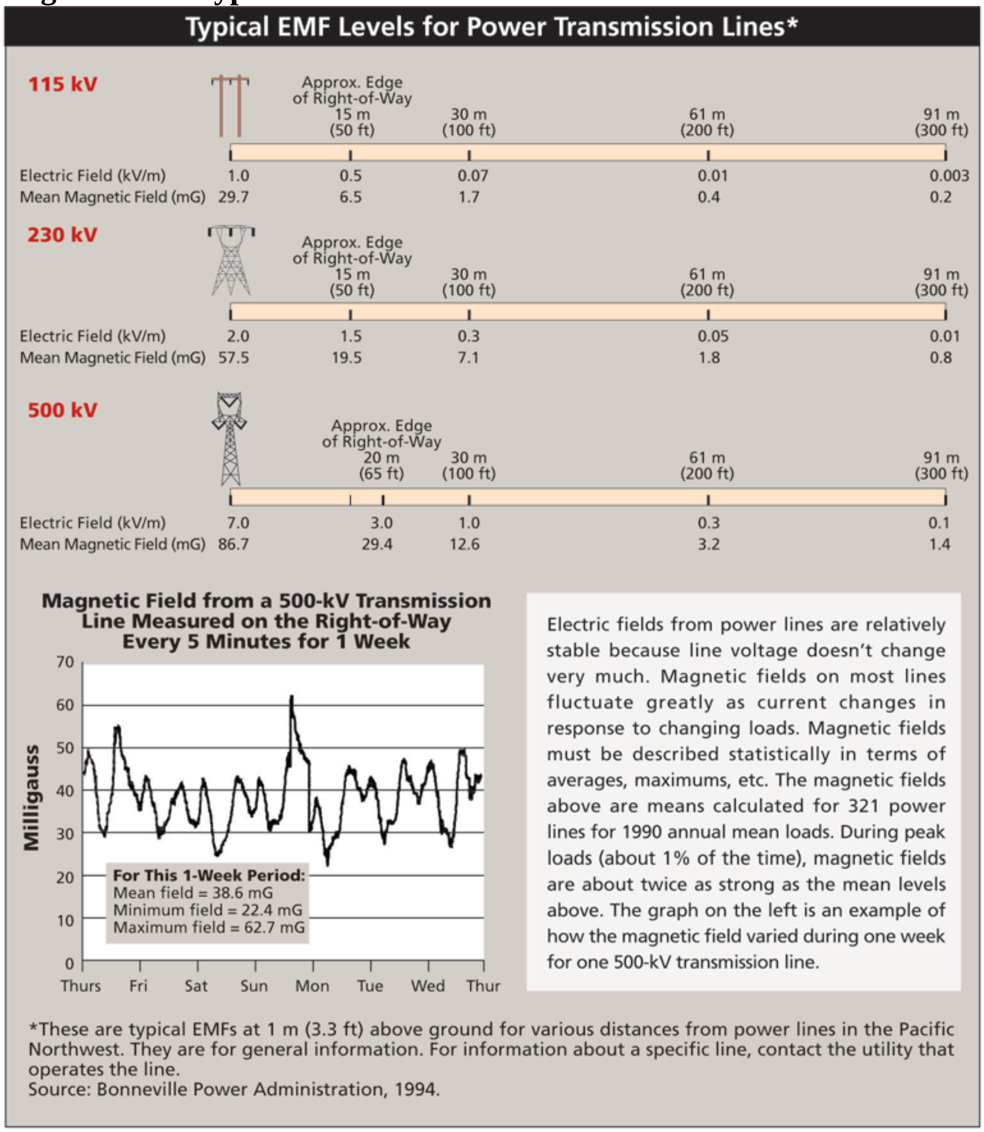
Magnetic fields result from the flow of current through wires or electrical devices and are proportional to current flow. Unlike electric fields, they pass through most materials and are therefore difficult to shield. For this reason, the majority of research on EMFs focuses on magnetic fields.

Magnetic fields are measured in units of gauss or Tesla. Gauss is the unit most commonly used in the United States. Tesla is the internationally accepted scientific term and the conversion between the two is 1 Tesla = 10,000 Gauss. Because most environmental EMF exposures involve magnetic fields that are only a fraction of a Tesla or a gauss, they are commonly measured in units of microtesla (μT) or milligauss (mG). A microtesla is 1/1,000,000 of a Tesla while a milligauss is 1/1,000 of a gauss. Therefore, 1 Tesla = 1,000,000 μT and 1 Gauss = 1,000 mG. To convert a measurement from μT to mG, multiply by 10 (NIEHS, 2002).

Electrical energy is often supplied as an alternating current where the electricity flows in one direction and then in the other to complete a cycle. EMFs are characterized by their wavelength, frequency, and amplitude (strength). At a distance of approximately 300 feet and at times of average electricity demand, magnetic fields from many transmission lines can be similar to typical background levels found in most homes. Figure 3-27 shows typical EMF levels for kV lines and structures and the decrease of EMFs as the distance from the structure increases.

In general, the strongest EMFs are concentrated in areas outside of a substation where transmission lines enter and leave the substation. EMFs emitted from substation equipment, such as transformers, reactors, and capacitor banks decrease at a rapid rate when moving away from source generators. Such effects are typically indistinguishable beyond the immediate range of such facilities (NIEHS, 2002).

Figure 3-27: Typical EMF Levels for Power Transmission Lines



Source: NIEHS, 2002.

Regulatory Framework

Currently there are no federal or North Dakota regulations in place that dictate the permitted strength of electrical fields beneath high voltage transmission lines. Public and occupational magnetic-field exposure guidelines that do exist are based on studies evaluating the impacts of short-term exposure to EMFs. The Institute of Electrical and Electronics Engineers' International Committee on Electromagnetic Safety on Non-Ionizing Radiation (ICES) has established public exposure guidelines of 9,040 mG for magnetic fields (ICES, 2002). The International Commission on Non-Ionizing Radiation Protection's (ICNIRP) Guidelines for Limiting Exposure to Time-Varying Electric, Magnetic and Electromagnetic Fields (1 hertz to 100 kilohertz) also recommends limits for both occupational and general public exposure to time-varying fields. At 60 hertz, ICNIRP electric field reference level is 4.2 kV/m and magnetic field reference level is 2,000 mG for public exposure (ICNIRP, 2010).

Public Health Effects of Electromagnetic Fields

There has been concern that prolonged exposure to EMFs can be a contributor to cancer, leukemia, and other diseases. Since the 1970s, numerous epidemiological studies have been conducted to assess the potential effect of magnetic fields on the risks of cancer and other diseases. While there have been many studies done regarding the health effects of transmission lines, the results are inclusive at this time.

The World Health Organization (2012) reports that:

> "Based on a recent in-depth review of the scientific literature, the World Health Organization concluded that current evidence does not confirm the existence of any health consequences from exposure to low level electromagnetic fields…Despite many studies, the evidence for any effect remains highly controversial. However, it is clear that if electromagnetic fields do have an effect on cancer, then any increase in risk will be extremely small. The results to date contain many inconsistencies, but no large increases in risk have been found for any cancer in children or adults."

USEPA states that:

> "Much of the research about power lines and potential health effects is inconclusive. Despite more than two decades of research to determine whether elevated EMF exposure, principally to magnetic fields, is related to an increased risk of childhood leukemia, there is still no definitive answer. The general scientific consensus is that, thus far, the evidence available is weak and is "not sufficient to establish a definitive cause-effect relationship"

While many findings are still inclusive at this time, USEPA reports:

> "In 1998, an expert working group, organized by the National Institute of Environmental Health Sciences, assessed the health effects from exposure to extremely-low frequency EMF, like those you would find in a home with power lines close by. Based on studies about childhood leukemia that involved a large number of households, they found that power line frequency magnetic fields are a possible cause of cancer. The National Institute of Environmental Health Sciences working group also concluded that the results of EMF animal, cellular, and mechanistic studies do not confirm or refute the finding of the human studies" (USEPA, 2006c).

Implantable Medical Devices

Pacemakers are used to treat arrhythmias, which are problems associated with the rate or rhythm of the heartbeat. During an arrhythmia, the heart can beat too fast, too slow, or with an irregular rhythm. When this happens, the heart may not be able to pump enough blood through the body. A pacemaker can relieve some arrhythmia symptoms and are designed to detect abnormal heart rhythms (U.S. Department of Health and Human Services, 2012).

Pacemakers and other cardiac electronic devices rely on complex micro-circuitry and use electromagnetic waves for their communication with the programmers. As a result, they are susceptible to interference from the surrounding electromagnetic fields. Electromagnetic interference can be defined as any signal, biological or not, that falls within a frequency spectrum that is being detected by the sensing circuitry of the pacemaker. This can interfere with the devices optimal function and is often a concern for patients (Lakshmanadoss et al., 2004).

At present, there is no standardized guidance regarding acceptable levels of EMF for pacemakers. However, the American Conference of Governmental Industrial Hygienists has prepared recommendations for occupational exposures including EMFs. These guidelines are designed to identify levels that nearly all workers may be exposed to repeatedly without adverse effect. For EMF, the recommendations suggest that persons with pacemakers or similar devices limit their exposure to electric fields to 1 kV/m and magnetic fields to 1,000 mG (American Conference of Governmental Industrial Hygienists, 2011).

3.12.2 Direct and Indirect Effects

This section discusses potential impacts, their duration, and intensity on safety and public health resulting from construction and operation of the proposed project, including the no-action alternative. Definitions for duration and intensity associated with safety and public health developed for this project are described in Table 3-52.

Table 3-52: Safety and Health Impact Context and Definitions

Context (Duration)	Low Intensity	Moderate Intensity	High Intensity
Short term: During construction period Long term: Life of the line (50 years.)	Construction of the proposed project would not result in 1) exposure of contaminated media to construction workers and/or 2) incidents associated with the installation of the transmission line and supporting infrastructure. Operation of the proposed project would not result in an increase of EMF levels that would rise to a level of concern with regard to public health and safety.	Construction of the proposed project may result in exposure of contaminated media by construction workers either through the disturbance of hazardous materials and/or chemical spills. The potential for incidents associated with the installation of the transmission line and supporting infrastructure increases. Operation of the proposed project would increase EMF levels, but not to a level that would adversely affect public health and safety.	Construction of the proposed project would result in exposure of contaminated media by construction workers either through the disturbance of hazardous materials and/or chemical spills. Incidents associated with the installation of the transmission line and supporting infrastructure would likely result. Operation of the proposed project would increase EMF levels to a level high to adversely affect public health and safety.

Potential public health and safety impacts that may result under the proposed project alternatives are provided below. The discussion is limited to those impacts that may be experienced through the increased exposure to EMFs in areas relatively close to the alternative routes.

No-action Alternative

Under the no-action alternative, the proposed transmission line would not be constructed. As a result, no adverse impacts on public health and safety would result from EMFs. Current EMF levels would remain relatively similar to current conditions due to the presence of existing transmission lines and other devices that emit EMFs in the project area.

Proposed Action

During construction of the proposed project, heavy equipment would be required and ground materials would be disturbed. The use of heavy equipment and other construction-related materials would likely include the use of oil and gas for fueling as well as other potentially hazardous materials. While it is not anticipated at this time, the disturbance of ground materials may reveal the presence of hazardous or potentially hazardous materials.

Direct contact between an object on the ground and an energized conductor poses the most serious risk of injury or death from a high-voltage transmission line. During construction of the proposed project, direct contact with an energized line is not anticipated. However, there would be multiple crossings of existing energized lines, both transmission and distribution, in addition to upgrades to existing substations. Prior to the onset of construction activities, Basin Electric would work with utility owners to coordinate line outages or other mitigation measures to ensure the safe implementation of the proposed project.

Prior to the onset of construction, a construction plan would be prepared. The plan would be prepared in accordance with the National Electrical Safety Code and the Occupational Safety and Health Administration's regulations, as required by federal law. Additionally, the plan would include prevention and response procedures such as those required in a spill prevention control and countermeasure plan and a stormwater pollution prevention plan under both state and federal law. Workers will be knowledgeable of the protocols in place and required to follow all procedures during construction activities. However, the potential does exist for minor and major injuries to occur during the construction of the proposed project. Such potential exists for all activities where construction and heavy equipment are used.

In order to assess potential impacts associated with an increase in EMFs as a result of the proposed project, the Corona and Field Effects Program was used to calculate and approximate future EMF levels. This model was developed by the Bonneville Power Administration (Bonneville Power Administration, n.d). The output from these calculations was used to plot the EMF profiles across distances from the centerline of the proposed alternative routes. Outputs from the model can be found in Appendix J.

The ROW for the proposed alternative routes is 75 feet from the centerline of the proposed project alignments. Under the proposed action alternatives, electric fields 75 feet from the proposed project alignment would be 0.214 kV/m, well below the ICNIRP identified level of 4.2 kV/m required to protect the public. Magnetic fields at the same distance measured 94 mG, also well below the ICNIRP identified level of 2,000 mG necessary to protect the public. These levels are also below those necessary to ensure the continued function of pacemakers and other implantable devices. Therefore, the operation of either of the alternative routes would not result in adverse impacts on public health and safety as a result of the slight increase in EMF levels.

Once in operation, the proposed alternative routes have the potential to cause stray voltage. This can occur from a maintenance issue or improperly grounded equipment under the transmission line or at electric service entrances to structures from distribution lines. Transmission lines can induce stray voltage on distribution lines in circumstances where the transmission line is parallel to and directly over the distribution line. If such configurations are created, some farm equipment (barns, fences, gates, etc.) may be subject to developing small electric charges that could be transferred to humans or livestock upon contact with equipment, structures, or facilities. Basin Electric would work to ensure that proper measures are implemented to avoid this to the greatest extent possible. Additionally, should stray voltage concerns be identified following construction activities, Basin Electric would correct the circumstances creating the stray voltage. As a result, no long-term impacts are anticipated.

High-voltage transmission lines are designed to automatically trip or become de-energized should they fall or come into contact with trees. They typically only fall during severe weather events, such as excessive ice or tornados, or if they are struck by a large vehicle. Should the proposed alternative routes be located within the vicinity of distribution lines and one such line should fall, then the risk of an energized distribution line on the ground would result presenting a safety hazard. Basin Electric would work to ensure that all safety precautions are taken to safely and quickly address any such incidents.

The proposed alternative routes include the installation of several hundred structures to support the current-carrying conductors. Many of these structures would be located in or adjacent to agricultural lands and may create an obstacle for equipment. The operation of farm equipment near proposed structures could result in unnecessary contact and/or damage to machinery and/or operators. As the proposed alternative routes are further refined, Basin Electric would work with affected property owners to locate structures in areas that would avoid or have reduced concern for potential impacts on farming and ranching operations.

Over the long term, no adverse impacts on public health and safety beyond negligible to minor are anticipated to result from the operation of the proposed alternative routes.

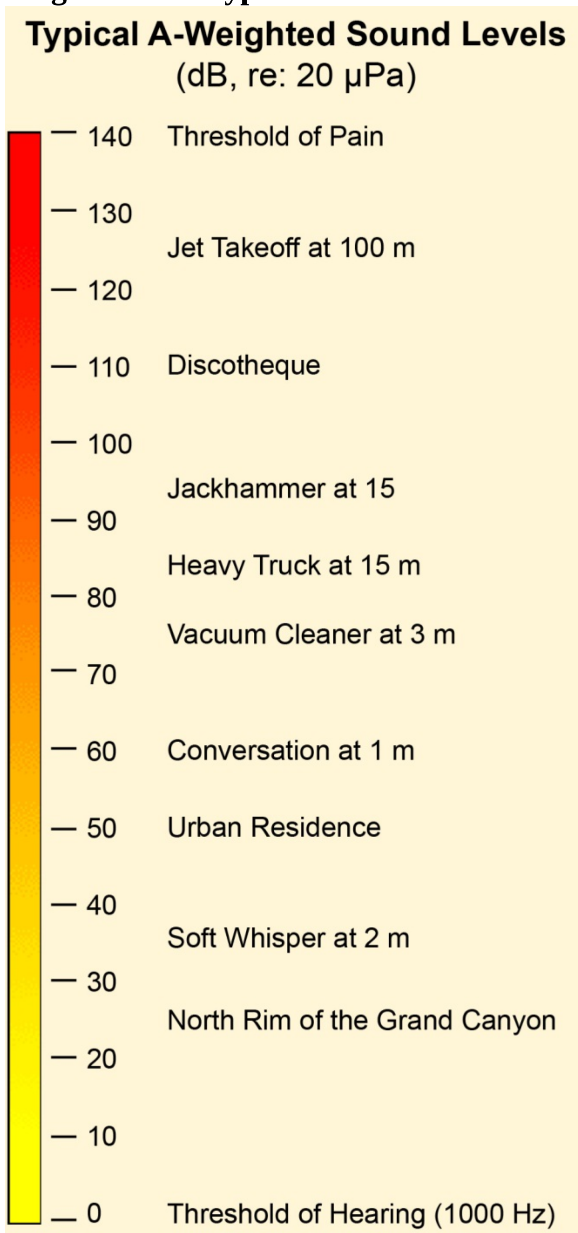
3.13 NOISE

3.13.1 Affected Environment

Noise is generally defined as unwanted sound. Sound is all around us; it becomes noise when it interferes with normal activities such as speech, concentration, or sleep. Noise associated with transmission lines is a factor during construction and operation of both the lines and substations. Noise emanates from vehicular traffic and crews associated with construction and maintenance of transmission lines and substations and noise coming from the transmission line itself once operational. Ambient noise (the existing background noise environment) can be generated by a number of noise sources, including mobile sources, such as automobiles and trucks; and stationary sources such as construction sites, machinery, or industrial operations. In addition, there is an existing and variable level of natural ambient noise from sources such as wind, streams and rivers, wildlife, and other sources.

The standard measurement unit of noise is the decibel (dB), which represents the acoustical energy present. Noise levels are measured in A-weighted decibels (dBA), a logarithmic scale that approaches the sensitivity of the human ear across the frequency spectrum. The human ear responds to noise in the audible frequencies in a similar way in most individuals. A 3 to 5-dBA increase is equivalent to doubling the sound pressure level, but is barely perceptible to the human ear. A 6-dBA is a readily perceptible change and a 10-dBA is doubling of the apparent loudness. Figure 3-28 provides examples of sound levels of typical noise sources and noise environments.

Figure 3-28: Typical Noise Levels



Source: Occupational Health and Safety Administration, 2012

In addition to changes in dB levels there are also objective factors to consider when determining the noise and how people have the potential to be affected by the noise. Noise in the environment is constantly changing and fluctuates based on a number of external forces including when a car drives by, a dog barks, or a plane passes overhead. To understand and quantify these fluctuations, noise metrics have been established. These metrics include the exceedance sound level (L_x). The L_x is the sound level exceeded by a certain percent (x) of the sampling period and is referred to as a statistical sound level. The most common L_x values are L_{eq}, L_{90}, L_{50}, and L_{10}. L_{eq} is the level of a constant sound over a specific time period that has the same sound energy as the actual sound over the same period. L_{dn} is another common noise metric, which applies a 10-dB penalty to nighttime noise levels.

Noise associated with the operation of transmission line includes corona, insulator, and Aeolian noise. Corona noise is the most common noise associated with transmission lines and is heard as a crackling or hissing sound. This type of noise varies with both weather and voltage of the line, and most frequently occurs in conditions of rain or high humidity. The noise comes from a breakdown of air into charged particles caused by the electrical field at the surface of conductors. Corona noise typically results in continuous noise levels of 40 to 50 dBA in close proximity to the transmission line and during wet or high-humidity conditions can range from 50 to 60-dBA. Corona noise levels are not consistent from location to location because conductor surface defects, damage, dust, and other inconsistencies can influence the noise levels. Insulator noise is similar to corona noise, but is not dependent on weather and is typically caused by dirty, nicked, or cracked insulators. Aeolian noise is caused by wind blowing through the conductors and/or structures and is usually infrequent and depends on wind velocity and vibration. Aeolian noise typically occurs when wind is steady and perpendicular to the lines, which sets up an Aeolian vibration that can produce resonance if the frequency on the vibration matches the natural frequency (Aspen Environmental Group, n.d.).

Ambient Noise Levels and Sources in Project Area

Ambient sound levels in the project area are highly variable and are based on sound sources and disturbances in the immediate area. For much of the project area, which is mostly open fields, agricultural, and rural residential areas, sound levels would typically vary between 40 and 45 dBA (Noise Polluting Criteria, n.d.). Communities located in the project area would experience higher sound levels from increased human activities. In addition, areas adjacent to roadways such as the U.S. Highway 2, U.S. Highway 85, several North Dakota state highways, and county and local roads would have higher noise levels, due to human activity and vehicle traffic. Conversely, the project area contains TRNP, USFS land, and several state parks all of which have restricted access and in general would have sound levels similar to those in open fields and agricultural areas and have the potential to be quieter than the general project area. In recent years, the development of numerous oil wells and associated human activity have increased isolated pockets of noise from construction, operation of the facilities, and human activity.

There are no county-specific regulations for noise in the project area.

3.13.2 Direct and Indirect Effects

Construction of the proposed transmission line would generate noise in the project area. Noise levels also may periodically increase during operation and maintenance. This noise would have the potential to affect nearby residences, recreational users, wildlife, and other receptors.

This section discusses potential impacts, their duration, and intensity on noise resulting from construction and operation of the proposed project, including the no-action alternative. Definitions for duration and intensity developed for this project are described in Table 3-53.

Table 3-53: Noise Impact Context and Definitions

Context (Duration)	Low Intensity	Moderate Intensity	High Intensity
Short term: During construction period Long term: Life of the line (50 years)	Noise impacts could attract attention, but would not dominate the soundscape or detract from current user activities.	Noise impacts would attract attention, and contribute to the soundscape, but would not dominate. User activities would remain unaffected.	Impacts on the characteristic soundscape would be considered significant when those impacts dominate the soundscape and detract from current user activities.

No-action Alternative

Under the no-action alternative, the proposed project would not occur and no construction or construction activities would take place, leading to no impacts on noise.

Alternative Route A

Noise impacts associated with Alternative Route A would stem from construction activities and operation and maintenance of the proposed transmission line and associated structures. Construction activities would create intermittent and short-term noise occurring only during the construction period. Potential sources of noise from construction activities include: construction of access roads and foundations at each transmission tower site; transmission tower site preparation; erection of tower structures at individual tower sites; helicopter assistance during transmission tower erections and stringing of conductors; material and staff vehicle transportation; and construction staff interactions and activities. The access roads and tower site preparation would be completed using conventional construction equipment. Table 3-54 lists the equipment that would likely be used for the project and summarizes noise levels produced by the equipment. Data presented in this table utilizes L_{eq}, a statistical descriptor that depicts the average sound level for environmental noise and accounts for fluctuating sound levels.

The overall combined noise estimated to be caused by conventional equipment involved in construction of the proposed project is 89 Db L_{eq}, at a distance of 50 feet. Noise produced by this construction equipment would decrease with distance at a rate of 6 dB per doubling distance from the site. Based on this rate Table 3-55 shows estimated construction noise levels at various distances from the construction site.

Table 3-54: Typical Construction Equipment Noise Levels

Type of Equipment	Maximum Level (dBA) at 50 Feet
Road Grader	85
Bulldozer	85
Heavy Truck	88
Backhoe	80
Pneumatic Tools	85
Crane	85
Combined Equipment	89

Source: Thalheimer, 1996.

Table 3-55: Construction Noise in the Vicinity of a Representative Construction Site

Distance from Construction Site (feet)	Hourly Leq (dBA)
25	95
50	89
100	83
200	77
400	71
800	65
1600	59

Note: The following assumptions were used:
Equipment used: (1) each- grader, bulldozer, heavy truck, backhoe, Pneumatic tools, concrete pump, crane
Reference noise level: 89 dBA (L_{eq})
Distance for the reference noise level: 50 feet
Noise attenuation rate: 6 dBA/doubling
This calculation does not include the effects, if any, of local shielding or atmospheric attenuation.

Noise stemming from construction and construction-related activities would occur along the entire proposed transmission line, although only at specific points where crews are working. However, noise increases would only be a concern if sensitive noise receptors (residences, schools, churches, libraries, etc.) are located near the proposed project to experience increases in noise. The majority of land use in the area is open range, undeveloped land, and agricultural areas, with only eight sensitive noise receptors (all residences) located within 500 feet of Alternative Route A. Existing ambient noise levels typically vary between 40 and 45 dB, quantified as quiet, with noise levels being slightly increased in the presence of communities and roadways. Based on these existing conditions an increase in noise levels exceeding 50 dBA would be considered moderate and all noise increases below 50 dBA would be considered low. Construction and construction activities in all areas without sensitive noise receptors would be temporary and highly localized, and impacts would be short-term and low based on the lack of population in the area. For sensitive noise receptors area noise impacts would be felt when construction was occurring at the localized area. Noise would be increased during ROW clearing, erection of transmission towers, stringing of conductors, and from construction vehicles and staff. When combined the construction of these towers would have moderate impacts on existing noise receptors, with the highest impact potentially coming from helicopter use to assist with tower erection. All construction impacts would be short term, would only occur during construction, and would cease upon completion of the construction process.

In addition, to construction of the transmission line, increases in noise levels would result from the construction of the proposed Judson and Tande 345-kV substations and Killdeer switchyard. Impacts from construction of the substations and switchyard would be similar to those presented for the transmission line, with noise from construction equipment and vehicles and construction labor. Impacts from construction would be limited to the construction period and would be localized to the proposed substation and switchyard project areas. While, the construction period of the substations and switchyard may be longer in the localized area, it would still occur in a relatively short time-period with overall impacts from construction being short term and low.

Noise impacts during operation and maintenance of the proposed project are expected to be negligible. Noise attributed to maintenance would occur when and if maintenance needs arise, with field vehicles used to access trouble spots and from the actual maintenance activity. These impacts would be short term and would typically be of low intensity. The operation of the proposed line would result primarily in corona-generated noise, occurring in the atmosphere near the conductor. Changes to local atmospheric pressure may result in a hissing or cracking sound that may be heard directly under the transmission line or within a few feet of the ROW depending on weather, altitude, and system voltage, with the level of corona noise receding with distance. None of the sensitive noise receptors are near enough to the transmission line to have their noise levels affected; therefore, impacts on noise would be short term and low.

At the site of the proposed substations at Judson and Tande, noise from operations would occur from substation equipment, with the primary source stemming from substation transformers and nearby transmission lines. Sounds commonly associated with a transformer are described as a hum. This hum is created by the expansion and contraction of the core when the transformer is energized and occurs approximately twice per alternating cycle. Noise from substation equipment and transmission lines would be the primary source of environmental noise in the area; however, because of the distance to sensitive noise areas, there would be no adverse increases in noise levels to these areas and increases would be short term and low to all individuals present in these areas. In addition to noise associated with the operation of the transformers, each transformer would have cooling fans that would create noise while in operation. Noise from these fans would come from either the motor's mechanical noise or through the blades disrupting the air. Of the eight sensitive noise receptors in the area of the transmission line and substations, none are within 500 feet of either of the proposed substations. One residence is located approximately 550 feet from the Judson 345-kV Substation and one residence has the potential to be located within 800 feet of the Tande 345-kV Substation. The Judson 345-kV Substation residence has the potential to recognize increased sound levels; however, it would be expected that all increases to sound levels would be well within an acceptable range and all impacts would similarly be low. Based on the distance to the Tande 345-kV Substation, impacts on the residence are expected to be low. Noise impacts from the operation of the proposed Killdeer switchyard would generally only occur during foggy or rainy days, when a hum or crackle may occur. This sound is typically drowned out by the weather. As a result, all noise impacts associated with the switchyard would be short term and low.

Alternative Route B

Impacts from the construction and operation of the proposed transmission line would be the same under Alternative Route B as those for Alternative Route A. There are seven sensitive noise areas located within the project area of Alternative Route B; however, none are located within 500-feet of the proposed transmission line, resulting in low impacts on these areas. Construction and operations impacts associated with the substations and switchyard in Alternative Route B are the same as Alternative Route A, with overall impacts on noise being low.

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4 CUMULATIVE IMPACTS

Cumulative impacts are defined as the "impact on the environment, which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions" (40 CFR 1508.7). Based on the policy guidance and methodology originally developed by CEQ in 1997 and an analysis of current case law, a process based on four primary steps is employed.

- **Step 1—Identify Resources Affected**. In this step, each resource affected by any of the alternatives is identified. These are the same resources described in the affected resources section. If there are no impacts to the resource as a result of the alternatives being considered, then there is no cumulative impact.

- **Step 2—Establish Boundaries.** In identifying past, present, and reasonably foreseeable actions to consider in the cumulative impact analysis, affected resource-specific spatial and temporal boundaries are identified. The spatial boundary is the area where past, present, and reasonably future actions have taken place, are taking place, or could take place and result in cumulative impacts to the affected resource when combined with the impacts of the alternatives being considered. This boundary is defined by the affected resource and may be a different size than the proposed project area. For example, impacts to water quality of a stream may include the watershed as the appropriate boundary for the cumulative impact analysis; whereas the analysis boundary for GHG emissions may be global.

  The temporal boundary describes how far into the past and forward into the future actions should be considered in the impact analysis. Appropriate spatial and temporal boundaries may vary for each resource. The temporal boundary is guided by CEQ guidance on considering past action and a rule of reason for identifying future actions.

- **Step 3—Identify Cumulative Action Scenario.** In this step, the past, present, and reasonably foreseeable future actions to be included in the impact analysis for each specific affected resource are identified. These actions fall within the spatial and temporal boundaries established in Step 2. These actions are identified considering guidance from CEQ, such as a document entitled "Guidance on Consideration of Past Actions in Cumulative Effects Analysis" and current case law, such as Ecology Center v. Castaneda, 574 F.3d 652, 667 (9th Cir. 2009), where the court gave deference to CEQ's interpretation of NEPA and stated that, as it relates to past actions, NEPA requires "adequate cataloging of relevant past projects in the area."

- **Step 4—Cumulative Impact Analysis.** This final step involves the analysis of the impacts of the actions identified in Step 3 in addition to the impacts of the proposed action and its alternatives. This will result in the total cumulative impact for each resource.

The completion of this process and its corresponding analyses result in a meaningful, defensible, and exhaustive cumulative impact analysis.

4.1 AFFECTED RESOURCES SUMMARY

The resources that will be evaluated for cumulative impacts are those resources that were evaluated for direct and indirect impacts and are summarized below.

- Aesthetics and Visual Resources
- Air Quality and GHGs
- Geology and Soils
- Water Resources, including groundwater, surface water, and floodplains
- Biological Resources, including vegetation, wildlife, threatened and endangered species, and wetlands
- Cultural Resources
- Land Use
- Socioeconomics
- Environmental Justice Populations
- Recreation and Tourism
- Infrastructure and Transportation
- Public Health and Safety
- Noise

4.2 CUMULATIVE EFFECT BOUNDARIES

In identifying past, present, and reasonably foreseeable actions to consider in the cumulative impact analysis, affected resource-specific spatial and temporal boundaries are identified. The spatial boundary is the area where past, present, and reasonably future actions have taken place, are taking place, or could take place and result in cumulative impacts on the affected resource when combined with the impacts of the alternatives being considered. This boundary is defined by the affected resource and may be a different size than the proposed project area. Table 4-1 provides a summary of cumulative impact boundaries by resource area. A detailed assessment of cumulative effect boundaries for each resource considered, including both spatial and temporal boundaries, are described further in the cumulative effects analysis section of this chapter.

Table 4-1: Cumulative Impact Boundaries by Resource Area

Affected Resource	Spatial Boundary	Temporal Boundary
Aesthetic and Visual Resources	The area that is visible from the project. The background is typically defined as 4 miles beyond the horizon line. For the purposes of the project, the spatial boundary will be 10 miles around the proposed route in Williams, McKenzie, Dunn, Mountrail and Mercer counties.	The temporal boundary is the life of the project; visual impacts will continue unless the transmission line is decommissioned and removed.
Air Quality	The spatial boundary is limited to the airshed in which the proposed action will occur, as project-related impacts could affect air quality within this airshed.	The temporal boundary is the life of the project (50 years), because some cumulative impacts could be expected to occur throughout this timeframe.
Greenhouse Gases	Given the nature and extent of GHG emissions, the appropriate spatial boundary is global as GHGs have been and are continuing to accumulate in the atmosphere.	The temporal boundary is the life of the project (50 years).
Geology and Soils	Project ROW	1 to 5 years: short term 5+ years: long term
Surface Water	Upper Missouri River/Lake Sakakawea, Knife River, Little Missouri River, and Little Muddy River sub-basins.	Life of the transmission line (50 years).
Floodplains	Floodplains located within the project ROW.	Life of the transmission line (50 years).
Vegetation	6-county area including Billings, Dunn, McKenzie, Mercer, Mountrail, and Williams counties	Life of the transmission line (50 years).
Wildlife	6-county area including Billings, Dunn, McKenzie, Mercer, Mountrail, and Williams counties	Life of the transmission line (50 years).
Wetlands	6-county area including Billings, Dunn, McKenzie, Mercer, Mountrail, and Williams counties	Life of the transmission line (50 years).

Affected Resource	Spatial Boundary	Temporal Boundary
Special Status Species	6-county area including Billings, Dunn, McKenzie, Mercer, Mountrail, and Williams counties	Life of the transmission line (50 years).
Cultural Resources	APE, which consists of the Study Area.	Life of the transmission line (50 years).
Land Use	5-county area including Dunn, McKenzie, Mercer, Mountrail, and Williams counties	Life of the transmission line (50 years).
Socioeconomics	5-county area including Dunn, McKenzie, Mercer, Mountrail, and Williams counties	Any cumulative actions that would overlap with the 2-year construction timeline are considered.
Environmental Justice Populations	The census blocks and census tracks within or intersecting the project area.	Any cumulative actions that would overlap with the 2-year construction timeline are considered.
Recreation and Tourism	1 mile of the transmission line; and/or extent of visual, air quality, water quality, traffic, and noise impacts	Life of the transmission line (50 years).
Utility Infrastructure	Study area counties with a focus on those areas within 1 mile of the proposed project.	Impacts would be primarily limited to construction of the proposed project. The analysis will identify known projects that are anticipated to extend 10 to 20 years into the future.
Transportation Infrastructure	Within 6 miles of the proposed project alternatives.	Impacts would be primarily limited to construction of the proposed project. The cumulative impacts analysis will include those projects that are reasonably foreseeable within the next 10 years.
Electric and Magnetic Fields	Within 500 feet of the proposed project.	Life of the transmission line (50 years).
Construction Equipment and Activities	Within 500 feet of the proposed project.	Short-term only. Limited to construction activities.
Noise	The spatial boundary is contained to all areas within hearing distance of the proposed action	The temporal impact is the life of the project (50 years); however, most of the potential cumulative impacts associated with the proposed project are expected to be short-term and limited to the construction phase of the project.

4.3 CUMULATIVE ACTION SCENARIO

Table 4-2 identifies actions that could cumulatively impact specific affected resources within the project area. The table identifies each resource considered and provides an accounting of past, present, and reasonably foreseeable future actions that could contribute to cumulative impacts.

Table 4-2: Cumulative Impacts by Resource Area

Affected Resource	Past Actions	Present Actions	Reasonably Foreseeable Future Actions
Aesthetics and Visual Resources			
Natural Features	Clearing of forests and tall grasslands (natural screening) for agricultural and oil and gas activities.	Same as past actions.	Same as present actions.
Built Features	Agricultural activities; construction and operation of existing transmission lines and substations; oil and gas activities; commercial and residential development.	Same as past actions.	Same as present actions.
Air Quality and GHG Emissions			
Air Quality Conditions	Oil and natural gas development, electricity generation , transportation activities, and all agriculture and community development activities.	Same as past actions.	Same as present actions.
Geology and Soils			
Topography	Oil and natural gas activities, transportation activities, and agricultural activities.	Same as past actions.	Same as present actions.
Geology	Oil and natural gas activities.	Same as past actions..	Same as present actions.
Soils	Oil and natural gas activities, transportation activities, water infrastructure activities, agriculture and community development activities.	Same as past actions.	Same as present actions.
Water Resources			
Surface Water	Oil and natural gas activities, electric utility activities, transportation activities, water infrastructure activities, agriculture and community development activities.	Same as past actions.	Same as present actions.

Affected Resource	Past Actions	Present Actions	Reasonably Foreseeable Future Actions
Floodplains	Oil and natural gas activities, electric utility activities, transportation activities, water infrastructure activities, agriculture and community development activities.	Same as past actions.	Same as present actions.
Biological Resources			
Vegetation	Clearing of vegetation (including permanent conversion to a non-natural land use) for oil and natural gas activities, mining activities, electric utility activities, transportation activities, water infrastructure activities, agriculture, and community development activities. Introduction of noxious weeds as a result of increased traffic from vehicles/equipment coming from other parts of the country.	Same as past actions.	Same as present actions.
Wildlife	Habitat loss or fragmentation due to oil and natural gas activities, mining activities, electric utility activities, transportation activities, water infrastructure activities, agriculture, and community development activities. Habitat alteration through introduction of noxious weeds as a result of increased traffic from vehicles/equipment coming from other parts of the country. Displacement (temporary and permanent) of species due to increased human activity and increased vehicular related mortality. Increased avian mortality from electrical transmission and distribution structures, oil and gas structures, and uncovered oil pits.	Same as past actions.	Same as present actions.

Affected Resource	Past Actions	Present Actions	Reasonably Foreseeable Future Actions
Wetlands	Draining (dredging) or filling of wetlands due to oil and natural gas activities, mining activities, electric utility activities, transportation activities, water infrastructure activities, agriculture, and community development activities. Introduction of noxious weeds as a result of increased traffic from vehicles/equipment coming from other parts of the country.	Same as past actions.	Same as present actions.
Special Status Species	Habitat loss or fragmentation due to oil and natural gas activities, mining activities, electric utility activities, transportation activities, water infrastructure activities, agriculture, and community development activities. Habitat alteration through introduction of noxious weeds as a result of increased traffic from vehicles/equipment coming from other parts of the country. Displacement (temporary and permanent) of species due to increased human activity and increased vehicular related mortality. Increased avian mortality from electrical transmission and distribution structures, oil and gas structures, and uncovered oil pits.	Same as past actions.	Same as present actions.
Cultural Resources			
Recorded Cultural Resources	Oil and natural gas activities, electric utility activities, transportation activities, water infrastructure activities.	Same as past actions.	Same as present actions.

Affected Resource	Past Actions	Present Actions	Reasonably Foreseeable Future Actions
Land Use			
Existing Land Use	Oil, natural gas development; electric utility activities (construction of power generation and transmission infrastructure); transportation activities (construction of existing roadway, railroad, and airport infrastructure); water infrastructure activities (construction of irrigation and hydropower infrastructure); agriculture and community development activities.	Same as past actions.	Same as present actions.
State and Federal Properties	Establishment of parks and conservation areas; oil and gas development; federal water development projects; electric utility activities (construction of power generation and transmission infrastructure); transportation activities (construction of existing roadway, railroad, and airport infrastructure); recreational activities.	Same as past actions.	Same as present actions.
Socioeconomics			
Demographic, Economic, Housing and Property Values, Public Services and Fiscal Conditions	Oil and natural gas activities, electric utility activities, transportation activities, water infrastructure activities, and community development activities.	Same as past actions.	Same as present actions.
Environmental Justice			
Environmental Justice Populations	Oil and natural gas activities, electric utility activities, transportation activities, water infrastructure activities, agriculture and community development activities.	Same as past actions.	Same as present actions.

Affected Resource	Past Actions	Present Actions	Reasonably Foreseeable Future Actions
Recreation and Tourism			
Dispersed Recreational Activities	Oil and natural gas activities, electric utility activities, transportation activities, water infrastructure activities, agriculture and community development activities.	Same as past actions.	Same as present actions.
Developed Recreational Activities	Oil and natural gas activities, electric utility activities, transportation activities, water infrastructure activities, agriculture and community development activities. Establishment of developed recreational facilities.	Same as past actions.	Same as present actions.
Infrastructure and Transportation			
Utility Infrastructure	Oil and natural gas activities, electric utility activities, and water infrastructure activities.	Same as past actions.	Same as present actions.
Transportation Infrastructure	Oil and natural gas activities, transportation activities.	Same as past actions.	Same as present actions.
Public Health and Safety			
Electric and Magnetic Fields	Oil and natural gas activities, electric utility activities.	Same as past actions.	Same as present actions.
Noise			
Ambient Noise Levels	Oil and natural gas activities, electricity generation activities, transportation activities and agriculture and community development activities.	Same as past actions.	Same as present actions.

4.4 PAST, PRESENT, AND REASONABLY FORESEEABLE FUTURE ACTIONS

The following section provides an overview of past, present, and reasonably foreseeable future actions that have affected, are affecting, or have the potential to affect, the resources analyzed in the cumulative effects analysis.

Oil and Natural Gas Activities

Oil and gas development and production has been and will continue to be a major activity in western North Dakota over the next several years. The focus of much of the recent development has been on the Bakken-Three Forks Formation. The number of new wells drilled and completed has continued to increase over the last several years. Table 4-3 shows the number of wells completed for each county within the project area between 2008 and 2011. In addition, more than 1,000 wells have been permitted for drilling during the first 6 months of 2012 (North Dakota Industrial Commission, 2012).

Table 4-3: Total Wells Completed in Select Counties in North Dakota

	2008	2009	2010	2011
Dunn	119	105	132	202
McKenzie	73	72	145	275
Mercer	0	1	0	0
Mountrail	193	236	293	316
Williams	34	32	116	256
Total	419	446	686	1049

Source: North Dakota Industrial Commission, 2012.

The intensive oil development can lead to other impacts on land, air and water resources. For instance, an estimate of the land area needed to support the oil development was made by applying an average acreage needed to drill and operate each well by the number of wells completed each year. Assuming approximately 5 to 7 acres are needed per well drilled, the average land area utilized in the development ranged from 2,500 acres in 2008 to 6,300 acres in 2011 for counties within the project area shown in Table 4-4.

The North Dakota Department of Mineral Resources has estimated the future development potential for the Bakken Formation in western North Dakota. Table 4-4 summarizes the estimated number of wells for select areas in or near the project area. This includes the number of wells to be drilled per year and the number of years the development will take to complete. Using an assumption that each well will require 5 to 7 acres for development, the total land area needed to support the future activity is estimated to range from 7,700 to 9,700 acres per year.

Table 4-4: Estimated Future Oil Development in Select Areas in Western North Dakota

	Number of Wells Predicted	Development Years
Ray-Tioga	430 - 540	11 to 14
Watford City - Keene	250 -310	5 to 7
Killdeer	235 - 290	6 to 8
Parshall	375 - 470	7 to 8

Source: NDDMR, 2011.

Specific projects associated with oil development and other projects considered in the cumulative impact analysis are summarized in Table 4-5.

Table 4-5: Past, Present and Reasonably Foreseeable Future Activity

Activity	Type of Activity	Description	Locations within the Project Area
Oil and Natural Gas Activities			
BakkenLink Pipeline LLC	Oil Pipeline	Line would transport crude oil to a rail-loading point in Fryburg, about 30 miles west of Dickinson. Receipt points would be Trenton, Ray, and Beaver Lodge in Williams County; Stanley and New Town in Mountrail County; Alexander, Keene, and Watford City in McKenzie County; and Dunn Center in Dunn County.	Williams, Mountrail, McKenzie, and Dunn counties
Bear Paw Energy LLC	Proposed gas plant and pipeline for natural gas, gasoline, and other natural gas liquids	The Garden Creek Gas Plant is proposed to be located near Watford City and would operate on 80 acres, producing natural gas and gasoline with other natural gas liquids. A proposed pipeline would transport the product 54 miles west to Sidney. Two additional facilities designated Stateline I and Stateline II, are proposed near Williston. A pipeline would also be constructed from these facilities to Sidney, but the route has not been proposed at this time.	McKenzie County
Bridger Pipeline LLC	Oil pipeline	The Four Bears Pipeline delivers oil from McKenzie and Dunn counties, beginning at ND State Highway 23 near Hawkeye and extending south through Dunn County to Fryburg in Billings County, a distance of 77 miles.	McKenzie and Dunn counties
Enbridge Bakken Program	Pipeline	An existing pipeline heads east to Berthold, then another pipeline heads northwest from Berthold to Steelman, Saskatchewan. A pipeline replacement would occur in Burke County, North Dakota, and a new pipeline would be constructed in southeastern Saskatchewan from Steelman to Cromer.	Ward County

Activity	Type of Activity	Description	Locations within the Project Area
EOG Resources	Crude oil-to-railroad loading facility	A crude oil-to-railroad loading facility operates in Stanley, North Dakota, transporting oil by rail to Stroud, Oklahoma. Up to one unit train per day with a maximum capacity of 60,000 gross barrels of oil per train is shipped.	Mountrail County
Hess Corporation	Natural gas plant and rail loading facility	Expansion of existing Tioga natural gas plant from 100 to 250 million cubic feet of natural gas per day. Construction of a rail loading facility; completion of the facilities is expected late 2012.	Williams County
Hiland Partners	Gas processing plant and gathering system	Expansion of a gas processing plant at Cartwright on the Yellowstone River to process 85 million cubic feet per day. The company also operates the Norse Gathering System in northern Williams and also in Divide and Burke counties.	McKenzie and Williams counties
ONEOK	Pipeline	Proposed Bakken Pipeline would transport natural gas liquids from natural gas processing plants in the Bakken shale to the Overland Pass Pipeline and would extend from Sidney, Montana, southward to Weld County, Colorado.	McKenzie and Williams counties
Rangeland Energy	Crude oil loading terminal	Proposed development of a crude oil loading terminal in Epping, North Dakota to serve as a marketing hub and a proposed connector pipeline to the Tioga area.	Williams County
Saddle Butte Pipeline, LLC	Pipeline	The proposed High Prairie Pipeline would extend 450 miles from Alexander, North Dakota to Clearbrook Minnesota, including across northern McKenzie and southern Mountrail counties. A 17-mile lateral would extend from Charlson south to Johnsons Corner in McKenzie County.	McKenzie and Mountrail counties
Saddle Butte Pipeline, LLC	Oil and gas pipelines and natural gas processing facility Gathering system with lateral pipelines and trunklines	Oil and gas gathering pipelines are located south of Watford City, with terminals or receipt points in Alexander, Midway, Johnsons Corner, Charlson, and Antelope. A natural gas processing facility is 7 miles south of Watford City, processing 25 million cubic feet per day. The proposed Grasslands Gathering System would involve 80 miles of lateral pipelines and 100 miles of trunklines. The Saddle Butte Pipeline extends into Dunn County.	McKenzie and Dunn counties
Savage Services	Rail terminal	Planned multi-user rail terminal in Trenton, North Dakota to load and ship unit trains of crude oil and other oil-field related materials.	Williams County

Activity	Type of Activity	Description	Locations within the Project Area
TransCanada	Natural gas facility and receipt facilities	The Northern Border Pipeline is a natural gas facility that extends northwest to southeast across the region of influence. It receives gas from Williston processing plants and synthetic gas from the Dakota Gasification Plant. There are receipt facilities at Buford, Charbonneau, and Watford City.	Williams, McKenzie, Dunn, and Mercer counties
Williston Basin Interstate Pipeline	Natural gas facility and pipelines Natural gas pipelines	This natural gas facility has lines from Watford City to Williston and Williston to Tioga, then north to Canada and east to Minot. Other natural gas lines connect natural gas plants in Billings County with the Northern Border Pipeline in Dunn County.	McKenzie, Williams, and Dunn counties
Continental Resources	Oil and gas development	Development of a mega-pad near Williston to support horizontally drilled wells.	Williams County
Electrical Utility Activities			
Charlie Creek to Antelope Valley 345-kV	Electric transmission line	Existing transmission lines	Mercer, Dunn, and McKenzie counties
Charlie Creek-Squaw Gap 115-kV	Electric transmission line	Existing transmission lines	McKenzie County
Williston to Tioga 230-kV	Electric transmission line	Existing transmission lines	Williams and Mountrail counties
Logan to Tioga 230-kV	Electric transmission line	Existing transmission lines	Ward and Mountrail counties
Tioga to Canada 230-kV	Electric transmission line	Existing transmission lines	Mountrail and Burke counties
Culbertson to Williston 115-kV	Electric transmission line	Existing transmission lines	Williams County, North Dakota and Roosevelt County, Montana
Williston to Genora 115-kV	Electric transmission line	Existing transmission lines	Williams County
Williston to Tioga 115-kV	Electric transmission line	Existing transmission lines	Williams and Mountrail counties
AVS, Beulah	Lignite-fired units	Two 450-MW lignite-fired units	Mercer County

Activity	Type of Activity	Description	Locations within the Project Area
Central Power Electric Cooperative	Electrical grid expansion	Major expansions to electrical grid to provide electricity to oil and gas industry related infrastructure and to private, and commercial and industrial businesses in their service territory. New Minot Southwest Substation Expansion of the Berthold Tap. New Kenaston Tap. All located to the east of the cumulative effects analysis area in Minot, North Dakota.	Ward, and McLean counties
Charlie Creek to Williston (Western)	Transmission line upgrade	Upgrade from 115-kV to 230-kV completed and currently in service.	McKenzie and Williams counties
Coteau Properties Company, Freedom Mine	Lignite coal mining	700 to 1,000 acres per year mined for lignite coal in Beulah, North Dakota.	Mercer County
Dakota Gasification Company	Natural gas production plant	Production of natural gas for Northern Border Pipeline.	Mercer County
Lonesome Creek Station	Natural gas peaking facility	Proposed natural gas peaking facility in Watford City, North Dakota. Connected by a 115-kV transmission line to McKenzie Electric Power Cooperative's existing Hay Butte Substation.	McKenzie County
McKenzie Electric Power Cooperative	Electrical grid expansion	Major expansions to electrical grid in Watford City, North Dakota.	McKenzie County
Mountrail-Williams Electric Cooperative	Electrical grid expansion Substations	Major expansions to electrical grid in Williston, North Dakota. The Wheelock Substation is in Williams County and a new Blaisdell Substation is in Mountrail County. Proposed 45-MW natural gas peaking facility connected by a 115-kV transmission line to Mountrail-Williams Electric Cooperative existing Stateline Substation (2012).	Williams and Mountrail counties
Pioneer Generation Station	Natural gas peaking facility	Proposed natural gas peaking facility in Williston, North Dakota. Connected by a 115-kV transmission line to Mountrail-Williams Electric Power Cooperative's existing Stateline Substation.	Williams County

Activity	Type of Activity	Description	Locations within the Project Area
Transportation Activities			
Williston Roadway Improvements	Road	East Williston Truck Route. Will reduce traffic on East Dakota Parkway. Northwest Bypass. Will bypass the city of Williston allowing traffic to flow without interference from local traffic and reducing congestion within the city. 32nd Avenue West. Will provide north/south connection between Highway 2/85 and 53rd Street NW. Williston Truck Reliever Route. Temporary route involving upgrades to Williams County Route 1 (145th Avenue NW) and CR 6 (57th Street NW).	Williams County
New Town Truck Reliever Route	Road	New Town Truck Reliever Route. A temporary route around the north side of New Town, from 1.5 miles east of New Town to 1 mile west of New Town.	Mountrail County
Watford City Truck Reliever Route	Road	Watford City Truck Reliever Route. Location unknown but it is expected to provide a southwest bypass.	McKenzie County
Killdeer Truck Reliever Route	Road	Killdeer Truck Reliever Route. Location unknown.	Dunn County
U.S. Highway 85 Reconstruction	Road	U.S. Highway 85 reconstruction from Arnegard to Williston. Priority is on rebuilding U.S. Highway 85 bypassing Alexander.	McKenzie and Williams counties
ND State Highway 200 Reconstruction	Road	ND State Highway 200 reconstruction from U.S. Highway 85 to Beulah.	Dunn and McKenzie counties
Expansion of Williston Airport	Airport	Expansion of Williston Airport to accommodate the increase in passenger traffic due to North Dakota's oil development.	Williams County
Water Infrastructure Activities			
Lake Sakakawea	General development	Change in environment from a large new flatwater lake. Recreation facilities and some rural residential development.	Dunn, McKenzie, Mercer, Mountrail, and Williams counties
Southwest Pipeline Project	Water pipeline and supporting infrastructure	Withdrawal of water from Lake Sakakawea to support regional water supply. Includes water treatment, main water transmission, and rural distribution.	Dunn and Mercer counties
Western Area Water Supply Project	Water supply infrastructure	Delivery of water from Williston treatment plant to surrounding areas.	McKenzie, Mountrail, and Williams counties

Activity	Type of Activity	Description	Locations within the Project Area
Agriculture and Community Development Activities			
Extraterritorial Area Expansion	Expansion of extraterritorial area	Expansion of Williston, North Dakota's extraterritorial area from 1 to 2 miles to allow additional zoning control of development.	Williams County
Housing Clusters	Housing development	New temporary and permanent housing clusters on the outskirts of existing communities, increasing the suburban character of some of the area.	
North Dakota Department of Trust Lands Energy Impact Office	Infrastructure expansion	The North Dakota Department of Trust Lands Energy Impact Office provides grants to extend city streets, expand sewer systems, expand landfills, and provide other public infrastructure upgrades.	
Flex PACE Affordable Housing Program	Housing development	The Bank of North Dakota, under its Flex PACE Affordable Housing Program, provides low-interest loans for the construction of multi-family housing projects in oil producing counties. This is a new program announced in 2012 and it is projected that a minimum of ten affordable housing projects will be financed by the $3 million available for interest rate buy downs.	
North Dakota Housing Finance Agency Tax Credits	Housing development	The North Dakota Housing Finance Agency provides tax credits for developers of low- and moderate-income housing. Currently 286 affordable housing units are under construction and $42 million in residential housing projects are under construction.	
Stream Impairment	Livestock grazing	Livestock grazing has caused stream impairment in Knife, Little Missouri, and Little Muddy rivers.	
Treatment of Noxious Weeds	Land disturbance	Land disturbance due to expansion of noxious weed-infested areas. LMNG has an active program to treat noxious weed areas.	

4.5 CUMULATIVE EFFECTS ANALYSIS

This section analyzes the impacts of the actions identified above in addition to the impacts of the proposed action and its alternatives. This will result in the total cumulative impact for each resource.

4.5.1 Aesthetics and Visual Resources

Past actions that have affected visual resources in the vicinity of the project include several oil and natural gas development and production projects, electrical utility construction, transportation improvements, and agricultural development. Present and ongoing activities that alter the landscape in the study area include agricultural activities (mainly crop production and livestock grazing), oil and mining operations, and operation of existing power lines.

Landscapes within the study area vary based on the location. The southern portion of the study area is a mosaic of agricultural fields and rolling prairie, with areas of grazing along steeper slopes. Rural homesteads and cleared well sites are the most common interruption to the landscape. The central portion of the study area consists of deep, highly eroded canyons and badlands with heavily wooded draws, as well as portions of national grasslands and a national park. The landscape is largely natural, with few human influences along ridges with cleared well sites and agricultural areas dominating the valleys. The northern portion of the study area is predominately agricultural, with large oil and gas operations dominating the built environment. Past and present actions have resulted in changes to the natural landscape and visual resources particularly in the northern portion of the study area. Agricultural conversion, oil and gas extraction, and pipelines and transmission line construction have all altered the landscapes.

Past actions constructed linear features (transmission line, pipelines, roads, and railroads) across some visually sensitive areas. For this project, alternatives were sited to follow existing linear infrastructure in order to mitigate visual impacts in sensitive areas. Both alternatives cross the Missouri River, the Little Missouri River (different locations), and the Lewis and Clark National Historic Trail in the vicinity of U.S. Highway 85 and/or adjacent to existing linear features. Alternative Route A crosses a portion of the LMNG, following U.S. Highway 85 and an existing transmission line corridor; however, part of the crossing would be a new ROW. Alternative Route A would create a new crossing of the scenic byway, in between three other existing transmission line crossings within a 20-mile stretch of road. Alternative Route B does not cross the national grasslands or a national park, but does cross the scenic byway along an existing transmission line and gas pipeline. Placing the potential transmission line adjacent to an existing transmission line helps to mitigate cumulative visual impacts, by reducing the number of times a motorist or visitor, would pass under a transmission line.

Given ongoing industrial and energy development in the area, it is likely that additional electrical infrastructure (transmission and distribution lines and substation expansions) will be built in the future. Standard transmission siting practices state that when siting a new transmission line, efforts should be made to parallel existing linear features. If a transmission line were to be built in the future and within the project area, it is likely that this project will be seen as an opportunity feature to parallel. Paralleling is seen as an opportunity to mitigate visual impacts on landscape, since similar visual impacts have previously occurred. Since characteristics of the landscape have previously changed and will continue to change over time, Alternative Route A would contribute to long-term, low-moderate level overall cumulative impacts, and Alternative Route B would contribute to long-term, low-level overall cumulative impacts.

4.5.2 Air Quality

The proposed project would construct and operate a transmission line, substations, and potentially a switchyard. The construction of these components would emit regulated amounts of criteria pollutants; however, this project, which would only create temporary particulate emissions, would not add to those NO_x and other pollutant levels. Construction of the components would add temporary fugitive dust and exhaust emissions to the airshed in the area and would add to GHG emissions. This would occur primarily during construction and during maintenance activities during operation. The proposed project, when added to other past, present, and proposed projects, would not contribute to a violation of air quality standards and would not significantly contribute to adverse cumulative effects on air quality or GHG emissions.

The northwest region of North Dakota is experiencing rapid development because of recent gas and oil activities. As a result of these activities, there is a dynamic, continuing, and growing need for more power to be delivered to that area. A study conducted by the IS, the regional distributor of electricity, evaluated the power supply and power delivery in the region to determine the adequacy of the existing transmission system from both a system delivery and reliability perspective (IS, 2011). The AVS to Neset Transmission Project is one of the projects identified in the study to deliver additional power to this region. But the power delivered by the AVS to Neset Transmission Project would come from a variety of generation resources on the IS, of which AVS is only one. In fact, AVS Units 1 and 2, both which commenced commercial operation in the mid-1980s, have operated at near-capacity for a couple decades, and do not have additional power to supply.

New generation built to serve the growing load on the IS since 2000 has been almost exclusively wind and natural gas, including 1) more than 700 MW of new wind generation capacity owned or purchased through power-purchase contracts by Basin Electric, 2) approximately 300 MW of natural-gas-combined-cycle generation owned and operated by Basin Electric that began commercial operation in August 2012 near White, South Dakota, and 3) approximately 380 MW of natural-gas-combustion-turbine generation owned and operated by Basin Electric near Groton, South Dakota, and Culbertson, Montana. As described below, an additional 270 MW of natural-gas-combustion-turbine generation is being permitted and constructed for voltage support and power in the Bakken region at two locations near Williston and Watford City, North Dakota, prior to completion of the AVS to Neset Transmission Project. Once the AVS to Neset Transmission Project is completed, new additional natural-gas-peaking power will become more readily available to all IS customers, not just the customers in the Bakken region of northwest North Dakota.

Finally, much of the new additional load that the AVS to Neset Transmission Project would serve is related to new natural gas processing facilities processing and compressing gas from the new production wells in the Bakken Formation. This domestically-produced natural gas will supply a clean, lower-carbon-intensive fossil fuel that will displace higher-carbon-intensive coal and oil. The high-grade oil produced from the Bakken Formation is also displacing imports of foreign oil, and is low in sulfur and easily distillable—factors that make it less carbon-intensive than foreign oil, with less of an environmental impact from transportation to the refinery and from processing at the refinery.

Air Emissions from Electricity Generation

As noted above, AVS has been operating at capacity or near-capacity for several decades. Consequently, there will not be any additional air emissions from AVS as a result of producing additional electricity for the new proposed AVS to Neset Transmission Project. AVS injects its power into the IS, and the power to serve the additional load in northwest North Dakota is drawn from the entire IS, not just AVS. The new generation resources Basin Electric has added to serve the IS and other east-side-grid customers since 2000 have been almost exclusively wind and natural gas, and the approximately 270 MW of new natural-gas-combustion-turbine resources currently being permitted and added in northwest North Dakota will have new-source-performance-standard and best-available-control-technology level review and controls for all regulated pollutants, including GHGs.

The results of the study (IS, 2011) indicate that between 2012 and 2016 several local distribution transmission line projects will be required to correct deficiencies at specific locations. In addition, the study notes that voltage support would be required at strategic locations to prevent any interruptions of service on the existing transmission lines that would result from the increased thermal loading because of voltage or current flow fluctuations on the lines due to the increasing electrical demand. In response to those studies, Basin Electric is developing the Pioneer Generation Station, near Williston and the Lonesome Creek Station, near Alexander in order to provide the necessary voltage support during periods of peak demand in the region.

Phase I of both projects will include a 45-MW simple cycle combustion turbine. Both Phase I projects will be in-service by mid-2013. Pioneer Generating Station Phase II and Lonesome Creek Station Phase II projects consist of placing two additional 45-MW simple cycle combustion turbines at each location. The two Phase II projects are scheduled to be completed in 2014 and 2015. These projects, consisting of approximately 270 MW of capacity, are needed to protect the reliability of power delivery and load serving capacity of the region independent in utility and timeline of the proposed AVS to Neset Transmission Project. Further, since they are intermediate and peaking resources that can chase load, they are ideal for addressing the immediate power needs in this area, but will provide reliable peaking power for the whole IS once the AVS to Neset Transmission Project is completed, and will be an ideal complementary form of generation to any additional wind resource that is added to the IS in the future. Since most of the new load in the Bakken Formation is of a 24-hour-a-day, 7-days-a-week, 365-days-a-year variety, wind is a not an available option to supply this new load. But once natural-gas-combustion-turbine generation is available, wind becomes an option as a complementary generation resource as baseload generation needs increase. The addition of these resources will avoid and mitigate additional impacts from generation to serve load in the Bakken Formation.

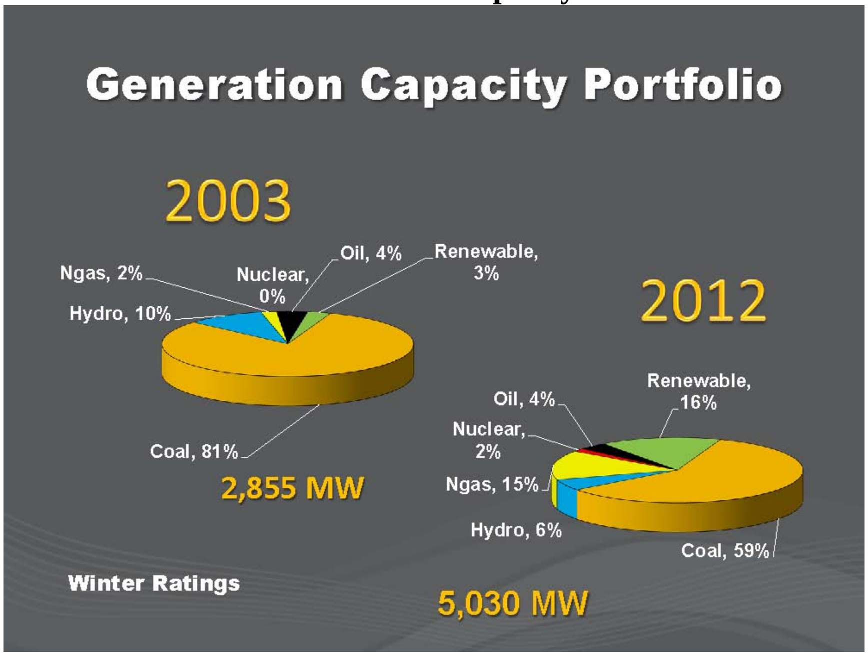
Further, this new generation will avoid and displace portable generation and combustion-engine-driven oil and gas extraction engines at the wells. It will also hasten the capture of more of the natural gas at the well-heads, and avoid both the flaring and release of natural gas during the oil extraction process.

The purpose of the AVS to Neset Transmission Project is to increase high voltage transmission line system reliability and the transmission load serving capacity in the region. The project will allow electricity that is currently being produced by Basin Electric and the other generation facilities interconnected to the IS to be effectively delivered to northwest North Dakota.

The AVS 345-kV Substation, located at the AVS generation facility, near Beulah, North Dakota has developed over the years as a hub for the flow of electricity into the northwest North Dakota region. The AVS 345-kV Substation is electrically interconnected with multiple generation resources that are owned by the various owners of generation resources within the IS system. These multiple generation sources of electrical power include natural gas, coal- and oil-fired generation, hydroelectric facilities, and renewable generation sources such as wind and waste heat recovery. These regional power generation resources will be managed by the IS in such a way to provide reliable power from the IS transmission system to the proposed new AVS to Neset Transmission Project.

In sum, the AVS to Neset Transmission Project's interconnection to the AVS 345-kV Substation would not increase additional air emissions from the AVS generation facility because the AVS generation facility operates near full capacity and does not have operating reserves to generate more power from either a capacity or availability perspective. Historically, the two units at the AVS generation facility typically operate at their full available output, in full compliance with their air permit. Further, there could be a minor increase in air emissions from the existing power generation facilities operated by Basin Electric, of which AVS is a part, or from the other generation facilities interconnected with the IS transmission system that currently support the existing loads and to serve the projected load growth in Basin Electric's service territory. As noted in Figure 4-1, between 2003 and 2012, as demand for power continued to increase in Basin Electric's service area, Basin Electric modified its mix of power generation production to include a higher percentage of generation from renewables (primarily wind), nuclear, and natural gas, as opposed to coal, to reduce GHG emission sources.

Figure 4-1: Basin Electric Generation Capacity Sources 2003 vs 2012



Source: Basin Electric, 2012a

4.5.3 Geology and Soils

The various pipeline and transmission line projects would provide temporary disturbance to soils beyond the considerable disturbance associated with normal agricultural activities; however, following construction the soils would still be available for previous agricultural or grazing uses. More permanent conversion would occur in the area of substations, natural gas processing plants, transmission towers, and road projects. The proposed project would add a minor amount of soil disturbance to the area and would cause permanent conversion in the area of transmission towers. This amount of permanent soil disturbance is estimated to be 1.04 acres for Alternative Route A and 1.13 acres for Alternative Route B for the transmission line. For the substations and switchyard, the amount of permanent soil disturbance is estimated be 24 acres for Alternative Route A and 36 acres for Alternative Route B. These amounts would not cause adverse cumulative effects on prime farmland in the region.

4.5.4 Water Resources

Groundwater

Cumulative impact boundaries are not applicable to groundwater resources as a result of the following discussion.

The numerous drilling activities occurring in and around the project area, in addition to the associated development activities, are affecting groundwater supply and quality. As long as the Bakken field continues to develop, these impacts will occur regardless of whether the transmission line is built. Since the construction of the project does not have any direct impacts on groundwater resources, it also does not contribute to direct cumulative impacts on groundwater resources.

Cumulative impacts to groundwater quality from spills are expected to be negligible due to the comprehensive and immediate clean-up requirements for industry. Since the project would facilitate further development activities within the Bakken field, indirect cumulative impacts on groundwater supply and quality may exist.

Surface Water

The spatial boundary for cumulative impacts on surface water resources includes surface waters in the Upper Missouri River/Lake Sakakawea, Knife River, Little Missouri River, and Little Muddy River sub-basins. The temporal boundary for cumulative impacts on surface water resources is 50 years taking into account the anticipated continued development of the Bakken field.

Pipeline and associated facility construction projects, as well as private agricultural activities in the project area, have contributed to negative impacts on surface water resources. These impacts have occurred primarily through erosion and sedimentation related to crop cultivation and road construction, runoff from agricultural areas, and wastewater pollution. Construction of the transmission line would use onsite erosion and sedimentation controls to prevent any direct cumulative effects on surface water quality.

Existing commercial and industrial development projects have affected the surface water supply primarily through drinking water and sewage water treatment, but also through the use of surface water in industrial activities. As long as the Bakken field continues to develop, these impacts will occur regardless of whether or not the proposed project occurs. The transmission line alone, would not create new demands for water, and therefore would not contribute to direct cumulative impacts on surface water supply.

Since the project would facilitate further development activities within the Bakken field, indirect cumulative impacts on surface water supply and quality may exist.

Floodplains

The spatial boundary for the cumulative impacts on surface water resources includes all floodplains within the project area. The temporal boundary for cumulative impacts on surface water resources is 50 years, taking into account the anticipated continued development of the Bakken field.

Construction activities in floodplains within the project area occur primarily as linear facilities (pipelines, transmission lines, roads, etc.). As long as the Bakken field continues to develop, impacts resulting from these activities will occur regardless of whether the proposed project is built. The transmission line construction would span floodplains where possible, which would not facilitate floodplain development. Therefore, direct cumulative effects would be minimal.

Since the project would facilitate further development activities within the Bakken field, indirect cumulative impacts on floodplains may exist.

4.5.5 Biological Resources

Vegetation

While most natural vegetation has been converted to agricultural lands, extensive areas of the study area counties, including the Missouri Plateau, Little Missouri Badlands, and River Breaks ecological subregions, retain their native vegetation. Most of the Glaciated Dark Brown Prairie, Missouri Coteau Slope, and Northern Missouri Coteau Slope have been converted to agriculture. Non-agricultural related vegetation disturbance in the study area is due mainly to agricultural uses; oil and gas development activities, and the associated residential/community development; transportation; and utility development activities. Most of these development activities permanently convert vegetated acreage to non-vegetated residential or industrial land uses. The exceptions to this are transmission lines and pipelines, which retain vegetative cover or revegetate after disturbance. However, in order to maintain and ensure the safety and reliability of these structures, forested areas or areas of dense shrubby vegetation are cleared and converted to grasslands. There has also been an increase in the number of noxious weeds found in the study area and their coverage due to the increased traffic in the study area. Increases in oil and gas development activities and the associated residential/community development, transportation, and power development activities are expected in the study area for the foreseeable future. The proposed project would result in short-term impacts on vegetation that is temporarily disturbed during the construction phase. Long-term impacts on vegetation would be limited to the permanent conversion of vegetated lands to utility land uses (transmission structures, substations, switchyards, gravel access roads, etc.), conversion of forested or wooded vegetated cover to herbaceous cover, and disturbance related to maintenance activities (mowing, herbicide application, tree trimming, danger tree removal, etc.).

Alternative Route A is expected to result in temporary disturbance of up to approximately 3,400 acres of vegetation during construction, permanent conversion of up to approximately 95 acres of forested vegetation to herbaceous vegetation, and permanent conversion of up to approximately

30 acres of vegetated land to transmission structure sites, substation sites, a switchyard, and gravel access roads. Alternative Route B is expected to result in temporary disturbance of up to approximately 3,650 acres of vegetation during construction, permanent conversion of up to approximately 100 acres of forested vegetation to herbaceous vegetation, and permanent conversion of up to approximately 50 acres of vegetated land to transmission structure sites, substation sites, a switchyard, and gravel access roads. Given that the majority of the impacts on vegetation from the proposed project are short term, the contribution to direct cumulative effects on vegetation is minimal given the magnitude of permanent land conversion associated with oil and gas, residential, community, and transportation development activities. Construction BMPs would be implemented to avoid the spread of noxious weeds in the ROW; therefore, the project is not expected to have a direct cumulative effect on the spread of noxious weeds.

Since the proposed project would facilitate further development in the study area, indirect impacts on vegetation are likely to occur.

Wetlands

About half of the 5 million acres of wetlands originally present in North Dakota have been lost. Most of these wetlands were in the prairie pothole area. In the study area, prairie potholes are not common but are most likely to occur in the Northwestern Glaciated Plains (Northern Missouri Coteau and Glaciated Dark Brown Prairie ecoregions). Most historic wetland loss in this region was due to draining and conversion for crop production. Current and future wetland loss in the study area is primarily associated with oil and gas; and residential, community, and transportation development. However, the high cost of permitting and mitigating impacts on wetlands and other waterbodies under CWA provides an incentive to avoid or minimize impacts on these areas. The CWA permitting process considers the effect of cumulative impacts and, in most cases, requires mitigation for impacts on wetlands or other waterbodies.

There are no anticipated wetland impacts associated with Alternative Route A. Under Alternative Route B there is an anticipated impact to an estimated 0.2-acre of forested wetland, which would result in conversion from a forested wetland to an herbaceous wetland. It is not known how many, if any, low-water crossings or culverts would be needed for each alternative route. However, culverts and water crossings would only be installed for construction and would be removed. No permanent fill of wetlands is anticipated as part of construction for the project. Wetland and stream crossings would only be allowed during dry periods or at designated crossing locations. The impacts on wetlands and other waterbodies will not be known for certain until a jurisdictional wetland delineation identifies wetlands and other waterbodies regulated under CWA and there is a final design for the transmission line. However, the proposed project would avoid wetlands impacts when possible and minimize impacts when they are unavoidable. Wetland impacts associated with the proposed project would be minimal, if they occur at all, and would not add to the cumulative effects on wetlands.

Since the proposed project would facilitate further development in the study area, indirect impacts on wetlands are likely to occur.

Wildlife

The less common wildlife species in this area, including elk, bighorn sheep, and mountain lion are associated with the Little Missouri Badlands. The proposed project crosses this ecoregion in east of TRNP near the U.S. Highway 85 corridor. Disturbance to sensitive mammals can be minimized by using an existing corridor in this area and restricting activity from April 1st to July 1st when big horn sheep are giving birth. Alternative Route A would utilize the existing U.S. Highway 85 corridor and would not contribute significantly to cumulative impacts on these sensitive mammal species. Alternative Route B would have more potential for affecting undisturbed badland habitat. The areas along the Missouri River, Little Missouri River, and Lake Sakakawea are a primary golden eagle habitat area. By crossing the far upper end of this Missouri River habitat, the proposed project is designed to avoid contributing to cumulative impacts on this species.

In addition, avian protection design features would be incorporated into the design of the transmission line and associated facilities to minimize impacts on raptors and other types of birds. These features along with other avian BMPs would be described in Basin Electric's Avian Protection Plan. Alternative Route A is expected to result in temporary disturbance of up to approximately 3,400 acres of habitat during construction, permanent conversion of up to approximately 95 acres of forested habitat to herbaceous habitat, and permanent loss of up to approximately 30 acres of habitat to transmission structure sites, substation sites, a switchyard, and gravel access roads. Alternative Route B is expected to result in temporary disturbance of up to approximately 3,650 acres of habitat during construction, permanent conversion of up to approximately 100 acres of forested habitat to herbaceous habitat, and permanent loss of up to approximately 50 acres of vegetated land to transmission structure sites, substation sites, a switchyard, and gravel access roads. The proposed project will cause an increase in habitat fragmentation and edge effects, but this increase is expected to be slight due to the overall homogeneity of the ROW. The proposed project will cause some temporary and permanent displacement of wildlife into adjacent habitats and may result in an increase in vehicular-related mortality during the construction period. However, the proposed project is not expected to contribute significantly to the cumulative effects on wildlife given the scale of other development activities and the mitigation measures proposed for this project.

Since the proposed project would facilitate further development in the study area, indirect impacts on wildlife are likely to occur.

Special Status Species

Black-footed Ferret — Black-footed ferrets are a federally listed endangered species that depend on prairie dog colonies as a source of food and shelter (USFWS, 1989). The black-footed ferret was thought to be extirpated in the wild from 1987 until 1991, when 49 captive animals were reintroduced into the wild in Wyoming. Since then, ferrets have been reintroduced into Montana, South Dakota, Colorado, and Arizona and are reproducing in the wild. The majority of unconfirmed sightings from North Dakota come from the southwest part of the state (USFWS, 2011c). There are no confirmed reports of black-footed ferrets in North Dakota; therefore, the proposed project is not expected to have direct cumulative effects on the black-footed ferret. Since the proposed project would facilitate further development in the study area, it may have the indirect effect of making future reintroduction of black-footed ferrets in this region of North Dakota non-viable.

Dakota Skipper — Suitable habitat for Dakota skipper may occur in prairie areas within the proposed ROW. It is expected that conditions and mitigation measures imposed by USFWS and USFS would eliminate or substantially reduce any direct cumulative effects on this species. Since the proposed project would facilitate further development in the study area, indirect impacts on Dakota skipper may occur.

Gray Wolf — Historically, the gray wolf occurred throughout the lower 48 U.S. states except for the southeast and the deserts of the southwest (USFWS, 2011d). The gray wolf was listed as endangered on March 9, 1978, in the lower 48 U.S. states (except Minnesota) (USFWS, 1987). In North Dakota, the gray wolf has been recently de-listed in the region east of the Missouri River from the South Dakota border to Lake Sakakawea and east of the center line of U.S. Highway 83 to the Canadian border. There are no known wolf packs or breeding groups in North Dakota. Wolves seen in North Dakota are likely animals dispersing from established populations in Minnesota and Canada (USFWS, 2012d). Since there are no known wolf packs or breeding populations in North Dakota, no direct cumulative effects on the species are expected from the proposed project. Since the proposed project would facilitate further development in the study area, it may have the indirect effect of inhibiting gray wolf dispersal to and colonization of North Dakota.

Interior Least Tern — Historically, the least tern was found on the Atlantic, Gulf of Mexico, and California coasts and on the Mississippi, Missouri, and Rio Grande river systems. It was found throughout the Missouri River system in North Dakota. The interior population of the least tern presently breeds in the Mississippi, Missouri, and Rio Grande river systems. The interior population of least terns was listed as endangered on June 27, 1985 (USFWS, 1990). Nesting least terns mainly utilize sandbars within the free flowing sections of the Missouri and Yellowstone rivers in North Dakota and to a lesser extent, islands and shorelines of both Missouri River reservoirs (Lake Sakakawea and Lake Oahe) in North Dakota (USFWS 1990, 2012). Habitat for this species in the proposed ROW would be limited to the area that crosses the Missouri River west of Williston, which is also designated critical habitat for the piping plover. Potential impacts on interior least tern and piping plover habitat would include the disturbance to birds and nesting areas, and placement of structures within areas of potential nesting habitat. It is expected that conditions and mitigation measures imposed by USFWS, such as restricting construction during the nesting season would eliminate or substantially reduce any direct cumulative effects on this species. Since the proposed project would facilitate further development in the study area, indirect impacts on interior least tern may occur.

Pallid Sturgeon — Both Alternative Routes A and B cross the Missouri River, known habitat for the pallid sturgeon, while paralleling U.S. Highway 85 near Williston. Habitat for the pallid sturgeon within the study area includes the upper reaches of the Missouri River and backwater floodplain areas. Impacts on sturgeon habitat are not anticipated as a result of the project since it would have no anticipated impacts on the Missouri River or backwater habitats of the Missouri River floodplain. Therefore, the proposed project would not contribute to direct cumulative effects on pallid sturgeon. Since the proposed project would facilitate further development in the study area, indirect impacts on pallid sturgeon may occur.

Piping Plover — Both Alternative Routes A and B contain 61.4 acres of critical habitat within the ROW for the piping plover. Critical habitat for the piping plover includes the banks of the Missouri River and associated islands and sandbars. Potential impacts on piping plover habitat would include the disturbance to birds and nesting areas, and placement of structures within areas of potential nesting habitat. Construction within designated critical habitat for piping plover would be avoided when practicable. If construction in designated critical habitat areas cannot be avoided, then Basin Electric will coordinate with USFWS regarding permitting requirements and construction conditions. It is expected that USFWS will prohibit construction in designated critical habitat during the piping plover nesting season (mid-April to mid-August). It is expected that conditions and mitigation measures imposed by USFWS, such as restricting construction during the nesting season would eliminate or substantially reduce any direct cumulative effects on this species. Since the proposed project would facilitate further development in the study area, indirect impacts on piping plover may occur.

Sprague’s Pipit — Suitable habitat for Sprague’s pipit may occur within the proposed ROW in areas of native prairie. It is expected that conditions and mitigation measures imposed by USFWS and USFS or outlined in Basin Electric’s Avian Protection Plan would eliminate or substantially reduce direct cumulative effects on this species. Since the proposed project would facilitate further development in the study area, indirect impacts on Sprague’s pipit may occur.

Whooping Crane — Although critical habitat for the whooping crane has not been designated in North Dakota; much of the study area is within the whooping crane migration corridor and contains habitat types that whooping cranes use for foraging and roosting. This migration corridor provides the area within which whooping cranes could be expected to occur during spring and fall migration periods. While crane occurrence at any particular location within the corridor would vary from year to year based on weather conditions and associated availability of water, wetlands, and crop stages, over time, the greatest crane occurrence and use would trend toward the core of the migration corridor. Approximately 194.5 and 209.4 miles of Alternative Routes A and B, respectively, lie within the migration corridor, with Alternative Route B having more of its length within the core of the corridor. The greatest potential for interaction with the proposed project would occur where areas identified as wetland stop-over habitat are located between the transmission line and agricultural lands used as foraging areas. Existing transmission lines in Williams County, especially in the Missouri Coteau Slope Ecoregion on the edge of the prairie pothole region, may be having effects on the whooping crane. It is expected that conditions and mitigation measures imposed by USFWS would eliminate or substantially reduce any direct cumulative effects on this species. Since the proposed project would facilitate further development in the study area, indirect impacts on whooping crane may occur.

Baird's Sparrow — Baird's sparrow is a smallish bird that lives almost exclusively in native prairie areas within the northern Great Plains. Habitat for Baird's sparrows is found in the northwestern and the east-central parts of the North Dakota (Missouri Coteau). Baird's sparrows can also be found nesting east of the Lake Sakakawea/Missouri River area (USFWS, 2012h). Suitable habitat for Baird's sparrow may occur within the proposed ROW in areas of native prairie. It is expected that conditions and mitigation measures imposed by USFS in the SUP and outlined in Basin Electric's Avian Protection Plan would eliminate or substantially reduce any direct cumulative effects on this species. Since the proposed project would facilitate further development in the study area, indirect impacts on Baird's sparrow may occur.

Bald Eagle — Bald eagles historically occurred throughout the United States and Canada, but experienced a dramatic population decline between the 1870s and the 1970s. Populations have since rebounded and there are breeding populations in all of the lower 48 states and Alaska (USFWS, 2007d). Nesting and foraging habitat may exist for the bald eagle within the proposed ROW, especially in the vicinity of the Missouri River crossing. It is expected that conditions and mitigation measures imposed by USFS in the SUP and outlined in Basin Electric's Avian Protection Plan would eliminate or substantially reduce any direct cumulative effects on this species. Since the proposed project would facilitate further development in the study area, indirect impacts on bald eagles may occur.

Burrowing Owl — The western burrowing owl is a grassland specialist distributed throughout western North America, primarily in open areas with short vegetation. It is known to occur in the LMNG and could occur in native and non-native grasslands in the proposed ROW (USFS, 2002). It is expected that conditions and mitigation measures imposed by USFS in the SUP and outlined in Basin Electric's Avian Protection Plan would eliminate or substantially reduce any direct cumulative effects on this species. Since the proposed project would facilitate further development in the study area, indirect impacts on western burrowing owls may occur.

Greater Prairie-chicken — Greater prairie-chickens are endemic to the grassland habitats of the central and eastern United States. Breeding populations of greater prairie chicken are known from Grand Forks County and Sheyenne National Grasslands in North Dakota (USFWS, 2012i). Since the greater prairie-chicken is not known from the project counties, no direct or indirect cumulative effects are expected. However, it is expected that conditions and mitigation measures imposed by USFS in the SUP and outlined in Basin Electric's Avian Protection Plan would eliminate or substantially reduce any direct cumulative effects on this species if it is present in the proposed ROW. Since the proposed project would facilitate further development in the study area, indirect impacts on greater prairie chickens could occur if undiscovered populations exist in the study area.

Plains Sharp-tailed Grouse — Sharp-tailed grouse inhabit high-structure grasslands from Alaska east to Hudson Bay and south to Utah, northeastern New Mexico and Michigan. The plains sharp-tailed grouse is a MIS for high-structure grasslands in the LMNG in the northern region and may occur in grasslands within the proposed ROW (USDA, 2001). It is expected that conditions and mitigation measures imposed by USFS in the SUP and outlined in Basin Electric's Avian Protection Plan would eliminate or substantially reduce any direct cumulative effects on this species. Since the proposed project would facilitate further development in the study area, indirect impacts on plains sharp-tailed grouse may occur.

Greater Sage-grouse — The greater sage-grouse is an obligate user of several species of sagebrush. Sage-grouse is only known or believed to occur in North Dakota in Bowman, Golden Valley, and Slope counties (USFWS, 2012j). Therefore, no direct or indirect effects on sage-grouse are expected. However, it is expected that conditions and mitigation measures imposed by USFWS and USFS, and outlined in Basin Electric's Avian Protection Plan would eliminate or substantially reduce any direct cumulative effects on this species if it is present in the proposed ROW. Since the proposed project would facilitate further development in the study area, indirect impacts on greater sage-grouse may occur if undiscovered populations exist in the study area.

Loggerhead Shrike — Loggerhead shrikes occupy a wide variety of open habitats including native and non-native grasslands, sage scrub, and other areas with a sparse coverage of bushes and trees and bare ground. Loggerhead shrikes are known to breed throughout North Dakota and are fairly common throughout the state, except in the Red River Valley (USGS, 1995). It is expected that conditions and mitigation measures imposed by USFS in the SUP and outlined in Basin Electric's Avian Protection Plan would eliminate or substantially reduce any direct cumulative effects on this species. Since the proposed project would facilitate further development in the study area, indirect impacts on loggerhead shrike may occur.

Long-billed Curlew — The long-billed curlew is the largest North American shorebird. It is known to breed in southwestern North Dakota, but is considered uncommon (USGS, 2006a). It is expected that conditions and mitigation measures imposed by USFS in the SUP and outlined in Basin Electric's Avian Protection Plan would eliminate or substantially reduce any direct cumulative effects on this species. Since the proposed project would facilitate further development in the study area, indirect impacts on long-billed curlew may occur.

Black-tailed Prairie Dog — The black-tailed prairie dog is a small, stout ground squirrel that several species, including the endangered black-footed ferret, depend on to varying degrees for food and shelter. The black-tailed prairie dog is a MIS for low-structure grasslands in the LMNG Northern Region and may occur in grasslands within the proposed ROW (USDA, 2001). It is expected that conditions and mitigation measures imposed by USFS in the SUP would eliminate or substantially reduce any direct cumulative effects on this species. Since the proposed project would facilitate further development in the study area, indirect impacts on the black-tailed prairie dog may occur.

Bighorn Sheep — Bighorn sheep are found in the badlands area of North Dakota and within the LMNG. It is expected that conditions and mitigation measures imposed by NDFGD or USFS in the SUP would eliminate or substantially reduce any direct cumulative effects on this species. Since the proposed project would facilitate further development in the study area, indirect impacts on bighorn sheep may occur.

Arogos Skipper — The Arogos skipper is known to occur in Ward County in western North Dakota and Ransom and Richland counties in eastern North Dakota (USGS, 2006c). It is not known to occur in the project counties; therefore, no direct or indirect cumulative effects are expected. However, it is expected that conditions and mitigation measures imposed by USFS in the SUP would eliminate or substantially reduce any direct cumulative effects on this species if it is present in the proposed ROW. Since the proposed project would facilitate further development in the study area, indirect impacts on the Arogos skipper could occur if undiscovered populations are present.

Broad-winged Skipper — The broad-winged skipper is known to occur in Ransom and Richland Counties in eastern North Dakota (USGS, 2006c). It is not known to occur in the project counties; therefore, no direct or indirect cumulative effects are expected. However, it is expected that conditions and mitigation measures imposed by USFS in the SUP would eliminate or substantially reduce any direct cumulative effects on this species if it is present in the proposed ROW. Since the proposed project would facilitate further development in the study area, indirect impacts on the broad-winged skipper could occur if undiscovered populations exist.

Dion Skipper — The Dion skipper is known to occur in Ransom and Richland counties in eastern North Dakota (USGS, 2006c). It is not known to occur in the project counties; therefore, no direct or indirect cumulative effects are expected. However, it is expected that conditions and mitigation measures imposed by USFS in the SUP would eliminate or substantially reduce any direct cumulative effects on this species if it is present in the proposed ROW. Since the proposed project would facilitate further development in the study area, indirect impacts on the Dion skipper could occur if undiscovered populations exist.

Mulberry Wing — The mulberry wing is known to occur in Cass, Ransom, Richland, and Sargent counties in eastern North Dakota (USGS, 2006c). It is not known to occur in the project counties; therefore, no direct or indirect cumulative effects are expected. However, it is expected that conditions and mitigation measures imposed by USFS in the SUP would eliminate or substantially reduce any direct cumulative effects on this species if it is present in the proposed ROW. Since the proposed project would facilitate further development in the study area, indirect impacts on the Mulberry wing could occur if undiscovered populations exist in the study area.

Ottoe Skipper — The Ottoe skipper is known to occur in Williams, McKenzie, Billings, Beach, Slope, Dunn, Ward, and Oliver counties in western North Dakota (USGS, 2006c). It is expected that conditions and mitigation measures imposed by USFS in the SUP would eliminate or substantially reduce direct cumulative effects on this species. Since the proposed project would facilitate further development in the study area, indirect impacts on the Ottoe skipper may occur.

Powesheik Skipper — In North Dakota, the Powesheik skipper is only known from the eastern portion of the state (USFWS, 2010b). Therefore, no direct or indirect cumulative effects to the Powesheik skipper are anticipated. However, it is expected that conditions and mitigation measures imposed by USFWS and USFS would eliminate or substantially reduce any direct cumulative effects on this species if it is present in the proposed ROW. Since the proposed project would facilitate further development in the study area, indirect impacts on the Powesheik skipper may occur if undiscovered populations exist.

Regal Fritillary — The regal fritillary is known in North Dakota from mostly southern counties, but is not known from the project counties (USGS, 2006b). Therefore, no direct or indirect cumulative effects on the regal fritillary are anticipated. However, it is expected that conditions and mitigation measures imposed by USFS in the SUP would eliminate or substantially reduce any direct cumulative effects on this species if it is present in the proposed ROW. Since the proposed project would facilitate further development in the study area, indirect impacts on the regal fritillary may occur if undiscovered populations exist.

Tawny Crescent — The tawny crescent is known from several eastern, northern, and western counties in North Dakota, including the project counties of Dunn and McKenzie (USGS, 2006c). It is expected that conditions and mitigation measures imposed by USFS in the SUP would eliminate or substantially reduce any direct cumulative effects on this species. Since the proposed project would facilitate further development in the study area, indirect impacts on the tawny crescent may occur.

4.5.6 Cultural Resources

The construction of the proposed project transmission line facilities could affect recorded and currently unknown cultural resources within the study area. The transmission line, with its pole installation and substation modification, has the potential to disturb archaeological sites. The project could alter the setting and viewsheds of historic structures or landscapes, or the setting of and access to Traditional Cultural Properties. Due to the localized effect on cultural resources through siting of the transmission line structures and substation modifications, the spatial boundary for the cumulative effects analysis is defined as the APE, as discussed in Section 3.6.1, which consists of the study area. The temporal boundary for the cumulative effects analysis is defined as the lifetime of the project. For all projects involving construction or subsurface activities, which are yet to be determined, unrecorded archaeological sites or traditional cultural properties may be disturbed. Cumulative loss of cultural resources would occur if archaeological site or traditional cultural properties are disturbed on multiple sites.

Historic buildings or other sites may be impacted, as well, in that construction of structures may impact the historic viewshed in which above-ground archaeological and historic resources are located. Impacts on cultural resources, including historic structures, archaeological sites, and traditional cultural properties, would be considered significant if they result in adverse effects to historic properties that are eligible for listing on the NRHP. Cumulative effects would consist of a loss of cultural resources to the area. Research on completed and ongoing projects in the vicinity of Alternative Routes A and B that require subsurface disturbance is in progress.

In addition to the potential project impacts, the principal types of impacts that other projects could have on cultural resources include physical destruction or damage caused by pipeline trenching, related excavations, or boring; introduction of visual, atmospheric, or audible elements during construction that diminish the integrity of the property’s significant historic features by short-term pipeline construction or construction of aboveground appurtenant facilities and roads; and change of the character of the property’s use or of physical features within the property’s setting that contribute to its significance. The main method of mitigation for potential impacts to cultural resources is avoidance and no impacts to cultural resources are anticipated.

4.5.7 Land Use

Alternative Route A would avoid all USFWS easements and would not contribute to cumulative effects to those properties. A major land use concern of the federal agencies is the protection of TRNP-North Unit, and the Lone Butte Management Area of the LMNG. Alternative Route A would therefore be located outside of the National Park. The Lone Butte Management Area is southeast of the national park and east of the USFS Summit campground on U.S. Highway 85. Lone Butte was not allocated to Management Area 1.2, Suitable for Wilderness, in the 2002 Land and Resource Management Plan for the Dakota Prairie National Grasslands. However, based on scoping comments the proposed Alternative Route A has been modified to be outside of the Lone Butte Management Area. Alternative Route A avoids the Long X Divide Management Area west of U.S. Highway 85 and south of TRNP, which was allocated to Management Area 1.2 in the Land and Resource Management Plan.

In addition to the transmission line, the Bakken Link pipeline is proposed to follow the U.S. Highway 85 corridor. Thus, Alternative Route A has the potential to cumulatively affect resources in the area along U.S. Highway 85. About 147 acres of transmission line ROW would be added to other pipeline and transmission line ROW commitments at the LMNG.

Alternative Route B would avoid the two grassland management units but is in the same general area as the Northern Border Pipeline and McKenzie Electric Power Cooperative's 115-kV transmission line. Thus, it would not create a new corridor across the Little Missouri River; however, it would cumulatively affect land resources in that area. The BakkenLink Pipeline, Bear Paw Energy natural gas liquids pipeline, and Western's Charlie Creek-Williston Transmission line also cross the LMNG. The cumulative effect of these three linear projects, along with the proposed project, on national forest system lands would be about 500 acres. Increased development in the area of cities, including new housing construction, is likely contributing to increased conversion of undeveloped land and associated impacts on terrestrial habitat and farmland. Similarly, the increased oil and gas development and processing plants are converting terrestrial habitat and farmland. The proposed project is being built to respond to this additional development and would not by itself contribute to adverse cumulative land use impacts. The cities and industrial developers would likely find another source of electric power, such as self-generation, if the proposed action were not built. Overall cumulative impacts to land use are expected to be low.

4.5.8 Socioeconomics

Continued rapid oil development in the area (1,500 new wells per year), as well as development and/or upgrading of pipelines, gathering systems, gas processing facilities, rail terminals, power plants, water and transportation infrastructure, transmission lines, and community developments will all require construction workforce in the study area. These employment opportunities keep unemployment rates and poverty levels very low, while average earnings are increasing. Increasing oil production also brings fiscal revenues to state and local governments, which are imperative as cities and counties try to accommodate the growth with increasing demands for local services and infrastructure. Workers spending their earnings in the region also support sales tax receipts for local governments. The cumulative impact of the proposed project associated with unemployment and fiscal receipts would be low, short-term, and beneficial.

The construction workers needed for all of these cumulative projects, along with those required for the proposed project, would add to stresses on services and infrastructure, notably housing, road maintenance, public services, and service industries (e.g., retail, food and beverage, gas stations, etc.). However, some of the community developments which provide affordable housing would help to alleviate some of these shortages. Municipal and county services, including public service provisions such as education, road repair and construction, police and law enforcement, judicial facilities and services, medical services and facilities, emergency services, and other social services can all be expected to increase driven by the growing workforce and population, even if it is temporary in nature. Additionally, with average earnings being driven up by higher-paying oil industry jobs, service sectors and other local salaries also rise to compete with the oil sector salaries, often causing financial stresses for small businesses. With the influx of population and workforce, often there are not sufficient supplies to meet the demand in stores, at gas pumps, in restaurants, etc., so establishments can increase local prices affecting the cost of living in the area.

The transmission construction jobs associated with the proposed project would be a temporary impact on these communities, and permanent increases in residents to these areas are not expected to directly result from the proposed project. However, during this construction period, the cumulative impacts associated with the proposed project on infrastructure, public services, cost of living, and housing are expected to be moderate, short-term, and adverse.

Property values could be adversely affected by development of other transmission lines, oil and gas wells, and other transportation and industrial facilities. However, royalties from oil and gas production could also increase property values. In addition, housing development and its related availability could also have an effect on property values. Since there are low adverse effects expected to property values associated with the transmission line, the cumulative impacts would also be low, with variable, individualized, and unpredictable impacts to property values.

The proposed project would bring electrical power and reliability to northwestern North Dakota to support the needed infrastructure and business construction and development associated with the rapid oil boom in the study area. Without the project to strengthen the electrical system, electricity capacity shortfall would likely impact the existing system and limit future development activities needed to accommodate the considerable population, housing, and business growth in the area. The proposed project will provide electricity needs, with beneficial, long-term cumulative impacts on the economic development of the region.

4.5.9 Environmental Justice

The proposed project would not have any disproportionate impacts on minority and low-income communities, and therefore would not contribute to any disproportionate cumulative impacts.

4.5.10 Recreation and Tourism

The proposed project would avoid TRNP and the Lone Butte and Long X Divide management areas of the LMNG. It would thus not be expected to have any cumulative impacts on recreational use of those areas. The proposed project would not displace any developed recreational or park uses. Temporary construction workers may use public RV parks during the construction period. The proposed project would only temporarily affect recreational uses such as hunting, hiking, and wildlife observation on private lands.

The major area with potential for cumulative recreational impacts would be the crossing of the Missouri River, in the Lewis and Clark WMA, where additional lands would be added to ROW adjacent to U.S. Highway 85. This impact would likely be temporary, and the area would be available for use after construction. Thus, there would be no adverse cumulative effects on recreation from this project.

4.5.11 Utility and Transportation Infrastructure

The increase in oil and gas-related activity in and around the project area has placed additional demand on both utility and transportation infrastructure. The ability for the oil and gas industry to grow is directly linked to a support network of infrastructure that is capable of accommodating this demand. There are numerous upgrades and improvements to utilities, such as transmission lines and pipelines, in and around the project area that are either planned or proposed to help support this growth.

During construction of the proposed project, Basin Electric will work with municipal officials and other utility service providers to ensure, to the greatest extent possible, that power outages and brownouts do not occur. Such effects should they be recognized may temporarily interrupt the delivery of electric service to some residents and businesses. Basin Electric would work to repair any such effects as quickly as possible. Therefore, should adverse cumulative effects result, they would be of relatively short duration and the extent to which they would be borne is not known at this time. However, it is not anticipated that construction activities associated with the proposed project would result in adverse cumulative impacts to the continued delivery of utility services.

The potential for power outages and brownouts that would result from the failure to implement identified upgrades and improvements would increase. The proposed project in combination with other planned or proposed upgrades and improvements would help support the increase in oil and gas activity and also protect nearby residents and businesses from adverse effects should power outages occur. As a result, the proposed project would not contribute to adverse cumulative impacts to utility services.

The proposed project is not anticipated to have an effect on the continued delivery of other utility services such as water supply and treatment and wastewater disposal. Therefore, the proposed project would not contribute to cumulative impacts that may be borne by these resources from other projects in the area.

The increase in population either directly or indirectly related to the oil and gas industry has placed additional demand on the transportation network (see Section 3.11.1). During construction of the proposed project, the introduction of material haul trucks and road closures would result in the temporary disruption of traffic patterns. Such effects would be of relatively short duration and would be timed to the greatest extent possible to avoid heavy travel periods. As a result, construction of the proposed project would result in temporary and localized adverse cumulative impacts to the transportation network.

In a 2010 study, UGPTI identified improvements to roadways maintained by either county or municipal governments that would be needed to support continued growth in the oil and gas industry. The North Dakota Department of Transportation in its five year transportation improvement plan identified a number of roadway improvements in the project area that are necessary. These projects may or may not be directly attributable to the oil and gas industry. Such improvements are independent of the proposed project but would improve travel patterns in areas experiencing a decreasing level of service. Because the proposed project would not introduce new vehicles to the roadway network with the exception of periodic maintenance vehicles serving various locations along the proposed project alignment, it would not contribute to adverse cumulative impacts to the transportation network.

The proposed project would not contribute to cumulative effects that may be borne by railroad and airport facilities as a result of other activities or projects in the area.

4.5.12 Public Health and Safety

Vehicular volume associated with the oil and gas industry and with population growth directly and indirectly related to this activity has increased notably over the past 10 years. As demonstrated in Section 3.11.1, accident rates have also increased. The construction of the proposed project would result in temporary disruptions to travel patterns associated with the movement of material haul trucks and roadway closures. As a result, the proposed project has the potential to contribute to short-term, adverse cumulative impacts associated with travel patterns during construction. Basin Electric would work with appropriate agencies to design and implement a construction plan that informs motorists of temporary changes in travel patterns and roadway signage necessary to minimize the potential for accidents to occur. Because the operation of the proposed project would result in the introduction of periodic maintenance vehicles to the roadway network and would not result in permanent road closures, it is not anticipated to contribute to adverse cumulative impacts that may result in public health and safety effects associated with accident rates.

As the proposed project is further refined, a construction plan will be developed to protect the health and safety of both workers and others in the vicinity from the stringing of the transmission line and the disturbance and removal of hazardous materials should any be identified during construction activities. Any such effects are anticipated to be localized and would not contribute to cumulative public health and safety effects. Additionally, the proposed project would not contribute to adverse public health and safety impacts that may result from activities associated with the oil and gas industry or projects in the area such as chemical spills or pipeline failure.

The operation of the proposed project would introduce new sources of EMF to the project area. As demonstrated in Section 3.12.1, EMFs resulting from the operation of the proposed project would be well below impact thresholds. Additionally, EMF levels are decreased to negligible at a distance of 50 feet and almost nonexistent at 100 feet from the transmission line centerline, an area well within the proposed project ROW. As a result, the proposed project would not contribute to adverse cumulative impacts associated with EMFs in the area. Because the proposed project would help support increased electrical demand, it would help ensure public health and safety by reducing the potential for power outages and brownouts.

4.5.13 Noise

Agriculture and community development activities have occurred and continue to occur in the project area, with the level of noise being localized and dependent on the activity and not significant in scale. Oil and gas development, gas processing plants, and new power plant development are contributing to community noise in rural areas where it has not been present in the past. Increased truck traffic associated with these developments is contributing to increased traffic noise in both rural and urban locations, with associated noise being localized. The proposed project would only temporarily contribute to these ongoing cumulative effects for a short time during construction and during routine maintenance activities and there would be no long-term cumulative noise impacts.

Table 4-6 provides a summary of the areas affected, the cumulative effects, and the contribution of the project to the cumulative effects for each resource area.

Table 4-6: Cumulative Effects Summary

Resource Area	Area of Influence	Cumulative Impacts	Contribution of Proposed Action to Cumulative Effects
Aesthetics and Visual Resources	The area that is visible from the project. The background is typically defined as 4 miles beyond the horizon line. For the purposes of the project, the spatial boundary will be 10 miles around the proposed route in Williams, McKenzie, Dunn and Mercer counties.	Projects that impact the scenic integrity of a landscape by introducing manmade elements; particularly overhead transmission lines in visually sensitive or previously undisturbed areas.	Minor additional visual impacts, due to use of existing corridors where there are already transmission lines and the large amount of oil and gas development on the landscape.
Air Quality and Greenhouse Gas Emissions	Air quality is contained to the airshed, with GHG emissions considered on a global scale.	Increased emissions from oil and gas, electricity generation, transportation, agriculture, and community development activities, with no non-attainment areas nearby.	Minor; no violation of NAAQS; negligible contribution to GHGs both from transmission line construction and operation.
Geology and Soils	Project ROW.	Loss of farmland to oil and gas pads and expansion of cities and towns.	Negligible.
Groundwater	N/A	Consumptive use for some oil and gas wells; deep low-quality groundwater used for well flooding.	N/A
Surface Water	Upper Missouri River/Lake Sakakawea, Knife River, Little Missouri River, and Little Muddy River sub-basins.	Water used for drilling fluid and fracking and to support new industrial and residential development.	Negligible.
Floodplains	Floodplains located within the project ROW.	Proposed linear facilities cross floodplains and would contribute to cumulative effects on floodplains of Missouri River and tributaries.	Minor; another corridor would cross floodplain of Missouri River and would likely span the floodplain of other streams; no change in floodplain hydrology from project.

Resource Area	Area of Influence	Cumulative Impacts	Contribution of Proposed Action to Cumulative Effects
Vegetation	5-county area including Dunn, McKenzie, Mercer, Mountrail, and Williams counties.	Permanent and minimal loss of woodland and wood riparian vegetation where reasonably foreseeable linear projects cross streams and woodlands; minimal and temporary impacts on grassland vegetation from construction of linear projects.	Minor from direct footprint of towers; clearing of woodland and woody riparian vegetation would be negligible.
Wildlife	5-county area including Dunn, McKenzie, Mercer, Mountrail, and Williams counties.	Some direct and indirect effects to habitat from oil and gas development and expanding urban development.	Minor effects during construction and operation.
Wetlands	5-county area including Dunn, McKenzie, Mercer, Mountrail, and Williams counties.	Linear projects would likely only have temporary and insignificant impacts to wetlands; no high-quality wetlands in refuges or easement lands affected.	Negligible; no net loss due to mitigation requirements.
Threatened and Endangered Species	5-county area including Dunn, McKenzie, Mercer, Mountrail, and Williams counties.	Impacts on aquatic and terrestrial species have occurred in the past with the damming of the Missouri River and other development activities in the study area.	Negligible with the use of BMPs for construction.
Cultural Resources	5-county area including Dunn, McKenzie, Mercer, Mountrail, and Williams counties.	No cumulative effects identified.	None anticipated.
Land Use	Dunn, McKenzie, Mercer, Mountrail, and Williams counties.	Expansions of land conversion to industrial and oil and gas uses have occurred in these counties. Loss of farmland to oil pads and infrastructure.	Negligible; land under transmission lines would continue to be available for agricultural and grazing uses.
Socioeconomics	Dunn, McKenzie, Mercer, Mountrail, and Williams counties.	Projects would continue to beneficially affect unemployment, fiscal receipts, and economic development in the area, while continuing to stress the provision of public services, infrastructure, available housing, and affecting the cost of living. Property values could also be impacted by projects.	The construction of transmission line would have short-term minor beneficial impacts on fiscal receipts and unemployment, and the operations of the project would provide long-term beneficial impacts on economic development in the region.

Resource Area	Area of Influence	Cumulative Impacts	Contribution of Proposed Action to Cumulative Effects
Environmental Justice	Census tracks and census blocks within and adjacent to the ROW.	Increased employment opportunities, as well as stresses on housing availability, provision of public services, and cost of living.	No disproportionate impacts on minority and low-income communities are anticipated.
Recreation and Tourism	Dunn, McKenzie, Mercer, Mountrail, and Williams counties.	Temporary increases in recreational area crowding from additional residents during the oil and gas boom. Temporary area closures or traffic congestion near recreational areas as a result of construction activities.	Negligible; any impacts would be temporary during construction.
Utility Infrastructure	Study area counties with a focus on those areas within 1 mile of the proposed project. It is understood that cumulative impacts may be experienced across a smaller region but the size of some utility infrastructure (i.e., transmission lines) is such that parsing out projects and potential impacts on a smaller scale may be very difficult.	Additional utilities in the form of transmission lines; electrical substations are needed to support the increase in the oil and gas industry.	The operation of the proposed project would help support the increased demand for electrical services in the project area.
Transportation Infrastructure	Within 6 miles of the proposed project alternatives.	The increase in oil and gas-related activity as well as the population necessary to support such activity has placed additional demand on the transportation network. Planned or proposed improvements may help alleviate some of the increased pressure that has been put on the roadway network.	Once in operation, the proposed project would not contribute to cumulative impacts borne by the transportation network from other actions or projects in the area.
Public Health and Safety	Within 500 feet of the proposed ROW.	Potential power outages and brownouts if other planned or proposed transmission lines are not implemented. Occasional chemical spills associated with oil and gas development and pipeline failures.	The implementation of the proposed project would help minimize power outages or brownouts.

Resource Area	Area of Influence	Cumulative Impacts	Contribution of Proposed Action to Cumulative Effects
Noise	All areas within hearing distance of the proposed project.	Industrial and construction activities associated with oil and gas activities and industrial natural gas processing plants contribute to existing agriculture and community noise.	Temporary impacts during construction; no contribution to cumulative impacts during operation.

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5 COMPARISON OF ALTERNATIVES

This section summarizes the comparative impacts of the no-action alternative and Alternative Routes A and B. The section summarizes potential mitigation for the direct and indirect effects identified in Chapter 3 and the potential irreversible and irretrievable commitment of resources under the action alternatives. Finally, the section discusses the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity.

5.1 COMPARATIVE IMPACTS OF ALTERNATIVES

Two alternatives (Alternative Routes A and B) and a no-action alternative were carried forward for analysis in this Draft EIS. In general, potential impacts do not vary greatly between the two action alternatives. Alternative Route B (210 miles) is approximately 15 miles longer than Alternative Route A (195 miles); as such, slightly more acreage would be affected for resources located along Alternative Route B than Alternative Route A. The nature and extent of potential impacts on private agricultural lands and public agency lands, such as the LMNG, would be similar to those for the entire lengths of both alternative routes. Comparative impacts for each of the route alternatives are summarized in Table 5-1.

Table 5-1: Comparative Impacts of Route Alternatives

Resource	Route A		Route B		Substations/Switchyards		No-action Alternative
Impact	**Permanent**	**Temporary**	**Permanent**	**Temporary**	**Permanent**	**Temporary**	
Land Use	3,536 acres of ROW would be required and would be restricted from some types of future development. 24 acres of land would be required for construction of new substations and require permanent conversion from agricultural uses to a utility use. ROW would include state and federal properties. ROW would include approximately 147.4 acres of LMNG, 56.4 acres of USACE property, approximately 144.6 acres of school trust lands, and cross within approximately 200 feet of BLM land.	Loss of use for landowners within ROW on private lands during construction. Access restrictions and/or loss of use within ROW during construction on state or federal properties. Disturbance from heavy equipment may result in some crop loss during construction.	3,807 acres of ROW would be required and would be restricted from some types of future development. ROW would include state and federal properties. 36 acres of land would be required for construction of new substations and a switchyard and require permanent conversion from agricultural uses to a utility use. ROW would include state and federal properties. ROW would include approximately 56.6 acres LMNG, 56.4 acres of USACE property, and approximately 138.8 acres school trust lands.	Loss of use for landowners within ROW on private lands during construction. Access restrictions and/or loss of use within ROW during construction on state or federal properties. Disturbance from heavy equipment may result in some crop loss during construction.	12 acres would be permanently converted from agriculture use to utility use for each substation and switchyard.	Construction-related impacts such as increased noise and dust on surrounding agricultural lands.	No direct effect; indirect effect if future land uses were impeded by lack of increased electrical supply necessary to meet demands of development.

Resource	Route A		Route B		Substations/Switchyards		No-action Alternative
Impact	Permanent	Temporary	Permanent	Temporary	Permanent	Temporary	
Socioeconomic Resources	Economic benefit to businesses and surrounding communities from increased electrical capacity and reliability. Potential changes in property values. Property tax revenues of $58,000 annually to study area counties.	Economic benefit to local communities during construction as a result of construction crews generating local revenue.	Economic benefit to businesses and surrounding communities from increased electrical capacity and reliability. Potential changes in property values. Property tax revenues of $63,000 annually to study area counties.	Economic benefit to local communities during construction as a result of construction crews generating local revenue.	Economic benefit to businesses and surrounding communities from increased electrical capacity and reliability. Potential changes in property values.	Minor economic benefit to local communities during construction as a result of construction crews generating local revenue.	No direct effect; indirect effect if no improved electric reliability and capacity. This would harm local communities by limiting future development opportunities.
Environmental Justice	Land use restrictions within ROW. Visual presence, and increase in fiscal receipts to counties.	Increase in noise and potential traffic disruptions during construction.	Land use restrictions within ROW. Visual presence and increase in fiscal receipts to counties.	Increase in noise and potential traffic disruptions during construction.	No effect.	Increase in noise and potential traffic disruptions during construction.	No effect.
Recreation and Tourism	Approximately 348 acres of state or federal land potentially open to dispersed recreational activities such as hunting would be located within the ROW. One USFS campground (Summit Campground) would be located within 0.5 mile of the ROW.	Increased noise, dust, and traffic congestion in recreational areas. Temporary access restrictions during construction on public use areas.	Approximately 252 acres of state or federal land potentially open to dispersed recreational activities such as hunting would be located within the ROW. No developed recreational facilities would be located within close proximity to the ROW.	Increased noise, dust, and traffic congestion in recreational areas. Temporary access restrictions during construction on public use areas.	Conversion of land for substations or switchyard would remove it from further land use, including recreational use. Each substation or switchyard would occupy 12 acres.	Increased noise, ground disturbance, access restrictions, and human activity may impede hunting activities around the substation or switchyard sites.	No effect.

Resource	Route A		Route B		Substations/Switchyards		No-action Alternative
Impact	**Permanent**	**Temporary**	**Permanent**	**Temporary**	**Permanent**	**Temporary**	
Utility Infrastructure and Transportation	No long-term effects on utility infrastructure are anticipated. No long-term effects on transportation are anticipated. Potential impacts on airports within 10 nautical miles would be avoided through coordination with FAA. Basin Electric would coordinate with BNSF to minimize or avoid potential impacts on railroads in areas where the alternative route would traverse railroads at a vertical elevation.	Existing utility infrastructure would be traversed during construction activities and may be temporary taken out of service. Some temporary road closures are likely during construction activities and may result in short-term adverse impacts. Basin Electric would also coordinate with BNSF in order to string the transmission line over existing railroad tracks.	No long-term effects on utility infrastructure are anticipated. No long-term effects on transportation are anticipated. Potential impacts on airports within 10 nautical miles would be avoided through coordination with FAA. Basin Electric would coordinate with BNSF to minimize or avoid potential impacts on railroads in areas where the alternative route would traverse railroads at a vertical elevation.	Existing utility infrastructure would be traversed during construction activities and may be temporary taken out of service. Some temporary road closures are likely during construction activities and may result in short-term adverse impacts. Basin Electric would also coordinate with BNSF in order to string the transmission line over existing railroad tracks.	No effect.	Short-term interruption of existing transmission lines during construction activities may result minor temporary impacts. The introduction of material haul trucks and road closures during construction activities may result in short-term adverse impacts.	Significant utility system failures and damage if capacity is not increased and demand increases as projected. Electrical equipment used for oil and gas pipelines could be limited by reliability thereby causing more distribution via truck, causing road damage.

Resource	Route A		Route B		Substations/Switchyards		No-action Alternative
Impact	**Permanent**	**Temporary**	**Permanent**	**Temporary**	**Permanent**	**Temporary**	
Geology and Landforms	Displacement of 1.73 million cubic feet of soil and rock during construction.	Potential for erosion on steeper slopes during construction.	Displacement of 1.9 million cubic feet of soil and rock during construction.	Potential for erosion on steeper slopes during construction.	No effect.	No effect.	No effect.
Soils and Farmland	Approximately 1 acre of soil (0.0009-acre per structure) would be permanently removed. Farmland for crop production would be permanently impacted only at structure locations.	334 acres (0.29-acre per structure) of temporary soil disturbance during construction within ROW, with temporary loss of crop production.	Approximately 1.1 acres of soil (0.0009-acre per structure) would be permanently removed. Farmland for crop production permanently impacted only at structure locations.	363 acres (0.29-acre per structure) of temporary soil disturbance during construction within ROW, with temporary loss of crop production.	Any farmland within the 12-acre substation or switchyard sites would be permanently converted to utility use.	No effect.	No effect.
Water Resources	No effects anticipated. Eleven perennial waterways and 6.5 acres of FEMA floodplain crossed, but all would be spanned.	Potential sedimentation and runoff caused by construction.	No effects anticipated. Fifteen perennial waterways and 6.5 acres of FEMA floodplain crossed, but all would be spanned.	Potential sedimentation and runoff caused by construction.	No effect.	No effect.	No effect.

Resource	Route A		Route B		Substations/Switchyards		No-action Alternative
Impact	**Permanent**	**Temporary**	**Permanent**	**Temporary**	**Permanent**	**Temporary**	
Vegetation	Approximately 95 acres of woodland potentially removed within ROW, depending on slope. One acre of vegetation permanently removed within ROW at structure locations. Potential introduction of noxious weeds within ROW to be avoided by weed mitigation measures.	Disturbance of vegetation within the ROW and along access roads during construction. Natural Heritage Inventory sensitive ecological community potentially impacted.	Approximately 100 acres of woodland potentially removed within ROW, depending on slope. 1.1 acres of vegetation permanently removed within ROW at structure locations. Potential introduction of noxious weeds within ROW to be avoided by weed mitigation measures.	Disturbance of vegetation within the ROW and along access roads during construction.	All vegetation removed from 12 acre sites and converted to utility use.	No effect.	No effect.
Wildlife	Loss of forested habitat due to removal of up to 95 acres of woodland within the ROW. Some mortality of small, less-mobile species. Potential avian species collisions with power lines.	Disturbance within and near the ROW during construction due to human intrusion, noise, and construction activity. Temporary loss of habitat due to vegetation clearing within ROW during construction.	Loss of forested habitat due to removal of up to 100 acres of woodland within the ROW. Some mortality of small, less-mobile species. Potential avian species collisions with power lines.	Disturbance within and near the ROW during construction due to human intrusion, noise, and construction activity. Temporary loss of habitat due to vegetation clearing within ROW during construction.	Loss of habitat within the 12 acre sites as these are converted to utility use.	Disturbance to nearby species due to construction activities.	No effect.

Resource	Route A		Route B		Substations/Switchyards		No-action Alternative
Impact	**Permanent**	**Temporary**	**Permanent**	**Temporary**	**Permanent**	**Temporary**	
Aquatic Resources	Change in local aquatic habitats in areas where vegetation is cleared along shoreline.	Potential for sedimentation, runoff, and spills during construction; to be avoided by use of BMPs.	Change in local aquatic habitats in areas where vegetation is cleared along shoreline.	Potential for sedimentation, runoff, and spills during construction; to be avoided by use of BMPs.	No effect.	No effect.	No effect.
Special Status Species	No adverse effect on listed species pending outcome of consultation with USFWS and USFS.	Potential impacts on grassland habitat within ROW during construction.	No adverse effect pending outcome of consultation with USFWS and USFS.	Potential impacts on grassland habitat within ROW during construction.	No effect.	No effect.	No effect.t
Wetlands	No effect. All 16 acres of wetland within ROW would be spanned. No structures placed in wetlands and no wetland vegetation would be cleared.	Potential sedimentation and runoff caused by construction near wetlands.	All 21 acres of wetland within ROW would be spanned. No structures placed in wetlands. Clearing of 0.02 acre of forested wetland within ROW could occur.	Potential sedimentation and runoff caused by construction near wetlands.	No effect.	Potential sedimentation and runoff caused by construction near wetlands located near substation and switchyard sites.	No effect.
Aesthetics and Visual Resources	Change in the visual characteristics and viewshed within project area and for residents located near the transmission line (8 residences within 500 feet).	Visibility of construction vehicles and equipment along ROW.	Change in the visual characteristics and viewshed within project area and for residents located near the transmission line (7 residences within 500 feet).	Visibility of construction vehicles and equipment along ROW.	Additional visual element added to the landscape.	No effect.	No effect.

Resource	Route A		Route B		Substations/Switchyards		No-action Alternative
Impact	Permanent	Temporary	Permanent	Temporary	Permanent	Temporary	
Cultural Resources	No adverse effects on NRHP-eligible cultural resources. 93 cultural resources have been identified within or immediately adjacent to the 1,000-foot preliminary APE.	No adverse effects on NRHP-eligible cultural resources.	No adverse effects on NRHP-eligible cultural resources. A total of 88 sites have been recorded within or immediately adjacent to the 1,000-foot preliminary APE.	No adverse effects on to NRHP-eligible cultural resources.	No adverse effects on NRHP-eligible cultural resources.	No adverse effects on NRHP-eligible cultural resources.	No effect.
Noise	No effect.	Increase in noise levels along the ROW from construction vehicles and equipment.	No effect.	Increase in noise levels along the ROW from construction vehicles and equipment.	No effect.	Increase in noise levels for nearby residences during construction of the substations and switchyard.	No effect.
Air Quality and GHG Emissions	Potential increase in GHG levels as a result of the operation of the transmission line.	Increases in fugitive dust caused by construction activity, vehicles, and equipment. Increased emissions from construction vehicles and equipment.	Potential increase in GHG levels as a result of the operation of the transmission line.	Increases in fugitive dust caused by construction activity, vehicles, and equipment. Increased emissions from construction vehicles and equipment.	Potential increase in GHG levels as a result of the operation of the substations and switchyard.	Increases in fugitive dust caused by construction activity, vehicles, and equipment. Increased emissions from construction vehicles and equipment.	No effect.

Resource	Route A		Route B		Substations/Switchyards		No-action Alternative
Impact	Permanent	Temporary	Permanent	Temporary	Permanent	Temporary	
Public Health and Safety	Long-term adverse effects expected to be negligible to minor. EMFs would be well below identified thresholds to protect the public. The operation of farm equipment near proposed structures could result in unnecessary contact and/or damage to machinery and/or operators. Standard operating and safety procedures would be employed to ensure the safe delivery of services.	Hazardous and/or potentially hazardous materials may be encountered during construction, or exposure to energized transmission lines. Theses impacts are likely to be minor with the implementation of construction plans that ensure worker safety, proper handling of hazardous materials, and spill cleanup.	Long-term adverse effects expected to be negligible to minor. EMFs would be well below identified thresholds to protect the public. The operation of farm equipment near proposed structures could result in unnecessary contact and/or damage to machinery and/or operators. Standard operating and safety procedures would be employed to ensure the safe delivery of services.	Hazardous and/or potentially hazardous materials may be encountered during construction, or exposure to energized transmission lines. Theses impacts are likely to be minor with the implementation of construction plans that ensure worker safety, proper handling of hazardous materials, and spill cleanup.	Long-term adverse effects are expected to be negligible to minor.	Hazardous and/or potentially hazardous materials may be encountered during construction. Impacts on public health and safety are likely to be minor with the implementation of construction plans that ensure worker and public safety, proper handling of hazardous materials, and spill cleanup.	No effect.

5.2 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Irreversible commitment of resources refers to the loss of future options for resource development or management, especially of nonrenewable resources such as cultural resources. Construction and operation of the proposed project would require the permanent conversion of 1.04 to 1.13 acres for the transmission line structures and 24 to 36 acres for new substations or a switchyard, depending on the alternative selected. This would include federal, state, and private lands. Most of these areas are in agricultural production. The introduction of new transmission lines would permanently change the visual landscape in some areas. The construction of the project would require the irretrievable commitment of non-recyclable building materials and fuel consumed by construction equipment.

5.3 RELATIONSHIP BETWEEN SHORT-TERM USES OF THE ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

NEPA legislation requires that an EIS describe “the relationship between local short-term uses of man’s environment and the maintenance and enhancement of long-term productivity.” Construction of the project would have short-term impacts on environmental resources associated with construction of the transmission line, including installation of poles, conductors, use of construction laydown areas, and use of the area as a transmission line ROW during the life span of the transmission line and its associated facilities. As indicated in the discussion under the individual resources, the small permanent footprint of the transmission line and the limited resource impacts indicate that operation of the facility would not likely affect regional natural resources to any significant degree. However, the land occupied by transmission towers would be an impact for the life of the transmission line, possibly exceeding 50 years. The proposed project would require development of 1.04 to 1.13 acres of land for the footprint of the transmission line towers and 24 to 36 acres to accommodate the proposed Killdeer switchyard and Judson and Tande 345-kV substations. Additional land would be needed for transmission ROW and access roadways.

Temporary impacts from construction activities are discussed in Chapter 3 and Table 5-1. The high voltage transmission line permit would require the applicant to restore the ROW, temporary work spaces, access roads, abandoned ROW, and other lands affected by construction of the project. During the restoration process, the applicant would work with landowners, NDGFD, USFS, and local wildlife management programs to ensure that the restored ROW

Estimated long-term impacts on resources within the 150-foot ROW are show in Table 5-3.

Table 5-2: Estimated Long-term Impacts (acres) on Resources within the 150-foot ROW and Related Facilities

Resource	Alternative A	Alternative B
ROW (acres)	3,536	3,807
Croplands (acres)	24	36
Grasslands (acres)	1.04	1.13
Soils and/or rock (cubic feet)	1.7 million	1.9 million
LMNG (acres)	147	57

Construction and operation of the project would result in long-term impacts on vegetation, limited to the permanent conversion of vegetated lands to utility land uses (transmission structures, substations, switchyards, and access roads), conversion of forested or wooded vegetated cover to herbaceous cover, and disturbance related to maintenance activities (mowing, herbicide application, tree trimming, and dangerous tree removal). Long-term (permanent) impacts would also accrue to prime and important farmland soils where transmission line structures are placed within the proposed ROW. However, these losses would constitute a small fraction of total lands within the proposed project ROW. These resources would not return to productive, pre-disturbance conditions until the transmission line and associated facilities are removed. In the case of wetland conversion, impacts could be mitigated through reclamation, restoration, or permanently protecting other wetlands for an offset of wetland losses. For all other resource areas identified in the EIS, long-term impacts beyond the project lifetime of 50 years are either not anticipated or expected to be avoided through mitigation measures.

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6 REGULATORY AND PERMIT REQUIREMENTS

The regulatory framework and authorizing actions relevant to the proposed project were introduced in Section 1.3 of this document. Table 1-2 provided a summary of the permits, regulations, consultations, and other actions that would be required for the project for each agency involved. Table 6-1 describes potential project requirements that should be considered. This includes permits, approvals, and consultation, etc. required for the project. Basin Electric would obtain necessary permits from counties and/or municipalities along the route (such as permits for road, highway, and flood channel encroachment and crossings; and temporary use and occupancy permits). Basin Electric would also obtain any necessary pipeline and utility crossing permits for crossings of natural gas pipelines and electrical transmission lines.

Table 6-1: Potential Project Requirements

Requirement	Citation	Description
Potential Federal Requirements		
Bald and Golden Eagle Protection Act	16 U.S.C 668-668d	The Act prohibits anyone, without a permit issued by the Secretary of the Interior, from “taking” bald or golden eagles, including their parts, nests, or eggs. A permitting program was established by the USFWS Division of Migratory Bird Management. If activities require the removal or relocation of an eagle nest, a permit is required from the Regional Bird Permitting office.
Clean Air Act	42 U.S.C. 7401	The Act establishes NAAQS for certain pervasive pollutants. The Act establishes limitations on SO_2 and NO_x emissions and sets permitting requirements. Authority for implementation of the permitting program is delegated to NDDOH, Division of Air Quality.
Clean Water Act	32 U.S.C. 1251	The Act contains standards to address the causes of pollution and poor water quality, including municipal and industrial wastewater discharges, polluted runoff from urban and rural areas, and habitat destruction. USEPA has delegated authority to the NDDOH, Division of Water Quality.
		Section 401 – Water Quality Certification for Wetlands. Requires certification for any permit or license issued by a federal agency for any activity that may result in a discharge into waters of the state to ensure that the proposed project will not violate state water standards. Permits are issued by the NDDOH, Division of Water Quality.
		Section 404 – Permits for Dredged or Fill Material. Regulates the discharge of dredged or fill material in the jurisdictional wetlands and waters of the United States. Permits are issued by USACE, with cooperation from USFWS and USEPA.
Determination of No Hazard to Air Navigation	14 C.F.R. Part 77	Requires that the FAA issue a determination stating whether the proposed construction or alteration would be a hazard to air navigation, and will advise all known interested persons.
Easements for Rights-of-Way	10 U.S.C. 2668	Easement will be required to cross lands owned and managed by USACE located near the Missouri River.

Requirement	Citation	Description
Endangered Species Act	16 U.S.C. 1531 et seq.	Section 7 of the Act requires any federal agency authorizing, funding, or carrying out any action to ensure that the action is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of critical habitat of such species. If the project is determined to be an activity that might incidentally harm (or “take”) endangered or threatened species, the applicant would be required to obtain an incidental take permit from the USFWS. In addition to obtaining the permit, the applicant would be required to develop a Habitat Conservation Plan.
Farmland Protection Policy Act	7 U.S.C. 4201 et seq.	The Act requires federal agencies to identify and quantify adverse impacts of federal programs on farmlands to minimize the number of federal programs that contribute to the unnecessary and irreversible conversion of agricultural land to non-agricultural uses. The Act designates farmland as prime, unique, of statewide importance, and of local importance. The Act is overseen by USDA’s NRCS.
Federal Highway Administration Encroachment Permits		The Department of Transportation’s Federal Highway Administration requires encroachment permits for crossing federally funded highways.
Federal Land Policy Management Act	7 U.S.C. 2801 et seq.	Requires that each federal land-managing agency have a program in place for controlling undesirable plant species and must implement cooperative agreements with the State. Requires that any environmental assessments or impact statements that may be required to implement plant control agreements must be completed within one year of the time the need for the document was established.
Federal Power Act	16 U.S.C. Chapter 12	Requires federal agencies to provide transmission service on a non-discriminatory basis through compliance with established tariffs.
Fish and Wildlife Conservation Act	16 U.S.C. 2901 et seq.	The Act encourages federal agencies to conserve and promote conservation of non-game fish and wildlife species and their habitats. Mitigation methods should be designed to conserve wildlife and their habitats.
Fish and Wildlife Coordination Act	16 U.S.C. 661 et seq.	The Act requires federal agencies to consult with USFWS and the state agency responsible for fish and wildlife resources if the project affects water resources.
Migratory Bird Treaty Act	16 U.S.C. 703 et seq.	The Act protects birds that have common migration patterns between the United States and Canada. Under the Act, taking, killing or possessing migratory birds or their eggs or nests is unlawful. The Act requires a Special Purpose Permit when an applicant demonstrates a legitimate purpose to violate the Act.
National Environmental Policy Act	42 U.S.C. 4321-4347	The Act requires agencies of the federal government to study the possible environmental impacts of major federal actions significantly affecting the quality of the human environment.

Requirement	Citation	Description
National Forest Management Act	16 U.S.C. 1600-1614	The Act requires the Secretary of Agriculture to assess forest lands, develop a management program based on multiple-use, sustained-yield principles, and implement a resource management plan for each unit of the National Forest System. It is the primary statute governing the administration of national forests.
National Historic Preservation Act	16 U.S.C. 470 et seq.	Section 106 of the Act requires the federal agency to take into account the effects of its undertakings on properties listed in or eligible for listing in the NRHP, including prehistoric or historic sites, and districts, buildings, structures, objects, or properties of traditional religious or cultural importance. The NHPA also requires the federal agency to afford the Advisory Council on Historic Preservation an opportunity to comment on the undertaking. The North Dakota State Historical Society must also provide consultation.
Noise Control Act	42 U.S.C. 4901-4918	The Act directs federal agencies to carry out programs in their jurisdictions "to the fullest extent within their authority" and in a manner that furthers a national policy of promoting an environment free from noise that jeopardizes health and welfare.
Occupational Safety and Health Act	29 U.S.C. 651 et seq.	The Act established regulations for the protection of worker health and safety. The applicant would be subject to Occupational Health and Safety Administration general industry standards and construction standards.
Pollution Prevention Act	42 U.S.C. 13101 et seq.	The Act establishes a national policy for waste management and pollution control.
Rural Utilities Service Environmental Policies and Procedures	7 C.F.R. Part 1794	RUS must make decisions that are based on an understanding of environmental consequences, and take actions that protect, restore, and enhance the environment. In assessing the potential environmental impacts of its actions, RUS will consult early with appropriate federal, state, and local agencies and other organizations to provide decision-makers with information on the issues that are significant to the action in question. The applicant is responsible for ensuring that proposed actions are in compliance with all appropriate RUS requirements. Environmental documents submitted by the applicant shall be prepared under the oversight and guidance of RUS. RUS will evaluate and be responsible for the accuracy of all information contained therein.
River and Harbors Act	33 U.S.C. 403	Section 10 of the Act prohibits the unauthorized obstruction or alteration of any navigable water of the United States. This section provides that the construction of any structure in or over any navigable water of the United States, or the accomplishment of any other work affecting the course, location, condition, or physical capacity of such waters is unlawful unless the work has been recommended by the Chief of Engineers and authorized by the Secretary of the Army, which has been delegated to the Chief of Engineers. A SUP is required to cross lands owned and managed by USACE located near the Missouri River.

Requirement	Citation	Description
Potential Executive Orders		
Executive Order 11988 Floodplain Management		The executive order directs federal agencies to establish procedures to ensure that they consider potential effects of flood hazards and floodplain management for any action undertaken. Agencies are to avoid impacts to floodplains to the extent practical.
Executive Order 11990 Protection of Wetlands		The executive order directs federal agencies to avoid short- and long-term impacts to wetlands if a practical alternative exists.
Executive Order 12898 Environmental Justice		The executive order directs federal agencies to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations.
Executive Order 13007 Indian Sacred Sites		The executive order directs federal agencies, to the extent permitted by law and consistent with agency missions, to avoid adverse effects to sacred sites and to provide access to those sites to Native Americans for religious practices.
Executive Order 13112 Invasive Species		The executive order directs federal agencies to prevent the introduction or to monitor and control invasive non-native species and provide for restoration of native species.
Executive Order 13175 Consultation and Coordination with Indian Tribal Governments		The executive order directs federal agencies to establish meaningful consultation and collaboration with tribal governments to strengthen United States government to government relationships with Indian tribes.
Executive Order 13186 Responsibilities of Federal Agencies to Protect Migratory Birds		The executive order directs federal agencies to avoid or minimize the negative impacts of their actions on migratory birds, and to take active steps to protect birds and their habitats.
Potential State Requirements		
Little Missouri Scenic River Act	ND Century Code 61-29	The Act aims to preserve the Little Missouri River as nearly as possible in its present state.
North Dakota Indian Burial Laws	ND Century Code 55-03 and 23-06-27	If prehistoric and historic human burials, human remains and burial goods are inadvertently discovered on state, local and private lands, all activities must cease until the State Historical Society completes an initial examination of the site.
North Dakota Department of Health Requirements	ND Century Code 61-28	In accordance with the North Dakota Water Pollution Control Act, the applicant must obtain authorization under the North Dakota Pollutant Discharge Elimination Systems from NDDOH. This authorization requires the applicant to have a stormwater pollution prevention plan.
State Road Crossing Permits		The applicant must obtain permits from the North Dakota Department of Transportation.
State Highway Access Permits		The applicant must obtain permits from the North Dakota Department of Transportation.
State Utility Occupancy Permits		The applicant must obtain permits from the North Dakota Department of Transportation.
Permits to Cross State Wildlife Management Areas		The applicant must obtain permits from NDGFD.

Requirement	Citation	Description
Consultation/Approval regarding State-Listed Species of Concern		The applicant must obtain permits from NDGFD.
Consultation regarding Noxious Weeds		The applicant must obtain permits from NDGFD.
Consultation regarding Killdeer Mountain Four Bears Scenic Byway		The applicant must obtain permits from the North Dakota Parks and Recreation Department.
North Dakota Energy Conversion and Transmission Facility Siting Act		The applicant must obtain certificate of Corridor Compatibility from NDPSC.
North Dakota Energy Conversion and Transmission Facility Siting Act		The applicant must obtain route permits from NDPSC.
Permits for crossing Trust Lands		The applicant must obtain permits from the North Dakota State Land Department.
Construction Permits		The applicant must obtain construction permits for crossing navigable waterways from the North Dakota State Water Commission.
Potential Departmental Requirements		
Viewshed Impact Consultation		NPS should provide the applicant with consultation regarding potential viewshed impacts to TRNP.
Conservation Reserve Program Consultation		The applicant must consult with the USDA Farm Services Agency, North Dakota Office.
Farmland Conversion Impact Rating		The applicant must obtain a Farmland Conversion Impact Rating from the USDA NRCS.
Potential Tribe Requirements		
Tribal Consultations		The following tribes may seek consultation on the project: Flandreau Santee Sioux, Santee Sioux Nation, Fort Peck Assiniboine & Sioux Tribes, Spirit Lake Tribe, Fort Belknap Indian Community, Standing Rock Sioux, Leech Lake Band of Ojibwe, Three Affiliated Tribes, Lower Sioux Indian Community, Turtle Mountain Chippewa, Minnesota Chippewa Tribe, Upper Sioux Indian Community, Prairie Island Indian Community, and White Earth Nation.
Other Potential Requirements		
Permits for County Road Encroachment		The applicant must obtain County Permits from Dunn, McKenzie, Mercer, Mountrail, and Williams counties.
County Conditional Use Permits		The applicant must obtain County Permits from Dunn, McKenzie, Mercer, Mountrail, and Williams counties.
Permits for County Floodplain Encroachment		The applicant must obtain County Permits from Dunn, McKenzie, Mercer, Mountrail, and Williams counties.
Authorization for Crossing Railroads		The applicant must obtain a permit from BNSF to cross railroads.

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7 AGENCIES AND TRIBES CONTACTED

Consultation with tribes, federal, and state agencies has been ongoing. Various federal and state interagency meetings were conducted to share project information and determine the scope of the EIS and throughout the development of the EIS.

7.1. COOPERATING AGENCIES

U.S. Department of Agriculture, Rural Utilities Service (lead agency) was assisted by the U.S. Department of Agriculture, Forest Service and the U.S. Department of Energy, Western Area Power Administration as cooperating agencies in preparing this EIS.

7.2. FEDERAL AGENCIES CONTACTED

- U.S. Army Corps of Engineers
- U.S. Department of Agriculture, Natural Resources Conservation Service
- U.S. Department of the Interior, Fish and Wildlife Service
- U.S. Environmental Protection Agency
- Federal Aviation Administration
- National Park Service

7.3. NORTH DAKOTA AGENCIES CONTACTED

- North Dakota Department of Health
- North Dakota State Historic Preservation Office
- North Dakota State Department of Trust Lands
- North Dakota Transmission Authority

7.4. TRIBES CONTACTED

- Flandreau Santee Sioux
- Santee Sioux Nation
- Fort Peck Assiniboine and Sioux Tribes
- Spirit Lake Tribe
- Fort Belknap Indian Community

- Standing Rock Sioux
- Leech Lake Band of Ojibwe
- Three Affiliated Tribes
- Lower Sioux Indian Community
- Turtle Mountain Chippewa
- Minnesota Chippewa Tribe
- Upper Sioux Indian Community
- Prairie Island Indian Community
- White Earth Nation

8 DISTRIBUTION LIST

8.1 FEDERAL AGENCIES

- Advisory Council on Historic Preservation
- Federal Aviation Administration
- Federal Emergency Management Agency
- Federal Energy Regulatory Commission
- Federal Highway Administration
- National Agricultural Library
- National Park Service
- Theodore Roosevelt National Park
- U.S. Army Corps of Engineers
- U.S. Department of Agriculture, Natural Resource Conservation Service
- U.S. Department of Agriculture, Animal and Plant Health Inspection Service
- U.S. Department of Energy
- U.S Department of Defense
- U.S. Environmental Protection Agency
- U.S. Fish and Wildlife Service
- U.S. Department of the Interior, Bureau of Indian Affairs
- U.S. Department of the Interior, Bureau of Land Management
- U.S. Department of the Interior, Office of Environmental Policy and Compliance
- U.S. Geological Survey
- U.S. Navy

8.2 TRIBAL GOVERNMENTS AND AGENCIES

- Crow Tribal Council
- Fort Peck Tribes

- Northern Arapaho Tribe
- Northern Cheyenne Tribal Council
- Oglala Sioux Tribal Council
- Rosebud Sioux Tribe of Indians
- Shoshone Business Council
- Standing Rock Sioux Tribe
- Three Affiliated Tribes

8.3 NORTH DAKOTA STATE AGENCIES

- North Dakota Department of Agriculture
- North Dakota Department of Commerce
- North Dakota Department of Health
- North Dakota Department of Transportation
- North Dakota Farm Bureau
- North Dakota Forest Service
- North Dakota Game and Fish Department
- North Dakota Geological Survey
- North Dakota Indian Affairs Commission
- North Dakota Industrial Commission
- North Dakota Parks and Recreation Department
- North Dakota Public Service Commission
- North Dakota State Historical Society
- North Dakota Heritage Center
- North Dakota State Land Department
- North Dakota State Legislature
- North Dakota Transmission Authority

- North Dakota Water Commission

8.4 LOCAL UNITS OF GOVERNMENT

- City of Beulah
- City of Kildeer
- City of Ray
- City of Watford City
- Dunn County
- McKenzie County
- Mercer County
- Mountrail County
- Town of Alexander
- Town of Arnegard
- Town of Dodge
- Town of Dunn Center
- Town of Epping
- Town of Golden Valley
- Town of Halliday
- Town of Rawson
- Town of Springbrook
- Town of Zap
- Williams County
- Williston City Commission

8.5 LOCAL LIBRARIES

- Beulah Public Library
- Bismarck Public Library

- Killdeer School & Public Library
- McKenzie County Library
- Stanley Public Library
- Williston Community Library

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10 LIST OF PREPARERS

Name	Agency/Firm	Title	Education	Years of Experience	Responsibility
Dennis Rankin	Rural Utility Service	Project Manager, Environmental Protection Specialist	B.A./M.S. Biology	35	Project Manager
Brad Jackson	Rural Utility Service	Engineer	B.S. Electrical Engineering	36	Transmission Planning and Engineering Review
Steve Slovikosky	Rural Utility Service	Engineer	B.S. Electrical Engineering	34	Transmission Planning and Engineering Review
Matt Marsh	Western Area Power Administration, Upper Great Plains	NEPA Project Manager			
Dave Kluth	Western Area Power Administration, Upper Great Plains	Regional Preservation Officer			
Rod O'Sullivan	Western Area Power Administration, Corporate Services Office	NEPA Project Manager			
Misti Sporer	Western Area Power Administration, Corporate Services Office	Biologist			
Nicole Mortenson	USDA Forest Service	Engineering and Minerals Project Specialist	B.S. Natural Resource Science	20	NEPA/Agency Coordination
David Valenzuela	USDA Forest Service	Minerals & Lands Manager	B.S. Geology	25	Federal Land Policy Management Act/Agency Coordination
Debbie Riely	USDA Forest Service	Realty Specialist	Bachelor of University Studies	8	Special Use Permit
Holly Bender	The Louis Berger Group, Inc.	Senior Economist	B.A. Political Science and Economics/ Ph.D. Mineral Economics	14	Socioeconomics and Environmental Justice

Name	Agency/Firm	Title	Education	Years of Experience	Responsibility
Dara L. Braitman	The Louis Berger Group, Inc.	Planner	B.A. Urban Studies/ M.U.P. Urban Planning	6	Utility and Transportation and Public Health and Safety
Kathryn G. Chipman	The Louis Berger Group, Inc.	Environmental Scientist	B.S. Biology and Environmental Sciences/ M.S. Environmental Sciences	2	Abstract, Executive Summary, Purpose and Need, Water Resources, and Cumulative Impacts.
Colleen Cunningham	The Louis Berger Group, Inc.	Environmental Scientist	B.A. Biology/ M.S. Environmental Science/ M.P.A. Public Affairs	11	Biological Resources
Lori Fox, AICP	The Louis Berger Group, Inc.	Deputy Director	B.A. Land Use and Environmental Planning/MCP	13	Environmental Policy
Robert Hughes	The Louis Berger Group, Inc.	Senior Project Manager	B.S. Biological Sciences/M.S. Biological Sciences	30	Technical Advisor
Emily Larson	The Louis Berger Group, Inc.	Biologist	B.S. Environmental Biology	5	Aesthetics and Visual Resources
Michael Mayer	The Louis Berger Group, Inc.	Senior Regulatory Specialist	JD, Certificate in Environmental Law/M.S. Wildlife and Fisheries Biology and Conservation/B.S. Wildlife Fisheries and Biology and Conservation	16	Quality Assurance and Quality Control; Regulatory Specialist
Lisa McDonald	The Louis Berger Group, Inc.	Senior Economist	B.S. Earth Science/ Ph.D. Mineral Economics	18	Project Manager
Jason Medema, LEED AP	The Louis Berger Group, Inc.	Environmental Planner	B.A. International Affairs/ M.S. Environmental Studies/ Graduate Certificate, Real Estate Development	8	Land Use and Recreation

Name	Agency/Firm	Title	Education	Years of Experience	Responsibility
David Plakorus	The Louis Berger Group, Inc.	Environmental Planner	B.A. History, minor in Political Science/ M.B.A. Business Administration/ M.U.R.P. Urban and Regional Planning	3	Air Quality, Greenhouse Gases, and Noise
James Puckett, GISP	The Louis Berger Group, Inc.	Environmental Scientist	B.A. Geography/ M.A. Geography/ Master of Public Administration	6	GIS Specialist
Joshua Schnabel	The Louis Berger Group, Inc.	Environmental Planner	B.A. Sociology/ M.A. Geography, Natural Resources Management and Environmental Planning	7	Socioeconomics, Air Quality, Visual Resources, Vegetation, and Geology
Joseph Tippett	The Louis Berger Group, Inc.	Senior Archaeologist	M.A. Anthropology/B.A. Anthropology	30	Cultural Resources
Landon Vine	The Louis Berger Group, Inc.	Environmental Scientist	B.S. Environmental Science/ M.S. Environmental Science	5	Biological Resources and Socioeconomics

Appendix A

Standard Mitigation Measures to be Used by Basin Electric for the Proposed AVS to Neset Transmission Project

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Appendix A - Standard Mitigation Measures to be Used by Basin Electric for the Proposed AVS 345-kV Transmission Project

General	
Gen-1	The requirements of all applicable Federal, State, and local environmental laws, executive orders, and regulations would be met during construction and operation of the proposed Project.
Gen-2	All permit conditions required by Federal, State, and local agencies would be adhered to for construction and operation of the proposed project.
Gen-3	Prior to construction, all construction personnel and heavy equipment operators would be instructed on the protection of cultural, paleontological, and ecological resources, and all applicable permit requirements. Construction contracts would address: • Federal, State, and local laws regarding antiquities, fossils, plants, and wildlife, including collection/removal • The importance and necessity of protecting such resources • All applicable permit requirements
Air Quality	
Air-1	The emission of dust into the atmosphere during construction would be minimized to the extent practical during the manufacture, handling, and storage of concrete aggregate. Methods and equipment would be used as necessary to collect, dispose, or prevent dust during these operations. The methods of storing and handling cement and additives would also include means of minimizing atmospheric discharges of dust.
Air-2	All construction equipment and vehicles will be maintained in efficient operating condition and comply with applicable state and federal emission standards. Engine idling time will be limited and equipment will be shut down when not in use. Vehicles and equipment that show excessive emissions or other inefficient conditions would not be operated until repairs or adjustments are made.
Air-3	All waste materials shall be disposed of at permitted waste disposal areas or landfills. Burning or burying waste materials on the right-of-way would not be permitted. Tree and grubbing residue may be buried on site or in the right-of-way with landowner approval.

Air-4	Nuisance to persons, dwellings, or crops resulting from dust originating from construction would be minimized. Oil and other petroleum derivatives would not be used for dust control. Speed limits on local gravel roads would be enforced to reduce dust.
Water Resources	
Water-1	Construction activities would comply with the requirements of North Dakota permits for stormwater discharges for construction activities, which specify appropriate best management practices, erosion and sediment control measures, and disposal practices. BMPs will be included in a Stormwater Pollution Prevention Plan. Construction activities adjacent to or encroaching on streams or waterways, including work within rights-of-way, construction of access roads on hillsides, and dewatering work for structure foundations, or earthwork operations would be conducted to prevent disturbed soils, muddy water, and eroded materials from entering streams or waterways by construction of intercepting ditches, bypass channels, barriers, settling ponds, or by other approved means.
Water-2	Construction activities would be conducted to prevent the accidental spillage of solid matter contaminants, debris, hazardous liquids, or other pollutants into streams, waterways, lakes, land, and underground aquifers. Such pollutants and waste include, but are not restricted to, refuse, garbage, cement, concrete, sanitary waste, industrial waste, oil, and other petroleum products, aggregate processing tailing, mineral salts, and thermal pollution. A hazardous materials management and spill prevention plan would be developed for construction that addresses storage, use, transportation, and disposal of hazardous materials, and an emergency response plan would be in place in the event of an accidental spill.
Water-3	Excavated material or construction materials would not be stockpiled or deposited near or on stream banks, lake shorelines, or other waterway perimeters unless protected from high water or storm runoff or encroachment upon the actual waterway itself.
Water-4	Wastewater discharge from any construction operations would not enter streams, waterways, or other surface waters without the appropriate permit(s).
Water-5	Equipment washing, storage of petroleum products, lubricants, solvents and hazardous materials, structure sites, and other disturbed areas would be located at least 100 feet, where practical, from rivers, streams (including ephemeral streams), ponds, lakes, and reservoirs. This includes construction vehicles and heavy equipment when parked overnight or longer.

Water-6	Right-of-way access roads would be located at least 100 feet, where practical, from rivers, ponds, lakes, and reservoirs.
Water-7	All stream crossings considered jurisdictional by USACE would be crossed by permit only. Where required, culverts of adequate size to accommodate the estimated peak flow of the stream would be installed. Disturbance of the stream banks and beds during construction would be minimized. Disturbed areas would be regarded and revegetated in accordance with mitigation measures listed for soil/vegetation resources.
Water-8	If the banks of ephemeral stream crossings are sufficiently high and steep that breaking them down for a crossing would cause excessive disturbance, culverts would be installed using the same measures as for culverts on perennial streams.
Water-9	Heavy equipment movement near streams and other surface waters would be minimized, to the extent practical.
Water-10	Narrow flood-prone areas would be spanned.
Geology and Minerals, Paleontology, and Soils	
Geo-1	Removed topsoil would be used for landscaping and as engineered fill, as appropriate, or stockpiled and re-spread subsequent to construction.
Geo-2	During construction, if any paleontological resources are discovered, work would cease within a 50-foot radius of the discovery. Any artifacts or fossils discovered would not be disturbed and Western would be notified of the discovery immediately.
Geo-3	Access roads would generally follow the contour of the land to the greatest extent practical rather than a straight line along the right-of-way where steep features would result in a higher erosion potential.
Geo-4	To the extent practical, excavated areas would be re-contoured so that large volumes of water would not collect and stand therein. Before being abandoned, the sides of excavations would be brought to stable slopes, giving a natural appearance, and revegetated. Waste soil piles would be shaped to provide a natural appearance.

Biological Resources	
Bio-1	Prior to construction, potentially-impacted wetland areas would be identified and marked. Wetland and riparian areas would be avoided to the extent practical by spanning of the wetlands and the placement of structures outside of wetland areas. If wetland or riparian areas are unavoidable, impacts would be minimized or mitigated. Jurisdictional waters that are impacted as a result of implementing the proposed project would be mitigated in accordance with USACE requirements.
Bio-2	Care would be used in preserving the natural landscape and vegetation. Construction operations would be conducted to prevent, to the extent practical, any unnecessary destruction, scarring, or defacing of the natural surroundings, vegetation, trees, and native shrubbery in the vicinity of the work. Vegetation would be replaced at landowner's request, providing mitigation complying with North American Electric Reliability Council (NERC) requirements.
Bio-3	A vegetation management plan will be developed to address the potential spread of noxious weeds during construction activities. This plan will contain strategies for prevention, detection, and control of noxious weeds. Example measures will include the washing of construction vehicles prior to use at construction work sites and revegetation with a native seed mix.
Bio-4	Upon completion of work, all non-agricultural disturbed areas and construction staging areas not needed for maintenance access would be re-graded so that all surfaces drain naturally, blend with the natural terrain, and are reseeded to blend with native vegetation with a seed mixture certified as free of noxious or invasive weeds. All destruction, scarring, damage, or defacing of the landscape resulting from construction would be repaired.
Bio-5	Construction staging areas would be located and arranged in a manner to preserve trees and vegetation to the maximum practicable extent. Unless otherwise agreed upon by the landowner, all storage and construction materials and debris would be removed from the construction staging areas once construction is complete, and the areas returned to original use or re-graded and seeded as for nonagricultural disturbed areas.
Bio-6	Construction staging areas would be located and arranged in a manner to preserve trees and vegetation to the maximum practicable extent. Unless otherwise agreed upon by the landowner, all storage and construction materials and debris would be removed from the construction staging areas once construction is complete, and the areas returned to original use or re-graded and seeded as for nonagricultural disturbed areas.

Bio-7	Native shrubs that would not interfere with access or the safe operation of the transmission line would be allowed to reestablish in the right-of-way. Areas with native shrubs that would be disturbed would be replanted with regionally-native species following the disturbance.
Bio-8	Trees and shrubs anticipated to be cleared, including those that are considered invasive species or noxious weeds shall be inventoried before cutting. The inventory shall record the location, number, and species of trees and shrubs. In windbreaks, shelterbelts, and other planted areas, trees or shrubs anticipated to be cleared, regardless of size, shall be inventoried for replacement. In native growth areas, trees anticipated to be cleared that are 1-inch diameter at breast height (dbh) or greater shall be inventoried for replacement, as well as all shrubs in the permanent ROW.
Bio-9	In native growth areas outside the permanent ROW, shrubs shall be cut flush with the surface of the ground, taking care to leave the naturally occurring seed bank and root stock intact. If soil disturbance is necessary, the native topsoil shall be preserved and replaced after construction is completed. Shrubs shall be allowed to regenerate naturally where native topsoil is preserved and replaced. Where native topsoil is not preserved and replaced, shrubs anticipated to be cleared shall be inventoried for replacement.
Bio-10	In native growth areas, trees and shrubs may be inventoried by actual count or by a sampling method that will properly represent the woody vegetation population. A sampling plan developed by the company, filed with the North Dakota Public Service Commission (NDPSC), and approved prior to the start of construction shall define the sampling method to be used for trees, for tall shrubs and for low shrubs. The data from the sample plots shall be extrapolated to the total acreage of the wooded area to be cleared to determine the species and quantity of trees and shrubs to be replaced.
Bio-11	Trees and shrubs shall be selectively cleared, leaving mature trees and shrubs intact where practical. The width of clear cuts through windbreaks, shelterbelts and all other wooded areas shall be limited to 50 feet or less unless otherwise approved by the NDPSC. If the area of trees or shrubs actually cleared differs from the area inventoried, the difference in number of trees and shrubs to be replaced shall be noted on the inventory.

Bio-12	Prior to replacement, documentation identifying the number and variety of trees removed as well as the mitigation plan for the proposed number, variety, type, location and date of replacement plantings shall be filed with the NDPSC for approval. Tree replacement shall be on a 2 to 1 basis with 2-year-old saplings. Shrub replacement shall be on a 2 to 1 basis with stem cuttings. Trees and shrubs shall be replaced by the same species or similar species, except in the case of invasive species or noxious weeds, suitable for North Dakota growing conditions as recommended by the North Dakota Forest Service.
Bio-13	Landowners shall be given the option of having replacement trees or shrubs planted off the right-of-way on the landowner's property or waiving that requirement in writing and allowing those replacement trees or shrubs to be planted at alternative locations.
Bio-14	At the conclusion of the project, documentation identifying the actual number, variety, type, location, and date of the replacement plantings shall be filed with the NDPSC. Tree and shrub replacements shall be inspected once a year for three years, on or about the anniversary of the plantings, and, on or shortly before October 1 of each year, a report shall be submitted to the Commission documenting the condition of replacement planting and any woodlands work completed. If after three years from the anniversary of the plantings the survival rate is less than 75 percent, the NDPSC may order additional planting(s).
Bio-15	An Avian Protection Plan (APP) would be developed to minimize impacts on nesting birds, as well as to minimize the electrocution and collision of migratory and resident bird species. The APP would include provisions for adequate distance between conductors and distances between conductors and grounded surfaces to minimize electrocution risk. The APP would identify timeframes for construction and routine maintenance to avoid the nesting period of breeding birds. It would also include methods for minimizing bird collisions during line routing as well as methods for minimizing collisions following construction. The APP would follow guidelines described at www.aplic.org. The APP would be provided to USFWS and the state wildlife agency for comment. A final copy of the APP would be provided to the applicable USFWS and state wildlife agency offices for their reference.
Bio-16	Holes drilled or excavated for pole placement or foundation construction and left unattended overnight would be marked and secured with temporary fencing to reduce the potential for livestock and wildlife to enter the holes, and for public safety.

Land Use	
Land-1	The minimum area necessary would be used for access roads during project construction.
Land-2	When practical, transmission structures would be located and designed to conform to the terrain. Leveling and benching of the structure sites would be the minimum necessary to allow structure assembly and erection.
Land-3	Transmission structures would be located, where practical, to span sensitive land uses. Where practical, construction access roads would be located to avoid sensitive conditions.
Land-4	The precise location of all structure sites, right-of-way, and other disturbed areas would be determined with landowners' or land management agencies' input.
Land-5	The movement of crews and equipment would be limited to the right-of-way and areas surveyed for cultural, historical, and biological resources, including access routes. To the extent practicable, the contractor would limit movement on the right-of-way to minimize damage to grazing land, crops, or property and would avoid marring the land.
Land-6	Where practical, construction activities would be scheduled during periods when agricultural activities would be minimally affected or the landowner would be compensated accordingly.
Land-7	Fences, gates, and similar improvements that are removed or damaged would be promptly repaired or replaced.
Land-8	Transmission structure design and placement would be selected to reduce potential conflicts with agricultural practices and to reduce the amount of land required for transmission lines.
Land-9	Right-of-way would be purchased through negotiations with each landowner affected by the proposed Project. Payment would be made of full value for crop damages or other property damage during construction or maintenance.

Land-10	When weather and ground conditions permit, all deep ruts that are hazardous to farming operations and equipment movement would be eliminated or compensation would be provided as an alternative if the landowner desires. Such ruts would be leveled, filled, and graded, or otherwise eliminated in an approved manner. Ruts, scars, and compacted soils from construction activities in productive hay or crop lands would be loosened and leveled by scarifying, harrowing, disking, or other appropriate methods. Damage to ditches, tile drains, terraces, roads, and other land features would be corrected. Land contours and facilities would be restored as nearly as practical to their original conditions.
Public Health and Safety	
PH-1	When appropriate, pilot vehicles would accompany the movement of heavy equipment. Traffic control barriers and warning devices would be used when appropriate.
PH-2	All necessary provisions would be made to conform to safety requirements for maintaining the flow of public traffic and avoiding congestion at critical locations. Construction operations would be conducted to offer the least possible obstruction and inconvenience to public traffic, such as by the use of pilot cars to accompany trucks with oversized loads and slow-moving vehicles, scheduling heavy equipment transport to avoid high traffic periods, and where feasible, use of existing rail facilities. Construction workers will be encouraged to carpool to the construction site.
PH-3	Design would include reasonable mitigation measures to reduce problems of induced currents into conductive objects within the right-of-way. Problems of induced currents during construction and operation would be resolved, to the mutual satisfaction of the parties involved.
PH-4	Complaints of radio or television interference generated by the transmission line would be investigated and appropriate mitigation measures would be implemented.
PH-5	Audible noise and electric and magnetic fields during construction and operation of the proposed Project would be addressed as necessary on a case-by-case basis.
PH-6	Transmission line materials would be designed to minimize corona. Tension would be maintained on all insulator assemblies to assure positive contact between insulators, thereby avoiding sparking. Caution would be exercised during construction to avoid nicking the conductor surface, which may provide points for corona to occur.

PH-7	The construction contractor would establish a health and safety program that incorporates Occupational Safety and Health Administration (OSHA) standards such as requirements for hearing protection, personal protective equipment, site access, chemical exposure limits, safe work practices, training program, and emergency procedures. The program would be reviewed with fire department personnel and emergency services personnel to reduce risk of construction and operation activities interfering with emergency response or evacuation plans and procedures.
PH-8	At the end of every work day, contractors would secure all construction areas to protect equipment and materials and discourage public access. Fueling of vehicles would be conducted in compliance with established procedures designed to minimize fire risks and fuel spills.
Visual Resources	
Vis-1	Structure types (designs) would be uniform, to the extent practical.
Vis-2	Transmission line materials would be designed to minimize corona. To reduce potential visual impacts at highway and trail crossings, structures would be placed at the maximum feasible distance from the crossing, within limits of structure design.
Noise	
Noise-1	An adequate buffer would be maintained around the proposed substation sites to minimize construction and operational noise impacts on area residents.
Noise-2	Power lines would be designed to minimize noise and other effects from energized conductors.
Noise-3	To avoid nuisance noise conditions, transmission line construction would be limited to daytime hours whenever practical.
Noise-4	To avoid nuisance conditions due to construction noise, all internal combustion engines used in connection with construction activity would be fitted with an approved muffler and spark arrester.

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Appendix B

Segment by Segment Descriptions of Alternatives

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Table 1: Route A Segments

Segment	Length (miles)	Description
AJ-1	3.7	Heads west out of AVS Substation in Mercer County along section line for three miles before turning north and following section line and crossing Basin's 345-kV transmission line.
AJ-2	36.7	Heads in northwest direction for approximately 1.2 miles to another section line. Travels approximately 13 miles due west, primarily along quarter-section line, before entering Dunn County. Once entering Dunn County, segment continues due west for another six miles before crossing ND State Highway 8. Continues west along quarter-section line for another 16.5 miles.
AJ-4	2.2	Travels northwest for approximately 2.2 miles to quarter-section line.
AJ-7	20.0	Heads west along quarter-section line for 5.4 miles, crosses ND State Highway 22. Heads southwest for 2.8 miles to another quarter-section line. Continues west along quarter-section line for approximately 6.4 miles, then extends to southwest before turning back to the west. Continues west and parallels section line for 2.3 miles, then shifts to southwest for one mile and crosses into McKenzie County. Segment then heads south.
AJ-10	2.0	Heads south and crosses WAPA 115-kV transmission line and ND State Highway 200. Heads west along section line while generally paralleling south side of ND State Highway 200 and Basin's 345-kV transmission line.
AJ-12	1.2	Heads west into Charlie Creek Substation while paralleling south side of ND State Highway 200 and Basin's 345-kV transmission line.
AJ-13	4.3	Crosses ND State Highway 200 and heads north for one mile before heading northwest.
AJ-14	10.5	Heads northwest, then extends to north and proceeds for approximately eight miles, generally paralleling to the east of U.S. Highway 85 along quarter-section line. Continues north for another mile.
AJ-17	1.1	Parallels east side of U.S. Highway 85 heading north.
AJ-18	1.0	Heads east-northeast for one mile.
AJ-19	5.3	Heads northeast for 1.8 miles, then crosses Little Missouri River. Continues to northeast for 0.4 mile before turning to northwest for approximately 0.8 mile. Proceeds 2.3 miles in general north direction.
AJ-21	12.7	Extends northwest for approximately five miles, then crosses U.S. Highway 85 and WAPA 230-kV transmission line. Continues to northwest for five miles, then heads north along quarter-section line for 2.5 miles.

AJ-27	13.7	Heads north along quarter-section line for 3.2 miles, crosses WAPA 230-kV transmission line and U.S. Highway 85 approximately three miles west of Watford City. Heads northwest for 10.5 miles.
AJ-30	1.4	Heads northwest for 1.4 miles.
AJ-31	6.0	Heads northwest for 6.0 miles.
AJ-32	3.9	Travels northwest for 0.4 miles and crosses U.S. Highway 85 and WAPA 230-kV transmission line. Continues to northwest for about one mile and turns north. Follows quarter-section line north for 2.4 miles.
AJ-34	8.5	Follows the quarter-section line north for approximately three miles, then parallels WAPA 230-kV transmission line located next to U.S. Highway 85 to northwest for approximately 2.5 miles. Crosses the Missouri River and enters Williams County shortly after leaving WAPA 230-kV transmission corridor and proceeds for another three miles in northwesterly direction.
AJ-36	2.1	Heads north, extends for approximately 0.5 mile, then angles to northeast for another 0.5 mile before crossing U.S. Highway 2. Extends north 0.5 mile before turning west for another 0.5 mile and terminating at site of proposed Judson Substation.
JN-1	1.9	Extends approximately 0.4 mile to the northwest and then 0.2 mile west before extending north for approximately 1.3 miles.
JN-3	6.4	Heads east-northeast for 1.5 miles, crosses MDU 115-kV transmission line, then turns to northeast for approximately three miles. Proceeds to the north along section line for 1.9 miles.
JN-4	7.5	Heads east and follows quarter-section line for three miles. Crosses a Basin 230-kV transmission line, then angles northeast for approximately 0.5 before turning to east. Extends east for approximately 1.6 miles, crosses U.S. Highway 2 and heads 1.4 miles due east. Turns and heads one mile northeast.
JN-6	12.9	Heads 3.1 miles northeast and then turns east. Follows quarter-section line to east for 9.8 miles and crosses MDU 115-kV transmission line.
JN-7	1.0	Heads north for one mile following quarter-section line.
JN-9	22.1	Heads 12.9 miles to east following quarter-section line. Heads approximately 1.5 miles to northeast, then heads 7.8 miles to east following quarter-section line.
JN-10	6.5	Turns north for 1.5 miles before crossing U.S. Highway 2. Continues north for two miles and crosses into Mountrail County. Continues north approximately 1.3 miles to Tande Substation. Extends north one mile and then west for approximately 0.6 miles before terminating at existing Neset Substation.

Table 2: Route B Segments

Segment	Length (miles)	Description
AJ-1	3.7	Heads west out of AVS Substation in Mercer County along section line for three miles before turning north and following section line and crossing Basin's 345-kV transmission line.
AJ-2	36.7	Heads in northwest direction for approximately 1.2 miles to another section line. Travels approximately 13 miles due west, primarily along quarter-section line, before entering Dunn County. Once entering Dunn County, segment continues due west for another six miles before crossing ND State Highway 8. Continues west along quarter-section line for another 16.5 miles.
AJ-5	2.0	Heads to the northwest for approximately two miles to a point representing a potential Killdeer Switching Station.
AJ-6**	1.2	Heads southwest for approximately 1.2 miles.
AJ-7**	20.0	Heads west along quarter-section line for 5.4 miles. Also crosses ND State Highway 22. Heads southwest for 2.8 miles to another quarter-section line. Continues west along quarter-section line for approximately 6.4 miles, then extends to southwest before turning back to the west. Continues west and parallels section line for 2.3 miles, then shifts to southwest for one mile and crosses into McKenzie County. Segment then heads south.
AJ-10**	2.0	Heads south and crosses WAPA 115-kV transmission line and ND State Highway 200. Heads west along section line while generally paralleling south side of ND State Highway 200 and Basin's 345-kV transmission line.
AJ-12**	1.2	Heads west into Charlie Creek Substation while paralleling south side of ND State Highway 200 and Basin's 345-kV transmission line.
AJ-8	9.4	Extends northwest for 7.1 miles before shifting to north-northwest. Proceeds north-northwest for approximately 2.3 miles and crosses ND State Highway 22, which in this area has been designated as part of the Killdeer Four Bears Scenic Byway.
AJ-20	16.2	Proceeds northwest one mile before turning north. Proceeds north along quarter-section line for 1.8 miles, then angles sharply to west-northwest for approximately 0.75 mile before proceeding northward for approximately four miles. Crosses Little Missouri River at this location and proceeds north for another mile before heading northeast for 2.7 miles. Proceeds 1.7 miles to northwest and enters McKenzie County. Continues northwest for 3.1 miles.
AJ-23	9.0	Heads west-northwest for 5.7 miles, then extends to north for 3.3 miles.

AJ-28	27.8	Heads northwest, crossing ND State Highway 23, and continues to northwest for nearly 11 miles. Proceeds due west along quarter-section line for 14.7 miles, crossing ND State Highway 1806. Heads northwest for 2.1 miles.
AJ-30	1.4	Heads northwest for 1.4 miles.
AJ-31	6.0	Heads northwest for 6.0 miles.
AJ-32	3.9	Travels northwest for 0.4 miles and crosses U.S. Highway 85 and WAPA 230-kV transmission line. Continues to northwest for about one mile and turns north. Follows quarter-section line north for 2.4 miles.
AJ-34	8.5	Follows the quarter-section line north for approximately three miles, then parallels WAPA 230-kV transmission line located next to U.S. Highway 85 to northwest for approximately 2.5 miles. Crosses the Missouri River and enters Williams County shortly after leaving WAPA 230-kV transmission corridor and proceeds for another three miles in northwesterly direction.
AJ-36	2.1	Heads north, extends for approximately 0.5 mile, then angles to northeast for another 0.5 mile before crossing U.S. Highway 2. Extends north 0.5 mile before turning west for another 0.5 mile and terminating at site of proposed Judson Substation.
JN-1	1.9	Extends approximately 0.4 mile to the northwest and then 0.2 mile west before extending north for approximately 1.3 miles.
JN-3	6.4	Heads east-northeast for 1.5 miles, crosses MDU 115-kV transmission line, then turns to northeast for approximately three miles. Proceeds to the north along section line for 1.9 miles.
JN-4	7.5	Heads east and follows quarter-section line for three miles. Crosses a Basin 230-kV transmission line, then angles northeast for approximately 0.5 before turning to east. Extends east for approximately 1.6 miles, crosses U.S. Highway 2 and heads 1.4 miles due east. Turns and heads one mile northeast.
JN-6	12.9	Heads 3.1 miles northeast and then turns east. Follows quarter-section line to east for 9.8 miles and crosses MDU 115-kV transmission line.
JN-7	1.0	Heads north for one mile following quarter-section line.
JN-9	22.1	Heads 12.9 miles to east following quarter-section line. Heads approximately 1.5 miles to northeast, then heads 7.8 miles to east following quarter-section line.
JN-10	6.5	Turns north for 1.5 miles before crossing U.S. Highway 2. Continues north for two miles and crosses into Mountrail County. Continues north approximately 1.3 miles to Tande Substation. Extends north for one mile and then west for approximately 0.6 miles before terminating at existing Neset Substation.

** segments identified as being able to provide a connection from the Killdeer Switchyard area to the Charlie Creek Substation

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Appendix C

Visual Simulations

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Before

After

Description of Photo Location:
47th LN NW
Looking North

Burns & McDonnell
SINCE 1898

Visual Simulation 1
AVS 345-kV Transmission Line
Basin Electric

Source: Trinity Animation, Inc.

Structure placements as shown are for photo simulation purposes only. Actual structure placement will be determined during detailed design and engineering of the route selected and approved.

Description of Photo Location:	Burns & McDonnell SINCE 1898	**Visual Simulation 2**
Lone Butte Looking West		**AVS 345-kV Transmission Line** **Basin Electric**

Source: Trinity Animation, Inc.

Structure placements as shown are for photo simulation purposes only. Actual structure placement will be determined during detailed design and engineering of the route selected and approved.

Before

After

Description of Photo Location:
Theodore Roosevelt National Park
Looking East

Burns & McDonnell SINCE 1898

Visual Simulation 3
AVS 345-kV Transmission Line
Basin Electric

Source: Trinity Animation, Inc.
Structure placements as shown are for photo simulation purposes only. Actual structure placement will be determined during detailed design and engineering of the route selected and approved.

Before

After

Description of Photo Location:
47th LN NW (Missouri River)
Looking Southeast

Visual Simulation 4
AVS 345-kV Transmission Line
Basin Electric

Source: Trinity Animation, Inc.
Structure placements as shown are for photo simulation purposes only. Actual structure placement will be determined during detailed design and engineering of the route selected and approved.

Before

After

Description of Photo Location:
State Highway 22
Looking North

Visual Simulation 5
AVS 345-kV Transmission Line
Basin Electric

Source: Trinity Animation, Inc.
Structure placements as shown are for photo simulation purposes only. Actual structure placement will be determined during detailed design and engineering of the route selected and approved.

Description of Photo Location:
State Highway 22
Looking Northeast

Visual Simulation 6
AVS 345-kV Transmission Line
Basin Electric

Source: Trinity Animation, Inc.
Structure placements as shown are for photo simulation purposes only. Actual structure placement will be determined during detailed design and engineering of the route selected and approved.

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Appendix D

Partial Listing of Wildlife and Fish Species Observed or Known to Occur near the Proposed Project

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APPENDIX D: Partial Listing of Wildlife and Fish Species Observed or Known to Occur near the Proposed Project

Scientific Name*	Common Name*
Mammals	
Sorex Cinereus	masked shrew
Myotis lucifugus	little brown myotis
Myotis septentrionalis	northern myotis
Myotis evotis	long-eared myotis
Lasionycteris noctivagans	silver-haired bat
Eptesicus fuscus	big brown bat
Lasiurus borealis	red bat
Lasiurus cinereus	hoary bat
Sylvilagus floridanus	eastern cottontail
Sylvilagus nuttallii	Nuttall's cottontail
Lepus townsendii	white-tailed jackrabbit
Eutamius minimus	least chipmunk
Sciurus niger	fox squirrel
Spermophilus tridecemlineatus	thirteen-lined ground squirrel
Spermophilus richardsonii	Richardson's ground squirrel
Spermophilus franklinii	Franklin's ground squirrel
Cynomys ludovicianus	black-tailed prairie dog
Thomomys talpoides	northern pocket gopher
Perognathus fasciatus	olive-backed pocket mouse
Castor canadensis	beaver
Peromyscus maniculatus	deer mouse
Peromyscus leucopus	white-footed mouse
Onychomys leucogaster	northern grasshopper mouse
Clethrionomys gapperi	southern red-backed vole
Microtus pennsylvanicus	meadow vole
Microtus ochrogaster	prairie vole
Ondatra zibethicus	muskrat
Rattus norvegius	Norway rat
Mus musculus	house mouse
Zapus hudsonius	meadow jumping mouse
Zapus princeps	western jumping mouse
Erethizon dorsatum	porcupine
Canis latrans	coyote
Vulpes vulpes	red fox
Procyon lotor	raccoon

Scientific Name*	Common Name*
Mustela nivalis	least weasel
Mustela frenata	long-tailed weasel
Mustela vison	mink
Taxidea taxus	badger
Mephitis mephitis	striped skunk
Lutra canadensis	river otter
Felis concolor	mountain lion
Felis rufus	bobcat
Cervus elaphus	elk
Odocoileus hemionus	mule Deer
Odocoileus virginianus	whitetail deer
Antilocapridae americana	pronghorn
Bison bison	bison
Ovis canadensis	bighorn sheep
Reptiles and Amphibians	
Scaphiopus bombifrons	plains spadefoot toad
Bufo woodhousei	Woodhouse's toad
Bufo cognatus	great plains toad
Bufo hemiosphrys	Canadian toad
Rana pipiens	northern leopard frog
Rana sylvatica	wood frog
Pseudacris triseriata	western chorus frog
Ambystoma tigrinum	tiger salamander
Phrynosoma douglassi	short-horned lizard
Sceloporus graciosus	sagebrush lizard
Chrysemys picta belli	western painted turtle
Chelydra serpentina	common snapping turtle
Thamnophis sirtalis	common garter snake
Thamnophis radix	plains garter snake
Opheodrys vernalis	smooth green snake
Heterdon nasicus	western hognose snake
Pituophis catenifer	bullsnake
Coluber constrictor	racer
Crotalus viridis	prairie rattlesnake
Birds	
Perdix perdix	gray partridge
Tympanuchus phasianellus	sharp-tailed grouse
Phasianus colchicus	ring-necked pheasant
Meleagris gallopavo	wild turkey

Scientific Name*	Common Name*
Zenaida macroura	mourning dove
Ardea herodias	great blue heron
Botaurus lentiginosus	American bittern
Nycticorax nycticorax	black-crowned night heron
Aechmophorus occidentalis	western grebe
Podiceps nigricollis	eared grebe
Grus canadensis	sandhill crane
Fulica americana	American coot
Charadrius melodus	piping plover
Charadrius vociferus	killdeer
Recurvirostra americana	American avocet
Phalaropus tricolor	Wilson's phalarope
Larus delawarensis	ring-billed gull
Sterna hirundo	common tern
Chlidonias niger	black tern
Sternula antillarum	least tern
Bartramia longicauda	upland sandpiper
Actitis macularia	spotted sandpiper
Catoptrophorus semipalmatus	willet
Limosa fedoa	marbled godwit
Tringa melanoleuca	greater yellowlegs
Branta canadensis	Canada goose
Aix sponsa	wood duck
Anas crecca	green-winged teal
Anas discors	blue-winged teal
Anas americana	American widgeon
Aythya valisineria	canvasback
Aythya americana	redhead
Anas strepera	gadwall
Anas platyrhynchos	mallard
Oxyura jamaicensis	ruddy duck
Anas clypeata	northern shoveler
Anas acuta	northern pintail
Tyrannus tyrannus	eastern kingbird
Tyrannus verticalis	western kingbird
Tachyceneta bicolor	tree swallow
Hirundo rustica	barn swallow
Progne subis	purple martin
Eremophila alpestris	horned lark

Scientific Name*	Common Name*
Parus atricapillus	black-capped chickadee
Sitta carolinensis	white-breasted nuthatch
Troglodytes aedon	house wren
Turdus migratorius	American robin
Sialia sialis	eastern bluebird
Lanius ludovicianus	loggerhead shrike
Toxostoma rufum	brown thrasher
Bombycilla cedrorum	cedar waxwing
Cyanocitta cristata	blue jay
Vireo gilvus	warbling vireo
Carduelis tristis	American goldfinch
Dendroica petechia	yellow warbler
Pheucticus melanocephalus	black-headed grosbeak
Spizella passerina	chipping sparrow
Sturnella neglecta	western meadowlark
Icterus galbula	northern oriole
Quiscalus quiscula	common grackle
Agelaius phoeniceus	red-winged blackbird
Cathartes aura	turkey vulture
Haliaeetus leucocephalus	bald eagle
Aquila chrysaetos	golden eagle
Circus cyaneus	northern harrier
Accipiter cooperii	cooper’s hawk
Buteo swainsoni	Swainson’s hawk
Buteo jamaicensis	red-tailed hawk
Falco columbarius	merlin
Falco sparverius	American kestrel
Falco mexicanus	prairie falcon
Asio otus	long-eared owl
Asio flammeus	short-eared owl
Bubo virginianus	great-horned owl
Athene cunicularia	burrowing owl
Otus asio	eastern screech owl
Fish	
Esox lucius	northern pike
Sander vitreus	walleye
Sander Canadensis	sauger
Perca flavescens	yellow perch
Etheostoma nigrum	johnny darter

Scientific Name*	Common Name*
Micropterus salmoides	largemouth bass
Micropterus dolomieu	smallmouth bass
Lepomis macrochirus	bluegill
Pomoxis nigromaculatus	black crappie
Pomoxis annularis	white crappie
Morone Chrysops	white bass
Aplodinotus grunniens	freshwater drum
Ictalurus punctatus	channel catfish
Ameiurus melas	black bullhead
Polyodon spathula	paddlefish
Lepisosteus platostomus	shortnose gar
Oncorhynchus mykiss	rainbow trout
Salmo trutta	brown trout
Salvelinus namaycush	lake trout
Oncorhynchus tshawytscha	chinook salmon
Lota lota	burbot
Catostomus commersonii	white sucker
Ictiobus cyprinellus	bigmouth buffalo
Moxostoma macrolepidotum	shorthead redhorse
Cyprinus carpio	common carp
Pimephales promelas	fathead minnow
Semotilus atromaculatus	creek chub
Notemigonus crysoleucas	golden shiner
Osmerus mordax	rainbow smelt

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Appendix E

U.S. Forest Service Sensitive Wildlife Species

SENSITIVE SPECIES LIST Forest Service, Region 1 Februrary 2011	States Where Sensitive (a)				State Ranking				Forests Where Species is Known (K) or Suspected (S) to Occur													Comments
	MT	**ID**	**ND**	**SD**	MT	ID	ND	SD	B/D	BRT	CLW	CUS	DPG	FLAT	GAL	HEL	IPNF	KOOT	L&C	LOLO	NEZ	
BIRDS																						
American peregrine falcon (*Falco peregrinus anatum*)	X	X	X	X	S3	S2B	S1	SX	K	K		K		K	K	K	K	K	K	K	K	Federally delisted on August 25, 1999. USFWS monitoring of status for 5-year intervals after delisting. Species of Concern in MT, State Endangered in SD. ND CWCS Level 3 spp.
Baird's sparrow (*Ammodramus bairdii)*			X	X	S3B		SU	S2B SZN				K	K									MT CFWCS as a Priority 2 spp. Listed in SD CWCS, and as a Level 1 species in ND CWCS.
Bald eagle (*Haliaeetus leucocephalus*)	X	X	X	X	S3	S3B S4N	S1	S1B S2N	K	K	K	K	K	K	K	K	K	K	K	K	K	Federally delisted on June 28, 2007. USFWS monitoring for 5-year intervals after delisting. State Threatened in SD. ND CWCS Level 1 spp.
Black-backed woodpecker (*Picoides arcticus*)	X	X			S3	S3		S3	K	K	K	K		K	K	K	K	K	K	K	K	Species of Concern in MT, and in MT CFWCS as a Priority 2 spp. Listed in SD CWCS, and as a Level 1 species in ND CWCS.
Black swift *(Cypseloides niger)*		X			S1B	S1B											K				S	Colonial nester with few known nesting sites. IPNF has known nesting sites.
Blue-gray gnatcatcher (*Polioptila caerulea)*	X				S2B			S1B SZN				K										Species of Concern in MT, and in MT CFWCS as a Priority 2 spp. South end of Priors Mtns. in MT.
Burrowing owl (*Athene cunicularia)*	X		X	X	S3B	S2B	SU	S3 S4B SZN				K	K						S			Species of Concern in MT, and in MT CFWCS as a Priority 1 spp. Listed in SD CWCS, and as a Level 2 species in ND CWCS.
Common loon *(Gavia immer)*	X	X			S3B	S1B S2N	S4	S1B S3						K			K	K		K	S	Species of Concern in MT, and in MT CFWCS as a Priority 1 spp. ID CWCS spp.
Flammulated owl *(Otus flammeolus)*	X	X			S3B	S3B		S1B SZN	K	K	K			K	S	K	K	K	S	K	K	Species of Concern in MT, and in MT CFWCS as a Priority 1 spp. ID CWCS spp.
Greater prairie chicken *(Tympanuchus cupido)*			X		SX		S2	S4					K									Listed in SD CWCS, and as a ND CWCS Level 2 spp.

SENSITIVE SPECIES LIST Forest Service, Region 1 Februrary 2011	States Where Sensitive (a)				State Ranking				Forests Where Species is Known (K) or Suspected (S) to Occur													Comments
	MT	**ID**	**ND**	**SD**	MT	ID	ND	SD	B/D	BRT	CLW	CUS	DPG	FLAT	GAL	HEL	IPNF	KOOT	L&C	LOLO	NEZ	
BIRDS continued																						
Greater sage-grouse *(Centrocercus urophasianus)*	X		X	X	S2	S2	SU	S2	K			S	K						S			Species of Concern in MT, and in MT CFWCS as a Priority 1 spp. Listed in SD CWCS, and as a Level 2 species in ND CWCS. No breeding sites on BDNF.
Harlequin duck *(Histrionicus histrionicus)*	X	X			S2B	S1B			K		K	K		K	K	S	K	K	K	K	K	Species of Concern in MT, and in MT CFWCS as a Priority 1 spp. ID CWCS spp.
Loggerhead shrike *(Lanius ludovicianus)*			X	X	S3B		SU	S3				K	K									Species of Concern in MT, and in MT CFWCS as a Priority 2 spp. ND CWCS Level 2 spp.
Long-billed curlew *(Numenius americanus)*			X	X	S3B	S2B	S2	S3B SZN				K	K								S	Species of Concern in MT, and in MT CFWCS as a Priority 1 spp. SD CWCS
Mountain quail *(Oreortyx pictus)*		X				S1															K	ID CWCS spp.
Pygmy nuthatch *(Sitta pygmaea)*		X			S4	S2		S2 S3			K						K				K	MT CFWCS Priority 2 spp. ID CWCS spp.
Sprague's pipit *(Anthus spragueii)*			X	X	S3B		S3	S2B SZN					K									Species of Concern in MT, and in MT CFWCS as a Priority 2 spp. Listed in SD CWCS, and as a Level 1 species in ND CWCS.
Trumpeter swan *(Cygnus buccinator)*	X				S3	S1B S2N	SX	S3	K						K							Species of Concern in MT, and in MT CFWCS as a Priority 2 spp. Listed in
White-headed woodpecker *(Picoides albolarvatus)*		X			SNA	S2															K	ID CWCS spp.
MAMMALS																						
Black-tailed prairie dog *(Cynomys ludovicianus)*	X		X	X	S3		SU	S4				K	K									Species of Concern in MT, and in MT CFWCS as a Priority 1 spp. ND CWCS
Bighorn sheep *(Ovis canadensis)*	X	X	X	X	S4	S1	S2		K	K		K	K	K	K	K		K	K	K	K	MT CFWCS as a Priority 3 spp.

SENSITIVE SPECIES LIST Forest Service, Region 1 Februrary 2011	States Where Sensitive (a)				State Ranking				Forests Where Species is Known (K) or Suspected (S) to Occur													Comments
	MT	**ID**	**ND**	**SD**	MT	ID	ND	SD	B/D	BRT	CLW	CUS	DPG	FLAT	GAL	HEL	IPNF	KOOT	L&C	LOLO	NEZ	
MAMMALS continued																						
Fisher *(Martes pennanti)*	X	X			S3	S1	S2		K	K	K			K		K	K	K	K	K	K	Species of Concern in MT, and in MT CFWCS as a Priority 2 spp. ID CWCS spp.
Fringed myotis *(Myotis thysanodes)*		X			S3	S2		S2	K		K	K	K			K	K	K	K		K	Sub Species of Concern does not occur on FS in SD.
Gray wolf *(Canis lupus)*	X	X			S4	S2			K	K	K	K	K	K	K	K	K	K	K	K	K	Delisted in Idaho and Montana in 2011. However, wolves remain federally listed in North and South Dakota.
Great Basin pocket mouse *(Perognathus parvus)*	X				S2 S3				S													Species of Concern in MT, and in MT CFWCS as a Priority 1 spp. At periphery of range on BDNF.
Long-eared myotis *(Myotis evotis)*				X	S4		SU	S1	K	K	K	K	K	K	K	K	K	K	K	K	K	MT CFWCS Priority 3 spp. ND CWCS Level 3 spp. Limited distribution, but does occur on NFS lands based on survey results.
Long-legged myotis *(Myotis volans)*				X	S4		SU	S5	K	K	K	K	K	K	K	K	K	K	K	K	K	MT CFWCS Priority 3 spp. ND CWCS Level 3 spp. Limited distribution, but does occur on NFS lands based on
North American wolverine *(Gulo gulo luscus)*	X	X			S3	S2			K	K	K	K		K	K	K	K	K	K	K	K	Species of Concern in MT, and in MT CFWCS as a Priority 2 spp. ID CWCS spp.
Northern bog lemming *(Synaptomys borealis)*	X	X			S2	S1			K	K				K		S	K	K	K	K		Species of Concern in MT, and in MT CFWCS as a Priority 1 spp.
Pallid bat *(Antrozous pallidus)*	X				S2	S1						K										Species of Concern in MT, and in MT CFWCS as a Priority 1 spp.
Pygmy rabbit *(Brachylagus idahoensis)*	X				S3	S2			K													Species of Concern in MT, and in MT CFWCS as a Priority 1 spp.
Spotted bat *(Euderma maculatum)*	X				S2	S3			K			K										Species of Concern in MT, and in MT CFWCS as a Priority 1 spp.
Towsend's big-eared bat *(Corynorhinus townsendii)*	X	X		X	S2	S3		S2 S3	K	K	K	K	K	K	K	K	K	K	K	K	K	Species of Concern in MT, and in MT CFWCS as a Priority 1 spp. SD CWCS spp. ID CWCS spp. Occurs on Nez

SENSITIVE SPECIES LIST Forest Service, Region 1 Februrary 2011	States Where Sensitive (a)				State Ranking				Forests Where Species is Known (K) or Suspected (S) to Occur													Comments
	MT	**ID**	**ND**	**SD**	MT	ID	ND	SD	B/D	BRT	CLW	CUS	DPG	FLAT	GAL	HEL	IPNF	KOOT	L&C	LOLO	NEZ	
White-tailed prairie dog *(Cynomys leucurus)*	X				S1							K										Species of Concern in MT, and in MT CFWCS as a Priority 1 spp.
AMPHIBIANS																						
Coeur d'Alene salamander (*Plethodon idahoensis)*	X	X			S2	S2				K	K						K	K		K	K	Species of Concern in MT, and in MT CFWCS as a Priority 1 spp. ID CWCS spp.
Great Plains toad *(Bufo cognatus)*	X				S2		SU	S5				K										MT CFWCS Priority 2 spp. Probable reduction in occurance/range.
Northern leopard frog *(Rana pipiens)*	X				S1-w S4-e	S2	SU	S5		S		K		S	K	K		K	K	S		Species of Concern in MT, and in MT CFWCS as a Priority 1 spp.
Plains spadefoot (*Spea bombifrons*)	X				S3		SU	S5				S				K						MT CFWCS Priority 2 spp. ND CWCS Level 1 spp. Probable reduction in occurance/range.
Western toad *(Bufo boreas)*	X	X			S2	S4			K	K	K	K		K	K	K	K	K	K	K	K	Species of Concern in MT, and in MT CFWCS as a Priority 1 spp. Loss of breeding sites is ongoing.
REPTILES																						
Greater short-horned lizard (*Phrynosoma hernandesi*)	X				S3		SU	S2				K							S			Species of Concern in MT, and in MT CFWCS as a Priority 2 spp. ND CWCS Level 2 spp.
Milk snake *(Lampropeltis triangulum)*	X				S2			S4				K										Species of Concern in MT, and in MT CFWCS as a Priority 1 spp.
Ringneck snake *(Diadophis Punctatus)*		X				S2		S2			K										S	ID CWCS spp. Unconfirmed occurance on NFS lands on Nez Perce NF.
Western hognose snake *(Heterodon nasicus)*	X				S2		SU	S5				K										Species of Concern in MT, and in MT CFWCS as a Priority 1 spp. ND CWCS
INSECTS																						
Arogos skipper *(Atrytone arogos iowa)*			X		SNR		SU	S2					K									

SENSITIVE SPECIES LIST Forest Service, Region 1 Februrary 2011	States Where Sensitive (a)				State Ranking				Forests Where Species is Known (K) or Suspected (S) to Occur													Comments
	MT	**ID**	**ND**	**SD**	MT	ID	ND	SD	B/D	BRT	CLW	CUS	DPG	FLAT	GAL	HEL	IPNF	KOOT	L&C	LOLO	NEZ	
INSECTS continued																						
Broad-winged skipper *(Poanes viator)*			X				S2	S2					K									
Dakota skipper (*Hesperia dacotae)*			X	X			S2	S2					K									
Dion skipper *(Euphyes dion)*			X				S1						K									
Mulberry wing *(poanes massasoit)*			X				S2	S1					K									
Ottoe skipper *(Hesperia ottoe)*			X	X	S2-w S3-e		SU	S2					K									Species of Concern in MT. SD CWCS spp.
Powesheik skipper *(Oarisma powesheik)*			X	X			SU	S2					K									SD CWCS spp.
Regal fritillary *(Speyeria idalia)*			X				S2	S3					K									SD CWCS spp.
Tawny crescent *(Phyciodes batessi)*			X		S2-w S3-e		S3	S2					K									

(a) Species are listed as Sensitive by State. The State where a species is listed as Sensitive is indicated by an "X" in the State/species column. A species iedntified as Sensitive within a State, will be considered as Sensitive on all Units within the state where it occurs, unless described otherwise.

(b) National Forest (Grasslands) where a species is known or suspected to occur, within States where a species is listed as Sensitive, are identified by shading and either a known "K" or suspected "S" in the Forest/species column.

CWCS = Comprehensive Wildlife Conservation Strategy

CFWCS = Comprehensive Fish and Wildlife Conservation Strategy

SD bird species may have two state ranks, one for breeding (S#B) and one for nonbreeding seasons (S#N)

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Appendix F

Special Status Vegetation and Survey Requirements

1. Contractor Qualifications

a. A degree in Botany or Plant Ecology, or thoroughly demonstrated botanical experience and knowledge to accurately inventory and document plant species and vegetation conditions.

b. Demonstrated skill in plant identification, use of plant taxonomic keys, and rare plant surveys. Knowledge of flora and habitat types of the northern Great Plains.

c. Ability to analyze the effects of a proposed project on botanical resources through knowledge of ecological theory and plant community dynamics in response to disturbance.

d. Ability to prepare technical reports and apply Forest Service procedures and directives in the preparation of BEs.

e. Ability to apply Standards and Guidelines identified in the Dakota Prairie Grasslands Land and Resource Management Plan (2001) to proposed projects.

2. Survey Protocol

Sensitive plant surveys must be conducted in a manner that provides a high probability of locating any sensitive or watch plant species that may be present. The survey botanist must obtain an accurate map of the site and proposed areas of disturbance from the permit applicant, and the field site must be accurately marked or flagged prior to the survey. All habitat likely to be disturbed by the proposed project must be systematically surveyed. Refer to survey intensity levels in the *Field Guide for Plant Survey* manual, and the article *Rare Plant Surveys: Techniques for Impact Assessment*, by James R. Nelson, from the Natural Areas Journal (Vol. 5, No. 3).

The following guidelines must be followed when conducting plant surveys.

a. Sensitive plant surveys must be conducted when sensitive species are most identifiable, such as during periods of flowering or phenological stages that facilitate their discovery. Compromises inevitably occur because there are fourteen sensitive plant species with different periods of growth and flowering. However, survey periods of May 15 through September 15 span a period of active growth or identifiable litter for most sensitive plant species on the LMNG. These dates encompass the acceptable survey season unless otherwise specified by the Forest Service.

b. Survey botanists must be familiar with characteristics of the twenty-four watch species listed for the LMNG and document any occurrences in the same manner as sensitive plant species. A determination of effects for watch plant species is not required within a BE unless one of the species is encountered.

c. Sensitive plant surveys must be discontinued during adverse weather conditions such as drought or plant-killing frost, and reasonable effort must be given to revisiting sites at a more appropriate time when these situations occur. If in doubt, the Forest Service botanist should be contacted.

d. Developments such as roadways and utility lines must be surveyed a minimum distance of 125 feet on each side of the centerline of disturbance, while a minimum of ten acres must be surveyed around well sites, stock tanks, or similar points of development. The total area of survey is referenced as the ***project area***.

e. If a sensitive or watch plant species is discovered within an area that would be adversely affected by the project, the surveyor must contact the Forest Service within seven days. If the occurrence is not reported within seven days it could result in delaying the concurrence of the survey and BE until the next year's survey season.

If a sensitive plant discovery is made within an area that would be directly disturbed by the project, there is a high potential that the project will be redesigned to alleviate adverse effects to the sensitive/watch plant species. In such cases, it may be appropriate for the contract botanist to survey potential alternate routes or site locations. However, it is the contractor's responsibility to coordinate project location adjustments with Forest Service personal and company representatives requesting the survey to ensure that alternate project locations will be acceptable.

f. The contractor must complete a *Sensitive/Watch Plant Population Survey Form* whenever a sensitive or watch plant species is discovered. Copies of the completed form must be submitted to the Forest Service botanist and the North Dakota Natural Heritage Program. Include a topographic map (maximum scale of 1:24,000) that delineates the plant population. Photographs and any additional notes on the occurrence should also be included.

g. Any collections of sensitive or watch plant species must be approved in a Forest Service permit. 36CFR261.9(d) prohibits "removing any plant that is classified as a threatened, endangered, sensitive, rare, or unique species", with a fine in ND of $100. Details of collection will be outlined in the permit that can be obtained at a local Forest Service office. However, it is important to evaluate the effect of collecting on potentially rare or small plant populations. If in doubt, collect the smallest quantities possible and/or only portions of individual plants. If there is a question about the possible identification of a sensitive species, the surveyor should contact the local Forest Service Botanist.

The collection of any plant species for personal use (not for resale) and not covered under 36CFR261.9(d) also requires a Forest Service permit,. A Forest Products Free Use Permit to collect plant specimens for personal use or species identification can be obtained at a local Forest Service office, free of charge.

h. A *Site and Setting Field Form* and *Plant Survey Form* must be completed for every proposed project for which a field survey is conducted. Latitude and longitude in degrees, minutes, and seconds, in **NAD83 datum**, must be recorded for each site. The datum used, including anything other than NAD83, must be recorded.

g.

h. Prominent plant communities across the survey site must be verbally (written description) or graphically identified with respect to their location of occurrence within the area of the proposed action. Habitat locations with the potential to support sensitive plant populations must be verbally or graphically identified. The occurrence of any invasive plant species within the project area must also be accurately identified.

i.

j. Invasive species are defined as non-native species that have the capacity to displace native species. On the LMNG, invasive species include those on the North Dakota noxious weed list such as leafy spurge and Canada thistle, as well as palatable species such as sweet clover, crested wheatgrass, Kentucky and Canada bluegrass, and smooth brome. See the attached list of invasive plant species that must be identified if occurring on a project site.

i. An assessment must be conducted for cumulative affects to vegetation resources. It is suggested that a 0.5 mile radius extending from all areas of likely disturbance associated with the project be used as the ***analysis area*** for cumulative effects. However, other areas or distances could be used if they logically represent past, present, and reasonably foreseeable future affects surrounding the project area.

An intensive ground survey of the analysis area is not expected, but the amount and type of active and reclaimed roads, well sites, utility lines, and other developments, must be estimated within the analysis area. These estimates are derived from a combination of field observations during survey work, aerial photographs, USGS quadrangle maps, and numerous GIS layers provided by the Forest Service that depict vegetation types and infrastructure developments. Observed plant compositions with respect to these developments must be discussed.

j. All activities on National Forest System lands are required to conform to the Federal Code of Regulations and applicable laws. It is the responsibility of surveyors to be aware of any special orders for the Dakota Prairie Grasslands or individual Ranger Districts in effect. Contact the local Ranger District for information on special orders or to obtain any required permits.

Off-road permits and collection permits must be retained at all times while on National Forest System lands.

3. <u>Biological Evaluation / Report Protocol</u>

The following information must be included in the BE and/or any forms specified for completion.

a. The BE must have a date and contain the name, address, and contact information of the company submitting the report. The project name should be identified on the cover page and the beginning of the BE/report. If the BE/report is acting on the behalf of another company for a lease or permit application with the Forest Service, the applicants name and contact information must be included.

b. The proposed action must be identified, i.e. construction of a well pad and 1.1 miles of access road, or upgrading of an existing two-track road to serve as the access road, etc. This includes the manner of action, i.e. a trackhoe will be used to dig a 6 feet wide trench or a dozer will blade 10 acres to remove the A soil layer and level the site. A full description of the action is required for adequate environmental effects analysis. Without this description it may be assumed there is no knowledge of the proposed action and the effects analysis is incomplete.

c. A legal description by Section, Quarter Section, Township, and Range, of the proposed project location. Include a legible topographic view of the project area with a scale no smaller than 1:24,000. We suggest providing larger scale maps and aerial or orthoquad maps of the project area.

d. The date of the field survey and name of the botanist(s) must be identified, along with the type of survey methodology utilized. The Site and Setting Survey Form must be included in the BE/report or attached as an appendix.

e. The current list of LMNG Sensitive and Watch plant species and a brief description of the preferred habitat for each sensitive species must be included in the BE/report or appendix.

f A site-specific narrative description of the habitat types and existing vegetation communities found within the survey area. The description must be logical and cohesive, such that the reader is provided with an accurate picture of vegetation composition and conditions within and around the project area. Dominant and co-dominant species by life form within distinct community types must be identified. Aspects, topographic positions, and dominant soil textures should be included in these descriptions.

g A complete floristic list of all plant species identified during the field survey must be provided. A field checklist is acceptable. A completed copy of the *Sensitive/Watch Plant Population Survey Form* is required if any new populations are discovered. Unoccupied but apparently suitable habitat for sensitive plant species must be identified with respect to its location within the project area.

h The occurrence and extent of invasive species within the project area must be discussed. It is particularly important to identify areas where project disturbances are likely to intersect with invasive plant communities. Maps of invasive species distributions across the project area are very helpful.

i Determination of Effects: Effects to sensitive plant species fall into the following categories. Contractors must utilize these categorical statements rather than paraphrase.

1. No impact
2. May impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.

3. Will impact individuals or habitat with a consequence that the action may contribute to a trend towards federal listing or cause a loss of viability to the population or species.
4. Beneficial impact.

See Section 4 for discussion on determinations.

A summary table of determinations should be included in the BE/report

The BE must provide a logical context for the determination of effects, considering ecological principles of habitat fragmentation, population dynamics, and viability. The absence of sensitive plant species in the project area does not necessarily equate to no impact. If suitable but unoccupied habitat exists for a particular sensitive plant species that is likely to be disturbed by the project, the determination will usually fall under Category 2 due to decreased habitat for dispersal. However, rationale for Category 2 should also include reasons why the project would not contribute to federal listing. For example, there may be documented populations in other areas of the LMNG that would not be affected, habitat within the project area is marginal, suitable habitat that would not be disturbed is extensive immediately adjacent to the project area, etc.

Direct and indirect effects of the proposed project on native plant communities and habitats must also be addressed in the BE. Examples of these effects include direct disturbance, habitat fragmentation, invasive plant expansion, invasive weed control treatments, decreased plant diversity, and loss of unique habitat unlikely to be reclaimable to pre-disturbance conditions.

An analysis of the cumulative effects must be addressed with respect to past, present, and reasonably foreseeable future effects. This entails an analysis of land use practices on the apparent condition and character of native prairie communities across the analysis area. A one-half mile radius around the project site should be used unless a more logical and defendable analysis area can be identified. Recorded field observations from the *Site and Setting Form* will include the presence and present vegetative characteristics of various active or reclaimed developments and other land use influences such as livestock grazing, agricultural lands, or invasive weed occurrences. GIS layers will be helpful in quantifying the land area that has been influenced by these activities, as well as the potential contribution of the proposed project and its effects. Contractors may not have complete knowledge or access to data sets of past, current, and future land use practices, but they should carry the analysis as far as possible from observations within the analysis area and data sets to which they have access.

j. Design Criteria: The report should include suggested design criteria to alleviate adverse effects and avoid unnecessary disturbances to native plant communities. Examples include recommendations for avoiding impacts to certain plant communities or species, or incorporating the control of invasive species within the scope of project development and design.

k. Bibliography of literature or references cited. Include only those cited in the text of the report.

4. BE Determination Language

a. *No Impact.*

A determination of "No Impact" for sensitive species occurs when a project or activity will have no environmental effects on habitat, individuals, a population or a species. If any "effects" are listed for a sensitive species in the NEPA document, then a "No Impact" conclusion is not appropriate.

b. *May Impact Individuals Or Habitat, But Will Not Likely Contribute To A Trend Towards Federal Listing Or Cause a Loss of Viability To the Population or Species.*

Impacting of individuals or habitats of sensitive species should be given careful consideration. The loss of populations or metapopulations is often the basis for eventual species extinction. Rationale should be provided regarding why the effects would not contribute to federal listing.

c. *Will Impact Individuals Or Habitat With A Consequence That The Action Will Contribute To A Trend Towards Federal Listing Or Cause a Loss of Viability To the Population or Species.*

Loss of individuals or habitat can be considered significant when the potential effect may contribute to a trend toward federal listing. The loss of individuals is particularly serious when there are few populations and/or few individuals within populations. For these situations, any effects to the species may lead to a loss of viability and contribute towards federal listing.

Projects or activities that adversely affect many individuals of a species with limited population numbers, or even a few individuals with a limited number of small populations should probably receive this conclusion.

d. *Beneficial Impact.*

Projects or activities that are designed or happen to benefit sensitive species should receive this conclusion.

Sensitive Species

NRCS Code	Scientific Name	Common Name	Conserv. Ranking	Documented Habitat on the LMNG
CHSU2	*Chenopodium subglabrum*	smooth goosefoot	G2G4/S1	Sandbars , terraces, and dune complexes along rivers and creeks. Exposed sandy substrates in uplands, blowouts, outcrops, colluvium, etc.
COPA3	*Collinsia parviflora*	blue lips	G5/S2	Woody understories, including green ash/elm draws, Rocky Mountain juniper, mesic shrub communities, and occasional xeric shrub communities.
CRTO4	*Cryptantha torreyana*	Torrey's cryptantha	G5/S1	Dry plains, rock outcrops, escarpments, pine slopes.
ERCE2	*Eriogonum cernuum*	nodding buckwheat	G5/S1	Exposed sand substrates with low plant cover in grasslands, hillsides, sandstone outcrops.
ERVI14	*Eriogonum visheri*	Dakota buckwheat	G3/S2S3	Relatively exposed clay/silt substrates with low plant cover such as outwash zones around eroding buttes, saddles, steep convex slopes, erosional breaks on prairie slopes. Occasional populations among dense saltgrass communities.
ESMI3	*Escobaria missouriensis*	Missouri foxtail cactus	G5/SNR	Prairie slopes and plains, stony to loamy to clayey short-grass to mixed-grass prairies. Also reported in woodlands of ponderosa pine or Quercus spp.
LEMO4	*Leucocrinum montanum*	sand lily	G5/S2	Generally shortgrass communities with fine textured substrates but also found in crested wheatgrass communities. Reported from open coniferous woodlands and hillsides, sagebrush scrub, and sandy flats, but common name seems to be a misnomer. ,..
MEPU3	*Mentzelia pumila*	dwarf mentzelia	G4/S1	Scoria exposures and colluvium with low plant cover. Also reported on slopes and sandy plains; occasionally on hard clays and rocky soils.
PHAL3	*Phlox alyssifolia*	alyssum-leaved phlox	G5/S1S2	Sandy or gravelly soil on and around Bullion Butte. Also reported on clay banks and limestone ridges of open prairie.
PIFL2	*Pinus flexillis*	limber pine	G5/S1	Semi-arid exposed rocky ridges and foothills in the Limber Pines RNA, likely of native-American origin.
POAC5	*Populus x acuminata*	lanceleaf cottonwood	HYB/S2	Mesic woody draws, often with springs/seeps, occasional near springs on open hillsides. Floodplains and stream banks.
SPAI	*Sporobolus airoides*	alkali sacaton	G5/S2	Secondary succession on clay outwash where tolerant of saline conditions, also on dry to moist sandy or gravelly soil.
TOHO	*Townsendia hookeri*	Hooker's Townsendia	G5/S1	Low to moderate plant cover on dry plains, hillsides, gravelly benches and weathered scoria, but often clay matrix subsoil.
TOEX2	*Townsendia exscapa*	Easter daisy	G5/SNR	Dry plains and hillsides, often with loamy or increased soil development and increased pant cover relative to T. hookeri.

Watch Species

NRCS Code	Scientific Name	Common Name	Conservation Ranking
AGEX	*Agrostis exarata*	spike bentgrass	G5/S1
ASAU4	*Astragalus australis* *(Astragalus aboriginum)*	Indian milkvetch	G5/S2S3
ASCR3	*Astragalus drummondii*	Drummond's milkvetch	G5/S1
ASVE5	*Astragalus vexilliflexus*	bentflower milkvetch	G4/S3
EPPY4	*Epilobium pygmaeum* [*Boisduvalia glabella*]	smooth spike-primrose	G5/S1S2
VRCA5	*Bromus carinatus*	mountain brome	G5/S1
CASI12	*Carex siccata* (*Carex feonea)*	dry spike sedge	G5/SNR
CASCS8	*Carex scirpoidea* (*Carex scirpiformi)*	bulrush sedge	G5/S1S2
CLCOT	*Clematis Columbiana var. tenuiloba* (*Clematis tenuiloba)*	rock clematis	G5?T4?/S1
ERCI4	*Erigeron divergens*	spreading fleabane	G5/S1
ERRA2	*Erigeron radicatus*	taproot fleabane	G3G4/S1
FRPU2	*Fritillaria pudica*	yellow fritillary	G5/SH
MYAPM	*Myosurus apetalus* var. *montanus*	bristly mousetail	G5T3T5/S1
OELA	*Oenothera laciniata*	cutleaf evening primrose	G5/SA?
ORLUL2	*Orobanche ludoviciana ssp. Ludoviciana* *(Orobanche multiflora)*	Louisiana broomrape	G5/S1
OXSE	*Oxytropis sericea*	white locoweed	G5/S1
PHPA29	*Phemeranthus parviflorus* (*Talinum parviflorum*)	prairie fameflower	G5/S2
PODI	*Potamogeton diversifolius*	pondweed	G5/S2S3
PODI2	*Potentilla diversifolia*	varileaf potentilla	G5/S1
POJA2	*Populus x jackii*	Balm-of-Gilead	GNA/SNR
SITR3	*Sibbaldiopsis tridentata* (*Potentilla tridentata)*	shrubby fivefingers	G5/S1
RACA4	*Ranunculus cardiophyllus*	heartleaf buttercup	G4 S1
ROCA	*Rorippa calycina* persistent	persistent sepal yellowcress	G3/SH
SMEC	*Smilax ecirrhata*	upright carrionflower	G?/S1S2

SENSITIVE/WATCH PLANT POPULATION SURVEY FORM

DATE OF SURVEY: ____/____/____ OBSERVER(S): ______________________________

LOCATION/POSITION TITLE (Forest/District of observer(s)): ______________________________

TAXONOMY: FAMILY: ____________________ SCIENTIFIC NAME: ______________________________

LOCATION (**ATTACH COPY OF PERTINENT TOPOGRAPHIC MAP SECTION, WITH POPULATION LOCATIONS):

COUNTY: ______________________________ USGS QUAD: ______________________________

TOWNSHIP: __________ RANGE: __________ SEC.(S): __________ 1/4 SEC.: ____________________

LATITUDE:______________________________ LONGITUDE:______________________________
(degrees, minutes, seconds, with NAD83 Datum)

OR UTM at Zone 13 Northing ______________________________ Easting ______________________________

ELEVATION (at population center (and range if known)): ______________________________

NATIONAL FOREST: ______LMNG____________________ RANGER DISTRICT: ______________________________

LAND OWNERSHIP/MANAGEMENT (IF NOT FS):______________________________

SITE NAME (usually based on an adjacent landmark): ______________________________

HABITAT:

ASPECT (S, SE, NNW, etc.): ____________________ % SLOPE: ______________________________

LIGHT EXPOSURE (open, shaded, etc.): ______________________________

TOPOGRAPHIC POSITION (crest, midslope, bottom, etc.): ______________________________

MOISTURE (typically xeric versus mesic versus wetland etc, do not reflect current/recent precipitation conditions)
____

VEGETATION STRUCTURE WITH POPULATION AREA:

TOTAL TREE COVER (%) ____________________TOTAL SHRUB COVER (%)____________________
TOTAL FORB COVER (%) ____________________TOTAL GRAMINOID COVER (%) ____________________
TOTAL MOSS/LICHEN COVER (%) ____________________TOTAL BARE GROUND (%) ____________________

ASSOCIATED PLANT COMMUNITY (dominant species):______________________________
____
____
____
____
____

HABITAT TYPE (if known): ______________________________

SOIL TYPE/TEXTURE (include type of bedrock, if known): ______________________________

POPULATION SIZE:

ESTIMATED # OF INDIVIDUALS (or exact count, if feasible; if plants are spreading vegetatively, indicate number of aerial stems): ______________________________

OF SUBPOPULATIONS (if applicable): ______________________________

SIZE OF POPULATION AREA (acres): ______________________________

BIOLOGY:

PHENOLOGY (% flower, fruit, dispersed fruit, vegetative): ______________________________

ANY SYMBIOTIC OR PARASITIC RELATIONSHIPS?: ______________________________

EVIDENCE OF DISEASE, PREDATION OR INJURY?: ______________________________

EVIDENCE OF SEED DISPERSAL AND ESTABLISHMENT: ______________________________
____
____

DOCUMENTATION:

PHOTOGRAPH TAKEN? (if so, indicate photographer and repository): ______________________________
____

SPECIMEN TAKEN? (if so, list collector, collection #, and repository): ______________________________
____

IDENTIFICATION (list name of person making determination, and/or name of flora or book used):______________________________
____

ECODATA PLOT NUMBER (generally completed by FS): ______________________________

EVIDENCE OF DISTURBANCE: ______________________________
____
____

MEASURES FOR PROTECTION:______________________________
____
____
____
____

INVASIVE / NOXIOUS PLANT SPECIES TO BE REPORTED WHEN OCCURRING ON A

5. PROJECT SURVEY SITE

FORBS	
Artemisia absinthium	Absinth Wormwood
Carduus acanthoides	Musk Thistle
Cardaria draba	Hoary Cress
Carduus nutans	Plumeless Thistle
Centaurea diffusa	Diffuse Knapweed
Centaurea maculosa	Spotted Knapweed
Centaurea repens	Russian Knapweed
Centaurea solstitalis	Yellow Starthistle
Cirsium arvense	Canada Thistle
Convolvulus arvensis	Field Bindweed
Euphorbia esula	Leafy Spurge
Cynoglossum officinale	Houndstongue
6. *Hyoscyamus niger*	Henbane
Lythrum salicaria	Purple Loosestrife
Melilotus spp.	Yellow or White Sweetclover
Sonchus spp.	Sowthistle
Tamarix spp.	Saltcedar
GRASSES	
Agropyron cristatum	Crested Wheatgrass
Agropyron elongatum	Tall Wheatgrass
Agropyron intermedium	Intermediate Wheatgrass
Agropyron repens	Quackgrass
Bromus inermis	Smooth Brome
Bromus japonicus	Japanese Brome
Bromus tectorum	Downy Brome / cheatgrass
Poa Pratensis	Kentucky bluegrass
Poa compressa	Canada bluegrass

SITE AND SETTING FORM

Site and Setting Form for Inventory Information

SITE ID **®**
DATE (MMDDYYY) **®**
Project Name
Site Sample Type ®

LAST **Name®**	***FIRST*** **Name ®**	
Ownership ®		
Region ® 01	**National Forest/Grassland ® 18**	**District ®**
State North Dakota	**County Number®**	**County Name**

Location Information

USGS Quad Name		
Township / Range / Section		
Q SEC	**QQ SEC**	**QQQ SEC**

Geodetic Datum NAD83 is required			
Lat dms:	**Degrees ______ N**	**Minutes __ __**	**Seconds __ __.__ __**
Long dms:	**Degrees _______ W**	**Minutes __ __**	**Seconds __ __.__ __**

Existing Vegetation Information

Please enter major dominance types found on the project area.

Dominant Life Form ®
Dominance Type
Dominance Type
Dominance Type
Dominance Type

Potential Vegetation Information

Habitat Type Name
Habitat Type Name
Habitat Type Name
Habitat Type Name
Habitat Type Name
Habitat Type Name

Description of past & current land use practices including reclaimed or active oil wells, roads, utility corridors, misc. developments, and apparent livestock grazing patterns. Include observations of species composition in regards to native versus non-native (invasive).

Estimate current acreage or mileage of active and reclaimed access roads, utility corridors, or other developments within ½ mile radius of project area. Document source of data as observed or compiled from GIS software and/or aerial photographs.

ACTIVE

RECLAIMED

Other Comments

Plant Survey Form

Area Surveyed __ __ __ __ __ __ __ __ ®	Unit of Measure ____________________________®
Survey Method___________________________®	Survey Type__________________________________

Invasive Plants and Noxious Weeds

Species:	Extent (area):
Description & Location:	
Species:	Extent:
Description & Location:	
Species:	Extent:
Description & Location:	
Species:	Extent:
Description & Location:	

Plant Species List (use additional format if needed)

Plant Name	Comments

USFS DPG Site and Setting Form Field Guide

Using the form in the Field

The Site and Setting Form will be used to record information on the location, site, and ecological setting.

Site ID [Var char 2(30)] ***Required***

Filled in by District Botanist

Date [Date (12)] ***Required***
Record the calendar month, day, and year the site was visited.

Code	Description
01/23/1984	January 23, 1984

Project Name Code (10-VarChar) Required
Use the code "O&G-survey" for botany surveys for oil and gas facilities and associated pipelines and roads.

Code	Project Name
O&G-survey	List project or company name, including well/pipeline name etc.

Site Sample Type (4-Char) Required
Record site sample type. For oil & gas associated surveys it should be FLGE.

Site Sample Type	Description
FLGE	Flora-general description

Examiner's Last, First Name and Middle Initial [Varchar 2(40)] ***Required***
Record the examiner's last, and first name is required. The middle initial is optional.

Last Name	First Name	Middle Initial
MacDonald	John	Q

<u>Ownership</u> (10-VarChar) Required. Record the landownership where the site is located. In the case of multiple ownerships, record the landownership where the preponderance of the site is located.

CODE	DESCRIPTION
USFS	U.S.D.A. Forest Service
PRIV	Private
STDL	State Land Dept.
OTH	Other
BLM	Bureau of Land Management

<u>Region</u> (2-Num) Required. Record 01 for Region One.

Region	Description
01	R 1 - Northern Region

<u>National Forest/Grassland</u> (2-Num) **Required.** Record 18 for the DPG.

National Forest/Grassland	Description
18	Dakota Prairie Grasslands

<u>District</u> (2-Num) **Required.** Record the Ranger District number where the site is located.

District Code	Description
07	Medora Ranger District
08	McKenzie Ranger District

<u>State</u> (7-VarChar) **Required.** Record the code for the state in which the site is located.

State	State Name
ND	North Dakota

<u>County Number (</u>7-VarChar) **Required and <u>County Name</u>** (255 VarChar)

County Number	County Name
007	Billings
033	Golden Valley
053	McKenzie
087	Slope

<u>USGS Quads Name</u> (8 Num, 40 VarChar). Record the USGS Quads Name where the site is located.

USGS Quad Name
Pretty Butte

Township/Direction and Range/Direction (60 VarChar). Record the Township and Direction and the Range and Direction where the site is located.

Township/Dir & Range/Dir	Description
7 N 14 E	Township 7 North Range 14 East

Section (3 VarChar). Record the Section where the site is located.

Section Code	Description
16	Section 16

Quarter Section (3 VarChar). Record the ¼ section subdivision where the site is located.

Q Section	Description
NE	NW ¼ of Section 16, T.7 N., R.69W. of 6th P.M

Quarter, Quarter Section (3 VarChar). Record the ¼¼ section subdivision where the site is located.

Quarter, Quarter Section	Description
SE	SW ¼ of NW ¼ of Section 16, T.7 N., R.69W. of 6th P.M

Quarter, Quarter, Quarter Section (3 VarChar). Record the ¼¼¼ section subdivision of the site.

Quarter, Quarter, Quarter Section	Description
SW	SE ¼ of SW ¼ of NW ¼ of Section 16, T.7 N., R.69W. of 6th P.M

Latitude and Longitude (Degrees, minutes, seconds)

Datum (6 VarChar) Record the geodetic datum for the Latitude and Longitude coordinates.

Datum	Description
NAD-83	North American Datum of 1983

Latitude (degree, minute, second) (9 VarChar)
Record the site latitude as measured by a Global Positioning System (GPS). Latitude consists of a 2-Character "degree", a 2-Character "minute", and a 4 character, 2 decimal "second". **(Default North Latitudes.)**

Latitude	Description
422006.07	Degree, minutes, seconds

Longitude (degree, minute, second) (10 VarChar)
Record the site longitude as measured by a GPS. Longitude consists of a 3-Character "degree", a 2-Character "minute", and a 4 character, 2 decimal "second". **(Default West Longitudes.)**

Longitude Code	Description
1051052.06	Degree, minutes, seconds

Dominant Life Form (2, 50 VarChar) **®.** Dominant life form on the site, transect or polygon. Dominant life form is defined as the characteristic form or appearance of a species at maturity.

Dominant Life form	Description	Corresponding PLANTS Life form
FB	Forb/herb	FB
GR	Graminoid	GR
NP	Nonvascular Plant	NP
SH	Shrub	SH
SS	Sub shrub	SS
TR	Tree	TR
UK	Unknown	

Dominance Type
Enter the dominance types using a naming convention that uses two dominant species for that type.

Dominance Type (examples)
Agropyron smithii/Bouteloua gracilis
Agropyron cristatum/Stipa comata

Habitat Type Code and Habitat Type Name (30, 240 VarChar)

The code associated with a habitat type. These codes are for regionally stewarded PNV habitat classification codes. The collective area which one plant association occupies or will come to occupy as succession advances.

LMNG Habitat Type Names
Agropyron smithii-Stipa viridula
Agropyron smithii-Stipa viridula-Bouteloua gracilis
Agropyron smithii-Stipa comata
Andropogon scoparius-Carex filifolia
Andropogon gerardii
Calamovilfa longifolia-Carex
Distichlis spicata
Puccinellia nuttalliana-Distichlis spicata
Stipa comata-Carex filifolia
Artemisia arbuscula-Bouteloua gracilis
Artemisia cana-Agropyron smithii
Artemisia tridentata wyomingensis-Agropyron smithii
Artemisia tridentata wyomingensis-Agropyron spicatum
Atriplex confertifolia-Artemisia tridentate wyomingensis
Juniperus horizontalis-Andropogon scoparius
Potentilla fruticosa-Andropogon scoparius
Rhus aromatica-Agropyron spicatum
Rhus aromatica-Muhlenbergia cuspidate
Sarcobatus vermiculatus-Agropyron smithii
Sarcobatus vermiculatus-Agropyron spicatum
Shepherdia argentea
Symphoricarpos occidentalis
Quercus macrocarpa/Corylus sp.
Quercus macrocarpa/Prunus virginiana
Populus tremuloides/Prunus virginiana
Fraxinus pennsylvanica/Prunus virginiana
Fraxinus pennsylvanica/Ulmus americana/Prunus virginiana
Fraxinus pennsylvanica/Symphoricarpos occidentalis
Juniperus scopulorum/Oryzopsis micrantha
Juniperus scopulorum/Agropyron spicatum
Pinus flexilis/Agropyron spicatum
Pinus ponderosa/Prunus virginiana
Pinus ponderosa/Juniperus communis

Pinus ponderosa/Agropyron spicatum
Pinus ponderosa/Carex heliophilia

Plant Survey Form

7. Area Surveyed [Numeric (12,2)] *Required.* Enter the number of acres or hectares in the survey area.

Area Surveyed
1,250

Survey Area Unit of Measure [Varchar 2(12)] ***Required***
The *Survey_Area* can be measured either in acres or hectares. Enter either hectares or acres in this field, acres are the default value for this field.

Code	Description
Acres	Acres surveyed
Hectares	Hectares surveyed

Survey Method [Varchar 2(20] ***Required***
Enter the method used for the survey. The three survey methods are recognized are observed, aerial and satellite imagery.

Code	Description
Observed	Surveys that were conducted using direct observation. They could have been completed on horseback, by vehicle, walking or helicopter. This is the default value.

Survey Type [Varchar2 (20,0] ***Required***
Enter the type of survey that was conducted. Enter one or more of the following. You may enter up to three survey types.

Code	Description
Aquatic	Aquatic surveys are confined to surveys within waterbodies such as streams, lakes, ponds and irrigated canals. Vegetation can be classified as emergent, floating, hydrophytic, or submergent. For surveys that include the transition zone to uplands and areas of seasonal or periodic flooding also record riparian surveys.
Cursory	The cursory survey is appropriately used to confirm the presence of objects of interest identified in previous surveys and the prefield analysis step. By its nature, the cursory visit is rapid, but does not provide in-depth environmental information. The entire area is traversed at least once. For example, stand condition as seen in aerial photography can be verified by a cursory visit to a location. Also, a cursory visit can be used to determine if a population that had been previously cataloged at a site remains present or intact
Features	The surveyed focused on area in and adjacent to developed features such as road, trails, campgrounds, parking lots and boat launches.

Code	Description
Field Check	Field Check is where the area is given a quick "once over" but do not walk completely through the project area. The entire area is not examined.
General	The area is given a closer look by walking through the area and perimeter or by walking more than once through the area. Most of the area is examined
Focused (Intuitive Controlled)	The intuitive controlled survey is the most commonly used and most efficient method of surveying. During pre-field analysis, potential suitable habitat is identified for each species of interest and the survey effort is focused in those areas. This method requires adequate knowledge of suitable habitat in order to accurately select the areas of focused search. When conducting intuitive controlled surveys, an area somewhat larger than the identified suitable habitat should be searched to validate current suitable habitat definitions.
Random	Random surveys employ an undirected traverse through a project area. They are employed either when there is inadequate natural history information about a species to discern its suitable habitat and the surveyor is simply searching for occurrences, or when a target species is very abundant within a search area and the surveyor is attempting to make estimates of population parameters such as intra-patch variations in density or the occurrence of predation or herbivory. However, a stratified random survey may be more efficacious in these cases.
Riparian	These are surveys that follow the shoreline of waterbodies such as lakes, streams and rivers. Riparian areas are defined as those areas that form the transition between permanently saturated wetlands and upland areas. For plants or areas that are obligatory in standing or moving water use aquatic survey.
Stratified Random	The stratified random survey is most often used within known population areas of target species or when an area of unknown suitability to be surveyed is relatively large. Stratified random surveys employ a series of randomly selected plots of equal size within a project area that are each thoroughly searched for target species. When conducting a stratified random survey, it is important to search an adequate number of sites that are of sufficient size to represent an adequate sample.
Systematic	The systematic survey is typically used in limited areas where the likelihood of occurrence of a target species is evenly distributed throughout the survey area. Systematic surveys are often employed either within focused search areas (e.g., stratified random and intuitive controlled methods), or when a proposed project is likely to produce significant habitat alterations for species that are especially sensitive to the proposed activities.

Invasive Plants and Noxious Weeds: Enter the scientific names of the invasive species or noxious weeds observed in the project area and their estimated extent in acres or square meters.

Plant Species List. List the scientific name of plant species observed in the project area.

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Appendix G

100 Species of Conservation Priority for North Dakota

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APPENDIX G - 100 Species of Conservation Priority for North Dakota

Level I Species	Level II Species	Level III Species
horned grebe	northern pintail	whooping crane
American white pelican	canvasback	peregrine falcon
American bittern	redhead	Brewer’s sparrow
Swainson’s hawk	northern harrier	McCown’s longspur
ferruginous hawk	golden eagle	smooth softshell turtle
yellow rail	bald eagle	false map turtle
willet	prairie falcon	northern prairie skink
upland sandpiper	sharp-tailed grouse	northern sagebrush lizard
long-billed curlew	greater prairie chicken	arctic shrew
marbled godwit	greater sage grouse	western small-footed myotis
Wilson’s phalarope	piping plover	long-eared myotis
Franklin’s gull	American avocet	long-legged myotis
black tern	least tern	plains pocket mouse
black-billed cuckoo	short-eared owl	hispid pocket mouse
Sprague’s pipit	burrowing owl	sagebrush vole
grasshopper sparrow	red-headed woodpecker	eastern spotted skunk
Baird’s sparrow	loggerhead shrike	gray wolf
Nelson’s sharp-tailed sparrow	sedge wren	chestnut lamprey
lark bunting	dickcissel	silver lamprey
chestnut-collared longspur	Le Conte’s sparrow	central stoneroller
Canadian toad	bobolink	hornyhead chub
plains spadefoot toad	common snapping turtle	pugnose shiner
smooth green snake	short-horned lizard	blacknose shiner
western hognose snake	redbelly snake	roseyface shiner

black-tailed prairie dog

sturgeon chub

sicklefin chub

pearl dace

blue sucker

pygmy shrew

Richardson's ground squirrel

swift fox

river otter

black-footed ferret

paddlefish

pallid sturgeon

silver chub

northern redbelly dace

flathead chub

trout-perch

threeridge

wabash pigtoe

mapleleaf

black sandshell

creek heelsplitter

pink heelsplitter

finescale dace

yellow bullhead

flathead catfish

logperch

river darter

pink papershell

Appendix H

Class I Survey Recorded Cultural Resources and Inventories

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Site File Search Results - Alternative A						
T/R-Section	**Site #**	**Site Type and Description**	**Recorder, Date**	**Eligibility**	**Tested (T)/Shovel Probed (SP)**	**Temporal/Cultural Affiliation**
145/088-07	32ME0803	Archaeological-stone circle, cairn, chipped stone	Kordecki, 1984	Unevaluated	No	Unknown
145/088-07	32ME2217	Multicomponent site: Architectural-farmstead, Historic-depression, foundation, cultural material scatter, glass, masonry, metal, wood	Stine, 2009	Not Eligible	No	Unknown, occupation 1900-1950
145/088-07	32MEx0161	Archaeological-isolated find: chipped stone	LCT, 1984	Not Eligible	No	Unknown
145/088-07	32MEx0624	Archaeological-isolated find: chipped stone	Meidinger, 2003	Not Eligible	No	Unknown
145/088-14	32ME1511	Archaeological-cairn	Boughton, 1999	Unevaluated	No	Unknown
145/088-16	32ME0247	Archaeological-stone circle, chipped stone	Dill, 1977	Not Eligible	T	Unknown
145/088-16	32ME1551	Archaeological-depression, stone circle, cairn, cultural material scatter, chipped stone, projectile point	Walker-Kuntz, 1999	Not Eligible	T	Late Prehistoric: Plains side notched projectile point
145/088-16	32ME1595	Architectural-windmill	Walker-Kuntz, 1999	Not Eligible	No	Historic
145/088-16	32ME1596	Architectural-windmill	Walker-Kuntz, 1999	Not Eligible	No	Historic
145/088-21	32ME1477	Archaeological-cairn, stone circle, chipped stone	Boughton, 1999	Not Eligible	T	Unknown

Site File Search Results - Alternative A						
145/088-21	32ME1478	Archaeological-cairn, stone circle, projectile point, chipped stone	Boughton, 1999	Eligible	T	Archaic and Late Prehistoric: Prairie side notched projectile point, Avonlea projectile point base, Besant projectile point base
145/088-22	32ME1513	Archaeological-hearth, human remains, stone circle, cairn, stone alignment, cultural material scatter, worked bone, ceramics, charcoal, faunal remains, projectile point, chipped stone	Boughton, 1999	Eligible	T, SP	Archaic and Late Prehistoric: Plains side-notched projectile point, Pelican Lake projectile point, Besant projectile point, Prairie side-notched projectile point, Plains/Prairie side-notched projectile point
145/088-22	32ME2161	Multicomponent site: Architectural-farmstead, windmill, Historic-dump, foundation, machinery, cultural material scatter, masonry, metal, wood	Walker-Kuntz, 1999	Not Eligible	No	Historic farmstead
145/088-23	32ME1516	Archaeological-cairn, stone circle, chipped stone	Boughton, 1999	Not Eligible	T, SP	Unknown
145/091-07	32DU1128	Archaeological-cultural material scatter, chipped stone	Kulevsky, 1994	Unevaluated	No	Unknown
145/092-10	32DU0220	Archaeological-cultural material scatter, faunal remains, fire cracked rock, chipped stone	Persinger, 1989	Unevaluated	No	Unknown
145/092-10	32DU1068	Archaeological-cultural material scatter, chipped stone	Borchert/Blikre/ Wermers, 1992	Unevaluated	No	Unknown

Site File Search Results - Alternative A						
145/092-12	32DU1128	Archaeological-cultural material scatter, chipped stone	Kulevsky, 1994	Unevaluated	No	Unknown
145/093-07	32DUx0672	Archaeological-isolated find: chipped stone	Heiner/Harty, 2007	Not Eligible	No	Unknown
145/093-10	32DU0168	Archaeological-cultural material scatter, chipped stone	Keuhn/Keim/ Borchert, 1983	Unevaluated	No	Unknown
145/093-11	32DU0168	Archaeological-cultural material scatter, chipped stone	Keuhn/Keim/ Borchert, 1983	Unevaluated	No	Unknown
145/093-12	32DUx0037	Historic-site lead: Hanks Post Office/ Townsite, cultural material scatter, foundation	Benson, 1980	Unevaluated	No	Unknown
145/094-06	32DU1602	Archaeological-cultural material scatter, chipped stone	Whitman/Lonski/ Jackson, 2011	Unevaluated	No	Unknown
145/094-10	32DU0420	Archaeological-stone circle, cairn, cultural material scatter	Greensheilds, 1975	Unevaluated	No	Unknown
145/095-01	32DU1164	Archaeological-cultural material scatter, chipped stone	Simon, 1979	Unevaluated	No	Unknown
145/095-01	32DU1602	Archaeological-cultural material scatter, chipped stone	Whitman/Lonski/ Jackson, 2011	Unevaluated	No	Unknown
145/095-04	32DU1252	Archaeological-cultural material scatter, chipped stone	Morrison, 2002	Unevaluated	No	Unknown
145/095-04	32DUx0601	Archaeological-isolated find: chipped stone	Potter, 2002	Not Eligible	No	Unknown

Site File Search Results - Alternative A						
145/095-04	32DUx0602	Archaeological-isolated find: chipped stone	Potter, 2002	Not Eligible	No	Unknown
145/095-04	32DUx0603	Archaeological-isolated find: chipped stone	Potter, 2002	Not Eligible	No	Unknown
145/095-05	32DUx0107	Archaeological-isolated find: projectile point	Kordecki, 1982	Not Eligible	No	Archaic: projectile point not specified
145/096-15	32DU0329	Archaeological-cultural material scatter, chipped stone	Woelfel, 1985	Not Eligible	No	Unknown
145/096-15	32DU1510	Archaeological-cultural material scatter, projectile point, chipped stone	Scott, 2010	Unevaluated	No	Late Prehistoric: side notched projectile point
145/097-16	32DU1034	Archaeological-cultural material scatter, fire cracked rock, chipped stone	Christensen, 1991	Unevaluated	No	Unknown
145/097-21	32DUx0050	Historic-site lead: Whetstone Townsite	Benson, 1980	Unevaluated	No	Unknown
145/098-07	32MZx0484	Archaeological-isolated find: chipped stone	Blikre, 1987	Not Eligible	No	Unknown
145/098-07	32MZx1073	Archaeological-isolated find: chipped stone	Kordecki, 2007	Not Eligible	No	Unknown
145/098-17	32MZx0485	Archaeological-isolated find: chipped stone	Shaw/Borchert, 1987	Not Eligible	No	Unknown
145/098-21	32MZ0589	Archaeological-cultural material scatter, chipped stone	Persinger, 1981	Eligible	No	Unknown
145/098-21	32MZ0592	Archaeological-cultural material scatter, projectile point, ground stone	Persinger, 1981	Eligible	No	Unknown: projectile point not specified

Site File Search Results - Alternative A						
145/098-21	32MZ0593	Archaeological-cultural material scatter, fire cracked rock, chipped stone	Persinger, 1981	Eligible	No	Unknown
145/098-21	32MZx0486	Archaeological-isolated find: chipped stone	Shaw/Borchert, 1987	Not Eligible	No	Unknown
145/098-25	32MZx0912	Archaeological-isolated find: chipped stone	Klinner, 1998	Not Eligible	No	Unknown
145/098-25	32MZx0916	Archaeological-isolated find: chipped stone	Klinner, 1998	Not Eligible	No	Unknown
145/098-33	32MZ1461	Archaeological-cultural material scatter, chipped stone	Stanley/ Montgomery/ Nathan, 1981	Unevaluated	No	Unknown
145/098-34	32MZ1006	Archaeological-quarry, cultural material scatter, chipped stone	Martorano/Killam, 1989	Unevaluated	No	Unknown
145/098-34	32MZ1561	Historic-WAPA transmission line	Fandrich, 2001	Not Eligible	No	1949-1951
145/098-35	32MZ0629	Archaeological-cultural material scatter, projectile point, chipped stone	Montgomery, 1982	Unevaluated	No	Unknown: projectile point not specified
145/098-35	32MZ1449	Archaeological-cultural material scatter, chipped stone	Klinner, 1998	Unevaluated	No	Unknown
145/098-35	32MZx0235	Archaeological-isolated find: chipped stone	Volk, 1980	Not Eligible	No	Unknown
145/099-01	32MZx0003	Historic-site lead: Converse Long X Ranch	Benson, 1980	Unevaluated	No	Unknown
147/098-18	32MZ1311	Archaeological-cultural material scatter, chipped stone, projectile point	Floodman, 1997	Unevaluated	SP	Unknown: possible late prehistoric arrow point

Site File Search Results - Alternative A						
147/098-18	32MZ1312	Archaeological-cultural material scatter, chipped stone, projectile point	Floodman, 1997	Eligible	No	Archaic: Pelican Lake projectile point
147/099-24	32MZ1561	Historic-WAPA transmission line	Fandrich, 2001	Not Eligible	No	1949-1951
147/099-24	32MZx0903	Historic-isolated find: ceramics	Larson, 1998	Not Eligible	No	Historic
147/099-25	32MZx0036	Historic-site lead: Mory Post Office	Benson, 1980	Unevaluated	No	Unknown
147/099-25	32MZx0902	Archaeological-isolated find: projectile point	Larson, 1998	Not Eligible	No	Unknown: projectile point is not diagnostic
148/098-19	32MZ0853	Archaeological-stone circle, cairn, cultural material scatter, chipped stone	Shaw, 1987	Unevaluated	No	Unknown
148/099-13	32MZ0854	Archaeological-cultural material scatter, chipped stone	Borchert, 1987	Unevaluated	No	Unknown
149/099-36	32MZ1561	Historic-WAPA transmission line	Fandrich, 2001	Not Eligible	No	1949-1951
150/099-06	32MZ0892	Archaeological-stone circle	Blikre, 1987	Unevaluated	No	Unknown
150/099-09	32MZ0881	Archaeological-stone circle	Blikre, 1987	Unevaluated	No	Unknown
150/099-16	32MZ0880	Archaeological-cairn	Blikre, 1987	Unevaluated	No	Unknown
150/099-21	32MZ2202	Historic-machinery, metal	Ferguson/Meno/ Smith, 2011	Not Eligible	No	Historic farm equipment
150/099-28	32MZ0879	Historic-depression, foundation, dump, cultural material scatter, ceramics, cloth, faunal remains, masonry, metal, plastic, rubber, shell, wood	Blikre, 1987	Not Eligible	No	Historic farmstead
150/099-28	32MZ1561	Historic-WAPA transmission line	Fandrich, 2001	Not Eligible	No	1949-1951

Site File Search Results - Alternative A						
150/099-28	32MZx0510	Archaeological-isolated find: chipped stone	Blikre/Shaw, 1987	Not Eligible	No	Unknown
151/100-06	32MZ0886	Archaeological-stone circle	Shaw/Borchert, 1987	Unevaluated	No	Unknown
151/100-07	32MZ0884	Archaeological-stone circle	Borchert, 1987	Unevaluated	No	Unknown
151/100-07	32MZ0885	Archaeological-stone circle	Borchert, 1987	Unevaluated	No	Unknown
151/100-07	32MZ0886	Archaeological-stone circle	Shaw/Borchert, 1987	Unevaluated	No	Unknown
151/100-08	32MZ0883	Archaeological-stone circle, cairn	Blikre/Burbidge, 1987	Unevaluated	No	Unknown
151/100-26	32MZ0893	Historic-depression, machinery, cultural material scatter, ceramics, glass, metal, wood	Burbidge/ Borchert, 1987	Unevaluated	No	Historic
152/101-18	32MZ1561	Historic-WAPA transmission line	Fandrich, 2001	Not Eligible	No	1949-1951
152/102-12	32MZ0696	Historic-cultural material scatter, ceramics, glass, masonry, metal, wood	Keim, 1983	Unevaluated	No	Historic homestead
152/102-12	32MZ0697	Archaeological-stone circle, cairn	Keim, 1983	Unevaluated	No	Unknown
152/102-13	32MZ0698	Archaeological-hearth, cultural material scatter, fire cracked rock, chipped stone	Keim/Borchert, 1983	Unevaluated	No	Unknown
153/101-05	32MZ1561	Historic-WAPA transmission line	Fandrich, 2001	Not Eligible	No	1949-1951
153/101-06	32MZ1561	Historic-WAPA transmission line	Fandrich, 2001	Not Eligible	No	1949-1951
153/101-08	32MZ1561	Historic-WAPA transmission line	Fandrich, 2001	Not Eligible	No	1949-1951
153/101-16	32MZ1554	Historic-irrigation ditch, earthwork	Fandrich, 2001	Eligible	No	1935-1953, Lewis and Clark Irrigation Canal

Site File Search Results - Alternative A						
153/101-16	32MZ1561	Historic-WAPA transmission line	Fandrich, 2001	Not Eligible	No	1949-1951
153/101-17	32MZ1561	Historic-WAPA transmission line	Fandrich, 2001	Not Eligible	No	1949-1951
154/102-10	32WI0085	Archaeological-cairn	Keim, 1985	Not Eligible	No	Prehistoric
154/102-15	32WI1188	Archaeological-cairn, alignment	Eigenberger, 2011	Unevaluated	No	Unknown
154/102-15	32WI1189	Archaeological-cairn	Eigenberger, 2011	Unevaluated	No	Unknown
154/102-15	32WI1192	Archaeological-cairn	Eigenberger, 2011	Unevaluated	No	Unknown
154/102-15	32WI1193	Archaeological-cairn	Eigenberger, 2011	Unevaluated	No	Unknown
154/102-23	32WI1195	Archaeological-stone circle, cairn	Eigenberger, 2011	Unevaluated	No	Unknown
154/102-23	32WI1214	Archaeological-stone arc	Eigenberger, 2011	Unevaluated	No	Unknown
154/102-36	32WI0302	Archaeological-stone circle, chipped stone, possible earthworks	Blikre, 1987	Unevaluated	No	Unknown
155/100-04	32WIx0481	Historic-site lead: mine	Kjos, 1984	Unevaluated	No	Unknown
155/100-04	32WIx0482	Historic-site lead: mine	Kjos, 1984	Unevaluated	No	Unknown
155/101-15	32WI0401	Archaeological-stone circle	Fox, 1978	Unevaluated	No	Unknown
155/101-16	32WI0012	Archaeological-stone circle, mound, cultural material scatter, bone, ceramics, faunal remains, projectile point, chipped stone	Kivett, 1948	Unevaluated	No	Late Prehistoric, Plains Nomadic: side notched projectile point
155/101-16	32WI1045	Archaeological-stone circle, cairn	Hiemstra, 2008	Unevaluated	No	Unknown
155/101-16	32WIx0141	Archaeological-site lead: cultural material scatter	Benson, 1980	Unevaluated	No	Unknown
155/101-16	32WIx0142	Historic-site lead: mine	Benson, 1980	Unevaluated	No	Unknown
155/101-17	32WI0266	Archaeological-stone circle, cairn	Persinger, 1986	Unevaluated	No	Unknown

Site File Search Results - Alternative A						
155/101-17	32WIx0143	Archaeological-site lead: cultural material scatter	Benson, 1980	Unevaluated	No	Unknown
155/102-36	32WIx0151	Archaeological-site lead: cultural material scatter	Benson, 1980	Unevaluated	No	Unknown
155/102-36	32WIx0152	Historic-site lead: mine	Benson, 1980	Unevaluated	No	Unknown
155/102-36	32WIx0484	Historic-site lead: quarry/mine	LCT, 1990	Unevaluated	No	Unknown
156/100-34	32WI0075	Historic-depression, cultural material scatter, glass, metal	Borchert, 1983	Unevaluated	No	Historic homestead-1913
156/100-36	32WI1185	Historic-well, depression, dump, foundation, cultural material scatter, metal, rubber, wood	Bluemle, 2011	Not Eligible	No	Historic farmstead
157/094-20	32MNx0485	Archaeological-site lead: cultural material scatter	Benson, 1980	Unevaluated	No	Unknown

Site File Search Results - Alternative B						
T/R-Section	**Sites #**	**Site Type & Description**	**Recorder, Date**	**Eligibility**	**Tested (T)/Shovel Probed (SP)**	**Temporal/Cultural Affiliation**
145/088-07	32ME0803	Archaeological-stone circle, cairn, chipped stone	Kordecki, 1984	Unevaluated	No	Unknown
145/088-07	32ME2217	Multicomponent site: Architectural-farmstead, Historic-depression, foundation, cultural material scatter, glass, masonry, metal, wood	Stine, 2009	Not Eligible	No	Unknown, occupation 1900-1950
145/088-07	32MEx0161	Archaeological-isolated find: chipped stone	LCT, 1984	Not Eligible	No	Unknown
145/088-07	32MEx0624	Archaeological-isolated find: chipped stone	Meidinger, 2003	Not Eligible	No	Unknown
145/088-14	32ME1511	Archaeological-cairn	Boughton, 1999	Unevaluated	No	Unknown
145/088-16	32ME0247	Archaeological-stone circle, chipped stone	Dill, 1977	Not Eligible	T	Unknown
145/088-16	32ME1551	Archaeological-depression, stone circle, cairn, cultural material scatter, chipped stone, projectile point	Walker-Kuntz, 1999	Not Eligible	T	Late Prehistoric: Plains side notched projectile point
145/088-16	32ME1595	Architectural-windmill	Walker-Kuntz, 1999	Not Eligible	No	Historic
145/088-16	32ME1596	Architectural-windmill	Walker-Kuntz, 1999	Not Eligible	No	Historic
145/088-21	32ME1477	Archaeological-cairn, stone circle, chipped stone	Boughton, 1999	Not Eligible	T	Unknown

Site File Search Results - Alternative B						
145/088-21	32ME1478	Archaeological-cairn, stone circle, projectile point, chipped stone	Boughton, 1999	Eligible	T	Archaic and Late Prehistoric: Prairie side notched projectile point, Avonlea projectile point base, Besant projectile point base
145/088-22	32ME1513	Archaeological-hearth, human remains, stone circle, cairn, stone alignment, cultural material scatter, worked bone, ceramics, charcoal, faunal remains, projectile point, chipped stone	Boughton, 1999	Eligible	T, SP	Archaic and Late Prehistoric: Plains side-notched projectile point, Pelican Lake projectile point, Besant projectile point, Prairie side-notched projectile point, Plains/Prairie side-notched projectile point
145/088-22	32ME2161	Multicomponent site: Architectural-farmstead, windmill, Historic-dump, foundation, machinery, cultural material scatter, masonry, metal, wood	Walker-Kuntz, 1999	Not Eligible	No	Historic farmstead
145/088-23	32ME1516	Archaeological-cairn, stone circle, chipped stone	Boughton, 1999	Not Eligible	T, SP	Unknown
145/091-07	32DU1128	Archaeological-cultural material scatter, chipped stone	Kulevsky, 1994	Unevaluated	No	Unknown
145/092-10	32DU0220	Archaeological-cultural material scatter, faunal remains, fire cracked rock, chipped stone	Persinger, 1989	Unevaluated	No	Unknown
145/092-10	32DU1068	Archaeological-cultural material scatter, chipped stone	Borchert/Blikre/ Wermers, 1992	Unevaluated	No	Unknown

Site File Search Results - Alternative B						
145/092-12	32DU1128	Archaeological-cultural material scatter, chipped stone	Kulevsky, 1994	Unevaluated	No	Unknown
145/093-07	32DUx0672	Archaeological-isolated find: chipped stone	Heiner/Harty, 2007	Not Eligible	No	Unknown
145/093-10	32DU0168	Archaeological-cultural material scatter, chipped stone	Keuhn/Keim/ Borchert, 1983	Unevaluated	No	Unknown
145/093-11	32DU0168	Archaeological-cultural material scatter, chipped stone	Keuhn/Keim/ Borchert, 1983	Unevaluated	No	Unknown
145/093-12	32DUx0037	Historic-site lead: Hanks Post Office/ Townsite, cultural material scatter, foundation	Benson, 1980	Unevaluated	No	Unknown
145/094-05	32DU1606	Architectural-farmstead	Whitman/Lonski/ Jackson, 2011	Unevaluated	No	Modern farmstead
145/094-06	32DU1165	Archaeological-cultural material scatter, chipped stone	Simon, 1979	Unevaluated	No	Unknown
145/094-06	32DUx0592	Archaeological-isolated find: chipped stone	Bluemle, 2002	Not Eligible	No	Unknown
145/094-10	32DU0420	Archaeological-stone circle, cairn, cultural material scatter	Greensheilds, 1975	Unevaluated	No	Unknown
145/095-01	32DU1164	Archaeological-cultural material scatter, chipped stone	Simon, 1979	Unevaluated	No	Unknown
145/095-04	32DU1252	Archaeological-cultural material scatter, chipped stone	Morrison, 2002	Unevaluated	No	Unknown
145/095-04	32DUx0601	Archaeological-isolated find: chipped stone	Potter, 2002	Not Eligible	No	Unknown

Site File Search Results - Alternative B						
145/095-04	32DUx0602	Archaeological-isolated find: chipped stone	Potter, 2002	Not Eligible	No	Unknown
145/095-04	32DUx0603	Archaeological-isolated find: chipped stone	Potter, 2002	Not Eligible	No	Unknown
145/095-05	32DUx0107	Archaeological-isolated find: projectile point	Kordecki, 1982	Not Eligible	No	Archaic: projectile point not specified
145/096-15	32DU0329	Archaeological-cultural material scatter, chipped stone	Woelfel, 1985	Not Eligible	No	Unknown
145/096-15	32DU1510	Archaeological-cultural material scatter, projectile point, chipped stone	Scott, 2010	Unevaluated	No	Late Prehistoric: side notched projectile point
145/097-16	32DU1034	Archaeological-cultural material scatter, fire cracked rock, chipped stone	Christensen, 1991	Unevaluated	No	Unknown
145/097-21	32DUx0050	Historic-site lead: Whetstone Townsite	Benson, 1980	Unevaluated	No	Unknown
145/098-25	32MZx0912	Archaeological-isolated find: chipped stone	Klinner, 1998	Not Eligible	No	Unknown
145/098-25	32MZx0916	Archaeological-isolated find: chipped stone	Klinner, 1998	Not Eligible	No	Unknown
145/098-33	32MZ1461	Archaeological-cultural material scatter, chipped stone	Stanley/ Montgomery/ Nathan, 1981	Unevaluated	No	Unknown
145/098-34	32MZ1006	Archaeological-quarry, cultural material scatter, chipped stone	Martorano/Killam, 1989	Unevaluated	No	Unknown
145/098-34	32MZ1561	Historic-WAPA transmission line	Fandrich, 2001	Not Eligible	No	1949-1951

Site File Search Results - Alternative B						
145/098-35	32MZ0629	Archaeological-cultural material scatter, projectile point, chipped stone	Montgomery, 1982	Unevaluated	No	Unknown: projectile point not specified
145/098-35	32MZ1449	Archaeological-cultural material scatter, chipped stone	Klinner, 1998	Unevaluated	No	Unknown
145/098-35	32MZx0235	Archaeological-isolated find: chipped stone	Volk, 1980	Not Eligible	No	Unknown
147/096-11	32DUx0799	Archaeological-isolated find: chipped stone	Reinhart, 2010	Not Eligible	No	Unknown
147/096-13	32DU0332	Archaeological-cultural material scatter, projectile point, chipped stone	Barenholtz, 1985	Not Eligible	T, SP	Unknown: projectile point is not diagnostic
147/096-14	32DU1507	Archaeological-cultural material scatter, chipped stone	Rienhart, 2010	Unevaluated	No	Unknown
147/096-25	32DU0351	Archaeological-quarry, cultural material scatter	McKibbin, 1985	Not Eligible	No	Unknown
148/095-07	32DU0343	Archaeological-cultural material scatter, chipped stone	Mehl,1985	Not Eligible	SP	Unknown
148/095-07	32DU0357	Archaeological-cultural material scatter, chipped stone	Medsker, 1985	Not Eligible	T, SP	Unknown
148/095-07	32DU0359	Archaeological-cultural material scatter, chipped stone	Medsker, 1985	Unevaluated	T, SP	Unknown
148/095-07	32DU1492	Archaeological-cultural material scatter, chipped stone	Engel, 2010	Unevaluated	No	Unknown

Site File Search Results - Alternative B						
148/096-12	32DU0342	Archaeological-cultural material scatter, chipped stone, projectile point	Medsker, 1985	Not Eligible	T, SP	Archaic: projectile point not specified
148/096-12	32DU0357	Archaeological-cultural material scatter, chipped stone	Medsker, 1985	Not Eligible	T, SP	Unknown
148/096-13	32DU0342	Archaeological-cultural material scatter, chipped stone, projectile point	Medsker, 1985	Not Eligible	T, SP	Archaic: projectile point not specified
148/096-13	32DU1500	Archaeological-cultural material scatter, chipped stone	Kulevsky, 2010	Unevaluated	No	Unknown
148/096-23	32DU1502	Archaeological-cultural material scatter, chipped stone	Kulevsky, 2010	Unevaluated	No	Unknown
149/095-29	32MZx1120	Archaeological-isolated find: chipped stone	Morrison, 209	Not Eligible	No	Unknown
149/096-13	32MZ0489	Archaeological-cultural material scatter, projectile point, chipped stone	Floodman, 1981	Unevaluated	T	Paleo: lanceolate projectile point base
151/100-06	32MZ0886	Archaeological-stone circle	Shaw/Borchert, 1987	Unevaluated	No	Unknown
151/100-07	32MZ0884	Archaeological-stone circle	Borchert, 1987	Unevaluated	No	Unknown
151/100-07	32MZ0885	Archaeological-stone circle	Borchert, 1987	Unevaluated	No	Unknown
151/100-07	32MZ0886	Archaeological-stone circle	Shaw/Borchert, 1987	Unevaluated	No	Unknown
151/100-08	32MZ0883	Archaeological-stone circle, cairn	Blikre/Burbidge, 1987	Unevaluated	No	Unknown
151/100-16	32MZ0882	Archaeological-cairn	Burbidge/Blikre, 1987	Unevaluated	No	Unknown

Site File Search Results - Alternative B						
151/100-16	32MZ0895	Archaeological-stone circle	Burbidge/Blikre, 1987	Unevaluated	No	Unknown
151/101-06	32MZ1561	Historic-WAPA transmission line	Fandrich, 2001	Not Eligible	No	1949-1951
152/101-18	32MZ1561	Historic-WAPA transmission line	Fandrich, 2001	Not Eligible	No	1949-1951
152/102-12	32MZ0696	Historic-cultural material scatter, ceramics, glass, masonry, metal, wood	Keim, 1983	Unevaluated	No	Historic homestead
152/102-12	32MZ0697	Archaeological-stone circle, cairn	Keim, 1983	Unevaluated	No	Unknown
152/102-13	32MZ0698	Archaeological-hearth, cultural material scatter, fire cracked rock, chipped stone	Keim/Borchert, 1983	Unevaluated	No	Unknown
153/101-05	32MZ1561	Historic-WAPA transmission line	Fandrich, 2001	Not Eligible	No	1949-1951
153/101-06	32MZ1561	Historic-WAPA transmission line	Fandrich, 2001	Not Eligible	No	1949-1951
153/101-08	32MZ1561	Historic-WAPA transmission line	Fandrich, 2001	Not Eligible	No	1949-1951
153/101-16	32MZ1554	Historic-irrigation ditch, earthwork	Fandrich, 2001	Eligible	No	1935-1953, Lewis and Clark Irrigation Canal
153/101-16	32MZ1561	Historic-WAPA transmission line	Fandrich, 2001	Not Eligible	No	1949-1951
153/101-17	32MZ1561	Historic-WAPA transmission line	Fandrich, 2001	Not Eligible	No	1949-1951
154/102-10	32WI0085	Archaeological-cairn	Keim, 1985	Not Eligible	No	Prehistoric
154/102-15	32WI1188	Archaeological-cairn, alignment	Eigenberger, 2011	Unevaluated	No	Unknown
154/102-15	32WI1189	Archaeological-cairn	Eigenberger, 2011	Unevaluated	No	Unknown
154/102-15	32WI1192	Archaeological-cairn	Eigenberger, 2011	Unevaluated	No	Unknown

Site File Search Results - Alternative B						
154/102-15	32WI1193	Archaeological-cairn	Eigenberger, 2011	Unevaluated	No	Unknown
154/102-23	32WI1195	Archaeological-stone circle, cairn	Eigenberger, 2011	Unevaluated	No	Unknown
154/102-23	32WI1214	Archaeological-stone arc	Eigenberger, 2011	Unevaluated	No	Unknown
154/102-36	32WI0302	Archaeological-stone circle, chipped stone, earthworks	Blikre, 1987	Unevaluated	No	Unknown
155/100-04	32WIx0481	Historic-site lead: mine	Kjos, 1984	Unevaluated	No	Unknown
155/100-04	32WIx0482	Historic-site lead: mine	Kjos, 1984	Unevaluated	No	Unknown
155/101-15	32WI0401	Archaeological-stone circle	Fox, 1978	Unevaluated	No	Unknown
155/101-16	32WI0012	Archaeological-stone circle, mound, cultural material scatter, bone, ceramics, faunal remains, projectile point, chipped stone	Kivett, 1948	Unevaluated	No	Late Prehistoric, Plains Nomadic: side notched projectile point
155/101-16	32WI1045	Archaeological-stone circle, cairn	Hiemstra, 2008	Unevaluated	No	Unknown
155/101-16	32WIx0141	Archaeological-site lead: cultural material scatter	Benson, 1980	Unevaluated	No	Unknown
155/101-16	32WIx0142	Historic-site lead: mine	Benson, 1980	Unevaluated	No	Unknown
155/101-17	32WI0266	Archaeological-stone circle, cairn	Persinger, 1986	Unevaluated	No	Unknown
155/101-17	32WIx0143	Archaeological-site lead: cultural material scatter	Benson, 1980	Unevaluated	No	Unknown
155/102-36	32WIx0151	Archaeological-site lead: cultural material scatter	Benson, 1980	Unevaluated	No	Unknown
155/102-36	32WIx0152	Historic-site lead: mine	Benson, 1980	Unevaluated	No	Unknown
155/102-36	32WIx0484	Historic-site lead: quarry/mine	LCT, 1990	Unevaluated	No	Unknown

Site File Search Results - Alternative B						
156/100-34	32WI0075	Historic-depression, cultural material scatter, glass, metal	Borchert, 1983	Unevaluated	No	Historic homestead-1913
156/100-36	32WI1185	Historic-well, depression, dump, foundation, cultural material scatter, metal, rubber, wood	Bluemle, 2011	Not Eligible	No	Historic farmstead
157/094-20	32MNx048 5	Archaeological-site lead: cultural material scatter	Benson, 1980	Unevaluated	No	Unknown

Appendix I

Cultural Resources for the Two Alternative Routes

Cultural Resources Individual to Each Alternative Route	
Alternative Route A	**Alternative Route B**
32DU1602	32DU0332
32MZ0589	32DU0342
32MZ0592	32DU0343
32MZ0593	32DU0351
32MZ0853	32DU0357
32MZ0854	32DU0359
32MZ0879	32DU1165
32MZ0880	32DU1492
32MZ0881	32DU1500
32MZ0892	32DU1502
32MZ0893	32DU1507
32MZ1311	32DU1606
32MZ1312	32DUx0592
32MZ2202	32DUx0799
32MZx0003	32MZ0489
32MZx0036	32MZ0882
32MZx0484	32MZ0895
32MZx0485	32MZx1120
32MZx0486	
32MZx0510	
32MZx0902	
32MZx0903	
32MZx1073	
Total Number of Sites Specific to Alternative Route A: 23	
Total Number of Sites Specific to Alternative Route B: 18	
Total Number of Sites Shared by Both Alternatives: 70	

Cultural Resource Types and Eligibility Determinations by County - Alternative Route A								
	Unevaluated	**Eligible**	**Not Eligible**	**Total Site**	**Tested**	**Shovel Probed**		
Dunn								
Archaeological	10	--	1	11	--	--		
Archaeological IF	--	--	5	5	--	--		
Historic SL	2	--	--	2	--	--		
Total	12	--	6	18	--	--		
Mercer								
Multicomponent Site	--	--	2	2	--	--		
Archaeological	2	2	4	8	6	2		
Archaeological IF	--	--	2	2	--	--		
Architectural	--	--	2	2	--	--		
Total	2	2	10	14	6	2		
Mountrail								
Archaeological SL	1	--	--	1	--	--		
Total	1	--	--	1	--	--		
Williams								
Archaeological	11	--	1	12	--	--		
Archaeological SL	3	--	--	3	--	--		
Historic	1	--	1	2	--	--		
Historic SL	5	--	--	5	--	--		
Total	20	--	2	22	--	--		
McKenzie								
Archaeological	15	5	--	20	--	--		
Archaeological IF	--	--	9	9	--	--		
Historic	2	1	3	6	--	--		
Historic SL	2	--	--	2	--	--		

Cultural Resource Types and Eligibility Determinations by County - Alternative Route A								
Historic IF	--	--	1	1	--	--		
Total	19	6	13	38	--	--		
Total Eligibility Determinations								
By County	**Unevaluated**	**Eligible**	**Not Eligible**	**Total Sites**	**Tested**	**Shovel Probed**		
Dunn	12	--	6	18	--	--		
Mercer	2	2	10	14	6	2		
Mountrail	1	--	--	1	--	--		
Williams	20	--	2	20	--	--		
McKenzie	19	6	13	38	--	--		
Totals All Counties	54	8	31	91	6	2		
Cultural Resource Totals								
by County	**Multicomponent**	**Archaeo**	**Archaeo IF**	**Archaeo SL**	**Historic**	**Historic IF**	**Historic SL**	**Architectural**
Dunn	--	11	5	--	--	--	2	--
Mercer	2	8	2	--	--	--	--	2
Mountrail	--	--	--	1	--	--	--	--
Williams	--	12	--	3	2	--	5	--
McKenzie	--	20	9	--	6	1	2	--
Totals All Counties	2	51	16	4	8	1	9	2
Total Cultural Resources	93							

Archae=Archaeological
IF=Isolated Find
SL=Site Lead

Cultural Resource Types and Eligibility Determinations by County - Alternative Route B

	Unevaluated	Eligible	Not Eligible	Total Site	Tested	Shovel Probed		
Dunn								
Archaeological	15	--	6	21	4	5		
Archaeological IF	--	--	7	7	--	--		
Architectural	1	--	--	1	--	--		
Historic SL	2	--	--	2	--	--		
Total	18	--	13	31	4	5		
Mercer								
Multicomponent Site	--	--	2	2	--	--		
Archaeological	2	2	4	8	6	2		
Archaeological IF	--	--	2	2	--	--		
Architectural	--	--	2	2	--	--		
Total	2	2	10	14	6	2		
Mountrail								
Archaeological SL	1	--	--	1	--	--		
Total	1	--	--	1	--	--		
Williams								
Archaeological	11	--	1	12	--	--		
Archaeological SL	3	--	--	3	--	--		
Historic	1	--	1	2	--	--		
Historic SL	5	--	--	5	--	--		
Total	20	--	2	22	--	--		
McKenzie								
Archaeological	13	--	--	13	1	--		
Archaeological IF	--	--	4	4	--	--		
Historic	1	1	1	3	--	--		

Cultural Resource Types and Eligibility Determinations by County - Alternative Route B								
Total	14	1	5	20	1	--		
Total Eligibility Determinations								
By County	**Unevaluated**	**Eligible**	**Not Eligible**	**Total Sites**	**Tested**	**Shovel Probed**		
Dunn	18	--	13	31	4	5		
Mercer	2	2	10	14	6	2		
Mountrail	1	--	--	1	--	--		
Williams	20	--	2	22	--	--		
McKenzie	14	1	5	20	1	--		
Totals All Counties	55	3	30	88	11	7		
Cultural Resource Totals								
by County	**Multicomponent**	**Archaeo**	**Archaeo IF**	**Archaeo SL**	**Historic**	**Historic IF**	**Historic SL**	**Architectural**
Dunn	--	21	7	--	--	--	2	1
Mercer	2	8	2	--	--	--	--	2
Mountrail	--	--	--	1	--	--	--	--
Williams	--	12	--	3	2	--	5	--
McKenzie	--	13	4	--	3	--	--	--
Totals All Counties	2	54	13	4	5	--	7	3
Total Cultural Resources	88							

Archae=Archaeological
IF=Isolated Find
SL=Site Lead

Manuscript File Search Results-Alternative Route A		
MS #	Reference	Location with Reference to Alternative Route A
143	Nobel, B. 1977 EMRIA Reclamation Studies Drilling Locations: Cultural Resources Report, Mercer County, North Dakota	145/88-14, 23
225	Dill, C. 1978 1977 Cultural Resources Inventory: Antelope Valley Station/A.N.G.C.G.C. Gasification Plant Site, Associated Mining Areas and Ancillary Facilities, Mercer County, North Dakota	145/88-13-16, 21-24
1314	Simon, A. and L. Loendorf 1980 Haymaker and Associates Gulf West Mormon Butte 1-21-2D Well Location and Access Route Survey, McKenzie County, North Dakota	147/98-7, 18 147/99-13
1686	Pearson, J. and A. Simon 1981 A Class III Intensive Inventory of the Proposed Route of MDU Trenton Plant Line in Williams County, North Dakota	154/102-36
1770	Simon, A. and L. Loendorf 1981 McKenzie Electric Cooperative, Inc., REC Line Survey, McKenzie County, North Dakota	145/98-25, 26
2117	Montgomery, S. and A. Simon 1981 Basin Electric Power Cooperative Charlie Creek 345KV Transmission Line Survey, McKenzie County, North Dakota	145/98-34, 35
2253	Simon, A. and L. Loendorf 1979 The Cultural Resource Survey of the Proposed Gathering Lines for Western North Dakota Amoco Pipeline Company, Billings County, McKenzie County, and Dunn County, North Dakota	145/98-25, 26, 35
2454	Rippeteau, B. 1981 Patrick Petroleum Block Survey Sections 20, 21, 29, 30, T145N, R98W, McKenzie County, North Dakota	145/98-21
2528	Good, K. 1982 Cultural Resource Inventory for Identified Locations Along U.S. Highway 2 Between Junctions of Highways 2 and 85 and Highways 2 and 52 in Mountrail, Ward and Williams Counties, North Dakota	156/95-12, 13
2543	Greiser, T. and S. Greiser 1981 Class II Cultural Resource Inventory, Dunn Center Coal Deposit Area, Dunn County, North Dakota, Volumes 1 and 2	145/92-8, 10 145/93-10, 12 145/94-11, 12

Manuscript File Search Results-Alternative Route A		
MS #	Reference	Location with Reference to Alternative Route A
2762	Borchert, J. 1993 Basin Electric Charles Creek Line, Sites UND-1 Through 22 Update, McKenzie County, and Dunn County, North Dakota	145/98-35
3247	Simon, A. and J. Borchert 1983 Class III Intensive Inventory of the Proposed Highway 200 to Voight Bay Road, Dunn County, North Dakota	145/92-7 145/93-10, 12 145/94-11
3251	Kuehn, D. and J. Borchert 1984 Archaeological Investigations Along the Portal Beaver Lodge to Alexander Pipeline Williams and McKenzie Counties, North Dakota	154/102-10 156/100-34
3313	Floodman, M. 1983 Getty Trading and Transportation Company McKenzie County Gathering System, McKenzie County, North Dakota	151/100-6, 8 151/101-1
3455	Root, M. and M. Gregg 1983 Archeology of the Northern Border Pipeline, North Dakota: Volume 2, Parts. 1-3 Survey and Background Information, McIntosh, Emmons, Morton, Stark, Mercer, Dunn, McKenzie, and Williams Counties, North Dakota	145/94-9, 10 145/95-5 149/99-22
3551	Borchert, J. 1984 Archaeological Investigations for the Basin Electric AVS to Charlie Creek 345 KV Transmission Line, Dunn County, North Dakota	145/98-34-36
3758	Linnabery, M. 1984 A Class III Inventory of the Williston Gas Company Pipeline Right of Way Segments Northern Gathering System, McKenzie and Billings Counties, North Dakota, and Supplemental Survey Number 3	147/99-13, 24, 25
3782	Bass, S. 1984 McKenzie-Williams Land Status Survey, 84-MT030-21 (E), McKenzie County, North Dakota	149/99-26, 35
4294	Noisat, B., J. Campbell, G. Moore and K. Schweigert 1986 A Reconnaissance Survey and Preliminary Assessment of the Cultural Resources of Lake Sakakawea in Williams and McKenzie Counties, North Dakota Volumes 1 and 2	153/101-16, 21

Manuscript File Search Results-Alternative Route A		
MS #	**Reference**	**Location with Reference to Alternative Route A**
4506	Borchert, J. 1988 MDU-Basin Charlie Creek to Williston 230 KV Electric Transmission Line, Williams and McKenzie Counties, North Dakota (UW #1016)	145/98-7, 17, 18, 20-22, 27 147/98-5-8, 18 148/98-18, 19, 30, 31 148/99-1, 12, 13 150/99-6, 8, 9, 16, 21, 28, 33 150/100-1 151/100-6, 7, 8, 22, 26, 35, 36 151/101-1 153/101-6, 8, 16, 17 153/102-1 154/102-36
4744	Mortrano, M., D. Killam, and P. Friedman 1990 Class I Literature Search and Class III Intensive Inventory Charlie Creek to Belfield 345-KC Transmission Line Project, Stark, McKenzie, Dunn, and Billings Counties, North Dakota	145/98-34
4846	Christensen, R. and K. Schwigert 1990 Archaeological Inventory of McKenzie Electric Cooperative Pole Replacement in Dunn and McKenzie Counties, North Dakota	145/91-7, 9 145/92-10, 12
5161	Newberry, G. and B. L. Olson 1991 Western Area Power Administration Charlie Creek-Belfield Transmission Line Project: Results of Limited Testing at Four Prehistoric Sites in Billings and McKenzie Counties, North Dakota	145/98-34
5412	Good, K. 1991 US 85- Watford City West, McKenzie County, Class III Cultural Resources Inventory Report	150/99-16, 21
5749	Olson, B. 1992 Amerada Hess Corporation, 10 Inch Natural Gas Pipeline Project Cultural Resources Inventory McKenzie and Williams Counties, North Dakota and Final Report	156/95-19
5845	Borchert, J. 1992 Dunn County Road Improvement {SC-1330(53)} Class III Cultural Resource Inventory UW#1552	145/92-10, 11

Manuscript File Search Results-Alternative Route A		
MS #	**Reference**	**Location with Reference to Alternative Route A**
5986	Lubinski, P. 1992 Tioga to Stanley Water Pipeline in Mountrail and Williams Counties, North Dakota: A Class III Cultural Resource Inventory	156/94-12
6051	Borchert, J. 1993 McKenzie Electric Cooperative, Inc. 1993-1994 Construction Routes in Dunn and McKenzie Counties, Class III Cultural Resource Inventory UW#1606	145/91-11
6146	Borchert, J. 1993 Consolidated Telephone Grassy Butte Exchange #1-10 Cable Routes Class III Reconnaissance Inventory McKenzie, Dunn and Billings Counties UW#1676	145/96-15
6269	Floodman, M. 1994 Two Pipeline Projects in Pasture 8 Little Missouri National Grasslands; McKenzie District Section 12 T147N R100W and Sections 23 and 24 T147N R99W McKenzie County, North Dakota	147/99-24
6643	Klinner, D. 1995 The Federal Aid Project Number BRO-1329(60) Bridge Replacement Project in Dunn County, North Dakota: Results of a Class III Cultural Resources Inventory UW#1827	145/92-7 145/93-12
6769	Kulevsky, A. 1996 KLJ/CTC Grassy Butte Telephone Exchange: A Class II and Class III Cultural Resource Inventory in Dunn and McKenzie Counties, North Dakota	145/97-17, 18
7010	Wermers, G. 1997 County Road Improvement Project in Dunn County, North Dakota. Federal Aid Project Number: SC-1305(51) UW#2001	145/96-18
7141	Floodman, M. 1997 1977 USDA Forest Service, Custer National Forest Negative Survey Reports in Golden Valley, Billings, Slope, and McKenzie Counties in North Dakota	147/98-7, 18 147/99-13
7144	Olson, B. 1998 Dakota Gasification Company Co2 Pipeline Selected Segments in Mercer, Dunn, McKenzie, Williams, and Divide Counties, North Dakota: A Class III Cultural Resource Inventory and Appendix B: USGS Topographic Coverage of the Pipeline	145/88-16, 21 145/89-10, 11

Manuscript File Search Results-Alternative Route A		
MS #	Reference	Location with Reference to Alternative Route A
7224	Porter, D. and D. Klinner 1998 Schwartz Construction Proposed Extraction Locations in McKenzie County, North Dakota UW#2068	149/98-31 149/99-36
7254	Klinner, D. 1998 Quantum Geophysical, Inc. Seismic Line in Sections 11, 12, 14, 23, 24, 25, 26, and 35, T145N, R98W, McKenzie County, North Dakota. UW #2117	145/98-24, 25, 36
7292	Klinner, D. 1999 Mountrail County Road Improvement Project in Portions of T157N, R94W, North Dakota UW#2107	157/94-28, 29
7318	Larson, T. 1998 Results of a Class III Cultural Resource Inventory for NDDOT Project Areas NH-7-085(031)112 and NH-7-085(032)120 McKenzie County North Dakota	147/99-12, 24, 25
7343	Klinner, D. 1999 Mercer County Road Improvement Project in Sections 13, 14, 23, and 24, T145N, R88W, North Dakota UW#2125	145/88-13, 14, 23, 24
7427	Morrison, J. 1999 Grassy Butte Cable Route: A Class III Cultural Resource Inventory, Billings, Dunn and McKenzie Counties, North Dakota	145/96-18
7610	Boughton, J., L. Litwinionek and S. Walker-Kuntz 2000 Cultural Resource Inventory of Permit Area Extensions D and H and the West Permit Area, the Coteau Mine, Beulah, Mercer County, North Dakota	145/88-14-17, 20-23
7684	Bluemle, W. 2000 Grassy Butte: A Class III Cultural Resource Inventory, McKenzie County, North Dakota	147/99-13 149/99-36
8223	Bluemle, W. 2002 Killdeer Exchange: A Class II and III Cultural Resource Inventory, Dunn County, North Dakota	145/95-3, 4
8448	Morrison, J. 2003 North Dakota Highway 22 From Killdeer to Lost Bridge: A Class III Cultural Resource Inventory, Dunn County, North Dakota	145/95-4

Manuscript File Search Results-Alternative Route A		
MS #	**Reference**	**Location with Reference to Alternative Route A**
8463	Hall, D., S. Knudsen and J. Lockman 2002 Cultural Resource Investigation Williston to Wolf Point Transmission Line Roosevelt County, Montana and Williams County, North Dakota	154/102-23
8550	Morrison, J. 2003 Consolidated Telecom's Halliday to Dunn Center Exchange: A Class III Cultural Resource Inventory Dunn County, North Dakota	145/94-10, 11
8605	Stine, E. 2003 Reinhardt Gravel Pit: A Cultural Resource Inventory in Mercer County, North Dakota	145/88-7
8670	Perkl, B., B. Mitchell, J. Lindbech, S. Bushey, R. Weddle, M. Bech and G. Bolling 2001 Cultural Resources Investigations Along U.S. Highway 2 in Ward, Mountrail, and Williams Counties, North Dakota. Volume I and II	156/94-12, 13
8840	Bluemle, W. 2004 Oliver-Mercer 2004: A Class III Cultural Resource Inventory, Oliver and Mercer Counties, North Dakota	145/90-12
8884	Fandrich, B. 2004 Williston to Charlie Creek: A Cultural Resource Inventory Along the Western Area Power Administration 115KV Transmission Line From the Williston Substation to the Charlie Creek Substation, Williams and McKenzie Counties, North Dakota	145/98-34 147/99-24 149/99-36 150/99-28 152/101-18 153/101-5, 6, 8, 16, 17
9076	Morrison, J. 2002 McKenzie County Water Resource District Phase II: Results of the Class II and III Cultural Resource Inventory of a Regional Water System in Portions of McKenzie County, North Dakota, Within the Little Missouri River, Yellowstone River and Garrison Study Units	149/99-36 150/99-16
9270	Stine, E. 2005 Highway 2: A Cultural Resource Inventory in Williams County, North Dakota	155/101-14
9747	Burns, W. 2006 The Folbag Survey, Williams County: A Class III Cultural Resource Inventory	155/100-5, 8

Manuscript File Search Results-Alternative Route A		
MS #	**Reference**	**Location with Reference to Alternative Route A**
9856	Harty, J., P. Heiner and J. Morrison 2006 Enbridge Pipelines (North Dakota) LLC, North Dakota Pipeline Expansion Project: A Class II and III Cultural Resource Inventory and Evaluative Testing of Three Sites, Williams County, North Dakota	154/102-10 156/100-33, 34
9938	Hiemstra, D. 2006 Grassy Butte Testing and Survey: A Cultural Resource Evaluation of Three Sites and One Site Lead and a Cultural Resource Inventory of Access Roads and Realignment for the Proposed Rebuild of Western Area Power Administration's Williston to Charlie Creek 115-kV Transmission Line in McKenzie County, North Dakota	147/99-24
9942	Hope, S., J. Boughton, L.A. Peterson, L.M. Peterson, and J. Bales 2006 Coteau: Data Recovery in the West Mine Area, Mercer County, North Dakota	145/88-21, 22
10084	Harty, J. 2007 Knudsvig 34-7H Well Pad and Access Road: A Class III Cultural Resource Inventory, Dunn County, North Dakota	145/93-7
10182	Springer, K. 2007 07-053-015 Well and Tank Project Cultural Resources Inventory, McKenzie County, North Dakota	149/99-9, 16
10642	Kordecki, C., C. Jackson, J. Neary, and D. Toom 2008 Southwest Water Pipeline Project, Medora-Beach Regional Service Area, Phase 3, 2007 Cultural Resource Inventories: Report on the South Fryburg Service Area, Fairfield Service Area and the Trotters Pocket, Billings, Dunn, Stark and Golden Valley Counties, North Dakota	145/97-15
10758	Hiemstra, D. and L. France 2008 Killdeer 115 kV Transmission Line: A Class III Cultural Resource Inventory Near Killdeer North Dakota in Dunn County, North Dakota	145/96-1
10798	Hiemstra, D. and A. Barth 2008 Williston to Tioga: A Class III Cultural Resource Inventory for a Proposed 230kV Transmission Line in Williams and Mountrail Counties, North Dakota	155/101-15, 16, 18
11097	Engel, D. 2009 Williston to Tioga: A Class III Cultural Resource Inventory for a Proposed 230kV Transmission Line in Williams and Mountrail Counties, North Dakota Addendum 1	155/101-16

Manuscript File Search Results-Alternative Route A		
MS #	**Reference**	**Location with Reference to Alternative Route A**
11276	Leuchtmann, A. 2009 Highway 85 From North Dakota Highway 200 to North Dakota Highway 2: A Class III Cultural Resource Inventory, McKenzie and Williams Counties, North Dakota	149/99-36
11540	Jackson, M. and D. Toom 2010 Dunn County 2010 Gartner Road Construction Project Class III Cultural Resources Survey Dunn County, North Dakota	145/96-1, 12
11691	Toom, D. and M. Jackson 2009 Zap-Hazen Main Transmission Line and Water Treatment Plant 2009 Class III Cultural Resources Inventory Zap Service Area, Southwest Water Pipeline Project, Mercer County, North Dakota	145/88-7, 8
11770	Williams, G. and A. Kulevsky 2010 Williston to Tioga: A Class III Cultural Resource Inventory for a Proposed 230kV Transmission Line in Williams and Mountrail Counties, North Dakota: Addendum 2: Site Staking and Additional Inventory of Three Segments	155/101-15, 16
11791	France, E. and D. Reinhart 2010 Bridger Pipeline Project: Class I and III Cultural Resource Investigations in Western North Dakota, Dunn, Billings, McKenzie Counties	145/96-15
11849	Bluemle, V. 2010 Highway 85 RP 168.5 to RP 179, Class III Cultural Resource Inventory, McKenzie County, North Dakota	152/101-18 153/101-16
11880	Irwin, J. 2010 A Class III Cultural Resource Inventory of Reroute Sections Along the Charlie Creek to Watford City Transmission Line, McKenzie County, North Dakota	145/98-27
11942	Bluemle, W. 2004 Williams Rural Water Association 2003-2004: A Class II and III Cultural Resources Inventory in Williams County, North Dakota	154/102-10, 11, 35
11956	Wermers, G. 2011 MZ-1026 Class III Inventory Report, McKenzie County, North Dakota	150/99-16, 21
12014	Kulevsky, A. 2010 Addendum 2 to Bridger Pipeline: Class I and III Cultural Resource Investigations in Western North Dakota, Dunn and McKenzie Counties: Four Reroutes	145/96-15

Manuscript File Search Results-Alternative Route A		
MS #	**Reference**	**Location with Reference to Alternative Route A**
12254	Jackson, M., D. Toom, and M. Lonski 2001 Zap Service Area Phase I Rural Distribution Lines 2010 a Class III Cultural Resource Inventory Southwest Water Pipeline Project, Mercer and Oliver County, North Dakota	145/88-13, 14, 16, 17, 23
12263	Riordan, C., J. Cooper, S. Lechert, and S. Slessman 2011 A Class I and Class III Cultural Resource Inventory of the Bear Paw Energy Natural Gas Liquids Garden Creek Pipeline, Private Lands, McKenzie County, North Dakota	149/99-4 150/99-16, 21, 28, 33
12664	Bluemle, W. 2011 Enbridge Pipelines (North Dakota), LLC'S Little Muddy Stations and Pipeline Project: A Class III Cultural Resources Inventory in Williams County, North Dakota	156/100-35, 36
12730	Morrison, J. 2011 McKenzie Rural Water District Regional Transmission Main and Facilities: Class II and Class III Cultural Resources Inventory, William and McKenzie Counties, North Dakota	153/101-12
12816	Engel, D. 2011 Continental Resources Atlanta 1-6H: A Class III Cultural Resource Inventory in Williams County, North Dakota	153/101-6
12850	Jackson, M., M. Lonski, and D. Toom 2011 Dunn Center Main Transmission Line 2011 Class III Cultural Resources Inventory Dunn Center Service Area, Southwest Water Pipeline Project, Dunn and Mercer Counties, North Dakota	145/94-6 145/96-1, 12
12865	Eigenberger, D. and S. Sabatke 2011 Class III Archaeological Inventory for the Basin Electric Power Cooperative Transmission Line Project, Williams County, North Dakota Final Project	154/102-15, 22, 23

Manuscript File Search Results-Alternative Route B		
MS #	**Reference**	**Location with Reference to Alternative B**
143	Nobel, B. 1977 EMRIA Reclamation Studies Drilling Locations: Cultural Resources Report, Mercer County, North Dakota	145/88-14, 23
225	Dill, C. 1978 1977 Cultural Resources Inventory: Antelope Valley Station/A.N.G.C.G.C. Gasification Plant Site, Associated Mining Areas and Ancillary Facilities, Mercer County, North Dakota	145/88-13-16, 21-24
837	Metcalf, M. and C. Zier 1979 Adobe Oil and Gas #34-31 Federal Well Pad and Access Route Survey Report, McKenzie County, North Dakota	149/95-32, 33
1572	Rippeteau, B. 1980 Consolidated Oil and Gas 1-28 Federal Access Road Survey, McKenzie County, North Dakota	149/96-9
1684	Rippeteau, B. 1981 Letec, Thunderbird Energies, Inc., Well Location and Access Route Survey, McKenzie County, North Dakota	149/95-18 149/96-13
1686	Pearson, J. and A. Simon 1981 A Class III Intensive Inventory of the Proposed Route of MDU Trenton Plant Line in Williams County, North Dakota	154/102-36
1770	Simon, A. and L. Loendorf 1981 McKenzie Electric Cooperative, Inc., REC Line Survey, McKenzie County, North Dakota	145/98-25, 26
2117	Montgomery, S. and A. Simon 1981 Basin Electric Power Cooperative Charlie Creek 345KV Transmission Line Survey, McKenzie County, North Dakota	145/98-34, 35
2253	Simon, A. and L. Loendorf 1979 The Cultural Resource Survey of the Proposed Gathering Lines for Western North Dakota Amoco Pipeline Company, Billings County, McKenzie County, and Dunn County, North Dakota	145/98-25, 26, 35
2528	Good, K. 1982 Cultural Resource Inventory for Identified Locations Along U.S. Highway 2 Between Junctions of Highways 2 and 85 and Highways 2 and 52 in Mountrail, Ward and Williams Counties, North Dakota	156/95-12, 13

Manuscript File Search Results-Alternative Route B		
MS #	**Reference**	**Location with Reference to Alternative B**
2543	Greiser, T. and S. Greiser 1981 Class II Cultural Resource Inventory, Dunn Center Coal Deposit Area, Dunn County, North Dakota, Volumes 1 and 2	145/92-8, 10 145/93-10, 12 145/94-11, 12
2762	Borchert, J. 1993 Basin Electric Charles Creek Line, Sites UND-1 Through 22 Update, McKenzie County, and Dunn County, North Dakota	145/98-35
3247	Simon, A. and J. Borchert 1983 Class III Intensive Inventory of the Proposed Highway 200 to Voight Bay Road, Dunn County, North Dakota	145/92-7 145/93-10, 12 145/94-11
3251	Kuehn, D. and J. Borchert 1984 Archaeological Investigations Along the Portal Beaver Lodge to Alexander Pipeline Williams and McKenzie Counties, North Dakota	154/102-10 156/100-34
3313	Floodman, M. 1983 Getty Trading and Transportation Company McKenzie County Gathering System, McKenzie County, North Dakota	151/100-6, 8, 9 151/101-1
3455	Root, M. and M. Gregg 1983 Archeology of the Northern Border Pipeline, North Dakota: Volume 2, Parts. 1-3 Survey and Background Information, McIntosh, Emmons, Morton, Stark, Mercer, Dunn, McKenzie, and Williams Counties, North Dakota	145/94-5, 6, 9, 10 145/95-1, 5 146/94-31
3551	Borchert, J. 1984 Archaeological Investigations for the Basin Electric AVS to Charlie Creek 345 KV Transmission Line, Dunn County, North Dakota	145/98-34-36
4294	Noisat, B., J. Campbell, G. Moore and K. Schweigert 1986 A Reconnaissance Survey and Preliminary Assessment of the Cultural Resources of Lake Sakakawea in Williams and McKenzie Counties, North Dakota Volumes 1 and 2	153/101-16, 21

Manuscript File Search Results-Alternative Route B		
MS #	Reference	Location with Reference to Alternative B
4506	Borchert, J. 1988 MDU-Basin Charlie Creek to Williston 230 KV Electric Transmission Line, Williams and McKenzie Counties, North Dakota (UW #1016)	151/100-6, 7, 8, 16 151/101-1 153/101-6, 8, 16, 17 153/102-1 154/102-36
4744	Mortrano, M., D. Killam, and P. Friedman 1990 Class I Literature Search and Class III Intensive Inventory Charlie Creek to Belfield 345-KC Transmission Line Project, Stark, McKenzie, Dunn, and Billings Counties, North Dakota	145/98-34
4846	Christensen, R. and K. Schwigert 1990 Archaeological Inventory of McKenzie Electric Cooperative Pole Replacement in Dunn and McKenzie Counties, North Dakota	145/91-7, 9 145/92-10, 12
5161	Newberry, G. and B. L. Olson 1991 Western Area Power Administration Charlie Creek-Belfield Transmission Line Project: Results of Limited Testing at Four Prehistoric Sites in Billings and McKenzie Counties, North Dakota	145/98-34
5749	Olson, B. 1992 Amerada Hess Corporation, 10 Inch Natural Gas Pipeline Project Cultural Resources Inventory McKenzie and Williams Counties, North Dakota and Final Report	156/95-19
5845	Borchert, J. 1992 Dunn County Road Improvement {SC-1330(53)} Class III Cultural Resource Inventory UW#1552	145/92-10, 11
5986	Lubinski, P. 1992 Tioga to Stanley Water Pipeline in Mountrail and Williams Counties, North Dakota: A Class III Cultural Resource Inventory	156/94-12
6051	Borchert, J. 1993 McKenzie Electric Cooperative, Inc. 1993-1994 Construction Routes in Dunn and McKenzie Counties, Class III Cultural Resource Inventory UW#1606	145/91-11
6146	Borchert, J. 1993 Consolidated Telephone Grassy Butte Exchange #1-10 Cable Routes Class III Reconnaissance Inventory McKenzie, Dunn and Billings Counties UW#1676	145/96-15

Manuscript File Search Results-Alternative Route B		
MS #	**Reference**	**Location with Reference to Alternative B**
6643	Klinner, D. 1995 The Federal Aid Project Number BRO-1329(60) Bridge Replacement Project in Dunn County, North Dakota: Results of a Class III Cultural Resources Inventory UW#1827	145/92-7 145/93-12
6769	Kulevsky, A. 1996 KLJ/CTC Grassy Butte Telephone Exchange: A Class II and Class III Cultural Resource Inventory in Dunn and McKenzie Counties, North Dakota	145/97-17, 18
7010	Wermers, G. 1997 County Road Improvement Project in Dunn County, North Dakota. Federal Aid Project Number: SC-1305(51) UW#2001	145/96-18
7144	Olson, B. 1998 Dakota Gasification Company Co2 Pipeline Selected Segments in Mercer, Dunn, McKenzie, Williams, and Divide Counties, North Dakota: A Class III Cultural Resource Inventory and Appendix B: USGS Topographic Coverage of the Pipeline	145/88-16, 21 145/89-10, 11 147/96-11, 13, 14, 36 148/95-6, 7 148/96-1, 12, 13, 23, 26
7254	Klinner, D. 1998 Quantum Geophysical, Inc. Seismic Line in Sections 11, 12, 14, 23, 24, 25, 26, and 35, T145N, R98W, McKenzie County, North Dakota. UW #2117	145/98-24, 25, 36
7292	Klinner, D. 1999 Mountrail County Road Improvement Project in Portions of T157N, R94W, North Dakota UW#2107	157/94-28, 29
7343	Klinner, D. 1999 Mercer County Road Improvement Project in Sections 13, 14, 23, and 24, T145N, R88W, North Dakota UW#2125	145/88-13, 14, 23, 24
7427	Morrison, J. 1999 Grassy Butte Cable Route: A Class III Cultural Resource Inventory, Billings, Dunn and McKenzie Counties, North Dakota	145/96-18

Manuscript File Search Results-Alternative Route B		
MS #	**Reference**	**Location with Reference to Alternative B**
7610	Boughton, J., L. Litwinionek and S. Walker-Kuntz 2000 Cultural Resource Inventory of Permit Area Extensions D and H and the West Permit Area, the Coteau Mine, Beulah, Mercer County, North Dakota	145/88-14-17, 20-23
8223	Bluemle, W. 2002 Killdeer Exchange: A Class II and III Cultural Resource Inventory, Dunn County, North Dakota	145/94-6 145/95-1, 3, 4 146/95-22 147/95-31
8448	Morrison, J. 2003 North Dakota Highway 22 From Killdeer to Lost Bridge: A Class III Cultural Resource Inventory, Dunn County, North Dakota	145/95-4 147/95-31 147/96-36
8463	Hall, D., S. Knudsen and J. Lockman 2002 Cultural Resource Investigation Williston to Wolf Point Transmission Line Roosevelt County, Montana and Williams County, North Dakota	154/102-23
8550	Morrison, J. 2003 Consolidated Telecom's Halliday to Dunn Center Exchange: A Class III Cultural Resource Inventory Dunn County, North Dakota	145/94-10, 11
8605	Stine, E. 2003 Reinhardt Gravel Pit: A Cultural Resource Inventory in Mercer County, North Dakota	145/88-7
8670	Perkl, B., B. Mitchell, J. Lindbech, S. Bushey, R. Weddle, M. Bech and G. Bolling 2001 Cultural Resources Investigations Along U.S. Highway 2 in Ward, Mountrail, and Williams Counties, North Dakota. Volume I and II	156/94-12, 13
8840	Bluemle, W. 2004 Oliver-Mercer 2004: A Class III Cultural Resource Inventory, Oliver and Mercer Counties, North Dakota	145/90-12
8884	Fandrich, B. 2004 Williston to Charlie Creek: A Cultural Resource Inventory Along the Western Area Power Administration 115KV Transmission Line From the Williston Substation to the Charlie Creek Substation, Williams and McKenzie Counties, North Dakota	152/101-18 153/101-5, 6, 8, 16, 17

Manuscript File Search Results-Alternative Route B		
MS #	Reference	Location with Reference to Alternative B
9270	Stine, E. 2005 Highway 2: A Cultural Resource Inventory in Williams County, North Dakota	155/101-14
9747	Burns, W. 2006 The Folbag Survey, Williams County: A Class III Cultural Resource Inventory	155/100-5, 8
9856	Harty, J., P. Heiner and J. Morrison 2006 Enbridge Pipelines (North Dakota) LLC, North Dakota Pipeline Expansion Project: A Class II and III Cultural Resource Inventory and Evaluative Testing of Three Sites, Williams County, North Dakota	154/102-10 156/100-33, 34
9942	Hope, S., J. Boughton, L.A. Peterson, L.M. Peterson, and J. Bales 2006 Coteau: Data Recovery in the West Mine Area, Mercer County, North Dakota	145/88-21, 22
10084	Harty, J. 2007 Knudsvig 34-7H Well Pad and Access Road: A Class III Cultural Resource Inventory, Dunn County, North Dakota	145/93-7
10265	Stine, E. 2007 Burlington Resources Brandvik Federal 24-13H: A Class III Cultural Resource Inventory in Dunn County, North Dakota	147/96-13, 24
10522	Bluemle, W. 2008 Continental’s Page 1-16H: A Class III Cultural Resource Inventory in McKenzie County, North Dakota	149/96-9
10642	Kordecki, C., C. Jackson, J. Neary, and D. Toom 2008 Southwest Water Pipeline Project, Medora-Beach Regional Service Area, Phase 3, 2007 Cultural Resource Inventories: Report on the South Fryburg Service Area, Fairfield Service Area and the Trotters Pocket, Billings, Dunn, Stark and Golden Valley Counties, North Dakota	145/97-15
10677	Swearson, W. and W. Burns 2008 Federal 34X-14 and Access Road: A Cultural Resource Inventory, McKenzie County, North Dakota	149/96-13
10710	Burns, W. 2008 Northern Border Connection of the Saddle Butte Pipeline: A Class III Cultural Resource Inventory, McKenzie County, North Dakota	149/96-5 150/96-32
10758	Hiemstra, D. and L. France 2008 Killdeer 115 kV Transmission Line: A Class III Cultural Resource Inventory Near Killdeer North Dakota in Dunn County, North Dakota	145/96-1

Manuscript File Search Results-Alternative Route B		
MS #	Reference	Location with Reference to Alternative B
10790	Burns, W. 2008 Porcupine Ridge #11X-2H Well Pad and Access Road: A Class III Cultural Resource Inventory, Dunn County, North Dakota	147/96-2 148/96-35
10798	Hiemstra, D. and A. Barth 2008 Williston to Tioga: A Class III Cultural Resource Inventory for a Proposed 230kV Transmission Line in Williams and Mountrail Counties, North Dakota	155/101-15, 16, 18
11097	Engel, D. 2009 Williston to Tioga: A Class III Cultural Resource Inventory for a Proposed 230kV Transmission Line in Williams and Mountrail Counties, North Dakota Addendum 1	155/101-16
11484	Burns, C. 2010 TAT State 14X-36 Well Pad and Access Road: A Class III Cultural Resource Inventory in Dunn County, North Dakota	147/96-2
11489	Burns, W. and G. Jackel 2010 Johnsrud Federal #34X-14 Well Pad and Access Road: A Class III Cultural Resource Inventory in McKenzie County, North Dakota	149/96-13
11540	Jackson, M. and D. Toom 2010 Dunn County 2010 Gartner Road Construction Project Class III Cultural Resources Survey Dunn County, North Dakota	145/96-1, 12
11566	France, E. 2010 True Companies-Bridger Pipeline on Three Affiliated Tribes Land: A Class III Cultural Resource Inventory in Dunn, County North Dakota	148/95-6, 7 148/96-1, 13, 23, 26
11691	Toom, D. and M. Jackson 2009 Zap-Hazen Main Transmission Line and Water Treatment Plant 2009 Class III Cultural Resources Inventory Zap Service Area, Southwest Water Pipeline Project, Mercer County, North Dakota	145/88-7, 8
11710	Morrison, J. 2010 2010 McKenzie Rural Water District Phase II Waterline: Class II and Class III Cultural Resource Inventory and Test Excavations, McKenzie County, North Dakota	149/96-11 150/96-17, 18

Manuscript File Search Results-Alternative Route B

MS #	Reference	Location with Reference to Alternative B
11770	Williams, G. and A. Kulevsky 2010 Williston to Tioga: A Class III Cultural Resource Inventory for a Proposed 230kV Transmission Line in Williams and Mountrail Counties, North Dakota: Addendum 2: Site Staking and Additional Inventory of Three Segments	155/101-15, 16
11791	France, E. and D. Reinhart 2010 Bridger Pipeline Project: Class I and III Cultural Resource Investigations in Western North Dakota, Dunn, Billings, McKenzie Counties	145/96-15 147/96-2, 11, 13, 14, 24, 25, 36 148/95-6, 7 148/96-1, 13, 23, 26, 35
11849	Bluemle, V. 2010 Highway 85 RP 168.5 to RP 179, Class III Cultural Resource Inventory, McKenzie County, North Dakota	152/101-18 153/101-16
11863	O'Donnchadha, B. 2010 Elk Creek USA 33-12H Well Pad and Access Road: A Class III Cultural Resource Inventory in McKenzie and Dunn Counties, North Dakota	148/95-7
11880	Irwin, J. 2010 A Class III Cultural Resource Inventory of Reroute Sections Along the Charlie Creek to Watford City Transmission Line, McKenzie County, North Dakota	145/98-27
11942	Bluemle, W. 2004 Williams Rural Water Association 2003-2004: A Class II and III Cultural Resources Inventory in Williams County, North Dakota	154/102-10, 11, 35
12013	Reinhart, D. 2010 Addendum 3 to Bridger Pipeline: Class I and III Cultural Resource Investigations in Western North Dakota, Dunn County: Monitoring at 32DU1502	148/96-23
12014	Kulevsky, A. 2010 Addendum 2 to Bridger Pipeline: Class I and III Cultural Resource Investigations in Western North Dakota, Dunn and McKenzie Counties: Four Reroutes	145/96-15 147/96-24, 25

Manuscript File Search Results-Alternative Route B		
MS #	Reference	Location with Reference to Alternative B
12015	Kulevsky, A. and E. France 2010 Addendum 1 to Bridger Pipeline: Class I and III Cultural Resource Investigations in Western North Dakota, Dunn and McKenzie Counties	147/96-25
12203	Morrison, J. 2011 2-H Moberg Federal 29-32 Well Pad and Access Roads: A Class III Cultural Resource Inventory, McKenzie County, North Dakota	149/95-20, 29
12254	Jackson, M., D. Toom, and M. Lonski 2001 Zap Service Area Phase I Rural Distribution Lines 2010 a Class III Cultural Resource Inventory Southwest Water Pipeline Project, Mercer and Oliver County, North Dakota	145/88-13, 14, 16, 17, 23
12664	Bluemle, W. 2011 Enbridge Pipelines (North Dakota), LLC'S Little Muddy Stations and Pipeline Project: A Class III Cultural Resources Inventory in Williams County, North Dakota	156/100-35, 36
12727	Engel, D. 2001 Burlington Resources HE 14-20MBH Well Pad: A Class III Cultural Resource Inventory in McKenzie County, North Dakota	151/97-29
12730	Morrison, J. 2011 McKenzie Rural Water District Regional Transmission Main and Facilities: Class II and Class III Cultural Resources Inventory, William and McKenzie Counties, North Dakota	153/101-12
12816	Engel, D. 2011 Continental Resources Atlanta 1-6H: A Class III Cultural Resource Inventory in Williams County, North Dakota	153/101-6
12850	Jackson, M., M. Lonski, and D. Toom 2011 Dunn Center Main Transmission Line 2011 Class III Cultural Resources Inventory Dunn Center Service Area, Southwest Water Pipeline Project, Dunn and Mercer Counties, North Dakota	145/94-5 145/96-1, 12
12865	Eigenberger, D. and S. Sabatke 2011 Class III Archaeological Inventory for the Basin Electric Power Cooperative Transmission Line Project, Williams County, North Dakota Final Project	154/102-15, 22, 23

Manuscript Reference to Cultural Resource Investigation for Each Alternative	
Alternative Route A	**Alternative Route B**
1314	837
2454	1572
3758	1684
3782	10265
5412	10522
6269	10677
7141	10710
7224	10790
7318	11484
7684	11489
9076	11566
9938	11710
10182	11863
11276	12013
11956	12015
12263	12203
	12727
Total Manuscripts Reference to Cultural Resource Investigation Specific to Alternative A: 16	
Total Manuscripts Reference to Cultural Resource Investigation Specific to Alternative B: 17	
T**otal Manuscripts Reference to Cultural Resource Investigation Shared by Both Alternatives:** 64	

Appendix J

Modeled Corona Outputs

```
               ***********************************************
               *       C O R O N A   A N D   F I E L D       *
               *        E F F E C T S   P R O G R A M        *
               *   Source: Bonneville Power Administration   *
               ***********************************************

             +++++++++++++++++++
             + INPUT DATA LIST +

            ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
           10/ 6/2011        5:46:35 pm
        +********  Basin 345/115kV EMF Calcs  ***************************
        +****  Double-Circuit Vertical -- (1)2306.2kcmil, (1)795kcmil ACSR ****
        +      1       0       6       8   362.0    2.00    1.00     .00

        (ENGLISH UNITS OPTION)

           LINE GRADIENTS COMPUTED BY PROGRAM

        PHYSICAL SYSTEM CONSISTS OF   8 CONDUCTORS, OF WHICH   6 ARE ENERGIZED PHASES

        +COMB  MF  XX  XX  XX  XX  XX  XX
        +   4.921   6.562   9.842    .000   1.000  75.000   3.280   4.000   3.280
        +115-A        A   -15.00   90.00    1   1.063     .00   69.70      .0     .88     .00
        +115-B        A   -17.00   65.00    1   1.063     .00   69.70  -120.0     .88     .00
        +115-C        A   -15.00   40.00    1   1.063     .00   69.70   120.0     .88     .00
        +345-A        A    15.00   80.00    1   1.802     .00  209.00      .0    1.65     .00
        +345-B        A    17.00   55.00    1   1.802     .00  209.00  -120.0    1.65     .00
        +345-C        A    15.00   30.00    1   1.802     .00  209.00   120.0    1.65     .00
        +GND-1        A    -8.00  110.00    1    .500     .00     .00      .0     .00     .00
        +GND-2        A     8.00  110.00    1    .500     .00     .00      .0     .00     .00
        +      81  -200.0     5.0
        +       0      .0      .0
```

COMBINED OUTPUT OF AUDIBLE NOISE, RADIO NOISE, TVI, OZONE CONCENTRATION, GROUND GRADIENT AND MAGNETIC FIELD

******** Basin 345/115kV EMF Calcs ***************************
**** Double-Circuit Vertical -- (1)2306.2kcmil, (1)795kcmil ACSR ****

362.0 KV

	DIST. FROM CENTER OF TOWER (FEET)	HEIGHT (FEET)	MAXIMUM GRADIENT (KV/CM)	SUBCON DIAM. (IN)	NO. OF SUBCON	SUBCON SPACING (IN)	VOLTAGE L-N (KV)	PHASE ANGLE (DEGREES)	CURRENT (KAMPS)	CORONA LOSSES (KW/MI)
115-A	-15.00	90.00	6.39	1.06	1.00	.00	69.70	.00	.875	.009
115-B	-17.00	65.00	7.93	1.06	1.00	.00	69.70	-120.00	.875	.038
115-C	-15.00	40.00	7.55	1.06	1.00	.00	69.70	120.00	.875	.028
345-A	15.00	80.00	14.96	1.80	1.00	.00	209.00	.00	1.650	19.347
345-B	17.00	55.00	15.88	1.80	1.00	.00	209.00	-120.00	1.650	28.506
345-C	15.00	30.00	15.44	1.80	1.00	.00	209.00	120.00	1.650	23.775
GND-1	-8.00	110.00	4.80	.50	1.00	.00	.00	.00	.000	.000
GND-2	8.00	110.00	5.50	.50	1.00	.00	.00	.00	.000	.000

AN MICROPHONE HT.= 4.9 FT, RI ANT. HT.= 6.6 FT, TV ANT. HT.= 9.8 FT, ALTITUDE= .0 FT
RI FREQ= 1.000 MHZ, TV FREQ= 75.000 MHZ, WIND VEL.(OZ) = 2.000 MPH, GROUND CONDUCTIVITY = 4.0 MMHOS /M
E-FIELD TRANSDUCER HT.= 3.3FT, B-FIELD TRANSDUCER HT. = 3.3FT

LATERAL DIST FROM REFERENCE (FEET)	AUDIBLE NOISE (RAIN) L50 DBA	AUDIBLE NOISE (FAIR) L50 DBA	RADIO INTERFERENCE (RAIN) L50 DBUV/M	RADIO INTERFERENCE (FAIR) L50 DBUV/M	TVI TOTAL RAIN DBUV/M	OZONE FOR RAIN RATE OF 1.00 IN/HR AT 0. FT.LEVEL PPB	ELECTRIC FIELD KV/M	MAGNETIC FIELD GAUSS
-200.0	47.6	22.6	49.1	32.1	14.8	.000000	.085	.01588
-195.0	47.7	22.7	49.4	32.4	15.0	.000000	.087	.01662
-190.0	47.8	22.8	49.7	32.7	15.2	.000000	.090	.01741
-185.0	47.9	22.9	49.9	32.9	15.4	.000000	.093	.01826
-180.0	48.0	23.0	50.2	33.2	15.6	.000000	.096	.01917
-175.0	48.2	23.2	50.5	33.5	15.9	.000000	.098	.02015
-170.0	48.3	23.3	50.8	33.8	16.1	.000000	.101	.02121
-165.0	48.4	23.4	51.1	34.1	16.3	.000000	.104	.02234
-160.0	48.5	23.5	51.4	34.4	16.5	.000000	.107	.02356
-155.0	48.7	23.7	51.8	34.8	16.8	.000000	.109	.02488
-150.0	48.8	23.8	52.1	35.1	17.0	.000000	.112	.02631
-145.0	49.0	24.0	52.5	35.5	17.2	.000000	.114	.02786
-140.0	49.1	24.1	52.8	35.8	17.5	.000000	.116	.02955
-135.0	49.2	24.2	53.2	36.2	17.8	.000000	.117	.03138
-130.0	49.4	24.4	53.6	36.6	18.0	.000000	.118	.03337
-125.0	49.5	24.5	54.0	37.0	18.3	.000000	.118	.03555
-120.0	49.7	24.7	54.4	37.4	18.6	.000000	.117	.03793
-115.0	49.9	24.9	54.9	37.9	18.9	.000000	.115	.04054
-110.0	50.0	25.0	55.3	38.3	19.2	.000000	.111	.04341
-105.0	50.2	25.2	55.8	38.8	19.5	.000000	.105	.04656
-100.0	50.4	25.4	56.3	39.3	19.8	.000000	.097	.05002
-95.0	50.6	25.6	56.8	39.8	20.1	.000000	.086	.05385
-90.0	50.8	25.8	57.4	40.4	20.5	.000000	.071	.05807
-85.0	51.0	26.0	58.0	41.0	20.8	.000000	.054	.06274
-80.0	51.2	26.2	58.5	41.5	21.2	.000000	.039	.06790

LATERAL DIST FROM REFERENCE (FEET)	AUDIBLE NOISE (RAIN) L50 DBA	AUDIBLE NOISE (FAIR) L50 DBA	RADIO INTERFERENCE (RAIN) L50 DBUV/M	RADIO INTERFERENCE (FAIR) L50 DBUV/M	TVI TOTAL RAIN DBUV/M	OZONE FOR RAIN RATE OF 1.00 IN/HR AT 0. FT.LEVEL PPB	ELECTRIC FIELD KV/M	MAGNETIC FIELD GAUSS
-75.0	51.4	26.4	59.2	42.2	21.5	.000000	.058	.07361
-70.0	51.6	26.6	59.8	42.8	21.9	.000000	.104	.07993
-65.0	51.8	26.8	60.5	43.5	22.3	.000000	.168	.08690
-60.0	52.1	27.1	61.2	44.2	22.7	.000000	.253	.09456
-55.0	52.3	27.3	61.9	44.9	23.2	.000000	.362	.10295
-50.0	52.6	27.6	62.6	45.6	23.6	.000000	.500	.11206
-45.0	52.8	27.8	63.4	46.4	24.3	.000000	.671	.12184
-40.0	53.1	28.1	64.2	47.2	25.0	.000000	.881	.13216
-35.0	53.4	28.4	65.0	48.0	25.7	.000000	1.133	.14286
-30.0	53.7	28.7	65.8	48.8	26.4	.000000	1.432	.15374
-25.0	54.0	29.0	66.6	49.6	27.3	.000000	1.778	.16468
-20.0	54.3	29.3	67.5	50.5	28.2	.000000	2.176	.17580
-15.0	54.7	29.7	68.6	51.6	29.1	.000000	2.629	.18759
-10.0	55.0	30.0	70.3	53.3	30.2	.000000	3.147	.20086
-5.0	55.3	30.3	72.1	55.1	31.2	.000000	3.727	.21630
.0	55.6	30.6	73.9	56.9	32.3	.000022	4.343	.23370
5.0	55.9	30.9	75.4	58.4	33.3	.000115	4.915	.25125
10.0	56.1	31.1	76.4	59.4	34.0	.000254	5.310	.26541
15.0	56.1	31.1	76.8	59.8	34.2	.000401	5.389	.27219
20.0	56.1	31.1	76.4	59.4	34.0	.000536	5.091	.26924
25.0	55.9	30.9	75.4	58.4	33.3	.008542	4.488	.25721
30.0	55.7	30.7	73.9	56.9	32.3	.078357	3.728	.23901
35.0	55.4	30.4	72.1	55.1	31.2	.170008	2.958	.21798
40.0	55.0	30.0	70.3	53.3	30.2	.241779	2.269	.19666
45.0	54.7	29.7	68.9	51.9	29.1	.297819	1.696	.17651
50.0	54.4	29.4	68.1	51.1	28.2	.344113	1.242	.15819
55.0	54.1	29.1	67.3	50.3	27.3	.382264	.893	.14188
60.0	53.8	28.8	66.5	49.5	26.4	.412707	.630	.12750
65.0	53.5	28.5	65.7	48.7	25.7	.435999	.437	.11489
70.0	53.2	28.2	64.8	47.8	25.0	.452955	.301	.10384
75.0	52.9	27.9	64.0	47.0	24.4	.464513	.214	.09414
80.0	52.7	27.7	63.2	46.2	24.0	.471607	.172	.08562
85.0	52.4	27.4	62.5	45.5	23.5	.475091	.164	.07812
90.0	52.2	27.2	61.7	44.7	23.1	.475709	.172	.07148
95.0	51.9	26.9	61.0	44.0	22.7	.474085	.183	.06560
100.0	51.7	26.7	60.3	43.3	22.3	.470733	.192	.06036
105.0	51.5	26.5	59.7	42.7	21.9	.466068	.199	.05570
110.0	51.2	26.2	59.0	42.0	21.5	.460423	.203	.05152
115.0	51.0	26.0	58.4	41.4	21.1	.454061	.204	.04777
120.0	50.8	25.8	57.8	40.8	20.7	.447193	.203	.04439
125.0	50.6	25.6	57.3	40.3	20.4	.439981	.201	.04135
130.0	50.5	25.5	56.7	39.7	20.1	.432554	.198	.03859
135.0	50.3	25.3	56.2	39.2	19.7	.425012	.193	.03609
140.0	50.1	25.1	55.7	38.7	19.4	.417433	.188	.03381
145.0	49.9	24.9	55.3	38.3	19.1	.409875	.182	.03174
150.0	49.8	24.8	54.8	37.8	18.8	.402385	.177	.02984
155.0	49.6	24.6	54.4	37.4	18.5	.394997	.171	.02810
160.0	49.4	24.4	53.9	36.9	18.2	.387736	.165	.02651
165.0	49.3	24.3	53.5	36.5	18.0	.380620	.159	.02504
170.0	49.1	24.1	53.1	36.1	17.7	.373663	.153	.02369
175.0	49.0	24.0	52.8	35.8	17.4	.366874	.147	.02244
180.0	48.9	23.9	52.4	35.4	17.2	.360259	.142	.02129
185.0	48.7	23.7	52.0	35.0	17.0	.353819	.137	.02022
190.0	48.6	23.6	51.7	34.7	16.7	.347556	.131	.01922
195.0	48.5	23.5	51.4	34.4	16.5	.341469	.127	.01830
200.0	48.3	23.3	51.1	34.1	16.3	.335557	.122	.01744

APPENDIX D - COMMISSION CORRESPONDENCE

BASIN ELECTRIC
POWER COOPERATIVE

1717 EAST INTERSTATE AVENUE
BISMARCK, NORTH DAKOTA 58503-0564
PHONE: 701-223-0441
FAX: 701-557-5336

December 5, 2011

RECEIVED

DEC 06 2011

PUBLIC SERVICE COMMISSION

Mr. Darrell Nitschke
Executive Secretary
North Dakota Public Service Commission
600 East Boulevard; Dept 408
Bismarck, ND 58505-0480

Dear Mr. Nitschke:

Pursuant to the provisions of Chapter 49-22 of the North Dakota Century Code and implementing rules, Basin Electric Power Cooperative (**Basin Electric**) herby notifies the North Dakota Public Service Commission (**Commission**) of our intent to construct the Antelope Valley Station to Neset 345-kV Transmission Project (**Project**).

In accordance with N.D.A.C. Chapter 69-06-03, the following information is provided to support our Letter of Intent:

1. **Description of Size and Type of Facility and the Area to be Served**

This Project is approximately 200 miles of predominately 345-kV transmission line originating from the Antelope Valley Station, located near Beulah, North Dakota, and terminating at the Neset 230-kV Substation located near Tioga, North Dakota. The 345-kV transmission line will also interconnect with the existing Charlie Creek Substation, located near Grassy Butte and Western Area Power Administration's Williston Substation. Two new substations will be required as a part of this project. The Judson 345-kV Substation will be located near Williston and a 345-kV substation will be located near the current Neset 230-kV Substation. This Project will serve the area in northwest North Dakota.

2. **A Map of the Study Area for the Proposed Site or Corridor**

The attached map depicts the Study area, and the existing: Antelope Valley Station, Charlie Creek Substation, Western's Williston Substation and the Neset 230-kV Substation. Also shown are the two proposed 345-kV substations.

3. **The Anticipated Construction and Operation Schedule**

The Project is expected to start construction in 2014. A two-year construction phase is anticipated with in-service expected in 2016. Permitting efforts including the corridor and route selection processes are underway. The Project requires various state, federal and local permits prior to initiating construction.

PU-11-696 Filed: 12/6/2011 Pages: 3
Letter of Intent
Basin Electric Power Cooperative

4. **An Estimate of the Total Cost of Construction**

The estimated cost for the Project is $300 million.

5. **Additional Information**

Basin Electric is responding to the accelerated growth of power requirements in northwest North Dakota. This transmission project will provide increased load service capacity and system reliability in northwest North Dakota. Basin Electric appreciates the Commission's attention to this matter. Basin Electric looks forward to developing the necessary transmission infrastructure to support our member systems in northwest North Dakota.

Sincerely,

Ronald R. Harper
CEO & General Manager

rrh/cm/gmj

Public Service Commission
State of North Dakota

COMMISSIONERS

Tony Clark
Brian P. Kalk
Kevin Cramer

Executive Secretary
Darrell Nitschke

600 East Boulevard, Dept. 408
Bismarck, North Dakota 58505-0480
Web: www.psc.nd.gov
E-mail: ndpsc@nd.gov
Phone: 701-328-2400
ND Toll Free: 1-877-245-6685
Fax: 701-328-2410
TDD: 800-366-6888 or 711

December 23, 2011

Ronald R. Harper
Basin Electric Power Cooperative
1717 East Interstate Avenue
Bismarck ND 58503

RE:
Case No. PU-11-696
Basin Electric Power Cooperative
345 kV Transmission Line- Mercer, Dunn, McKenzie, Williams Counties
Siting Application

Dear Mr. Harper:

At its regular meeting on December 21, 2011, the North Dakota Public Service Commission passed a motion acknowledging the Letter of Intent and assessing a filing fee of $100,000 in the above-referenced case. A copy of the Commission motion is enclosed.

Sincerely,

Cara DeSaye

Cara DeSaye
Public Utilities Division

Enclosure

APPROVED
DATE: 12-21-11

MOTION

December 21, 2011

Basin Electric Power Cooperative **Case No. PU-11-696**
345 kV Transmission Line – Mercer,Dunn,McKenzie,Williams
Siting Application

I move the Commission acknowledge the Letter of Intent and assess a filing fee of $100,000 due upon filing of an application in Case No. PU-11-696, Basin Electric Power Cooperative's proposed Antelope Valley Station to Neset 345 kV Transmission Project in Mercer, Dunn, McKenzie and Williams Counties of North Dakota.

JRL

APPENDIX E - DESIGN DATA REPORT

(To be provided by Basin Electric)

APPENDIX F - WORK PLAN FOR DISCOVERY OF UNANTICIPATED CULTURAL RESOURCES ARTIFACTS

(To be provided by Basin Electric)

APPENDIX G - PLAN AND PROFILE

(To be provided by Basin Electric)

APPENDIX H - LEGAL DESCRIPTION FOR THE PROJECT ROUTE

(To be provided by Basin Electric)

APPENDIX I - STANDARD MITIGATION MEASURES

General	
Gen-1	The requirements of all applicable Federal, State, and local environmental laws, executive orders, and regulations would be met during construction and operation of the proposed Project.
Gen-2	All permit conditions required by Federal, State, and local agencies would be adhered to for construction and operation of the proposed project.
Gen-3	Prior to construction, all construction personnel and heavy equipment operators would be instructed on the protection of cultural, paleontological, and ecological resources, and all applicable permit requirements. Construction contracts would address: • Federal, State, and local laws regarding antiquities, fossils, plants, and wildlife, including collection/removal • The importance and necessity of protecting such resources • All applicable permit requirements
Air Quality	
Air-1	The emission of dust into the atmosphere during construction would be minimized to the extent practical during the manufacture, handling, and storage of concrete aggregate. Methods and equipment would be used as necessary to collect, dispose, or prevent dust during these operations. The methods of storing and handling cement and additives would also include means of minimizing atmospheric discharges of dust.
Air-2	All construction equipment and vehicles will be maintained in efficient operating condition and comply with applicable state and federal emission standards. Engine idling time will be limited and equipment will be shut down when not in use. Vehicles and equipment that show excessive emissions or other inefficient conditions would not be operated until repairs or adjustments are made.
Air-3	All waste materials shall be disposed of at permitted waste disposal areas or landfills. Burning or burying waste materials on the right-of-way would not be permitted. Tree and grubbing residue may be buried on site or in the right-of-way with landowner approval.

Air-4	Nuisance to persons, dwellings, or crops resulting from dust originating from construction would be minimized. Oil and other petroleum derivatives would not be used for dust control. Speed limits on local gravel roads would be enforced to reduce dust.
Water Resources	
Water-1	Construction activities would comply with the requirements of North Dakota permits for stormwater discharges for construction activities, which specify appropriate best management practices, erosion and sediment control measures, and disposal practices. BMPs will be included in a Stormwater Pollution Prevention Plan. Construction activities adjacent to or encroaching on streams or waterways, including work within rights-of-way, construction of access roads on hillsides, and dewatering work for structure foundations, or earthwork operations would be conducted to prevent disturbed soils, muddy water, and eroded materials from entering streams or waterways by construction of intercepting ditches, bypass channels, barriers, settling ponds, or by other approved means.
Water-2	Construction activities would be conducted to prevent the accidental spillage of solid matter contaminants, debris, hazardous liquids, or other pollutants into streams, waterways, lakes, land, and underground aquifers. Such pollutants and waste include, but are not restricted to, refuse, garbage, cement, concrete, sanitary waste, industrial waste, oil, and other petroleum products, aggregate processing tailing, mineral salts, and thermal pollution. A hazardous materials management and spill prevention plan would be developed for construction that addresses storage, use, transportation, and disposal of hazardous materials, and an emergency response plan would be in place in the event of an accidental spill.
Water-3	Excavated material or construction materials would not be stockpiled or deposited near or on stream banks, lake shorelines, or other waterway perimeters unless protected from high water or storm runoff or encroachment upon the actual waterway itself.
Water-4	Wastewater discharge from any construction operations would not enter streams, waterways, or other surface waters without the appropriate permit(s).
Water-5	Equipment washing, storage of petroleum products, lubricants, solvents and hazardous materials, structure sites, and other disturbed areas would be located at least 100 feet, where practical, from rivers, streams (including ephemeral streams), ponds, lakes, and reservoirs. This includes construction vehicles and heavy equipment when parked overnight or longer.

Water-6	Right-of-way access roads would be located at least 100 feet, where practical, from rivers, ponds, lakes, and reservoirs.
Water-7	All stream crossings considered jurisdictional by USACE would be crossed by permit only. Where required, culverts of adequate size to accommodate the estimated peak flow of the stream would be installed. Disturbance of the stream banks and beds during construction would be minimized. Disturbed areas would be regarded and revegetated in accordance with mitigation measures listed for soil/vegetation resources.
Water-8	If the banks of ephemeral stream crossings are sufficiently high and steep that breaking them down for a crossing would cause excessive disturbance, culverts would be installed using the same measures as for culverts on perennial streams.
Water-9	Heavy equipment movement near streams and other surface waters would be minimized, to the extent practical.
Water-10	Narrow flood-prone areas would be spanned.
Geology and Minerals, Paleontology, and Soils	
Geo-1	Removed topsoil would be used for landscaping and as engineered fill, as appropriate, or stockpiled and re-spread subsequent to construction.
Geo-2	During construction, if any paleontological resources are discovered, work would cease within a 50-foot radius of the discovery. Any artifacts or fossils discovered would not be disturbed and Western would be notified of the discovery immediately.
Geo-3	Access roads would generally follow the contour of the land to the greatest extent practical rather than a straight line along the right-of-way where steep features would result in a higher erosion potential.
Geo-4	To the extent practical, excavated areas would be re-contoured so that large volumes of water would not collect and stand therein. Before being abandoned, the sides of excavations would be brought to stable slopes, giving a natural appearance, and revegetated. Waste soil piles would be shaped to provide a natural appearance.

Biological Resources	
Bio-1	Prior to construction, potentially-impacted wetland areas would be identified and marked. Wetland and riparian areas would be avoided to the extent practical by spanning of the wetlands and the placement of structures outside of wetland areas. If wetland or riparian areas are unavoidable, impacts would be minimized or mitigated. Jurisdictional waters that are impacted as a result of implementing the proposed project would be mitigated in accordance with USACE requirements.
Bio-2	Care would be used in preserving the natural landscape and vegetation. Construction operations would be conducted to prevent, to the extent practical, any unnecessary destruction, scarring, or defacing of the natural surroundings, vegetation, trees, and native shrubbery in the vicinity of the work. Vegetation would be replaced at landowner's request, providing mitigation complying with North American Electric Reliability Council (NERC) requirements.
Bio-3	A vegetation management plan will be developed to address the potential spread of noxious weeds during construction activities. This plan will contain strategies for prevention, detection, and control of noxious weeds. Example measures will include the washing of construction vehicles prior to use at construction work sites and revegetation with a native seed mix.
Bio-4	Upon completion of work, all non-agricultural disturbed areas and construction staging areas not needed for maintenance access would be re-graded so that all surfaces drain naturally, blend with the natural terrain, and are reseeded to blend with native vegetation with a seed mixture certified as free of noxious or invasive weeds. All destruction, scarring, damage, or defacing of the landscape resulting from construction would be repaired.
Bio-5	Construction staging areas would be located and arranged in a manner to preserve trees and vegetation to the maximum practicable extent. Unless otherwise agreed upon by the landowner, all storage and construction materials and debris would be removed from the construction staging areas once construction is complete, and the areas returned to original use or re-graded and seeded as for nonagricultural disturbed areas.
Bio-6	Construction staging areas would be located and arranged in a manner to preserve trees and vegetation to the maximum practicable extent. Unless otherwise agreed upon by the landowner, all storage and construction materials and debris would be removed from the construction staging areas once construction is complete, and the areas returned to original use or re-graded and seeded as for nonagricultural disturbed areas.

Bio-7	Native shrubs that would not interfere with access or the safe operation of the transmission line would be allowed to reestablish in the right-of-way. Areas with native shrubs that would be disturbed would be replanted with regionally-native species following the disturbance.
Bio-8	Trees and shrubs anticipated to be cleared, including those that are considered invasive species or noxious weeds shall be inventoried before cutting. The inventory shall record the location, number, and species of trees and shrubs. In windbreaks, shelterbelts, and other planted areas, trees or shrubs anticipated to be cleared, regardless of size, shall be inventoried for replacement. In native growth areas, trees anticipated to be cleared that are 1-inch diameter at breast height (dbh) or greater shall be inventoried for replacement, as well as all shrubs in the permanent ROW.
Bio-9	In native growth areas outside the permanent ROW, shrubs shall be cut flush with the surface of the ground, taking care to leave the naturally occurring seed bank and root stock intact. If soil disturbance is necessary, the native topsoil shall be preserved and replaced after construction is completed. Shrubs shall be allowed to regenerate naturally where native topsoil is preserved and replaced. Where native topsoil is not preserved and replaced, shrubs anticipated to be cleared shall be inventoried for replacement.
Bio-10	In native growth areas, trees and shrubs may be inventoried by actual count or by a sampling method that will properly represent the woody vegetation population. A sampling plan developed by the company, filed with the North Dakota Public Service Commission (NDPSC), and approved prior to the start of construction shall define the sampling method to be used for trees, for tall shrubs and for low shrubs. The data from the sample plots shall be extrapolated to the total acreage of the wooded area to be cleared to determine the species and quantity of trees and shrubs to be replaced.
Bio-11	Trees and shrubs shall be selectively cleared, leaving mature trees and shrubs intact where practical. The width of clear cuts through windbreaks, shelterbelts and all other wooded areas shall be limited to 50 feet or less unless otherwise approved by the NDPSC. If the area of trees or shrubs actually cleared differs from the area inventoried, the difference in number of trees and shrubs to be replaced shall be noted on the inventory.

Bio-12	Prior to replacement, documentation identifying the number and variety of trees removed as well as the mitigation plan for the proposed number, variety, type, location and date of replacement plantings shall be filed with the NDPSC for approval. Tree replacement shall be on a 2 to 1 basis with 2-year-old saplings. Shrub replacement shall be on a 2 to 1 basis with stem cuttings. Trees and shrubs shall be replaced by the same species or similar species, except in the case of invasive species or noxious weeds, suitable for North Dakota growing conditions as recommended by the North Dakota Forest Service.
Bio-13	Landowners shall be given the option of having replacement trees or shrubs planted off the right-of-way on the landowner's property or waiving that requirement in writing and allowing those replacement trees or shrubs to be planted at alternative locations.
Bio-14	At the conclusion of the project, documentation identifying the actual number, variety, type, location, and date of the replacement plantings shall be filed with the NDPSC. Tree and shrub replacements shall be inspected once a year for three years, on or about the anniversary of the plantings, and, on or shortly before October 1 of each year, a report shall be submitted to the Commission documenting the condition of replacement planting and any woodlands work completed. If after three years from the anniversary of the plantings the survival rate is less than 75 percent, the NDPSC may order additional planting(s).
Bio-15	An Avian Protection Plan (APP) would be developed to minimize impacts on nesting birds, as well as to minimize the electrocution and collision of migratory and resident bird species. The APP would include provisions for adequate distance between conductors and distances between conductors and grounded surfaces to minimize electrocution risk. The APP would identify timeframes for construction and routine maintenance to avoid the nesting period of breeding birds. It would also include methods for minimizing bird collisions during line routing as well as methods for minimizing collisions following construction. The APP would follow guidelines described at www.aplic.org. The APP would be provided to USFWS and the state wildlife agency for comment. A final copy of the APP would be provided to the applicable USFWS and state wildlife agency offices for their reference.
Bio-16	Holes drilled or excavated for pole placement or foundation construction and left unattended overnight would be marked and secured with temporary fencing to reduce the potential for livestock and wildlife to enter the holes, and for public safety.

Land Use	
Land-1	The minimum area necessary would be used for access roads during project construction.
Land-2	When practical, transmission structures would be located and designed to conform to the terrain. Leveling and benching of the structure sites would be the minimum necessary to allow structure assembly and erection.
Land-3	Transmission structures would be located, where practical, to span sensitive land uses. Where practical, construction access roads would be located to avoid sensitive conditions.
Land-4	The precise location of all structure sites, right-of-way, and other disturbed areas would be determined with landowners' or land management agencies' input.
Land-5	The movement of crews and equipment would be limited to the right-of-way and areas surveyed for cultural, historical, and biological resources, including access routes. To the extent practicable, the contractor would limit movement on the right-of-way to minimize damage to grazing land, crops, or property and would avoid marring the land.
Land-6	Where practical, construction activities would be scheduled during periods when agricultural activities would be minimally affected or the landowner would be compensated accordingly.
Land-7	Fences, gates, and similar improvements that are removed or damaged would be promptly repaired or replaced.
Land-8	Transmission structure design and placement would be selected to reduce potential conflicts with agricultural practices and to reduce the amount of land required for transmission lines.
Land-9	Right-of-way would be purchased through negotiations with each landowner affected by the proposed Project. Payment would be made of full value for crop damages or other property damage during construction or maintenance.

Land-10	When weather and ground conditions permit, all deep ruts that are hazardous to farming operations and equipment movement would be eliminated or compensation would be provided as an alternative if the landowner desires. Such ruts would be leveled, filled, and graded, or otherwise eliminated in an approved manner. Ruts, scars, and compacted soils from construction activities in productive hay or crop lands would be loosened and leveled by scarifying, harrowing, disking, or other appropriate methods. Damage to ditches, tile drains, terraces, roads, and other land features would be corrected. Land contours and facilities would be restored as nearly as practical to their original conditions.
Public Health and Safety	
PH-1	When appropriate, pilot vehicles would accompany the movement of heavy equipment. Traffic control barriers and warning devices would be used when appropriate.
PH-2	All necessary provisions would be made to conform to safety requirements for maintaining the flow of public traffic and avoiding congestion at critical locations. Construction operations would be conducted to offer the least possible obstruction and inconvenience to public traffic, such as by the use of pilot cars to accompany trucks with oversized loads and slow-moving vehicles, scheduling heavy equipment transport to avoid high traffic periods, and where feasible, use of existing rail facilities. Construction workers will be encouraged to carpool to the construction site.
PH-3	Design would include reasonable mitigation measures to reduce problems of induced currents into conductive objects within the right-of-way. Problems of induced currents during construction and operation would be resolved, to the mutual satisfaction of the parties involved.
PH-4	Complaints of radio or television interference generated by the transmission line would be investigated and appropriate mitigation measures would be implemented.
PH-5	Audible noise and electric and magnetic fields during construction and operation of the proposed Project would be addressed as necessary on a case-by-case basis.
PH-6	Transmission line materials would be designed to minimize corona. Tension would be maintained on all insulator assemblies to assure positive contact between insulators, thereby avoiding sparking. Caution would be exercised during construction to avoid nicking the conductor surface, which may provide points for corona to occur.

PH-7	The construction contractor would establish a health and safety program that incorporates Occupational Safety and Health Administration (OSHA) standards such as requirements for hearing protection, personal protective equipment, site access, chemical exposure limits, safe work practices, training program, and emergency procedures. The program would be reviewed with fire department personnel and emergency services personnel to reduce risk of construction and operation activities interfering with emergency response or evacuation plans and procedures.
PH-8	At the end of every work day, contractors would secure all construction areas to protect equipment and materials and discourage public access. Fueling of vehicles would be conducted in compliance with established procedures designed to minimize fire risks and fuel spills.
Visual Resources	
Vis-1	Structure types (designs) would be uniform, to the extent practical.
Vis-2	Transmission line materials would be designed to minimize corona. To reduce potential visual impacts at highway and trail crossings, structures would be placed at the maximum feasible distance from the crossing, within limits of structure design.
Noise	
Noise-1	An adequate buffer would be maintained around the proposed substation sites to minimize construction and operational noise impacts on area residents.
Noise-2	Power lines would be designed to minimize noise and other effects from energized conductors.
Noise-3	To avoid nuisance noise conditions, transmission line construction would be limited to daytime hours whenever practical.
Noise-4	To avoid nuisance conditions due to construction noise, all internal combustion engines used in connection with construction activity would be fitted with an approved muffler and spark arrester.

APPENDIX J - NIEHS REPORT

NIEHS REPORT on *Health Effects from Exposure to Power-Line Frequency Electric and Magnetic Fields*

Prepared in Response to the 1992 Energy Policy Act (PL 102-486, Section 2118)

NIEHS

National Institute of Environmental Health Sciences
National Institutes of Health

Supported by the NIEHS/DOE

EMF RAPID

NIH Publication No. 99-4493

NIEHS REPORT on

Health Effects from Exposure to Power-Line Frequency Electric and Magnetic Fields

Prepared in Response to the 1992 Energy Policy Act
(PL 102-486, Section 2118)

National Institute of Environmental Health Sciences
National Institutes of Health

Dr. Kenneth Olden, Director

Prepared by the
NIEHS EMF-RAPID Program Staff

NIH Publication No. 99-4493

Supported by the NIEHS/DOE

DEPARTMENT OF HEALTH & HUMAN SERVICES Public Health Service

National Institutes of Health
National Institute of
Environmental Health Sciences
P. O. Box 12233
Research Triangle Park, NC 27709

May 4, 1999

Dear Reader:

In 1992, the U.S. Congress authorized the Electric and Magnetic Fields Research and Public Information Dissemination Program (EMF-RAPID Program) in the Energy Policy Act. The Congress instructed the National Institute of Environmental Health Sciences (NIEHS), National Institutes of Health and the U.S. Department of Energy (DOE) to direct and manage a program of research and analysis aimed at providing scientific evidence to clarify the potential for health risks from exposure to extremely low frequency electric and magnetic fields (ELF-EMF). The EMF-RAPID Program had three basic components: 1) a research program focusing on health effects research, 2) information compilation and public outreach and 3) a health assessment for evaluation of any potential hazards arising from exposure to ELF-EMF. The NIEHS was directed to oversee the health effects research and evaluation, and the DOE was given the responsibility for overall administration of funding and engineering research aimed at characterizing and mitigating these fields. The Director of the NIEHS was mandated upon completion of the Program to provide this report outlining the possible human health risks associated with exposure to ELF-EMF. The scientific evidence used in preparation of this report has undergone extensive scientific and public review. The entire process was open and transparent. Anyone who wanted “to have a say” was provided the opportunity.

The scientific evidence suggesting that ELF-EMF exposures pose any health risk is weak. The strongest evidence for health effects comes from associations observed in human populations with two forms of cancer: childhood leukemia and chronic lymphocytic leukemia in occupationally exposed adults. While the support from individual studies is weak, the epidemiological studies demonstrate, for some methods of measuring exposure, a fairly consistent pattern of a small, increased risk with increasing exposure that is somewhat weaker for chronic lymphocytic leukemia than for childhood leukemia. In contrast, the mechanistic studies and the animal toxicology literature fail to demonstrate any consistent pattern across studies although sporadic findings of biological effects have been reported. No indication of increased leukemias in experimental animals has been observed.

The lack of connection between the human data and the experimental data (animal and mechanistic) severely complicates the interpretation of these results. The human data are in the "right" species, are tied to "real life" exposures and show some consistency that is difficult to ignore. This assessment is tempered by the observation that given the weak magnitude of these increased risks, some other factor or common source of error could explain these findings. However, no consistent explanation other than exposure to ELF-EMF has been identified.

Epidemiological studies have serious limitations in their ability to demonstrate a cause and effect relationship whereas laboratory studies, by design, can clearly show that cause and effect are possible. Virtually all of the laboratory evidence in animals and humans and most of the mechanistic work done in cells fail to support a causal relationship between exposure to ELF-EMF at environmental levels and changes in biological function or disease status. The lack of consistent, positive findings in animal or mechanistic studies weakens the belief that this association is actually due to ELF-EMF, but it cannot completely discount the epidemiological findings.

The NIEHS concludes that ELF-EMF exposure cannot be recognized at this time as entirely safe because of weak scientific evidence that exposure may pose a leukemia hazard. In my opinion, the conclusion of this report is insufficient to warrant aggressive regulatory concern. However, because virtually everyone in the United States uses electricity and therefore is routinely exposed to ELF-EMF, passive regulatory action is warranted such as a continued emphasis on educating both the public and the regulated community on means aimed at reducing exposures. The NIEHS does not believe that other cancers or non-cancer health outcomes provide sufficient evidence of a risk to currently warrant concern.

The interaction of humans with ELF-EMF is complicated and will undoubtedly continue to be an area of public concern. The EMF-RAPID Program successfully contributed to the scientific knowledge on ELF-EMF through its support of high quality, hypothesis-based research. While some questions were answered, others remain. Building upon the knowledge base developed under the EMF-RAPID Program, meritorious research on ELF-EMF through carefully designed, hypothesis-driven studies should continue for areas warranting fundamental study including leukemia. Recent research in two areas, neurodegenerative diseases and cardiac diseases associated with heart rate variability, have identified some interesting and novel findings for which further study is ongoing.

Advocacy groups have opposing views concerning the health effects of ELF-EMF. Some advocacy groups want complete exoneration and others want a more serious indictment. Our conclusions are prudent and consistent with the scientific data. I am satisfied with the report and believe it provides a pragmatic, scientifically-driven basis for any further regulatory review.

I am pleased to transmit this report to the U.S. Congress.

Sincerely,

Kenneth Olden, Ph.D.
Director

NIEHS EMF-RAPID PROGRAM STAFF

Gary A. Boorman, D.V.M., Ph.D., Associate Director for Special Programs, Environmental Toxicology Program and Director, EMF-RAPID Program

Naomi J. Bernheim, M.S., Biologist, Office of Special Programs, Environmental Toxicology Program and Program Assistant, EMF-RAPID Program

Michael J. Galvin, Ph.D., Health Scientist Administrator, Division of Extramural Research and Training and Extramural Program Administrator, EMF-RAPID Program

Sheila A. Newton, Ph.D., Director, Office of Policy, Planning and Evaluation

Fred M. Parham, Ph.D., Staff Scientist, Laboratory of Computational Biology and Risk Analysis

Christopher J. Portier, Ph.D., Associate Director for Risk Assessment, Environmental Toxicology Program; Chief, Laboratory of Computational Biology and Risk Analysis; and Coordinator, EMF Hazard Evaluation

Mary S. Wolfe, Ph.D., Associate Coordinator, EMF Hazard Evaluation, Environmental Toxicology Program

ACKNOWLEDGEMENTS

This report would not have been possible without the concerted and generous help of literally hundreds of research scientists. Many of the scientists who wrote the articles, which are cited in this report, attended our science review symposia where their research was carefully evaluated and critiqued. Their patience with our questions and their professional attitude in evaluating their own work was extraordinary and is greatly appreciated. We are also indebted to the many scientists from outside of the electric and magnetic fields (EMF) research community who participated in our symposia and spent time and effort evaluating these data on our behalf; this provides a clear example of the dedication of scientists concerned about health issues.

Special thanks are extended to the 30 scientists who attended the Working Group Meeting in June 1998. Their hard work and conscientious effort led to one of the most concise and clear reviews of the extremely low frequency (ELF) EMF literature ever developed. The thousands of man-hours extended by this group in such a short period of time provided us with a background document on ELF-EMF health risks that made this report a much simpler task. We wish especially to thank Dr. Arnold Brown for attending our public meetings on the Working Group Report; his extensive experience and insightful comments helped to make these meetings a great success. We would also like to thank Dr. Brown and Dr. Paul Gailey for reviewing this report prior to its release and Mr. Fred Dietrich for advising us on exposure issues during the preparation of this document. Finally we would like to acknowledge the U.S. Department of Energy as our partner in the EMF-RAPID Program and its EMF program officer, Dr. Imre Gyuk.

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EXECUTIVE SUMMARY

Introduction

Electrical energy has been used to great advantage for over 100 years. Associated with the generation, transmission, and use of electrical energy is the production of weak electric and magnetic fields (EMF). In the United States, electricity is usually delivered as alternating current that oscillates at 60 cycles per second (Hertz, Hz) putting fields generated by this electrical energy in the extremely low frequency (ELF) range.

Prior to 1979 there was limited awareness of any potential adverse effects from the use of electricity aside from possible electrocution associated with direct contact or fire from faulty wiring. Interest in this area was catalyzed with the report of a possible association between childhood cancer mortality and proximity of homes to power distribution lines. Over the next dozen years, the U.S. Department of Energy (DOE) and others conducted numerous studies on the effects of ELF-EMF on biological systems that helped to clarify the risks and provide increased understanding. Despite much study in this area, considerable debate remained over what, if any, health effects could be attributed to ELF-EMF exposure.

In 1992, the U.S. Congress authorized the Electric and Magnetic Fields Research and Public Information Dissemination Program (EMF-RAPID Program) in the Energy Policy Act (PL 102-486, Section 2118). The Congress instructed the National Institute of Environmental Health Sciences (NIEHS), National Institutes of Health and the DOE to direct and manage a program of research and analysis aimed at providing scientific evidence to clarify the potential for health risks from exposure to ELF-EMF. The EMF-RAPID Program had three basic components: 1) a research program focusing on health effects research, 2) information compilation and public outreach and 3) a health assessment for evaluation of any potential hazards arising from exposure to ELF-EMF. The NIEHS was directed to oversee the health effects research and evaluation and the DOE was given the responsibility for overall administration of funding and engineering research aimed at characterizing and mitigating these fields. The Director of the NIEHS was mandated upon completion of the Program to provide a report outlining the possible human health risks associated with exposure to ELF-EMF. This document responds to this requirement of the law.

This five-year effort was signed into law in October 1992 and provisions of this Act were extended for one year in 1997. The Program ended December 31, 1998. The EMF-RAPID Program was funded jointly by Federal and matching private funds and has been an extremely successful Federal/private partnership with substantial financial support from the utility industry. The NIEHS received $30.1 million from this program for research, public outreach, administration and the health assessment evaluation of ELF-EMF. In addition to EMF-RAPID Program funds from the DOE, the NIEHS contributed $14.5 million for support of extramural and intramural research including long-term toxicity studies conducted by the National Toxicology Program.

NIEHS Conclusion

The scientific evidence suggesting that ELF-EMF exposures pose any health risk is weak. The strongest evidence for health effects comes from associations observed in human populations with two forms of cancer: childhood leukemia and chronic lymphocytic leukemia in occupationally exposed adults. While the support from individual studies is weak, the epidemiological studies demonstrate, for some methods of measuring exposure, a fairly consistent pattern of a small, increased risk with increasing exposure that is somewhat weaker for chronic lymphocytic leukemia than for childhood leukemia. In contrast, the mechanistic studies and the animal toxicology literature fail to demonstrate any consistent pattern across studies although sporadic findings of biological effects (including increased cancers in animals) have been reported. No indication of increased leukemias in experimental animals has been observed.

The lack of connection between the human data and the experimental data (animal and mechanistic) severely complicates the interpretation of these results. The human data are in the “right” species, are tied to “real-life” exposures and show some consistency that is difficult to ignore. This assessment is tempered by the observation that given the weak magnitude of these increased risks, some other factor or common source of error could explain these findings. However, no consistent explanation other than exposure to ELF-EMF has been identified.

Epidemiological studies have serious limitations in their ability to demonstrate a cause and effect relationship whereas laboratory studies, by design, can clearly show that cause and effect are possible. Virtually all of the laboratory evidence in animals and humans and most of the mechanistic work done in cells fail to support a causal relationship between exposure to ELF-EMF at environmental levels and changes in biological function or disease status. The lack of consistent, positive findings in animal or mechanistic studies weakens the belief that this association is actually due to ELF-EMF, but it cannot completely discount the epidemiological findings.

The NIEHS concludes that ELF-EMF exposure cannot be recognized as entirely safe because of weak scientific evidence that exposure may pose a leukemia hazard. In our opinion, this finding is insufficient to warrant aggressive regulatory concern. However, because virtually everyone in the United States uses electricity and therefore is routinely exposed to ELF-EMF, passive regulatory action is warranted such as a continued emphasis on educating both the public and the regulated community on means aimed at reducing exposures. The NIEHS does not believe that other cancers or non-cancer health outcomes provide sufficient evidence of a risk to currently warrant concern.

The interaction of humans with ELF-EMF is complicated and will undoubtedly continue to be an area of public concern. The EMF-RAPID Program successfully contributed to the scientific knowledge on ELF-EMF through its support of high quality, hypothesis-based research. While some questions were answered, others remain. Building upon the knowledge base developed under the EMF-RAPID Program, meritorious research on ELF-EMF through carefully designed, hypothesis-driven studies should continue for areas warranting fundamental study including leukemia. Recent research in two areas, neurodegenerative diseases and cardiac diseases associated with heart rate variability, have identified some interesting and novel findings for which further study is ongoing.

Background

Program Oversight and Management

The 1992 Energy Policy Act created two committees to provide guidance and direction to this program. The first, the Interagency Committee (IAC), was established by the President of the United States and composed of representatives from the NIEHS, the DOE and seven other Federal agencies with responsibilities related to ELF-EMF. This group receives the report from the NIEHS Director and must prepare its own report for Congress. The IAC had responsibility for developing a strategic research agenda for the EMF-RAPID Program, facilitating interagency coordination of Federal research activities and communication to the public and monitoring and evaluating the Program.

The second committee, the National EMF Advisory Committee (NEMFAC), consisted of representatives from public interest groups, organized labor, state governments and industry. This group was involved in all aspects of the EMF-RAPID Program providing advice and critical review to the DOE and the NIEHS on the design and implementation of the EMF-RAPID Program's activities.

ELF-EMF Health Effects Research

The EMF-RAPID Program's health effects research initiative relied upon accepted principles of hazard identification and risk assessment to establish priorities. All studies supported by the NIEHS and the DOE under this program were selected for their potential to provide solid, scientific data on whether ELF-EMF exposure represents a human health hazard, and if so, whether risks are increased under exposure conditions in the general population. Research efforts did not focus on epidemiological studies (i.e. those in the human population) because of time constraints and the number of ongoing, well-conducted studies. The NIEHS health effects research program focused on mechanistic, cellular and laboratory studies in the areas of neurophysiology, behavior, reproduction, development, cellular research, genetic research, cancer and melatonin. Mechanistic, cellular and laboratory studies are part of the overall criteria used to determine causality in interpreting epidemiological studies. In this situation, the most cost-effective and efficient use of the EMF-RAPID Program's research funds was clearly for trying to clarify existing associations identified from population studies. The DOE research initiatives focused on assessment of exposure and techniques of mitigation.

The EMF-RAPID Program through the combined efforts of the NIEHS and the DOE radically changed and markedly improved the quality of ELF-EMF research. This was accomplished by providing biological and engineering expertise to investigators and emphasizing hypothesis-driven, peer-reviewed research. Four regional facilities were also set-up where state-of-the-art magnetic field exposure systems were available for in-house and outside investigators to conduct mechanistic research. The EMF-RAPID Program through rigorous review and use of multi-disciplinary research teams greatly enhanced the understanding of the interaction of biological systems with ELF-EMF.

Information Dissemination and Public Outreach

The EMF-RAPID Program provided the public, regulated industry and scientists with useful, targeted information that addressed the issue of uncertainty regarding ELF-EMF health effects. Two booklets, a question and answer booklet on ELF-EMF and a layman's booklet addressing ELF-EMF in the workplace, were published. A telephone information line for ELF-EMF was available where callers could request copies of ELF-EMF documents and receive answers to standard questions from operators. The NIEHS also developed a web-site for the EMF-RAPID Program where all of the Program's documents are on-line and links are available to other useful sites on ELF-EMF. Efforts were made to include the public in EMF-RAPID Program activities through sponsorship of scholarships to meetings; holding open, scientific workshops; and setting aside a two-month period for public comment and review on ELF-EMF and the workshop reports. In addition, the NIEHS sponsored attendance of NEMFAC members at relevant scientific meetings and at each of the public comment meetings.

Health Risk Assessment of ELF-EMF Exposure

In preparation of the NIEHS Director's Report, the NIEHS developed a process to evaluate the potential health hazards of ELF-EMF exposure that was designed to be open, transparent, objective, scholarly and timely under the mandate of the 1992 Energy Policy Act. The NIEHS used a three-tiered strategy for collection and evaluation of the scientific information on ELF-EMF that included: 1) three science review symposia for targeted ELF-EMF research areas, 2) a working group meeting and 3) a period of public review and comment. Each of the three symposia focused on a different, broad area of ELF-EMF research: mechanistic and cellular research (24-27 March 1997, Durham, NC), human population studies (12-14 January 1998, San Antonio, TX) and laboratory human and clinical work (6-9 April 1998, Phoenix, AZ). These meetings were aimed at including a broad spectrum of the research community and the public in the evaluation of ELF-EMF health hazards, identifying key research findings and providing opinion on the quality of this research. Discussion reports from small discussion groups held for specific topics were prepared for each meeting.

Following the symposia, a working group meeting (16-24 June 1998, Brooklyn Park, MN) was held where a scientific panel reviewed historical and novel evidence on ELF-EMF and determined the strength of the evidence for human health and biological effects. Stakeholders and the public attended this meeting and were given the opportunity to comment during the process. The Working Group conducted a formal, comprehensive review of the literature for research areas identified from the symposia as being important to the assessment of ELF-EMF-related biological or health effects. Separate draft documents covering areas of animal carcinogenicity, animal non-cancer findings, physiological effects, cellular effects, theories and human population studies (epidemiology studies) in children and adults for both occupational and residential ELF-EMF exposures were rewritten into a single book. The Working Group characterized the strength of the evidence for a causative link between ELF-EMF exposure and disease in each category of research using the criteria developed by the International Agency for Research on Cancer (IARC).

The IARC criteria fall into four basic categories: sufficient, limited, inadequate and evidence suggesting the lack of an effect. After critical review and discussion, members of the Working Group were asked to determine the categorization for each research area; the range of responses reflected the scientific uncertainty in each area. A majority of the Working Group members concluded that childhood leukemia and adult chronic lymphocytic leukemia from occupational exposure were areas of concern. For other cancers and for non-cancer health endpoints, the Working Group categorized the experimental data as providing much weaker evidence or no support for effects from exposure to ELF-EMF.

Following the Working Group Meeting, the NIEHS established a formal review period for solicitation of comments on the symposia and Working Group reports. The NIEHS hosted four public meetings (14-15 September 1998, Tucson, AZ; 28 September, Washington, DC; 1 October 1998, San Francisco, CA; and 5 October 1998, Chicago, IL) where individuals and groups could voice their opinions; the meetings were recorded and transcripts prepared. In addition, the NIEHS received 178 written comments that were also reviewed in preparation of this report. The remarks that NIEHS received covered many areas related to ELF-EMF and provided insight about areas of concern on behalf of the public, researchers, regulatory agencies and industry.

INTRODUCTION

Electricity is used to the benefit of people all over the world. Wherever electricity is generated, transmitted or used, electric fields and magnetic fields are created. These fields are a direct consequence of the presence and/or motion of electric charges. It is impossible to generate and use electrical energy without creating these fields; hence they are an inevitable consequence of our reliance on this form of energy. Electrical energy is generally supplied as alternating current where the electricity flows in one direction and then in the other to complete a cycle. The number of cycles completed in a fixed period of time (such as a second) is known as the frequency and is generally measured in units of Hertz (Hz), which are cycles per second. In the United States, electricity is usually delivered as 60 Hz alternating current; 50 to 60 Hz cycles are generally referred to as the power-line frequency of alternating current electricity. Just as alternating current electricity has a frequency, so do the associated electric and magnetic fields (EMF). Thus, 60 Hz alternating current electricity will generate a 60 Hz electric field and a 60 Hz magnetic field. EMF with cycle frequencies of greater than 3 Hz and less that 3000 Hz is generally referred to as extremely low frequency (ELF) EMF. In addition to magnetic fields associated with electricity, the earth also has a static magnetic field (frequency of 0 Hz) that varies by location from approximately 30 to 50 µT.

Electricity has been used, to great advantage, for 100 years and with this widespread use, there has been limited awareness of any potential adverse health effects other than effects caused by direct contact such as electrocution or by faulty wiring such as fire. Research into potential health effects caused by the ELF-EMF resulting from indirect exposure to electrical energy has been underway for several decades. The catalyst that sparked increased study in this area of research was the 1979 report by Wertheimer and Leeper (*1*) that children living near power lines had an increased risk for developing cancer. Since that initial finding, there have been numerous studies of human populations, animals and isolated cells aimed at clarification of the observations of Wertheimer and Leeper and others. Despite this multitude of research, considerable debate remains over what, if any, health effects can be attributed to ELF-EMF exposure.

In 1992, under the Energy Policy Act (PL 102-486, Section 2118), the U.S. Congress instructed the National Institute of Environmental Health Sciences

(NIEHS), National Institutes of Health and the U.S. Department of Energy (DOE) to direct and manage a program of research and analysis aimed at providing scientific evidence to clarify the potential for health risks from exposure to ELF-EMF. This resulted in formation of the EMF Research and Public Information Dissemination Program (EMF-RAPID Program). The EMF-RAPID Program had three basic components: 1) a research program focusing on health effects research primarily through mechanistic studies of ELF-EMF and engineering research targeting measurement, characterization and management of ELF-EMF; 2) information compilation and dissemination through brochures, public outreach and an ELF-EMF information line for communicating with the public; and 3) a health assessment including an analysis of the research data aimed at summarizing the strength of the evidence for evaluation of any hazard possibly arising from exposure to ELF-EMF. The NIEHS was directed to oversee the health effects research and evaluation and the DOE was given responsibility for engineering research aimed at characterizing and mitigating these fields. Under the Energy Policy Act, the Director of the NIEHS is mandated upon completion of the EMF-RAPID Program to provide a report outlining the possible human health risks associated with exposure to ELF-EMF. This document responds to this requirement of the law.

Funding

The EMF-RAPID Program was funded jointly by Federal and matching private funds; through fiscal year 1998, authorized funding for this program was approximately $46 million. Administration of funding for the EMF-RAPID Program was the responsibility of the DOE with funds for NIEHS-sponsored program activities transferred from the DOE to the NIEHS. The EMF-RAPID Program has been an extremely successful Federal/private partnership with substantial financial support from the utility industry. The NIEHS received $30.1 million from this program for research, public outreach, administration and the health assessment evaluation of ELF-EMF. Of the funds received, the NIEHS spent the majority (89%) for research through grants and contracts. The remainder was used for public outreach/administration (2%) and the health risk evaluation (9%). In addition to EMF-RAPID Program funds from the DOE, the NIEHS contributed $14.5 million for support of extramural grants and contracts and intramural research as well as long-term toxicity studies conducted by the National Toxicology Program.

Oversight and Program Management

The 1992 Energy Policy Act created two committees that have provided guidance and direction to the EMF-RAPID Program. One committee is the Interagency Committee (IAC) and is composed of representatives from NIEHS, DOE and the seven Federal agencies (listed below) with responsibilities related to ELF-EMF:

- Department of Defense
- Department of Transportation
- Environmental Protection Agency
- Federal Energy Regulatory Commission
- National Institute of Standards and Technology
- Occupational Safety and Health Administration
- Rural Electrification Administration

The IAC, which was established by the President of the United States, will receive the report from the NIEHS Director, and must prepare its own report for Congress. The IAC had responsibility for developing a strategic research agenda for the Program, making recommendations for coordination of Federal research activities and communication to the public and monitoring and evaluating the EMF-RAPID Program.

The second committee is the National Electric and Magnetic Fields Advisory Committee (NEMFAC) that consists of representatives from public interest groups, organized labor, state governments and industry. This group advised DOE and NIEHS on design and implementation of the EMF-RAPID Program and provided input and recommendations to the IAC. The NEMFAC was involved in all aspects of the EMF-RAPID Program, providing critical public review throughout the process of evaluating evidence for potential health effects.

ELF-EMF Health Effects Research

The research initiative sponsored under the EMF-RAPID Program's health effects research program relied on the accepted principles of hazard identification and risk assessment to establish priorities. All studies supported by the NIEHS and the DOE under this program were selected for their potential to provide solid, scientific data on whether ELF-EMF exposure represents a human health hazard, and if so, whether risks are increased under exposure conditions in the general population.

Research efforts did not focus on epidemiological studies (i.e. those in the human population) because of time constraints and the number of ongoing, well-conducted studies. The NIEHS health effects research program focused on mechanistic, cellular and laboratory studies in the areas of neurophysiology, behavior, reproduction, development, cellular research, genetic research, cancer and melatonin. Information about the health effects research projects that were supported by the NIEHS is compiled into a booklet (*2*). Mechanistic, cellular and laboratory studies are part of the overall criteria used to determine causality in interpreting epidemiological studies. In this situation, the most cost-effective and efficient use of the EMF-RAPID Program's research funds was clearly for trying to clarify existing associations identified from population studies. The DOE research initiatives focused on assessment of exposure and techniques of mitigation. Presentation of the DOE-sponsored research was presented at an engineering review symposium in April 1998 (*3*).

The EMF-RAPID Program through the combined efforts of the NIEHS and the DOE radically changed and markedly improved the quality of ELF-EMF research. This was accomplished by providing biological and engineering expertise to investigators and emphasizing hypothesis-driven, peer-reviewed research. These efforts resulted in better exposure systems, better documentation of the exposure systems and more complete reporting of the exposures in the literature. The EMF-RAPID Program through rigorous review and use of multi-disciplinary research teams greatly enhanced the understanding of the interaction of biological systems with ELF-EMF.

The EMF-RAPID Program, in a collaborative effort between the DOE and NIEHS, established four regional ELF-EMF exposure facilities where state-of-the-art magnetic field exposures could be conducted. Two facilities were located in DOE laboratories (Pacific Northwest Laboratories, Richland, WA and Oak Ridge National Laboratories, Oak Ridge, TN) while NIEHS oversaw ELF-EMF exposure facilities at the Food and Drug Administration (FDA, Rockville, MD) and at the National Institute for Occupational Safety and Health (NIOSH, Cincinnati, OH). During the course of the EMF-RAPID Program, these facilities focused on in-house mechanistic studies, and advances were made in conducting studies that have minimal bias. These centers also served as sites for investigators who wanted to conduct preliminary investigations without the expense of having to build their own exposure facilities.

Information Dissemination and Public Outreach

One of the three major components of the EMF-RAPID Program is dissemination of information on ELF-EMF. Both NIEHS and DOE share responsibility for the communication aspects of the program and jointly developed an outreach plan and oversaw its implementation. Both the IAC and NEMFAC reviewed information materials developed under this program.

The EMF-RAPID Program provided information to any interested parties about possible human health effects of ELF-EMF, the types and extent of human exposure, technologies for measuring and characterizing fields, methods for assessing and managing exposure and other topics specified in the legislation. The Program strove to provide the public, regulated industry and scientists with useful, targeted information based upon established risk communication principles (*4*, *5*). The communication program candidly addressed the issue of scientific uncertainty regarding ELF-EMF health effects and the overall complexity of the ELF-EMF issue, while providing information in a format appropriate for a variety of audiences.

The EMF-RAPID Program developed a question and answer booklet on ELF-EMF that was published in January 1995. This booklet is easy to read and has become very popular with more than 100,000 copies distributed nationwide. Because of the diversity of the U.S. population and the needs of the Spanish speaking community, a Spanish version of this booklet was also developed and more than 10,000 copies have been distributed. The EMF-RAPID Program, in conjunction with NIOSH, also developed and published a booklet entitled "EMF in the Workplace" in September 1996. This publication provides basic information in lay terms about ELF-EMF exposures in the workplace.

The EMF-RAPID Program made available an ELF-EMF public information line where interested parties could call with questions about ELF-EMF and request information. The U.S. Environmental Protection Agency (EPA) initiated this telephone line with funds from the EMF-RAPID Program in 1995 and transferred its oversight to the NIEHS in August 1997. The information line was open 10 hours a day for five days a week and received approximately 380 calls per month. Callers were provided copies of the ELF-EMF public information documents, and the operators were trained to give accurate responses to standard questions.

The NIEHS took the lead in developing the EMF-RAPID Program web-site (www.niehs.nih.gov/emfrapid/home.htm) that began operation on October 1, 1996. All of the EMF-RAPID Program's documents are available online in their entirety including the public information booklets described earlier, research information, the NIEHS Science Review Symposia reports (described below), the NIEHS Working Group Report (described below) and the public meeting comments received on these reports. There are links to other useful sites relating to ELF-EMF including the four regional exposure facilities. This site receives an average of 500 visits per day from approximately 21 countries. The requests come from individuals as well as commercial, educational, government, military and non-profit organizations.

The NIEHS actively recruited the inclusion of concerned citizens into the EMF-RAPID Program in several ways. Two scholarships were created to allow representatives from two citizen groups to attend an annual research review meeting conducted by the DOE. All EMF-RAPID Program sponsored meetings were open to any interested parties and public comments at them were welcome. The NIEHS also set aside a two-month period for public comment and review on ELF-EMF and the meeting reports. In addition, costs for NEMFAC members to attend the Science Review Symposia, the chair of NEMFAC to attend the Working Group Meeting and one member of the NEMFAC to attend each of the public meetings were also provided. Finally, in cooperation with the EPA, a workshop was held in May 1995 to give policymakers current information on ELF-EMF and provide them with access to experts knowledgeable in communicating information on this topic.

After the EMF-RAPID Program ends, the documents from this program will continue to be publicly available through the National Technical Information Service. Also, copies of these materials are located in the Library of Congress and libraries of the EPA regional offices, the NIEHS and the National Academy of Sciences.

Literature Review and Health Risk Assessment

Recent scientific panels on methods for health risk assessment (*4-6*) have advocated open, participatory processes for the evaluation of health risks from environmental exposures. The strategy developed by the NIEHS for collecting and evaluating research information in preparation of the Director's report followed many of the recommendations of these recent panels. The resulting program, reviewed and accepted by both the IAC and NEMFAC, provides a blueprint for future risk assessments and is novel in the risk assessment community (*7, 8*). The program focused on a broad-based, scientific debate covering all of the diverse fields represented in ELF-EMF research and included scientists from both within and outside the EMF community. In addition, an aggressive outreach program was used to invite and include all interested parties in the debate. This program consisted of three basic tiers:

- A series of three science review symposia focused on 1) mechanistic research, 2) epidemiological research and 3) laboratory research (animals and humans). At each meeting participants considered the quality and reproducibility of the scientific evidence, suggested what literature provides the strongest scientific evidence for making a decision, suggested additional avenues for research and provided opinions on whether or not there is support for a causal linkage between exposure to ELF-EMF and an associated biological or health effect.
- A working group meeting where a select panel of scientists critically evaluated the entirety of research evidence on ELF-EMF health effects and determined the strength of the evidence for human health effects.
- A period of public review and comment on the reports from the symposia and working group prior to their use by NIEHS in preparing this report.

The Science Review Symposia were designed as open, public workshops aimed at including a broad spectrum of the research community in evaluating ELF-EMF health hazards. To minimize bias, outstanding research scientists from outside of the ELF-EMF research community were included in all reviews; these scientists provided an objective evaluation of the experimental methods used and the hypotheses underlying many of the studies. These EMF and non-EMF scientists were given the task of identifying key research findings and providing opinion on the quality of the research. The workshops were held 24-27 March 1997 in Durham, NC; 12-14 January 1998 in San Antonio, TX; and 6-9 April 1998 in Phoenix, AZ. Over 100 individuals attended each meeting and included representatives from the public, stakeholders, regulatory agencies, NEMFAC and IAC as well as scientists from varied disciplines including, but not limited to, medicine, epidemiology, molecular and cellular biology, physics, engineering, statistics, toxicology, pathology and neurobiology. The format for these meetings included plenary sessions with overview lectures to familiarize attendees about research findings and issues for specific ELF-EMF topics and small breakout discussion groups. The breakout group sessions (composed of 25-30 attendees per group) provided time for in-depth discussions on the quality and reproducibility of ELF-EMF research findings and possible linkages with health effects. The rapporteurs and facilitator for each session prepared a short report that was reviewed by attendees of that breakout group. The breakout group reports from each science review symposium are available as printed documents (*9-11*) or on the EMF-RAPID Program web-site.

The Working Group Meeting was held 16-24 June 1998 in Brooklyn Park, MN. Prior to this meeting, a group of select scientists was given the task of conducting a formal, comprehensive review of the literature for research areas identified from the symposia as being important to the assessment of ELF-EMF-related biological or health effects. At the Working Group Meeting, the panel of 30 international scientists, both from within and outside the field of ELF-EMF research, critically evaluated and rewrote the draft chapters into a single book (*12*). In addition to reviewing the literature, the Working Group also characterized the strength of the evidence in each category of research using the criteria developed by the International Agency for Research on Cancer (IARC). These criteria are given in Appendix A of the Working Group Report. The literature included in the report was limited to published, cited findings or novel work being prepared for publication that could be peer-reviewed by the Working Group members.

Following the Working Group Meeting, the NIEHS established a formal review period of 10 August – 9 October 1998 to receive comments on the Working Group Report and symposia reports. During this period, the NIEHS hosted four public meetings (14-15 September 1998, Tucson, AZ; 28 September 1998, Washington, DC; 1 October 1998, San Francisco, CA; and 5 October 1998, Chicago, IL) where individuals and groups could voice their comments orally and/or in writing to NIEHS officials and other scientists involved with preparation of this report. The meetings were recorded and a transcript was prepared.

Attendance at the public meetings varied from 32 to 101 attendees per meeting. Formal comments (8 to 21 per meeting) were provided by various groups including the general public, researchers, utility industry, advocacy groups and state governmental agencies. Written comments, independent of oral presentations, were also solicited during the comment period; 178 entries from individuals and groups were received. These transcripts and written comments were used by the NIEHS in preparing this report.

Do Electric and Magnetic Fields Pose a Health Risk?

The scientific evidence suggesting that ELF-EMF exposures pose any health risk is weak. The strongest evidence for health effects comes from associations observed in human populations with two forms of cancer: childhood leukemia and chronic lymphocytic leukemia in occupationally exposed adults. While the support from individual studies is weak, the epidemiological studies demonstrate, for some methods of measuring exposure, a fairly consistent pattern of a small, increased risk with increasing exposure that is somewhat weaker for chronic lymphocytic leukemia than for childhood leukemia. In contrast, the mechanistic studies and the animal toxicology literature fail to demonstrate any consistent pattern across studies although sporadic findings of biological effects (including increased cancers in animals) have been reported. No indication of increased leukemias in experimental animals has been observed.

The lack of connection between the human data and the experimental data (animal and mechanistic) severely complicates the interpretation of these results. The human data are in the “right” species, are tied to “real-life” exposures and show some consistency that is difficult to ignore. This assessment is tempered by the observation that given the weak magnitude of these increased risks, some other factor or common source of error could explain these findings. However, no consistent explanation other than exposure to ELF-EMF has been identified.

Epidemiological studies have serious limitations in their ability to demonstrate a cause and effect relationship whereas laboratory studies, by design, can clearly show that cause and effect are possible. Virtually all of the laboratory evidence in animals and humans and most of the mechanistic work done in cells fail to support a causal relationship between exposure to ELF-EMF at environmental levels and changes in biological function or disease status. The lack of consistent, positive findings in animal or mechanistic studies weakens the belief that this association is actually due to ELF-EMF, but it cannot completely discount the epidemiological findings.

The NIEHS concludes that ELF-EMF exposure cannot be recognized as entirely safe because of weak scientific evidence that exposure may pose a leukemia hazard. In our opinion, this finding is insufficient to warrant aggressive regulatory concern. However, because virtually everyone in the United States uses electricity and therefore is routinely exposed to ELF-EMF, passive regulatory action is warranted such as a continued emphasis on educating both the public and the regulated community on means aimed at reducing exposures. This is described in greater detail in the section, *Recommended Actions*. The NIEHS does not believe that other cancers or non-cancer health outcomes provide sufficient evidence of a risk to currently warrant concern.

Scientific Evidence Supporting This Conclusion

The reports from the Science Review Symposia (*9-11*) and the Working Group (*12*) provide detailed reviews of the literature in this area of science. What follows is a brief synopsis of this evidence. The reader should refer to the individual reports for greater detail.

Background on the Limitations of Epidemiology Studies

Epidemiological studies are used to investigate the associations between health effects and exposure to a presumed disease agent. A well-designed and conducted epidemiological study involves several steps including identification of a study population, definition of the exposure to be studied, choice of the type of study to conduct (e.g. cohort study versus case-control study) and description of the period over which the exposure is relevant. All of these factors influence the quality of a study and the limits that must be placed on interpretation of a study's findings.

In carefully controlled laboratory and clinical investigations, study subjects are typically assigned to a treatment or exposure regimen. In epidemiological investigations, the inability to randomly assign exposures means that investigators must design their study so that the individuals who develop the disease of interest (cases) resemble the individuals who are disease-free (controls) in all aspects except for exposure; this is intended to limit possible bias. Bias due to improper selection of cases and controls is introduced if exposure is related to characteristics that would make cases more or less likely to be sampled than controls, or once sampled, to participate.

In the Nordic countries, comprehensive national population registries are generally used for selecting controls. If all persons are listed in these population registries and participation rates are high, bias due to selection of improper controls is unlikely even if exposure is related to participation. In countries such as the United States where population registries do not exist, other methods must be used to study rare diseases like leukemia for which existing cohort studies are inadequate. These methods lead to difficulties in identifying, contacting and recruiting controls that match the cases in all aspects other than exposure. For example, controls are sometimes identified through stratified random sampling of individual telephone numbers (random-digit dialing). Random-digit dialing may not properly identify controls of low socioeconomic status that do not have telephones; this could bias the results found in studies of childhood leukemias (*13*).

It is also possible to introduce bias through the selection of cases. For example, case selection bias may occur in studies that are based on mortality records (death certificates) if the survival rates of the exposed and unexposed subjects differ. This may occur if, for example, the exposure is related to socioeconomic status, and different socioeconomic groups have different survival rates for the studied disease (this might be due to a difference in the ability of cases to receive medical care). In addition, for diseases that are easily cured or allow patients to survive with the disease for a long period of time, persons who contract the disease and are treated properly may die of other causes and not appear as cases.

The inability to randomly assign exposures also introduces the possibility of confounding. Confounding occurs when the exposure of interest is associated with another factor that can increase (or decrease) the risk of getting the disease of interest (*14*). For example, smoking increases the risk of oral cancer; smoking is also associated with alcohol consumption, and there is a greater proportion of smokers among alcohol drinkers than among non-drinkers. Because smoking increases the risk of oral cancer and alcohol drinkers are more likely to smoke than non-drinkers are, alcohol drinkers will have a greater risk of oral cancer simply as a consequence of the greater percentage of smokers among alcohol drinkers. Thus, any study showing an increased risk of oral cancer associated with alcohol drinking will overstate that risk (resulting in a positive bias) if the effect of smoking is not carefully evaluated. Confounding can produce bias in either direction, artificially increasing or decreasing risks, depending on the direction of the association between the exposure, the disease and the confounder. When known, confounding can be controlled through statistical methods. Because there are very few known causes of childhood leukemias and chronic lymphocytic leukemia, it is difficult to identify and control potential confounders in these studies.

Another limitation of epidemiological studies is that exposure occurs through the natural course of events rather than being assigned and controlled by the investigator. Thus, a determination of the degree of exposure can be incorrect leading to what is known as “exposure misclassification.” Exposure misclassification may distort measures of association observed in a study. For example, in epidemiological studies aimed at exposures received on the job (occupational studies), it is common to define exposures by the type of job a person performs. Errors may occur in assigning job titles or the jobs themselves may have markedly different exposures for different individuals. It is also possible that the exposure assignment may differ for diseased and non-diseased subjects. Information on exposure can be obtained either prospectively (before the disease has occurred) or retrospectively (after the disease has occurred). In the case where exposure is determined prior to disease onset, there is a reduced potential for misclassification of the exposure. In the case where exposure is determined after the onset of the disease, especially where it is obtained from questioning individuals with the disease, the recall of exposure may be influenced by the fact that the patient has a disease and is influenced by previous descriptions of potential causes of that disease.

Epidemiological studies have used various methods for estimating past ELF-EMF exposure to provide scientific evidence concerning the possibility of health effects from exposure to ELF-EMF. Residential exposures to ELF-EMF have been conducted in five basic ways: wire codes that are essentially based upon distance to major structures used for delivering electrical energy (e.g. high tension power lines and transformers); calculated magnetic fields that are based upon a theoretical calculation of the magnetic field emitted by certain types of power lines using historical electrical loads on those lines; spot measurements that generally give a single, instantaneous measurement of the magnitude of the magnetic field in one or more spots in a residence; average measured fields that are essentially spot measurements taken repeatedly every few seconds for 24 hours and averaged over time; and personal average measured fields where the subject wears a monitor and measurements are taken repeatedly every few seconds for 48 hours and averaged over time.

The validity of individual exposure assessment methods has been examined and each has its limitations (*12, 15-20*). Wire codes and calculated fields have the advantage of remaining fairly consistent over time making them more likely to be correctly determined during the time of cancer onset. However, their main disadvantage over measured fields is a lack of consideration of all possible sources of exposure, in particular fields from in-home appliances and ground currents. The relationship of wire codes to direct magnetic field measurements has been examined; the reliability of wire codes as a quantitative measure of magnetic field exposure is variable (*15, 17, 19, 20*).

Childhood Cancers

The hypothesis generated by the seminal study of Wertheimer and Leeper (*1*) used wire codes to evaluate residential exposures in children. Four additional epidemiological studies in which wire codes were used to assess exposure to ELF-EMF are of sufficient quality to be used in the evaluation of a causal association between the risk of childhood leukemia and exposure to magnetic fields. Two of the studies reported an association (*21, 22*), and two studies reported no association with the risk for childhood leukemia (*23, 24*). A trend of increasing risk with wire codes classification implying increased fields was observed in the two positive studies (*21, 22*). All of these studies, including the seminal study, could have been affected by the types of biases described earlier including exposure bias (*1*), control selection (all five studies), and confounding from other risk factors (all five studies). In addition, the seminal study and the four subsequent studies differed in their groupings of leukemias ranging from evaluating all types of leukemias (*1, 21, 22, 24*) to evaluating only acute lymphoblastic leukemia (*23, 24*), the most common form of the disease in children. The most recent U.S. study (*23*) is the largest of the four subsequent studies for evaluating ELF-EMF exposure. Even though this study (*23*) shows a negative association when comparing Wertheimer-Leeper wire codes with leukemia risks, when combined with the remaining studies (*21, 22, 24*) in a meta-analysis (a form of statistical analysis in which like studies are combined to get a single answer), the results indicate a marginal association for the highest exposure group versus the lowest exposure groups. Removal of any of the three remaining studies (*21, 22, 24*) diminishes this association substantially. After removal of the one follow-up study with the most severe design limitations (*21*), the association is no longer present. Another study (*25*) was not included in the meta-analysis due to study limitations; this study showed no effect of wire codes.

Four epidemiological studies (*26-29*) assessed exposure using calculated fields; all four studies were conducted in Nordic countries. Three of the studies observed an increased leukemia risk in one or more exposure group (*26-28*) although only one (*26*) achieved statistical significance. All four studies were population-based, with minimal potential for selection bias both in terms of control selection and participation rates. The main limitations of all four studies are the small number of cases overall and the small number of cases and controls in the high exposure group. The general trend of these studies provides marginal support for a small, increased risk (*30*).

Four studies in which spot measurements were used to assess exposure to magnetic fields are clearly of greater quality than the remaining studies (*21, 22, 26, 31*). Two of these studies (*21, 22*) observed increased risks of marginal significance in one or more exposure groups and the other two (*26, 31*) showed no risk. Overall, spot measurements do not show an appreciable excess risk for leukemia when the four studies are combined (*30*).

Four studies used 24-hour measured magnetic fields to assess exposure (*22-24, 31*)[1]. The studies examined three different classifications of childhood leukemias: acute lymphocytic leukemia (*23, 24*), acute leukemia (*31*) and leukemia including nonlymphocytic leukemia (*22, 24*). The results of three of the studies showed an increased risk for children in higher exposure class(es); in two studies there were no statistically significant differences (*22, 24*), in the largest study only one experimental category out of many was statistically significant

[1] This publication (24) only provides a single odds ratio from their analysis of the 24-hour measurements. Additional information was obtained from the principal author.

(*23*), and depending on the grouping, the fourth study achieved statistical significance (*31*). The data reported for the largest study (*23*) suggest an exposure–response relationship that the original authors did not consider important. The pattern of dose versus response in this study was considerably different from the pattern in the other two studies with multiple dose groups (*22, 24*). The results of these studies, when combined, provide weak evidence for an association between exposure based on 24-hour measured magnetic fields and a small, increased incidence of childhood leukemia (*30*).

One study (*24*) assessed exposure using 48-hour personal monitors that measured both magnetic fields and electric fields. Analyses were done for all childhood leukemias and separately for acute lymphocytic leukemia. The general trend in the data indicated a negative association for both magnetic fields (current or predicted two years prior to diagnosis) and electric fields. No statistically significant positive associations were observed. This study, using personal exposure meters, does not support an association between ELF-EMF exposure and childhood leukemia.

Several of the same studies described earlier also looked at electrical appliance use and the risk of childhood leukemia (*22, 32, 33*). The results do not fit a coherent pattern.

None of the individual epidemiological studies provides convincing evidence linking magnetic field exposure with childhood leukemia. Hence, in making an assessment, one must rely upon the evaluation of the data as a whole using expert judgment and the meta-analyses as a guide. The pattern of response, for some methods of measuring exposure, suggests a weak association between increasing exposure and increasing risk. The small number of cases in these studies makes it impossible to firmly demonstrate this association. This level of evidence, while weak, is still sufficient to warrant limited concern.

Two other childhood cancers have been sufficiently studied to warrant comment. Two early studies observed an increased risk of brain cancers using wire codes as the exposure measure (*1, 21*). Later studies using wire codes (*34, 35*), calculated fields (*26-28, 36*) and measured fields (*35*) failed to support this finding. The association between exposure to ELF-EMF and childhood lymphomas was considered in several epidemiological investigations (*1, 21, 26-28, 36*). In all studies, the number of cases of lymphoma in the high exposure groups was too small for any reliable inference to be drawn. In general, these data do not support the concern that exposure to magnetic fields may increase the risk of brain cancers or lymphomas in children.

Adult Cancers

Epidemiological reports of diseases associated with occupational exposure to ELF-EMF preceded concerns about residential exposure. Reports of various health problems in high-voltage substations in the former USSR initially focused attention on ELF electric fields (*37*). Initial studies in the United States (*38*, *39*) led to over 100 epidemiological investigations of workplace exposure to ELF-EMF and various diseases. The early studies were based on workers in jobs assumed to entail exposure, and more recent studies used measured fields.

Recent studies evaluating the association between exposure to magnetic fields and chronic lymphocytic leukemia (*40-44*) show mixed results. The two studies in the United States (*43*, *44*) reported no association, but one (*44*) used death certificates to identify the cases (chronic lymphocytic leukemia has a rather long survival time that can confound the diagnosis of the cases). One of the remaining studies (*42*) indicated increased risk, which did not achieve statistical significance, and the two Scandinavian studies (*40*, *41*) showed significantly elevated risks in one or more exposure groups. Both of the Scandinavian studies had consistently increasing risks with increasing exposure. Each of these studies has its limitations and the limitations are different across studies, as are the designs and exposure assessment methods. Taken together, the studies provide weak evidence for an association between occupational exposure to magnetic fields and chronic lymphocytic leukemia.

Acute myelogenous leukemia was considered in these same epidemiological studies. The results, which were observed from these studies, are not sufficiently compelling to support an association.

The association between exposure to magnetic fields and a variety of other cancers has also been considered in occupational settings. Included are brain cancers, breast cancers (in both males and females), testicular cancers, cancers in offspring of workers, lymphoma, multiple myeloma, melanoma, non-Hodgkin's lymphoma, thyroid cancers and many others. Some evidence exists for an association between brain cancers and exposure to ELF-EMF and between female breast cancers and ELF-EMF exposure; however, the studies evaluating these associations are inconsistent and have limits to their interpretation making them inadequate for supporting or refuting an effect. In the remaining cases, the evidence supporting an association is negative or too weak to warrant concern.

The risks of adult cancer based on residential exposure to ELF-EMF have been evaluated in a number of studies. Risks of leukemia (of all types and of specific sub-types) from residential exposures were evaluated in several recent studies (*40*, *45-50*). The calculated field studies (*40*, *47-50*) showed mixed results for the different sub-types of leukemia studied and for changes in the definition of the exposure category. Specifically, when chronic lymphocytic leukemias was examined separately (this was done in only two of the studies), the results were inconsistent with one study (*40, 48*) showing no increased risk and with the other (*49*) showing fairly consistent dose-response with increasing cumulative exposure. The remaining studies, using wire codes (*46*) and measured fields (*46, 48*), demonstrated no increased risk. These data are inadequate for evaluating the association between exposure to ELF-EMF and leukemias. Specifically, for chronic lymphocytic leukemia, which demonstrated a weak association in the occupational studies, there are mixed results for adults in the residential studies.

The risk for leukemia associated with use of electrical appliances was also considered in two studies (*45, 51*). These studies resulted in inconsistent findings and generally do not support an association between appliance use and increased leukemia risk.

Limited data are available on risks of male and female breast cancer associated with residential exposure to ELF-EMF. A small, non-significant association between use of electric blankets and the risk for breast cancer was observed in one, large U.S. study (*52*) but not in another (*53*). Both found no evidence for an association with duration of exposure. Three studies, using exposure measured by calculated fields (*50, 54, 55*), identified no association between exposure to magnetic fields and the risk of breast cancer. These same scientists (*40, 47, 48, 50, 55*) also looked at exposures to ELF-EMF and cancers of the central nervous system (such as brain cancers); no associations were found.

None of the associations between cancer and residential exposure to magnetic fields in adults were indicative of a positive association. However, the specific adult cancer showing weak evidence of a positive association with occupational exposure to ELF-EMF, chronic lymphocytic leukemia, was inadequately studied in residential settings. It cannot, therefore, be concluded that there is no association.

Non-Cancer Findings in Humans

The relationship between spontaneous abortion and exposure to ELF-EMF has been considered in several studies. Recent occupational and residential studies were the focus of this assessment. In the first occupational study (*56*), no association was observed. In a second occupational study (*57*), a significant association was found with exposure to high ELF-EMF; however, the response rate was very poor, particularly among controls, which could have biased this result upward. Pregnancy loss was investigated in two residential cohort studies (*58, 59*). In one study (*58*), an increased risk was observed in the highest exposure category but not in the intermediate category. In the other (*59*), no association was observed for any measure of exposure. In a carefully designed prospective study in the United States (*60*), no association was reported between measured fields (including personal exposure monitoring) and intrauterine growth, birth weight or gestational age.

Low birth weight (*60, 61*), intrauterine growth retardation (*60*), preterm birth (*61*) and congenital anomalies arising from the father's exposure (*62*) were not associated with occupational exposures to ELF-EMF. The risk for congenital anomalies in relation to the mother's use of heated waterbeds and electric blankets around the time of conception was evaluated in three studies (*63-65*); no association was observed for heated waterbeds in any study, and inconsistent results were reported for electric blanket use.

The association between occupational exposure to ELF-EMF and Alzheimer's disease was considered in five studies (*66-70*). All five studies showed increases in one or more exposure groups with four studies (*66-69*) showing statistically significant increases and one (*70*) showing non-statistically significant increases. All of these studies suffer from design limitations that make it inappropriate to use them for addressing a causal association between ELF-EMF exposure and Alzheimer's disease. Two of these (*66, 67*) are based on diagnoses from death certificates (Alzheimer's disease is not consistently noted on death certificates). Two studies (*68, 69*) used different groups of cases and controls; some of the control groups included persons with other types of dementia, and proxy information was used to define the exposure of cases. The one remaining study (*70*) was evaluated using data for twins and also suffered many limitations. These data are inadequate for interpreting the possibility of an association.

The association between exposure to magnetic fields and amyotrophic lateral sclerosis was assessed in three studies (*66, 71, 72*). One study (*71*) showed an increased risk in the highest exposure group and the other two studies were negative. Adequate adjustment could not be made for known risk factors (electric shocks or a family history of amyotrophic lateral sclerosis) making these studies difficult to interpret.

Suicide and depression were studied in three occupational epidemiological studies (*72-74*). These studies do not support an association with ELF-EMF exposure.

Two occupational studies (*75, 76*) assessed possible adverse cardiovascular outcomes that may result from exposure to magnetic fields. In the first study (*75*), a significant decrease in risk using a broadly defined cardiovascular grouping was observed. In the second (*76*), data from five utilities were examined. This study was motivated *a priori* by a biological hypothesis based on the results of human clinical studies on heart rate variability (*77*) for increased numbers of deaths due to arrhythmia and acute myocardial infarct. Significant, exposure-dependent associations were reported. Lacking additional epidemiological studies to collaborate these results, these data are inconclusive regarding an association between cardiovascular disease and exposure to ELF-EMF.

Human clinical studies of ELF-EMF exposures were carried out mainly through three major research initiatives. These include a long series of studies of utility workers begun in the 1960s in the former USSR (*37*), human laboratory research conducted in the 1970s in Germany (*78*, *79*) and the human laboratory research program started in 1982 at the Midwest Research Institute in the United States (*80*). Dedicated facilities for human exposure testing were designed and constructed in Australia (*81*), Canada (*82*), England (*83*), France (*84*), Germany (*78*), New Zealand (*85*), the Russian Federation (*86*) and the United States (*87, 88*). Research with human volunteers is currently under way in many of these facilities.

A large number of clinical end-points were evaluated in these laboratories. Several effects reported at high exposures warrant little concern as health dangers such as hair standing on end in very strong electric fields and flickering visual sensations in very strong magnetic fields. However, a number of measurements potentially linked to health effects have been studied. The central nervous system was one of the first areas investigated as a potential site of interaction with ELF-EMF. Studies of changes in brain wave patterns (electroencephalography) during waking hours were generally negative showing little or no effect of ELF-EMF, especially in the range of power-line frequencies (*79*, *80*, *86*, *89-94*). Several studies (*95-97*) showed decreased sleep and reduced sleep efficiency during ELF-EMF exposure. These studies all had deficiencies (e.g. disturbance of subjects by drawing blood and incomplete adaptation of study subjects to the laboratory environment) making them inconclusive.

Changes in human pulse as a function of exposure to ELF-EMF fall into two categories: changes in the number of beats per minute (pulse rate) and changes in the variability of the electro-chemical signals going to the heart (heart-rate variability). Two research groups examined changes in pulse rate following exposure to ELF-EMF (*80*, *91-93*, *98*, *99*). All five clinical studies (*80*, *91-93*, *99*) from the same laboratory showed a decrease in pulse rate in at least one exposure group; however, all exposures represented rather large, combined electric and magnetic fields (6 to 12 kV/m and 10 to 30 μT, respectively). The remaining study (*98*) was a field trial under a high-tension power line and no effect was observed. The biological mechanism is unknown, and the general effect is very small making it unlikely that this is a health risk at lower doses.

Changes in heart-rate variability were evaluated in a retrospective analysis of three previous studies (*77*). Some changes in heart-rate variability were observed, which according to the authors, could indicate a potential for increased risk of sudden cardiovascular death. However, even though decreased heart-rate variability is associated with increased risk of cardiovascular death, it is not clear that transiently induced changes in healthy individuals will carry any risk. While these findings are inconclusive, the recent epidemiological result (*76*) discussed earlier suggests this area may warrant additional study.

Two possible mechanistic explanations for cancer findings from exposure to ELF-EMF, changes in melatonin (a hormone associated with sleep) and changes in the immune system, have been studied. The potential for ELF-EMF exposure to alter nighttime melatonin levels was addressed in 11 studies (*81, 84, 96, 100-106*). The clinical studies (*81, 84, 96, 102, 103*) demonstrated no consistent pattern of melatonin reduction (one study saw a marginal effect in men with already reduced melatonin levels and one saw a reduction in onset of the nightly increase in melatonin). In the occupational studies (*100, 101, 105, 106*), some changes were reported in urinary excretion of melatonin metabolites (the result of degradation of melatonin in the body) following workplace exposure (when melatonin levels are generally low), but not in evening melatonin levels. In the one residential study (*104*), significant dose-related reductions were associated with measured fields in bedrooms, but not with other measures (e.g. wire codes and total 72-hour exposure). All combined, these studies provide little support that exposure to ELF-EMF is altering melatonin levels in humans. A number of other hormones were also studied such as testosterone, thyroid hormones and several stress hormones; no effects of ELF-EMF exposure on these levels were observed.

Few laboratories studied the effects of ELF-EMF on the immune system. Three studies investigated effects of ELF-EMF exposure on the immune system (*80, 107, 108*) and all were negative.

Finally, there have been a number of case reports of mood changes and hypersensitivity thought attributable to ELF-EMF exposure (manifested as physiological reactions, disturbed sleep, fatigue, headaches, loss of concentration, dizziness, eye strain and skin problems). These symptoms generally seem to be intermittent and difficult to study clinically. Several carefully designed studies (*109-113*) were performed to evaluate the response of persons with these symptoms to ELF-EMF. In general, these studies were negative with the exception of one (*112*) that reported an increased incidence of skin rashes in persons exposed to high ambient electric fields (>31 V/m) relative to control fields (<10 V/m). These data are insufficient to support an association between ELF-EMF and hypersensitivity.

Animal Cancer Data

Animal carcinogenicity studies are routinely used to identify environmental agents that may increase cancer risk in humans. Many areas of biological investigation are more efficiently studied in animal models than in human beings, because the agent can be studied invasively and under carefully controlled environmental conditions. The use of animal models in studying effects of ELF-EMF exposure is limited by two problems: extrapolation of experimental findings across species and extrapolation of laboratory exposure patterns to environmental exposure patterns. Animal carcinogenic studies of ELF-EMF were done at levels of exposure generally much higher and having greater uniformity in frequency and intensity than would appear in environmental settings. These experimental conditions were chosen to maximize the ability of a researcher to detect an effect, if one exists, for a clearly defined exposure.

The laboratory data in animal models are inadequate to conclude that exposure to ELF-EMF alters the rate or pattern of cancer. There are some sporadic findings (including increased cancers) with no clear interpretation; however, it is noteworthy that these data provide no support for the reported epidemiological findings (discussed earlier) of increased risk for leukemia from ELF-EMF exposure.

Only a few lifetime bioassay studies (*114-116*) have been performed for ELF-EMF exposure. These studies exposed large groups of animals generally for periods of up to two years at magnetic field intensities considerably higher than elevated residential exposures. No consistent effects of ELF-EMF exposure on cancer rates in bioassay animals were found. The most comprehensive study conducted through the National Toxicology Program (*115*) used four exposure groups (control, 2, 200 and 1000 µT continuous exposure for 18.5 hours per day and 1000 µT intermittent exposure) and four gender/species groups. There were no exposure-related clinical findings for rats or mice. The two-year study found no evidence of carcinogenicity in female rats and male or female mice at any exposure level and equivocal evidence for carcinogenicity in male rats based upon an increased incidence of thyroid gland C-cell tumors.

A similar study (*114*) was conducted in female rats where exposure to 60 Hz linearly polarized magnetic fields (control, 2, 20, 200 and 2000 µT continuous exposure) began *in utero* two days before birth and continued for 20 hours per day for two years. No consistent, exposure-related clinical findings or evidence of carcinogenic activity from 60 Hz magnetic fields were reported. In another study (*116*) male and female rats were exposed to control, 500 or 5000 µT 50 Hz magnetic fields for 22.6 hours per day for two years. No differences in cancer rates between field-exposed and sham-exposed animals were found.

Epidemiological findings have suggested a possible association between magnetic field exposure and breast cancer in men (*117, 118*) or women (*119*). In addition, a hypothesis was proposed that magnetic field exposure might lower nocturnal melatonin levels that could increase risk for breast cancer (*120*). Animal studies using chemically induced mammary cancer followed by magnetic field promotion of carcinogenesis were undertaken to test whether mammary cancer was affected by ELF-EMF exposure.

Following an initial report that magnetic fields promoted mammary tumor development in rodents (*121*), a comprehensive series of studies on ELF-EMF exposure and mammary tumor initiation and promotion in the rodent model was conducted (*122-124*). In these studies, female Sprague-Dawley rats were used and cancer was initiated by intragastric administration of four weekly doses of 7,12-dimethylbenz[a]anthracene (DMBA) followed by promotion with 50 Hz ELF magnetic fields, 24 hours per day for 13 weeks. One of the early studies in this series (*122*), where the data were subsequently examined histologically (*125*), provided evidence that magnetic fields of low flux density (100 µT) promoted increased growth and size of mammary tumors but did not affect tumor incidence. The same laboratory repeated this work, and in additional studies testing different magnetic flux densities, examined the question of whether a dose-response relationship exists with field intensity (*126-128*). Over the range of 10 to100 µT magnetic fields (50 Hz), a higher (not statistically significant) number of total tumors was found in the field-exposed groups. Magnetic field exposure was not associated with more tumors per tumor-bearing animal. Effects on tumor latency and size were not consistent across the studies.

The National Toxicology Program (*129*) conducted similar studies. Animals were exposed to magnetic fields at both European frequency (50 Hz, 100 or 500 µT) and American frequency (60 Hz, 100 µT) 18.5 hours per day, seven days per week for 13 weeks following intragastric administration of four weekly doses of DMBA as the initiator. There was no difference in size or incidence of mammary gland tumors between control and exposed groups. However, the tumor incidence was high in all groups, and sensitivity was reduced for detecting a promoting effect of magnetic fields. The study was repeated at a lower dose of DMBA. Tumor incidence, latency and size, total number of tumors and number of tumors per tumor-bearing animal were not affected by magnetic field exposure; in the exposure groups there were slightly fewer total mammary neoplasms (not statistically significant) than in controls. A 26-week study, where animals received a single initiating dose of DMBA, gave similar results (*129*); there were significantly fewer tumors for the two exposed groups. However, the tumor incidence was high in all groups, and sensitivity was reduced for detecting promoting effects of magnetic fields. This collection of studies (*129*) provides strong evidence of no effect of magnetic fields on the promotional development of mammary cancer.

Another laboratory (*130*) also examined the effects of magnetic field exposure, which included transients, on mammary tumor development in female Sprague-Dawley rats. This study differed slightly in experimental design from the ones described earlier, but used DMBA as initiator and examined similar magnetic fields, 250 and 500 µT, at 50 Hz. No effects of magnetic fields were observed.

The explanation for the observed difference among these studies is not readily apparent. However, within the limits of the experimental rodent model of multistage mammary carcinogenesis, the findings do not provide consistent evidence for a promoting effect of ELF-EMF on chemically induced mammary cancer.

Animal models of skin carcinogenesis are well established for the study of the initiation, promotion and progression of cancer (*131*). Several laboratories examined whether 50 and 60 Hz magnetic fields promoted or co-promoted development of cancer using this model (*132-137*). Skin tumors were initiated by topical treatment of the animals with a known chemical carcinogen (e.g. DMBA) followed by exposure to various intensities of magnetic fields or combinations of magnetic fields plus a known chemical promoter (e.g. 12-*O*-tetradecanoyl phorbol 13-acetate, TPA). The findings from these studies demonstrated no significant promotional effect of magnetic fields on skin tumor development.

Rat liver is a most commonly used experimental model for investigating multistage carcinogenesis in tissues other than the skin (*138*). Several experiments from a single laboratory used this model to investigate ELF-EMF exposure effects and reported no evidence of a promotional or co-promotional role of magnetic fields in cancer development (*139, 140*).

Several epidemiological studies have suggested a possible association between ELF-EMF exposure and an increased risk for leukemia. Two types of animal models were used for determining whether magnetic fields can alter the time of onset or incidence of leukemia: 1) initiation with X-rays or chemical carcinogen followed by ELF-EMF exposure and 2) progression of leukemia by injection of leukemia cells into the animal followed by ELF-EMF exposure.

The largest ELF-EMF study using an agent to initiate disease involved over 2000 mice with different doses of ionizing radiation to initiate lymphoma followed by either exposure to 1400 µT magnetic fields or no exposure for up to 30 months. Exposure to magnetic fields did not affect the incidence or time of onset of leukemia/lymphoma, the rate of death among animals with leukemia/lymphoma or the leukemia sub-types (*141*). In another study (*142*), no promotional effects of a 1000 µT 50 Hz magnetic field in mice were found following initiation of lymphoma/leukemia with DMBA.

A study of leukemia progression was conducted in Fischer rats inoculated with large granular lymphocytic leukemia cells (*143, 144*). In the first study (*144*), treatment with a 1000 µT continuous 60 Hz magnetic field did not significantly alter the clinical progression of the disease in exposed versus ambient-field controls. In the second study (*143*), an additional, lower inoculum of leukemia cells was included to increase sensitivity as well as intermittent magnetic field presentation (3 min on, 3 min off). No significant effects were observed for the continuous field exposure at either inoculum; however, with intermittent fields at the higher inoculum, latency to disease was slightly decreased.

The findings from the lifetime bioassay study ((*115*), discussed earlier) with ELF-EMF exposure are also consistent with the absence of an effect on leukemia/lymphoma. When animals exposed to a range of magnetic fields for up to two years were examined, no increases in leukemias or lymphomas were found in the 16 gender/species groups.

Two studies were conducted in genetically altered mice that are prone to leukemia (*145, 146*). These studies showed no evidence of magnetic field effects on lymphoma incidence.

Based upon some evidence from occupational and residential studies suggesting an increased risk for brain cancer with ELF-EMF exposure, several animal studies examined this question. Rodent models are relatively insensitive to the induction of brain cancer by chemicals, and as such, caution should be used in interpreting the findings from studies with ELF-EMF exposure. The lifetime studies in rodents (*114-116*) demonstrated no effect of magnetic field exposure on brain cancer. In the large initiation/promotion leukemia study in female mice ((*141*), discussed earlier), sections of the brain were prepared and reviewed for primary proliferative lesions (*147*). No evidence of an effect of magnetic field exposure on primary brain tumors was found.

Non-Cancer Health Effects in Experimental Animals

A number of non-cancer end-points were investigated for possible adverse effects of ELF-EMF exposure. In general, the experimental models used to study interactions with ELF-EMF have been guided by methods and end-points that were developed to assay the effects of other physical and chemical agents such as drugs, chemicals and ionizing radiation.

The effects of ELF-EMF exposure on the immune system were investigated in multiple animal models including baboons and rodents, and there is no consistent evidence in experimental animals for effects from ELF-EMF exposure. Reports of effects in baboons (*148*) were not confirmed when the study was repeated. Some studies had methodological difficulties making interpretation of the findings difficult (*127, 149*). Other studies found no or inconsistent effects of ELF-EMF exposure on immune system indices and function (*150, 151*).

Seven studies examined standard measurements of hematological and clinical chemistry indices following ELF-EMF exposure (*152-158*); several included a limited number of animals and were of short duration. These studies provide no evidence that exposure to ELF-EMF affects hematological or clinical chemistry parameters in rodents.

A variety of animal models including non-human primates, pigeons and rodents were exposed to high intensity electric or magnetic fields to study the behavior and physiology of the nervous system. Detection of electric fields by animals is a well-established phenomenon, and the sensitivity thresholds for animals appear to be similar.

Various neuro-behavioral responses including avoidance and aversion and learning and performance were tested for effects from exposure to ELF-EMF. The data from studies including baboons and rodents suggest that exposure to strong electric fields can be perceived (*159-162*), but there is no evidence that these fields are harmful at environmental intensities. The addition of a magnetic field to the electric field appears to modulate the acute behavioral response of animals to perceptible electric fields (*163, 164*).

Relatively little evidence is available for evaluating whether exposure to ELF electric fields can affect performance of learned behavior. The studies in baboons (*160, 161*) suggest that any effects are minimal. In contrast, exposure to ELF magnetic fields was associated with several effects: adverse (*165, 166*), beneficial (*167*) or absent (*168, 169*) depending upon the task being performed and the timing of the magnetic field exposure. Studies in non-human primates with combined exposure to electric fields and magnetic fields detected no impact on operant performance (*164, 170*).

Epidemiological studies have addressed the question of whether ELF-EMF exposure affects reproduction and development. Studies using avian species were conducted, but their relevance to mammalian systems is not clear. Studies examining teratogenic and reproductive end-points were also done in mammalian systems. An extensive evaluation of magnetic field exposure (control, 2, 200 and 1000 µT continuous exposure and 1000 µT intermittent exposure) on fetal development and reproductive toxicity in the rodent was conducted (*171*). There was no evidence of any maternal or fetal toxicity or malformation. A further study examined multi-generational reproductive toxicity using a continuous breeding experiment. The results suggested no evidence of altered reproductive performance or developmental toxicity in the rat (*172*).

At the onset of the EMF-RAPID Program, one hypothesis was that magnetic fields acting through the retina as a sensitive receptor reduce melatonin levels. It was thought that this depression might act as a risk factor for cancer (*120, 173*). Studies examining effects of ELF-EMF exposure on circulating melatonin levels were conducted in a variety of mammalian species. Overall, the experimental evidence is lacking in consistency and quality across the studies. The data in rodents is weak, but suggests that when effects do occur, the result is a decrease in melatonin concentration. There is no evidence for ELF-EMF effects on melatonin in sheep and baboons. These findings parallel those reported from clinical investigations in humans and population studies (discussed earlier).

Long-term exposure to electric fields decreases melatonin concentrations slightly in rats (*174-177*); the biological significance of this effect is not understood. In a series of studies of acute magnetic field exposure in hamsters (*178-180*), a suppression of pineal and plasma melatonin levels reported in the earliest study was not replicated in later studies. Studies in rats with different magnetic field exposures, field intensities and times of exposure relative to the dark cycle have not shown consistent effects of magnetic fields on melatonin levels. Some laboratories reported that long-term exposure to magnetic fields in rats can reduce nocturnal pineal or blood concentrations of melatonin (*123, 181-184*), but other laboratories did not find similar results (*127, 129, 185, 186*). Interpretation of the findings from this large data set is complicated by variability across studies in confounding factors such as species, strain, gender, co-exposure to chemicals, field characteristics and measured outcomes. Long-term studies of ELF-EMF exposure in lambs (*187, 188*) and baboons (*189*) showed no effects on melatonin levels.

Studies of Cellular Effects of ELF-EMF

The number of cellular components, processes and systems that can possibly be affected by ELF-EMF is large. Historically, testing of potentially toxic substances has relied on the use of carefully controlled *in vitro* experimental systems. In an attempt to identify potentially carcinogenic or toxic effects of an agent, these studies have typically exposed cells to the agent over a range of doses including levels above those encountered in the environment. Measurements are then made of cellular end-points as a means to detect alterations in processes such as differentiation, proliferation, gene expression and signal transduction pathways. This toxicological approach was applied to ELF-EMF in general through exposure of cultured cells over a range of doses. Because nothing is known about the potential mechanistic action of ELF-EMF on biological end-points, careful consideration must be given to the range over which the experimental doses of ELF-EMF is varied. The extrapolation of observed effects to lower field intensities may be inappropriate as ELF-EMF may have different mechanistic actions over different patterns of field intensity. Likewise, the actual agents responsible for the ELF-EMF “dose” to which individuals are exposed are not clear. Environmental ELF-EMF exposure is complex being composed of not only pure 60 Hz electric fields and magnetic fields, but also possibly transients (intermittent spikes and changes in the frequency of the field) and harmonics (multiples of the pure 60 Hz exposure: 120, 180, 240, etc.). To understand this complexity, careful control of laboratory exposure conditions also becomes important to ensure that the exposure being tested is known.

The breadth of *in vitro* data on ELF-EMF produced over the last two decades is enormous. Many of these investigations were done using unique experimental protocols in single laboratories. Under the EMF-RAPID Program, a major focus was research that targeted examination of *in vitro* effects that might clarify potential mechanistic actions of ELF-EMF in order to explain reported epidemiological associations with magnetic fields. Because of the noted complexity of ELF-EMF exposures, efforts were also made to standardize the exposure systems used in these studies to allow for comparability of findings across laboratories. Through oversight by the DOE, on-site quality assurance evaluations were made of laboratories funded by this program. In addition, four regional ELF-EMF exposure facilities were established and made available for use by investigators (discussed earlier).

Through the EMF-RAPID Program, considerable progress was made in the area of *in vitro* research on ELF-EMF. Many of these studies of ELF-EMF exposure focused on end-points commonly associated with cancer (e.g. cell proliferation, disruption of signal transduction pathways and inhibition of differentiation). Convincing evidence for causing effects is only available for magnetic flux densities greater than 100 µT or internal electric field strengths greater than approximately 1 mV/m. To date, there is no generally accepted biophysical mechanism by which actions of lower intensity ELF-EMF exposures, including those reported to be of concern in epidemiological studies, might be explained.

Given the concern about whether ELF-EMF exposure is carcinogenic, considerable effort was undertaken to investigate whether ELF-EMF exposures can damage DNA or induce mutations. It has been generally believed that the energy associated with ELF-EMF is not sufficient to cause direct damage to DNA; however, it has been postulated that indirect effects might be possible by ELF-EMF altering processes within cells that could subsequently lead to changes in DNA structure. Overall, there was considerable variability in experimental design and methodology used in these studies resulting in no conclusive evidence that genotoxic effects result from ELF-EMF exposures.

Studies also examined the potential cytogenetic effects of power-frequency sine wave or pulsed magnetic fields using model systems of human cells isolated directly from peripheral blood and amniotic fluid or cultured human lymphocytes and leukemia cells. Overall, the studies varied considerably, and in general, there is no evidence of chromosomal damage even when cells were exposed to relatively strong magnetic fields (*190, 191*). Chromosomal aberrations were reported in one study (*192*) using pulsed magnetic fields; however, the exposures tested were within the range of exposures reported in other studies to have no effect.

Relatively few studies have addressed the question of whether ELF-EMF exposures cause genetic mutations (*193*). Studies using bacteria or yeast cells

(*194, 195*) to investigate possible mutational changes in DNA reported no damage from ELF-EMF exposure at levels less than 1000 µT. However, at higher field strength (400,000 µT, 50 Hz), well above environmental field intensities, enhanced mutagenicity was reported in two cell lines (*196, 197*). Exposure to ELF-EMF (magnetic field strengths ≥500 µT) following exposure to ionizing radiation was reported to produce significant enhancement of mutagenicity (*197, 198*); ELF-EMF exposure alone had no effect. Several investigators examined the ability of ELF-EMF to alter the repair of DNA strand breaks caused by hydrogen peroxide or radiation; no effects with exposure to either magnetic or electric fields were observed (*199-201*).

The concept that ELF-EMF might be carcinogenic through effects on gene transcription was stimulated by an extensive series of studies in human leukemia cells (*202*, *203*). It was initially reported that high-intensity ELF-EMF exposure increased expression of several genes important in carcinogenesis. The presence of this effect was later reported to occur at field intensities more characteristic of environmental levels (*204*) and in three types of human cell lines (*203, 205*, *206*). Because some of these genes may have a central role in controlling cancer, these findings were of great significance. Intense efforts by several laboratories failed to confirm the reported findings (*207-210*). Follow-up studies by the original investigators demonstrated strain-specific responsiveness to ELF-EMF of the cell line (*211*), although this does not appear to explain the inability of other laboratories to confirm the reported findings (*209*).

Several investigations were undertaken to determine whether cells might respond to ELF-EMF with transcriptional or translational changes of heat-shock proteins, which are important in control of stress within a cell. Exposure of cells to ELF-EMF was reported from a single laboratory to result in increases in some of these proteins (*212-214*).

Signal transduction processes aid cells in receiving signals from their environment and from other cells. These signals help to regulate cellular processes such as gene expression, metabolic activity, differentiation and proliferation. Signals received by the cell membrane, which control processes within the cell, have been proposed as a means by which ELF-EMF might affect cellular function. In the case of electrical signals, these are not expected to penetrate the cell's outer membrane but may signal release of proteins on the cell membrane that could alter cellular function.

Numerous laboratories performed studies to evaluate potential ELF-EMF effects on cellular end-points related to signal transduction pathways, which if altered, might be carcinogenic. Overall the body of evidence suggests that ELF-EMF exposures at magnetic field intensities greater than 100 µT and electric fields greater than 1 mV/m have shown effects on signal transduction pathways. Studies at lower exposures are inconclusive.

Recent studies investigated whether ELF-EMF exposure might play a role in B-cell leukemogenesis (the major form of childhood leukemia) through signaling pathways. A series of studies, which focused on one particular signal (the protein kinase C-linked signaling cascade), provided preliminary evidence that *in vitro* exposure to ELF-EMF (100 µT) can affect this pathway (*215-217*). This finding was not reproduced by a second independent laboratory (*218*).

Because of concern about ELF-EMF possibly being carcinogenic, studies were initiated to investigate whether there were effects on ornithine decarboxylase (ODC), an enzyme activated during carcinogenesis. An early study (*219*) reported increased ODC activity in three cell lines in response to a sinusoidal 60 Hz electric field (10 mV/cm). Subsequent work by others demonstrated effects of ELF magnetic fields (field strengths ≤ 100 µT) on ODC although the experimental conditions (e.g. cell line/tissue, field intensity, time of exposure) varied among laboratories (*220-222*). One study reported increased ODC activity in mouse lymphoma cells exposed to 10 µT 60 Hz magnetic fields (*220*). Attempts to reproduce this finding were not successful (*223, 224*).

Abnormal cellular proliferation is a hallmark of carcinogenesis. This complex process is under control of numerous signal transduction pathways. Several laboratories studied *in vitro* cellular proliferation as an end-point for ELF-EMF effects. Alterations in proliferation were observed in a number of laboratories using a variety of exposure conditions (magnetic fields strengths of 1000 to 5000 µT) and cell lines (*225-227*). Two studies (*228, 229*) did not confirm an earlier report (*227*) of increased colony growth for cells exposed to 60 Hz magnetic fields, although one study (*229*) used a similar experimental protocol. Another study, which used several methods for independently assessing proliferation, reported increased growth over an exposure range of 50 to100 Hz and 100 to 700 µT (*230*).

Disruption of the normal circadian rhythm of melatonin, a hormone produced by the pineal gland, has been postulated as a possible mechanism whereby ELF-EMF exposure might increase risk for breast cancer (*120*). Studies in a human breast cancer cell line (*231*) showed that cellular proliferation *in vitro* was decreased by treatment with physiological levels of melatonin; exposure to a sinusoidal ELF magnetic field (1.2 µT) could overcome this effect. These studies were extended and the anti-proliferative effects of tamoxifen (an anti-cancer therapy) were also reported to be reversed by a 1.2 µT field (*232*). Another laboratory presented similar findings (*233*). The original laboratory also reported finding comparable effects using a second human breast cancer cell line (*234*) and a human glioma cell line (*235*). There is some concern about the experimental design of these studies and further work is underway. In addition, because the observed effect is small, the importance of these findings for human health is not clear (*236*).

Numerous investigations have examined ELF-EMF exposure effects on markers characteristics of cellular differentiation (e.g. matrix protein synthesis; cell surface characteristics; cell morphology, size and orientation). Several of these studies demonstrated a role of electric fields in affecting cellular behavior. Two investigations of alterations in matrix protein production studied effects of electric fields (*237, 238*) and found a positive correlation between dose and the differentiated state of the cells. Studies examining ELF-EMF effects on alterations of cell surface markers used a variety of cell types. In two of these investigations, the observed cellular effects were attributed to the induced electric fields (*239, 240*). Exposure to 60 Hz electric fields was also found to suppress formation of osteoclast-like cells in marrow culture (*241*).

Biophysical Theory

The physics governing the interactions of ELF-EMF with matter were elucidated over a century ago and succinctly stated in the Maxwell equations. Years of successful application of these principles for practical advances have left little doubt about our ability to understand and predict electromagnetic biophysical phenomena when details of the system and fields are completely described. Given the complexity, dynamics and organization in living organisms, it is difficult to apply this knowledge. Living organisms function through the use of biochemical and electrical signals carefully controlled by the organism's structure. Early attempts to explain the biological effects of ELF-EMF focused on simple application of electromagnetic theory to calculate the forces on biological molecules and the energies transferred to them by weak ELF-EMF. The extremely small magnitude of these interactions led many investigators to conclude that they would not occur at normally encountered field strengths. This has not fundamentally changed; calculations still strongly suggest that the small electric fields and magnetic fields associated with ELF-EMF in environmental settings cannot be expected to supply, by themselves, the energies necessary for chemical changes.

The complexity and structure of biological systems make uniform application of these findings difficult. For example, even very small fields might act as control signals to modify processes that depend on metabolically supplied energy. This would be analogous to extremely weak radio signals, such as those transmitted over thousands of miles, that control locally supplied energy or power a loud-speaker or a large-screen television set. The exact nature of biological signal processing systems and their susceptibility to control by time-varying ELF-EMF is of continuing interest. Biological systems contain complex feedback loops and amplification sequences in which very small changes at one point may ultimately lead to very large changes further along the communication chain. In considering ELF-EMF changes on the nature of biological signals, it is essential to recognize that all aspects of a field (frequency, amplitude and pattern) may be involved. These considerations make definitive statements based upon biophysical theory difficult to apply to living organisms.

Several mechanisms for explaining ELF-EMF effects on biological systems have been proposed. One set of theories (*242-248*) predicts effects of ELF-EMF on chemical reactions due to resonances that depend on complex interactions between constant and oscillating magnetic fields. There is limited experimental support for these theories (*12*); the validity of the assumptions used in the theories has been questioned (*249*).

Modification of the transfer of electrons from one molecule to another has also been suggested as a theoretical mechanism for the effects of ELF-EMF (*250-255*). However, the energies involved in electron binding are many orders of magnitude larger than those contained in weak, externally applied electric fields or magnetic fields (*256-260*) making these theories difficult to accept.

It is also possible that ELF-EMF could interact with magnetic particles in human cells (*261-264*). However, work with this theory (*263-265*) would suggest that such effects can occur only with large magnetic fields and are not applicable to the normal human environment; these conclusions may be premature (*12*, *266*).

Magnetic fields are capable of altering specific types (e.g. radical pair formation) of chemical reactions (*267-273*). Potential effects of ELF-EMF have been predicted by analytical work (*274-278*). Such reaction effects have been shown for strong fields (*279*), but there are few studies of the effects in biological systems with moderate to low field intensities.

Biochemical and biomechanical processes are generally dynamic. It has been suggested that rather than causing changes in the usual state of the system, ELF-EMF may induce slight changes in the frequency of events that trigger other processes, especially for effects on chemicals that oscillate within cells and between cells and their environments (*250*, *277*, *280-286*). Both theoretical (*287-291*) and biological (*292-294*) studies exist that support this suggestion. However, there is open debate about whether this phenomenon is applicable for ELF-EMF exposures that are generally found in the human environment.

All of the theories for biological effects of ELF-EMF suffer from a lack of detailed, quantitative knowledge about the processes to be modeled. Nevertheless, theoretical models are useful, even in the absence of critical data, because they can indicate what data are needed, suggest previously uncontemplated experiments, suggest bounds on risks under defined situations and provide nonlinear methods of analysis of critical data based upon presumed mechanisms. The current biophysical theories for ELF-EMF would suggest little possibility for biological effects below exposures of 100 µT. However, considering the complexity of biological systems and the limitations required by the assumptions used to mathematically model these theories, this finding has to be viewed with caution.

HOW HIGH ARE EXPOSURES IN THE U.S. POPULATION?

An evaluation of the importance of any environmental agent requires knowledge of both the potential health impacts associated with exposure and the exposure levels encountered by the population. For any environmental exposure, a clear estimate of risk is made more difficult by the lack of a well-defined measure of dose. For ELF-EMF, it is unknown whether time-averaged fields, time above a threshold, the electric current induced by the field, the magnetic field itself, or specific temporal characteristics of the field (e.g. frequency, waveform, or intermittency) are relevant to human health.

Recognizing this uncertainty and faced with practical limitations, investigators have employed several different methods to estimate human exposure to ELF-EMF. Most of these approaches provide an estimate of the 24-hour time-average of the 60 Hz magnetic field. The first ELF-EMF epidemiological study, as well as several subsequent studies, estimated exposure by developing a code to describe power-line wiring near homes. More recent studies performed actual measurements of magnetic fields using either survey instruments in homes or miniature monitors worn by an individual for periods of up to 24 hours or more (personal exposure measurements). Another approach was to calculate time-average magnetic field exposures based on electric current in nearby power lines and distance of homes to the lines. This report focuses entirely on recent studies that measured magnetic fields, and highlights single spot measurements and 24-hour, time-weighted averages.

Several studies measured magnetic fields in either homes (*22, 26, 295-298*) or personal exposures (*297, 299*). These studies and others (*16, 18, 20, 300-309*) compared different types of measurements in an attempt to relate the results across various epidemiological studies. Two of the studies (*297, 299*) attempted to evaluate nationwide exposures in the U.S. population. One study (*297*) measured magnetic fields in various locations within homes using fixed meters. This survey, although not designed to describe individual exposures, provides a snapshot of residential fields, and the results are probably reasonably representative of residential conditions. An extensive measurement protocol (*297*) was used including spot measurements inside rooms, field recordings in the home, measurements of field profiles from wiring outside the home, measurements of household appliances and measurement of fields from currents in the electrical grounding system. The other study (*299*) relied entirely upon personal monitors mailed to participants along with a questionnaire that addressed characteristics of the individual wearing the monitor. These two studies form the basis for most of the discussion that follows.

Measured magnetic field exposures to individuals and measurements in homes tend to have an asymmetric distribution with the bulk of their values in the low range with fewer values in the range of higher exposures. Therefore, the central tendency of the values is better represented as a geometric mean (log-weighted average) and the variation around that mean given as a geometric standard deviation. Another measure commonly used is the median, which denotes the estimate of exposure for which 50% of the population have smaller exposures and 50% have larger exposures. In addition, estimates are also presented for the portion of the population in the upper range of exposure. This report presents averages as geometric means with geometric standard deviations given in parenthesis beside the average estimate.

Average 24-hour personal magnetic field exposure for individuals in the U.S. population (*299*) is about 0.09 µT (geometric standard deviation of approximately 2.2). About 44% of the population have 24-hour exposures above 0.1 µT, about 14% above 0.2 µT, about 2.5% above 0.5 µT and less than 1% above 0.75 µT. The median measured fields using monitors located for 24 hours in several places in the homes (*297*) was 0.06 µT with about 28% of the homes exceeding 0.1 µT, about 11% of the homes exceeding 0.2 µT and about 2% exceeding 0.5 µT. The main difference between the home and personal exposure measurements pertains to exposures incurred outside of the home and the movement of individuals within the home near ELF-EMF sources.

Personal exposures measured within the home (*299*) averaged 0.08 µT (2.5) for time not in bed and 0.05 µT (3.52) for time spent in bed. In comparison, personal exposures at work averaged 0.1 µT (2.57), exposure at school averaged 0.06 µT (2.1) and exposure during travel measured 0.1 µT (2.0). Approximately 38% of the personal measurements in the home (not in bed) were above 0.1 µT, about 14% were above 0.2 µT and about 3.5% were above 0.5µT. Personal measurements at home and in bed were slightly different in the low exposure range with approximately 30% of the measurements above 0.1 µT, but similar in the high exposure region with about 14% above 0.2 µT and about 4% above 0.5 µT. It is clear from these numbers that personal exposures tend to be somewhat larger than those observed by fixed measurement of fields in homes.

Personal exposures do not appear to differ by gender, but do differ by age (*299*) with young children (less than five years of age) having an average exposure of 0.08 µT (2.1), school-aged children (five to 17 years of age) having an average exposure of 0.08 μT (2.2), working-aged adults (18 to 64 years of age) having an average exposure of 0.1 μT (2.2) and retirement-aged adults (greater than 64 years of age) having an average exposure of 0.09 μT (2.2). There are some regional differences in exposure across the United States, but these are differences that are likely to change based upon the seasons and are not likely to have a major impact upon exposure considerations. Residents of apartments and duplexes seem to have higher average exposures (approximately 0.1 μT) compared to residents of other dwelling types (0.05 to 0.07 μT) (*297*).

The presence of overhead power lines near homes contributes to both personal exposures and fixed home measurements. In a large study using fixed monitors in homes (*297*), estimates of fields due to power-line fields were determined independent of exposures measured in the homes. Both the power-line and grounding system fields were combined and compared to the short-term field levels measured in the centers of rooms. Combined, the two sources add up to much of the spot residential fields in homes having higher than usual magnetic field levels.

A comparison was made between different types of power lines to determine which ones produced the greatest fields. Transmission lines and certain types of distribution lines produced the greatest fields (medians ranging from 0.09 to 0.38 μT, although the number of residences exposed to these fields was small), and several types of primary distribution lines produced the lowest median fields (medians ranging from 0.01 to 0.02 μT). The majority of homes were associated with underground distribution lines that still generated fields with a median of 0.03 μT and with 5% exceeding 0.13 μT (roughly 75% of the median for all homes).

The effect of power lines on personal exposures was also assessed (*299*), but in contrast to the previous discussion, self-reporting was used to classify the types of power lines. Persons reporting three-phase primary distribution lines (average exposure at home 0.083 μT), multiple three-phase primary distribution lines (average exposure at home 0.1 μT) and transmission lines (average exposure at home 0.1 μT) had the highest average exposures, while those reporting single phase (average exposure of 0.07 μT) and two-phase primary distribution lines (average exposure of 0.05 μT) had the lowest exposure. For all types of lines, 25% of the population had exposures greater than 0.1 to 0.2 μT and 5% had exposures greater than 0.3 to 0.5 μT. At distances of greater than 50 feet, the type of power lines appeared to have little impact on the average exposure and only a minor impact on the number of individuals with the highest exposures.

Several other factors contributed to increased personal exposure and/or increased residential exposure. These included type of home (single family homes had smaller average exposures than multi-family homes), size of the home (smaller homes had higher fields), age of the home (older homes had higher fields), waterline type inside the home (homes with metal pipes tended to have higher fields) and location of the home (urban and suburban homes had higher fields than rural homes).

Magnetic fields generated by appliances were also studied (*297*). Exposures tend to vary greatly by distance to the appliance and type of appliance. In general, microwave ovens, toaster ovens, ceiling heat and refrigerators generated the highest fields. However, the contributions of these fields to personal exposure will depend upon placement of the appliance, distance from the appliance, frequency of use, manufacturer, etc. Any observations on exposures from appliances are not easily generalized.

Occupational exposures have been evaluated in a large number of studies (see Table 2.4 (*12*)). The list of occupations with ELF-EMF exposure is quite large and will not be repeated here. In general, electrical workers, persons working near machines with electric motors and welders tend to have the highest exposures with time-weighted average magnetic field exposure levels in the range of 0.1 to 4.0 μT.

CONCLUSIONS AND RECOMMENDATIONS

Previous Panel Reviews

Since 1990, more than 60 reports and literature reviews written by various expert panels, individual researchers or governmental officials have examined the ELF-EMF scientific evidence worldwide. While most of these documents are one-time assessments, some U.S. states (including Connecticut, Maryland, Virginia) have recognized public concern for this topic and monitored this issue on a yearly or periodic basis (*310*). A number of national reviews of ELF-EMF research have also been prepared.

The most recent panel reviews (*19, 311-316*) used a variety of evaluation criteria and differing types of information to evaluate potential health effects from ELF-EMF exposures. Several groups concluded that the epidemiological evidence for childhood and adult cancers was inconsistent and inconclusive and was insufficient to address risks (*19, 311, 312, 315, 316*). Several noted that there existed some associations between exposures and cancers, but without mechanistic and animal evidence to support the effect, concluded it was still basically a hypothesis to be studied further (*19, 313-315*). For all of these reviews, the conduct of additional research was suggested.

NIEHS Conclusion

As part of the EMF-RAPID Program's assessment of ELF-EMF-related health effects, an international panel of 30 scientists met in June 1998 to review and evaluate the weight of the ELF-EMF scientific evidence (*12*). Using criteria developed by the International Agency for Research on Cancer, none of the Working Group considered the evidence strong enough to label ELF-EMF exposure as a "known human carcinogen" or "probable human carcinogen." However, a majority of the members of this Working Group (19/28 voting members) concluded that exposure to power-line frequency ELF-EMF is a "possible" human carcinogen. This decision was based largely on "limited evidence of an increased risk for childhood leukemias with residential exposure and an increased occurrence of CLL (chronic lymphocytic leukemia) associated with occupational exposure." For other cancers and for non-cancer health endpoints, the Working Group categorized the experimental data as providing much weaker evidence or no support for effects from exposure to ELF-EMF.

The NIEHS agrees that the associations reported for childhood leukemia and adult chronic lymphocytic leukemia cannot be dismissed easily as random or negative findings. The lack of positive findings in animals or in mechanistic studies weakens the belief that this association is actually due to ELF-EMF, but cannot completely discount the finding. The NIEHS also agrees with the conclusion that no other cancers or non-cancer health outcomes provide sufficient evidence of a risk to warrant concern.

The ultimate goal of any risk assessment is to estimate the probability of disease in an exposed population. In general, this involves the combination of three basic pieces of information: the probability that the agent causes the disease, the response as a function of exposure given that the exposure does cause disease and the distribution of exposures in the population being studied. The NIEHS believes that the probability that ELF-EMF exposure is truly a health hazard is currently small. The weak epidemiological associations and lack of any laboratory support for these associations provide only marginal, scientific support that exposure to this agent is causing any degree of harm.

The NIEHS concludes that ELF-EMF exposure cannot be recognized as entirely safe because of weak scientific evidence that exposure may pose a leukemia hazard. In our opinion, this finding is insufficient to warrant aggressive regulatory concern. However, because virtually everyone in the United States uses electricity and therefore is routinely exposed to ELF-EMF, passive regulatory action is warranted such as a continued emphasis on educating both the public and the regulated community on means aimed at reducing exposures. The NIEHS does not believe that other cancers or non-cancer health outcomes provide sufficient evidence of a risk to currently warrant concern.

Several groups have attempted to determine the risk of childhood leukemia in the general population under the unproven assumption that ELF-EMF is truly causing this disease (*317-319*). If this assumption were correct, these calculations generally suggest, on average, that between 5% and 15% of childhood leukemias could be caused by exposures to ELF-EMF with confidence intervals including 0%. Based upon this assumption, our own evaluations using the most current data and several different methods of analysis do not disagree with these percentages. The risk of getting leukemia prior to age 15 in the United States is about 0.05% (5/10,000 people) (*320*). This would make the lifetime risk of childhood leukemia attributable to ELF-EMF (again, conditional on the risk being real) between 2.5 to 7.5 per 100,000 people. On a yearly basis, this conditional risk is approximately 15 times less than the lifetime risk or 2 to 6 additional cases per million children per year.

The National Toxicology Program routinely examines environmental exposures to determine the degree to which they constitute a human cancer risk and produces the “Report on Carcinogens” listing agents that are “known human carcinogens” or “reasonably anticipated to be human carcinogens.” It is our opinion that based on evidence to date, ELF-EMF exposure would not be listed in the “Report on Carcinogens” as an agent “reasonably anticipated to be a human carcinogen.” This is based on the limited epidemiological evidence and the findings from the EMF-RAPID Program that did not indicate an effect of ELF-EMF exposure in experimental animals or a mechanistic basis for carcinogenicity.

Recommended Actions

Regulatory action on any environmental exposure can be multifaceted and proceed by any of a number of options. In general, if regulatory action is to be taken, the types of controls can be broken down into restrictions placed on the production of the hazard and those placed on individuals who might come in contact with the hazard. In the case of ELF-EMF, there are several issues that complicate any regulatory action. First, there is only marginal, scientific support that exposure to ELF-EMF is a health hazard. Second, it is unclear what aspect of the exposure, if any, may be the active component of the field resulting in the increased cancer risk. While the association observed is with average magnetic field measures, controls resulting in reductions in these field levels may not alleviate the risk. Third, it is impossible to remove all ELF-EMF exposure and remain a modern, technologically advanced society. Finally, considering the weak degree of evidence involved, it is critical that the potential risks from any alternatives to our current methods of using electricity be carefully evaluated.

Regulatory actions prompted by this review of ELF-EMF are not the purview of the NIEHS. The Interagency Committee (IAC, described earlier) has been involved in all aspects of both our research program and the process of reviewing these data. The agencies that compose the IAC employ experts who have greater experience and knowledge concerning mitigation of ELF-EMF exposure than the NIEHS. However, it is important that the strength of the evidence reported here be placed in a context that is clear to the regulatory authorities. Therefore, the NIEHS is providing the following suggestions that are intended to give scope for future regulatory actions.

The NIEHS suggests that the level and strength of evidence supporting ELF-EMF exposure as a human health hazard are insufficient to warrant aggressive regulatory actions; thus, we do not recommend actions such as stringent standards on electric appliances and a national program to bury all transmission and distribution lines. Instead, the evidence suggests passive measures such as a continued emphasis on educating both the public and the regulated community on means aimed at reducing exposures. NIEHS suggests that the power industry continue its current practice of siting power lines to reduce exposures and continue to explore ways to reduce the creation of magnetic fields around transmission and distribution lines without creating new hazards. We also encourage technologies that lower exposures from neighborhood distribution lines provided that they do not increase other risks, such as those from accidental electrocution or fire.

Exposures in individual residences are linked to certain characteristics. Their chief causes are improper grounding and improper wiring, which if addressed by properly following current electrical codes, can be mitigated and exposures reduced. Older homes may also have higher ambient exposures, but these must be assessed on a case-by-case basis. Many of the U.S. electric utility companies will measure fields in their customers' homes and help them to identify sources of high fields; we encourage continuation of this practice. Finally, the NIEHS would encourage the manufacturers of household and office appliances to consider alternatives that reduce magnetic fields at a minimal cost. We feel that the risks do not warrant major and expensive redesign of modern electrical appliances, but inexpensive modifications should be sought to reduce exposures.

Certain occupations result in high field exposures. The NIEHS encourages the National Institute for Occupational Safety and Health and the Occupational Safety and Health Administration to review these findings and carefully evaluate if current occupational exposure standards are adequate.

In summary, the NIEHS believes that there is weak evidence for possible health effects from ELF-EMF exposures, and until stronger evidence changes this opinion, inexpensive and safe reductions in exposure should be encouraged.

Future Research

The NIEHS is committed to the support of hypothesis-driven research on any environmental exposure that is of concern for human beings. Exposure to ELF-EMF is no different. These exposures warrant continued monitoring because ELF-EMF exposure is ubiquitous and the use of electromagnetic technology is growing in our society.

The characteristics of ELF-EMF and their possible interactions with biological systems have been investigated for several decades. The EMF-RAPID Program successfully contributed to the scientific knowledge on ELF-EMF through its support of high quality, hypothesis-based research. While some questions were answered, others remain. Building upon the knowledge base developed under the EMF-RAPID Program, meritorious research on ELF-EMF through carefully designed, hypothesis-driven studies should continue for areas warranting fundamental study including leukemia. The NIEHS will continue to support research in this area. Certain areas of research, however, warrant noting.

There are several epidemiological studies of ELF-EMF exposures and childhood leukemia underway that may help clarify this issue. Any new epidemiological studies of ELF-EMF exposure are not warranted unless, in some unique manner, the studies differ from existing ones and can test new hypotheses. Very little is known about the mechanisms and causes of childhood leukemias and chronic lymphocytic leukemia in adults. Many agencies, including the National Institutes of Health, have ongoing programs in these areas aimed at improving our understanding of these diseases. As risk factors are identified, we strongly recommend re-analysis of the existing ELF-EMF epidemiology data to determine if these risk factors reduce or strengthen the reported findings of concern expressed in this document. Where currently available studies cannot adequately address newly discovered risk factors, the NIEHS encourages new studies.

Several non-cancer health areas including neurodegenerative and cardiovascular diseases have been identified as being of national concern, but for which there are few, high quality studies to evaluate adequately whether ELF-EMF exposure might have effects. Preliminary work suggests that ELF-EMF exposure may be linked to cardiovascular deaths resulting from arrhythmia and acute myocardial infarction. The mechanism for such an effect, if true, is not known, but possibly occurs through exposure-related effects on autonomic nervous system control of cardiac function. Also, several exploratory studies have suggested possible associations between occupational ELF-EMF exposure and neurodegenerative diseases specifically amyotrophic lateral sclerosis and Alzheimer’s disease. The data on these end-points are inadequate for interpreting the possibility of an association. Research in these areas should cover all aspects of scientific investigation including epidemiology, laboratory and mechanistic studies.

Preliminary studies in transformed breast cancer cells suggest that ELF-EMF exposures can overcome effects of melatonin and tamoxifen in regulating cell growth. This effect of ELF-EMF appears to occur at magnetic field exposures that may be encountered in the environment. Several other laboratories have presented similar, unpublished findings at national meetings. The importance of this finding for human health is unclear, but considering the magnitude of the incidence of breast cancer, this area warrants further investigation.

There is a continued need for more biologically realistic mathematical models to evaluate the biophysics of ELF-EMF and for biological systems specifically developed to evaluate the validity and utility of these mathematical models. While it is clearly established that certain animals can sense weak magnetic fields for navigation and homing, the physical basis for these processes is unknown. More remains to be learned about the physics of magnetic field interactions with biological systems.

The interaction of humans with ELF-EMF is complicated and will undoubtedly continue to be an area of public concern. The World Health Organization through its own international program on ELF-EMF will review this field in the year 2003. The NIEHS is a partner in this process.

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APPENDIX K - EMF ANALYSIS

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************************************************
*       C O R O N A   A N D   F I E L D        *
*        E F F E C T S   P R O G R A M         *
*   Source: Bonneville Power Administration    *
************************************************

  +++++++++++++++++++
  + INPUT DATA LIST +

   ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
    10/ 6/2011          5:46:35 pm
 +********  Basin 345/115kV EMF Calcs  ***************************
 +****  Double-Circuit Vertical -- (1)2306.2kcmil, (1)795kcmil ACSR ****
 +      1       0       6       8   362.0    2.00    1.00     .00

 (ENGLISH UNITS OPTION)

    LINE GRADIENTS COMPUTED BY PROGRAM

 PHYSICAL SYSTEM CONSISTS OF   8 CONDUCTORS, OF WHICH   6 ARE ENERGIZED PHASES

 +COMB  MF  XX  XX  XX  XX  XX  XX
 +   4.921   6.562   9.842    .000   1.000  75.000   3.280   4.000   3.280
 +115-A        A   -15.00   90.00    1   1.063     .00   69.70      .0     .88     .00
 +115-B        A   -17.00   65.00    1   1.063     .00   69.70  -120.0     .88     .00
 +115-C        A   -15.00   40.00    1   1.063     .00   69.70   120.0     .88     .00
 +345-A        A    15.00   80.00    1   1.802     .00  209.00      .0    1.65     .00
 +345-B        A    17.00   55.00    1   1.802     .00  209.00  -120.0    1.65     .00
 +345-C        A    15.00   30.00    1   1.802     .00  209.00   120.0    1.65     .00
 +GND-1        A    -8.00  110.00    1    .500     .00     .00      .0     .00     .00
 +GND-2        A     8.00  110.00    1    .500     .00     .00      .0     .00     .00
 +      81  -200.0     5.0
 +       0      .0      .0
```

COMBINED OUTPUT OF AUDIBLE NOISE, RADIO NOISE, TVI, OZONE CONCENTRATION, GROUND GRADIENT AND MAGNETIC FIELD

******** Basin 345/115kV EMF Calcs ***************************
**** Double-Circuit Vertical -- (1)2306.2kcmil, (1)795kcmil ACSR ****

362.0 KV

	DIST. FROM CENTER OF TOWER (FEET)	HEIGHT (FEET)	MAXIMUM GRADIENT (KV/CM)	SUBCON DIAM. (IN)	NO. OF SUBCON	SUBCON SPACING (IN)	VOLTAGE L-N (KV)	PHASE ANGLE (DEGREES)	CURRENT (KAMPS)	CORONA LOSSES (KW/MI)
115-A	-15.00	90.00	6.39	1.06	1.00	.00	69.70	.00	.875	.009
115-B	-17.00	65.00	7.93	1.06	1.00	.00	69.70	-120.00	.875	.038
115-C	-15.00	40.00	7.55	1.06	1.00	.00	69.70	120.00	.875	.028
345-A	15.00	80.00	14.96	1.80	1.00	.00	209.00	.00	1.650	19.347
345-B	17.00	55.00	15.88	1.80	1.00	.00	209.00	-120.00	1.650	28.506
345-C	15.00	30.00	15.44	1.80	1.00	.00	209.00	120.00	1.650	23.775
GND-1	-8.00	110.00	4.80	.50	1.00	.00	.00	.00	.000	.000
GND-2	8.00	110.00	5.50	.50	1.00	.00	.00	.00	.000	.000

AN MICROPHONE HT.= 4.9 FT, RI ANT. HT.= 6.6 FT, TV ANT. HT.= 9.8 FT, ALTITUDE= .0 FT
RI FREQ= 1.000 MHZ, TV FREQ= 75.000 MHZ, WIND VEL.(OZ) = 2.000 MPH, GROUND CONDUCTIVITY = 4.0 MMHOS /M
E-FIELD TRANSDUCER HT.= 3.3FT, B-FIELD TRANSDUCER HT. = 3.3FT

LATERAL DIST FROM REFERENCE (FEET)	AUDIBLE NOISE (RAIN) L50 DBA	AUDIBLE NOISE (FAIR) L50 DBA	RADIO INTERFERENCE (RAIN) L50 DBUV/M	RADIO INTERFERENCE (FAIR) L50 DBUV/M	TVI TOTAL RAIN DBUV/M	OZONE FOR RAIN RATE OF 1.00 IN/HR AT 0. FT.LEVEL PPB	ELECTRIC FIELD KV/M	MAGNETIC FIELD GAUSS
-200.0	47.6	22.6	49.1	32.1	14.8	.000000	.085	.01588
-195.0	47.7	22.7	49.4	32.4	15.0	.000000	.087	.01662
-190.0	47.8	22.8	49.7	32.7	15.2	.000000	.090	.01741
-185.0	47.9	22.9	49.9	32.9	15.4	.000000	.093	.01826
-180.0	48.0	23.0	50.2	33.2	15.6	.000000	.096	.01917
-175.0	48.2	23.2	50.5	33.5	15.9	.000000	.098	.02015
-170.0	48.3	23.3	50.8	33.8	16.1	.000000	.101	.02121
-165.0	48.4	23.4	51.1	34.1	16.3	.000000	.104	.02234
-160.0	48.5	23.5	51.4	34.4	16.5	.000000	.107	.02356
-155.0	48.7	23.7	51.8	34.8	16.8	.000000	.109	.02488
-150.0	48.8	23.8	52.1	35.1	17.0	.000000	.112	.02631
-145.0	49.0	24.0	52.5	35.5	17.2	.000000	.114	.02786
-140.0	49.1	24.1	52.8	35.8	17.5	.000000	.116	.02955
-135.0	49.2	24.2	53.2	36.2	17.8	.000000	.117	.03138
-130.0	49.4	24.4	53.6	36.6	18.0	.000000	.118	.03337
-125.0	49.5	24.5	54.0	37.0	18.3	.000000	.118	.03555
-120.0	49.7	24.7	54.4	37.4	18.6	.000000	.117	.03793
-115.0	49.9	24.9	54.9	37.9	18.9	.000000	.115	.04054
-110.0	50.0	25.0	55.3	38.3	19.2	.000000	.111	.04341
-105.0	50.2	25.2	55.8	38.8	19.5	.000000	.105	.04656
-100.0	50.4	25.4	56.3	39.3	19.8	.000000	.097	.05002
-95.0	50.6	25.6	56.8	39.8	20.1	.000000	.086	.05385
-90.0	50.8	25.8	57.4	40.4	20.5	.000000	.071	.05807
-85.0	51.0	26.0	58.0	41.0	20.8	.000000	.054	.06274
-80.0	51.2	26.2	58.5	41.5	21.2	.000000	.039	.06790

LATERAL DIST FROM REFERENCE (FEET)	AUDIBLE NOISE (RAIN) L50 DBA	AUDIBLE NOISE (FAIR) L50 DBA	RADIO INTERFERENCE (RAIN) L50 DBUV/M	RADIO INTERFERENCE (FAIR) L50 DBUV/M	TVI TOTAL RAIN DBUV/M	OZONE FOR RAIN RATE OF 1.00 IN/HR AT 0. FT.LEVEL PPB	ELECTRIC FIELD KV/M	MAGNETIC FIELD GAUSS
-75.0	51.4	26.4	59.2	42.2	21.5	.000000	.058	.07361
-70.0	51.6	26.6	59.8	42.8	21.9	.000000	.104	.07993
-65.0	51.8	26.8	60.5	43.5	22.3	.000000	.168	.08690
-60.0	52.1	27.1	61.2	44.2	22.7	.000000	.253	.09456
-55.0	52.3	27.3	61.9	44.9	23.2	.000000	.362	.10295
-50.0	52.6	27.6	62.6	45.6	23.6	.000000	.500	.11206
-45.0	52.8	27.8	63.4	46.4	24.3	.000000	.671	.12184
-40.0	53.1	28.1	64.2	47.2	25.0	.000000	.881	.13216
-35.0	53.4	28.4	65.0	48.0	25.7	.000000	1.133	.14286
-30.0	53.7	28.7	65.8	48.8	26.4	.000000	1.432	.15374
-25.0	54.0	29.0	66.6	49.6	27.3	.000000	1.778	.16468
-20.0	54.3	29.3	67.5	50.5	28.2	.000000	2.176	.17580
-15.0	54.7	29.7	68.6	51.6	29.1	.000000	2.629	.18759
-10.0	55.0	30.0	70.3	53.3	30.2	.000000	3.147	.20086
-5.0	55.3	30.3	72.1	55.1	31.2	.000000	3.727	.21630
.0	55.6	30.6	73.9	56.9	32.3	.000022	4.343	.23370
5.0	55.9	30.9	75.4	58.4	33.3	.000115	4.915	.25125
10.0	56.1	31.1	76.4	59.4	34.0	.000254	5.310	.26541
15.0	56.1	31.1	76.8	59.8	34.2	.000401	5.389	.27219
20.0	56.1	31.1	76.4	59.4	34.0	.000536	5.091	.26924
25.0	55.9	30.9	75.4	58.4	33.3	.008542	4.488	.25721
30.0	55.7	30.7	73.9	56.9	32.3	.078357	3.728	.23901
35.0	55.4	30.4	72.1	55.1	31.2	.170008	2.958	.21798
40.0	55.0	30.0	70.3	53.3	30.2	.241779	2.269	.19666
45.0	54.7	29.7	68.9	51.9	29.1	.297819	1.696	.17651
50.0	54.4	29.4	68.1	51.1	28.2	.344113	1.242	.15819
55.0	54.1	29.1	67.3	50.3	27.3	.382264	.893	.14188
60.0	53.8	28.8	66.5	49.5	26.4	.412707	.630	.12750
65.0	53.5	28.5	65.7	48.7	25.7	.435999	.437	.11489
70.0	53.2	28.2	64.8	47.8	25.0	.452955	.301	.10384
75.0	52.9	27.9	64.0	47.0	24.4	.464513	.214	.09414
80.0	52.7	27.7	63.2	46.2	24.0	.471607	.172	.08562
85.0	52.4	27.4	62.5	45.5	23.5	.475091	.164	.07812
90.0	52.2	27.2	61.7	44.7	23.1	.475709	.172	.07148
95.0	51.9	26.9	61.0	44.0	22.7	.474085	.183	.06560
100.0	51.7	26.7	60.3	43.3	22.3	.470733	.192	.06036
105.0	51.5	26.5	59.7	42.7	21.9	.466068	.199	.05570
110.0	51.2	26.2	59.0	42.0	21.5	.460423	.203	.05152
115.0	51.0	26.0	58.4	41.4	21.1	.454061	.204	.04777
120.0	50.8	25.8	57.8	40.8	20.7	.447193	.203	.04439
125.0	50.6	25.6	57.3	40.3	20.4	.439981	.201	.04135
130.0	50.5	25.5	56.7	39.7	20.1	.432554	.198	.03859
135.0	50.3	25.3	56.2	39.2	19.7	.425012	.193	.03609
140.0	50.1	25.1	55.7	38.7	19.4	.417433	.188	.03381
145.0	49.9	24.9	55.3	38.3	19.1	.409875	.182	.03174
150.0	49.8	24.8	54.8	37.8	18.8	.402385	.177	.02984
155.0	49.6	24.6	54.4	37.4	18.5	.394997	.171	.02810
160.0	49.4	24.4	53.9	36.9	18.2	.387736	.165	.02651
165.0	49.3	24.3	53.5	36.5	18.0	.380620	.159	.02504
170.0	49.1	24.1	53.1	36.1	17.7	.373663	.153	.02369
175.0	49.0	24.0	52.8	35.8	17.4	.366874	.147	.02244
180.0	48.9	23.9	52.4	35.4	17.2	.360259	.142	.02129
185.0	48.7	23.7	52.0	35.0	17.0	.353819	.137	.02022
190.0	48.6	23.6	51.7	34.7	16.7	.347556	.131	.01922
195.0	48.5	23.5	51.4	34.4	16.5	.341469	.127	.01830
200.0	48.3	23.3	51.1	34.1	16.3	.335557	.122	.01744

APPENDIX L - NOISE ANALYSIS

Memorandum

Date: October 11, 2011

To: Cris Miller, Basin Electric Power Cooperative

From: Tess Fuller and Mary Hauner-Davis, Burns & McDonnell

Subject: Judson Substation Pre-Construction Noise Analysis

Burns & McDonnell has analyzed the expected sound contribution from the proposed Judson Substation, located near Williston, North Dakota for Basin Electric Power Cooperative (Basin Electric). The model analyzed the sound levels expected at the nearest residences to the substation due to the two transformers (one initial and one future) at Basin Electric's Judson Substation as well as the sound contribution from the two transformers (one initial and one future) at the proposed Mountrail Williams Electric Cooperative (MWEC) substation, which will be located directly west of the Basin Electric Substation.

Introduction to Sound

Sound is caused by vibration of air molecules and is measured on a logarithmic scale with units of decibels (dB). Sound is composed of various frequencies. Frequency is measured in Hertz (Hz), which is the number of cycles per second. The typical human ear can hear frequencies ranging from approximately 20 Hz to 20,000 Hz. Typically, the human ear is most sensitive to sounds in the middle frequencies (1,000 to 8,000 Hz) and is less sensitive to sounds in the low and high frequencies. As such, the A-weighting scale was developed to simulate the frequency response of the human ear to sounds at typical environmental levels. The A-weighting scale emphasizes sounds in the middle frequencies and de-emphasizes sounds in the low and high frequencies. Any sound level to which the A-weighting scale has been applied is expressed in A-weighted decibels, dBA. For reference, the A-weighted sound pressure level and subjective loudness associated with some common noise sources are listed in Table 1.

There are also objective factors to consider when determining the noise and how people may be affected by the noise. Noise in the environment is constantly fluctuating, such as when a car drives by, a dog barks, or a plane passes overhead. Therefore, noise metrics have been developed to quantify fluctuating environmental noise levels. Among these metrics are L_{eq} and L_{dn}, used in this analysis. L_{eq} is the level of a constant sound over a specific time period that has the same sound energy as the actual sound over the same period. The L_{dn} noise level is a day-night average noise level in which a 10-dB penalty is applied to the nighttime noise levels.

Table 1
Typical Sound Pressure Levels Associated with Common Noise Sources

Sound Pressure Level (dBA)	Subjective Evaluation	Environment	
		Outdoor	Indoor
140	Deafening	Jet aircraft at 75 ft	
130	Threshold of pain	Jet aircraft during takeoff at a distance of 300 ft	
120	Threshold of feeling	Elevated train	Hard rock band
110		Jet flyover at 1000 ft	Inside propeller plane
100	Very loud	Power mower, motorcycle at 25 ft, auto horn at 10 ft, crowd noise at football game	
90		Propeller plane flyover at 1000 ft, noisy urban street	Full symphony or band, food blender, noisy factory
80	Moderately loud	Diesel truck (40 mph) at 50 ft	Inside auto at high speed, garbage disposal, dishwasher
70	Loud	B-757 cabin during flight	Close conversation, vacuum cleaner, electric typewriter
60	Moderate	Air-conditioner condenser at 15 ft, near highway traffic	General office
50	Quiet		Private office
40		Farm field with light breeze, birdcalls	Soft stereo music in residence
30	Very quiet	Quiet residential neighborhood	Bedroom, average residence (without TV and stereo)
20		Rustling leaves	Quiet theater, whisper
10	Just audible		Human breathing
0	Threshold of hearing		

Source: Adapted from Architectural Acoustics, M. David Egan, 1988 and Architectural Graphic Standards, Ramsey and Sleeper, 1994.

Department of Housing and Urban Development (HUD) Sound Criteria
Because there are no county or state regulations for noise, this project will be compared to HUD guideline noise levels for residential areas. HUD developed formal requirements related specifically to noise in 1971 (23 CFR 772). The noise regulations set forth the exterior noise standards shown in Table 2 for new housing construction assisted or supported by HUD. These

noise levels are based on the L_{dn} noise level, which applies a 10-dB penalty to the nighttime noise levels. Essentially, the nighttime noise level should be below an L_{eq} of 55 dBA and the daytime noise level should be below an L_{eq} of 65 dBA to meet the HUD standard.

Table 2
HUD Site Acceptability Standards

Noise Level, L_{dn} (dBA)	Acceptability
Not exceeding 65	Acceptable
65 to 75	Normally not acceptable
Exceeding 75	Unacceptable

Based on the HUD guidance for new construction, an L_{dn} of 65 dBA will be considered acceptable for the residences near the substation. For the purposes of this memo, the predicted noise levels from the transformers at the substations will be compared to the HUD standards.

Modeling Methodology
The transformers that are expected to be installed at the Basin Electric Judson Substation will be 345/230 kV transformers with a rating of 600 MVA. The sound profile for the transformers was calculated using the equations from the Electric Power Plant Environmental Noise Guide[1] so the transformer would emit sound pressure levels of 75 dBA two meters from the unit. The two transformers at the MWEC Substation are expected to be 115-24.9/14.4 kV transformers that have a rating between 12 and 20 MVA. The sound power profile for these transformers was predicted using the maximum transformer rating and equations from the Environmental Noise Guide. The expected sound power profiles created and modeled for these transformers are shown below in Table 3.

Initially, only one transformer at each site will be installed at the substations. This noise study included both transformers at each substation and therefore this assessment is conservative and assumes the full build-out for the substations.

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[1] Electric Power Plant Environmental Noise Guide, Volume 1, 2nd Edition (Edison Electric Institute, 1984)

Table 3
Expected Transformer Sound Profiles

Substation	Number of Trans-formers	Maximum Transformer Rating (MVA)	Transformer Sound Power Level (Lw) at Octave Band Frequency (Hz) (dBA)									Overall Sound Level (dBA)
			31.5	63	125	250	500	1000	2000	4000	8000	
MWEC	2	20	85	91	93	88	88	82	77	72	65	97.0
Basin Electric	2	600	90.5	96.5	98.5	93.5	93.5	87.5	82.5	77.5	70.5	102.5

Noise receivers were placed at the three residences to the west along 143rd Avenue, and near the residential area to the south of the proposed substation in the noise model. See Figure 1 in Attachment 1 for locations of the modeled sound receivers. The sound metric L_{dn} was calculated to compare with the HUD standards, giving a 10-dB penalty to nighttime noise.

Predicted Noise Levels

The modeled sound pressure levels and L_{dn}'s for the residential areas are shown below in Table 4.

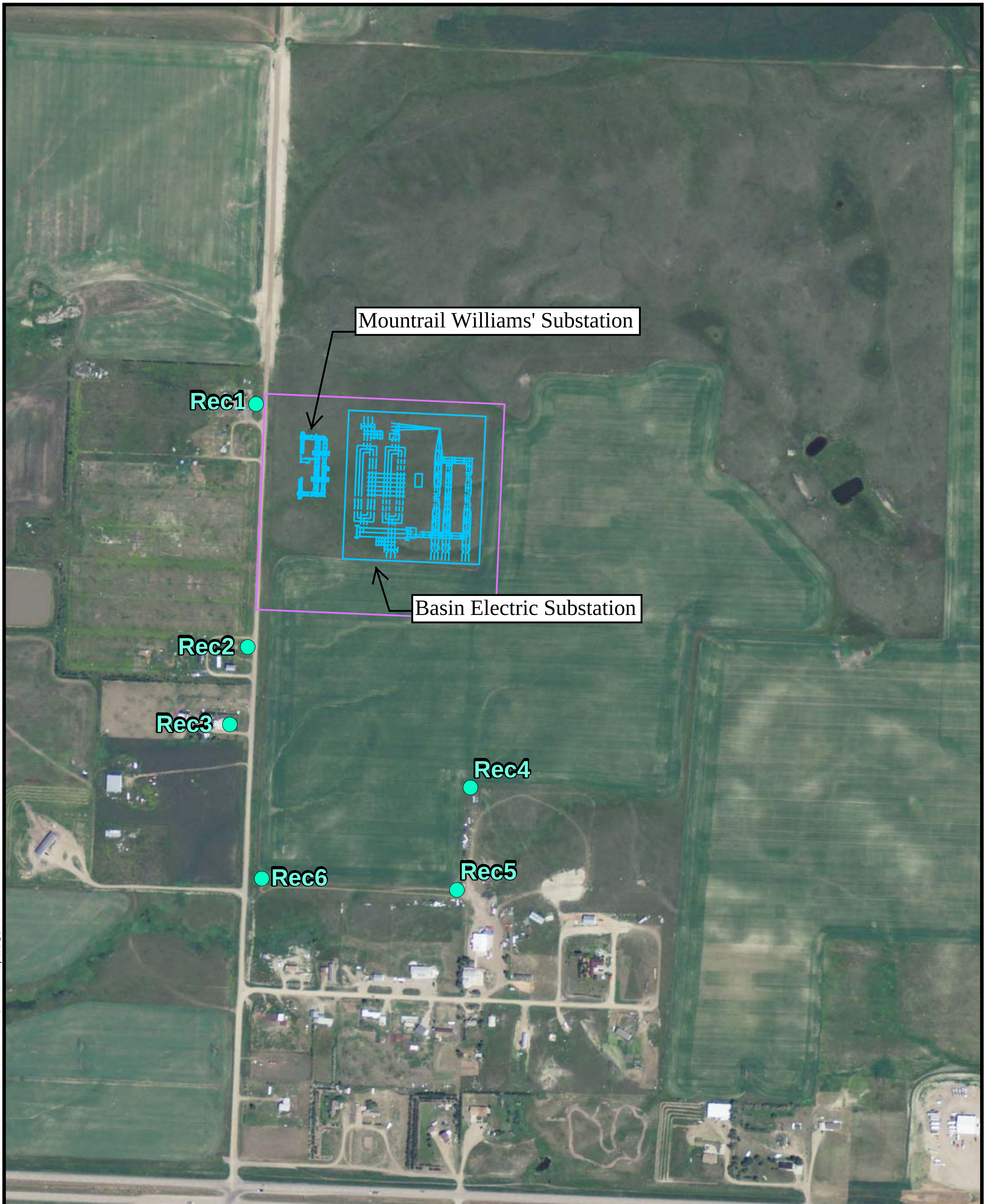
Table 4
Expected Worst-Case Sound Levels

Receiver	Zoning Classification	Sound Pressure Level L_{eq} (dBA)	Sound Pressure Level L_{dn} (dBA)
Rec1	Residential	47.4	53.8
Rec2	Residential	42.4	48.8
Rec3	Residential	39.8	46.2
Rec4	Residential	40.4	46.8
Rec5	Residential	37.8	44.2
Rec6	Residential	37.0	43.4

HUD requirements state that L_{dn} sound levels cannot exceed 65 dBA for site acceptability. The highest predicted L_{dn} impact at the nearby residences is 53.8 dBA. Initially, the maximum sound level at a residence will be an L_{dn} of 50.8 dBA (L_{eq} of 44.4 dBA) with only one transformer operating at each substation. Generally, standard house construction will reduce outside noise levels by 10 to 20 dB inside the house, so noise levels inside the house due to operation of the transformers will be on the order of 43.8 dBA L_{dn} or less.

Based on the modeling and results presented above, it is not expected that building both the MWEC and Basin Electric substations at full build-out will cause the HUD requirements to be exceeded.

Attachment: Figure 1—Judson Substation Noise Receiver Locations



Legend

Residential Zoned Receiver

Parcel to be Re-Zoned

NORTH

2,000 1,000 0

Scale in Feet

Burns & McDonnell SINCE 1898

Figure 1
Receiver Locations
Predictive Noise Model
Basin Electric Power Cooperative
Judson Substation

Path: R:\Basin\61495_AVS_345\GIS\DataFiles\ArcDocs\Judson_Substation_Layout_jwd_Oct42011.mxd tfuller 10/11/2011

Issued: 10/11/2011

APPENDIX M - VISUAL SIMULATIONS

Description of Photo Location:
47th LN NW
Looking North

Burns & McDonnell
SINCE 1898

Visual Simulation 1
AVS 345-kV Transmission Line
Basin Electric

Source: Trinity Animation, Inc.
Structure placements as shown are for photo simulation purposes only. Actual structure placement will be determined during detailed design and engineering of the route selected and approved.

Description of Photo Location:	Burns & McDonnell SINCE 1898	**Visual Simulation 2**
Lone Butte		**AVS 345-kV Transmission Line**
Looking West		**Basin Electric**

Source: Trinity Animation, Inc.

Structure placements as shown are for photo simulation purposes only. Actual structure placement will be determined during detailed design and engineering of the route selected and approved.

Description of Photo Location:
Theodore Roosevelt National Park
Looking East

Burns & McDonnell SINCE 1898

Visual Simulation 3
AVS 345-kV Transmission Line
Basin Electric

Source: Trinity Animation, Inc.
Structure placements as shown are for photo simulation purposes only. Actual structure placement will be determined during detailed design and engineering of the route selected and approved.

Description of Photo Location:
47th LN NW (Missouri River)
Looking Southeast

Visual Simulation 4
AVS 345-kV Transmission Line
Basin Electric

Source: Trinity Animation, Inc.
Structure placements as shown are for photo simulation purposes only. Actual structure placement will be determined during detailed design and engineering of the route selected and approved.

Description of Photo Location:

State Highway 22
Looking North

Burns & McDonnell
SINCE 1898

Visual Simulation 5
AVS 345-kV Transmission Line
Basin Electric

Source: Trinity Animation, Inc.

Structure placements as shown are for photo simulation purposes only. Actual structure placement will be determined during detailed design and engineering of the route selected and approved.

Description of Photo Location:
State Highway 22
Looking Northeast

Visual Simulation 6
AVS 345-kV Transmission Line
Basin Electric

Source: Trinity Animation, Inc.
Structure placements as shown are for photo simulation purposes only. Actual structure placement will be determined during detailed design and engineering of the route selected and approved.

APPENDIX N - CLASS I SURVEY RECORDED CULTURAL RESOURCES AND INVENTORIES

Site File Search Results - Alternative A						
T/R-Section	**Site #**	**Site Type and Description**	**Recorder, Date**	**Eligibility**	**Tested (T)/Shovel Probed (SP)**	**Temporal/Cultural Affiliation**
145/088-07	32ME0803	Archaeological-stone circle, cairn, chipped stone	Kordecki, 1984	Unevaluated	No	Unknown
145/088-07	32ME2217	Multicomponent site: Architectural-farmstead, Historic-depression, foundation, cultural material scatter, glass, masonry, metal, wood	Stine, 2009	Not Eligible	No	Unknown, occupation 1900-1950
145/088-07	32MEx0161	Archaeological-isolated find: chipped stone	LCT, 1984	Not Eligible	No	Unknown
145/088-07	32MEx0624	Archaeological-isolated find: chipped stone	Meidinger, 2003	Not Eligible	No	Unknown
145/088-14	32ME1511	Archaeological-cairn	Boughton, 1999	Unevaluated	No	Unknown
145/088-16	32ME0247	Archaeological-stone circle, chipped stone	Dill, 1977	Not Eligible	T	Unknown
145/088-16	32ME1551	Archaeological-depression, stone circle, cairn, cultural material scatter, chipped stone, projectile point	Walker-Kuntz, 1999	Not Eligible	T	Late Prehistoric: Plains side notched projectile point
145/088-16	32ME1595	Architectural-windmill	Walker-Kuntz, 1999	Not Eligible	No	Historic
145/088-16	32ME1596	Architectural-windmill	Walker-Kuntz, 1999	Not Eligible	No	Historic
145/088-21	32ME1477	Archaeological-cairn, stone circle, chipped stone	Boughton, 1999	Not Eligible	T	Unknown

Site File Search Results - Alternative A						
145/088-21	32ME1478	Archaeological-cairn, stone circle, projectile point, chipped stone	Boughton, 1999	Eligible	T	Archaic and Late Prehistoric: Prairie side notched projectile point, Avonlea projectile point base, Besant projectile point base
145/088-22	32ME1513	Archaeological-hearth, human remains, stone circle, cairn, stone alignment, cultural material scatter, worked bone, ceramics, charcoal, faunal remains, projectile point, chipped stone	Boughton, 1999	Eligible	T, SP	Archaic and Late Prehistoric: Plains side-notched projectile point, Pelican Lake projectile point, Besant projectile point, Prairie side-notched projectile point, Plains/Prairie side-notched projectile point
145/088-22	32ME2161	Multicomponent site: Architectural-farmstead, windmill, Historic-dump, foundation, machinery, cultural material scatter, masonry, metal, wood	Walker-Kuntz, 1999	Not Eligible	No	Historic farmstead
145/088-23	32ME1516	Archaeological-cairn, stone circle, chipped stone	Boughton, 1999	Not Eligible	T, SP	Unknown
145/091-07	32DU1128	Archaeological-cultural material scatter, chipped stone	Kulevsky, 1994	Unevaluated	No	Unknown
145/092-10	32DU0220	Archaeological-cultural material scatter, faunal remains, fire cracked rock, chipped stone	Persinger, 1989	Unevaluated	No	Unknown
145/092-10	32DU1068	Archaeological-cultural material scatter, chipped stone	Borchert/Blikre/ Wermers, 1992	Unevaluated	No	Unknown

Site File Search Results - Alternative A						
145/092-12	32DU1128	Archaeological-cultural material scatter, chipped stone	Kulevsky, 1994	Unevaluated	No	Unknown
145/093-07	32DUx0672	Archaeological-isolated find: chipped stone	Heiner/Harty, 2007	Not Eligible	No	Unknown
145/093-10	32DU0168	Archaeological-cultural material scatter, chipped stone	Keuhn/Keim/ Borchert, 1983	Unevaluated	No	Unknown
145/093-11	32DU0168	Archaeological-cultural material scatter, chipped stone	Keuhn/Keim/ Borchert, 1983	Unevaluated	No	Unknown
145/093-12	32DUx0037	Historic-site lead: Hanks Post Office/ Townsite, cultural material scatter, foundation	Benson, 1980	Unevaluated	No	Unknown
145/094-06	32DU1602	Archaeological-cultural material scatter, chipped stone	Whitman/Lonski/ Jackson, 2011	Unevaluated	No	Unknown
145/094-10	32DU0420	Archaeological-stone circle, cairn, cultural material scatter	Greensheilds, 1975	Unevaluated	No	Unknown
145/095-01	32DU1164	Archaeological-cultural material scatter, chipped stone	Simon, 1979	Unevaluated	No	Unknown
145/095-01	32DU1602	Archaeological-cultural material scatter, chipped stone	Whitman/Lonski/ Jackson, 2011	Unevaluated	No	Unknown
145/095-04	32DU1252	Archaeological-cultural material scatter, chipped stone	Morrison, 2002	Unevaluated	No	Unknown
145/095-04	32DUx0601	Archaeological-isolated find: chipped stone	Potter, 2002	Not Eligible	No	Unknown

Site File Search Results - Alternative A						
145/095-04	32DUx0602	Archaeological-isolated find: chipped stone	Potter, 2002	Not Eligible	No	Unknown
145/095-04	32DUx0603	Archaeological-isolated find: chipped stone	Potter, 2002	Not Eligible	No	Unknown
145/095-05	32DUx0107	Archaeological-isolated find: projectile point	Kordecki, 1982	Not Eligible	No	Archaic: projectile point not specified
145/096-15	32DU0329	Archaeological-cultural material scatter, chipped stone	Woelfel, 1985	Not Eligible	No	Unknown
145/096-15	32DU1510	Archaeological-cultural material scatter, projectile point, chipped stone	Scott, 2010	Unevaluated	No	Late Prehistoric: side notched projectile point
145/097-16	32DU1034	Archaeological-cultural material scatter, fire cracked rock, chipped stone	Christensen, 1991	Unevaluated	No	Unknown
145/097-21	32DUx0050	Historic-site lead: Whetstone Townsite	Benson, 1980	Unevaluated	No	Unknown
145/098-07	32MZx0484	Archaeological-isolated find: chipped stone	Blikre, 1987	Not Eligible	No	Unknown
145/098-07	32MZx1073	Archaeological-isolated find: chipped stone	Kordecki, 2007	Not Eligible	No	Unknown
145/098-17	32MZx0485	Archaeological-isolated find: chipped stone	Shaw/Borchert, 1987	Not Eligible	No	Unknown
145/098-21	32MZ0589	Archaeological-cultural material scatter, chipped stone	Persinger, 1981	Eligible	No	Unknown
145/098-21	32MZ0592	Archaeological-cultural material scatter, projectile point, ground stone	Persinger, 1981	Eligible	No	Unknown: projectile point not specified

Site File Search Results - Alternative A						
145/098-21	32MZ0593	Archaeological-cultural material scatter, fire cracked rock, chipped stone	Persinger, 1981	Eligible	No	Unknown
145/098-21	32MZx0486	Archaeological-isolated find: chipped stone	Shaw/Borchert, 1987	Not Eligible	No	Unknown
145/098-25	32MZx0912	Archaeological-isolated find: chipped stone	Klinner, 1998	Not Eligible	No	Unknown
145/098-25	32MZx0916	Archaeological-isolated find: chipped stone	Klinner, 1998	Not Eligible	No	Unknown
145/098-33	32MZ1461	Archaeological-cultural material scatter, chipped stone	Stanley/ Montgomery/ Nathan, 1981	Unevaluated	No	Unknown
145/098-34	32MZ1006	Archaeological-quarry, cultural material scatter, chipped stone	Martorano/Killam, 1989	Unevaluated	No	Unknown
145/098-34	32MZ1561	Historic-WAPA transmission line	Fandrich, 2001	Not Eligible	No	1949-1951
145/098-35	32MZ0629	Archaeological-cultural material scatter, projectile point, chipped stone	Montgomery, 1982	Unevaluated	No	Unknown: projectile point not specified
145/098-35	32MZ1449	Archaeological-cultural material scatter, chipped stone	Klinner, 1998	Unevaluated	No	Unknown
145/098-35	32MZx0235	Archaeological-isolated find: chipped stone	Volk, 1980	Not Eligible	No	Unknown
145/099-01	32MZx0003	Historic-site lead: Converse Long X Ranch	Benson, 1980	Unevaluated	No	Unknown
147/098-18	32MZ1311	Archaeological-cultural material scatter, chipped stone, projectile point	Floodman, 1997	Unevaluated	SP	Unknown: possible late prehistoric arrow point

Site File Search Results - Alternative A						
147/098-18	32MZ1312	Archaeological-cultural material scatter, chipped stone, projectile point	Floodman, 1997	Eligible	No	Archaic: Pelican Lake projectile point
147/099-24	32MZ1561	Historic-WAPA transmission line	Fandrich, 2001	Not Eligible	No	1949-1951
147/099-24	32MZx0903	Historic-isolated find: ceramics	Larson, 1998	Not Eligible	No	Historic
147/099-25	32MZx0036	Historic-site lead: Mory Post Office	Benson, 1980	Unevaluated	No	Unknown
147/099-25	32MZx0902	Archaeological-isolated find: projectile point	Larson, 1998	Not Eligible	No	Unknown: projectile point is not diagnostic
148/098-19	32MZ0853	Archaeological-stone circle, cairn, cultural material scatter, chipped stone	Shaw, 1987	Unevaluated	No	Unknown
148/099-13	32MZ0854	Archaeological-cultural material scatter, chipped stone	Borchert, 1987	Unevaluated	No	Unknown
149/099-36	32MZ1561	Historic-WAPA transmission line	Fandrich, 2001	Not Eligible	No	1949-1951
150/099-06	32MZ0892	Archaeological-stone circle	Blikre, 1987	Unevaluated	No	Unknown
150/099-09	32MZ0881	Archaeological-stone circle	Blikre, 1987	Unevaluated	No	Unknown
150/099-16	32MZ0880	Archaeological-cairn	Blikre, 1987	Unevaluated	No	Unknown
150/099-21	32MZ2202	Historic-machinery, metal	Ferguson/Meno/ Smith, 2011	Not Eligible	No	Historic farm equipment
150/099-28	32MZ0879	Historic-depression, foundation, dump, cultural material scatter, ceramics, cloth, faunal remains, masonry, metal, plastic, rubber, shell, wood	Blikre, 1987	Not Eligible	No	Historic farmstead
150/099-28	32MZ1561	Historic-WAPA transmission line	Fandrich, 2001	Not Eligible	No	1949-1951

Site File Search Results - Alternative A						
150/099-28	32MZx0510	Archaeological-isolated find: chipped stone	Blikre/Shaw, 1987	Not Eligible	No	Unknown
151/100-06	32MZ0886	Archaeological-stone circle	Shaw/Borchert, 1987	Unevaluated	No	Unknown
151/100-07	32MZ0884	Archaeological-stone circle	Borchert, 1987	Unevaluated	No	Unknown
151/100-07	32MZ0885	Archaeological-stone circle	Borchert, 1987	Unevaluated	No	Unknown
151/100-07	32MZ0886	Archaeological-stone circle	Shaw/Borchert, 1987	Unevaluated	No	Unknown
151/100-08	32MZ0883	Archaeological-stone circle, cairn	Blikre/Burbidge, 1987	Unevaluated	No	Unknown
151/100-26	32MZ0893	Historic-depression, machinery, cultural material scatter, ceramics, glass, metal, wood	Burbidge/ Borchert, 1987	Unevaluated	No	Historic
152/101-18	32MZ1561	Historic-WAPA transmission line	Fandrich, 2001	Not Eligible	No	1949-1951
152/102-12	32MZ0696	Historic-cultural material scatter, ceramics, glass, masonry, metal, wood	Keim, 1983	Unevaluated	No	Historic homestead
152/102-12	32MZ0697	Archaeological-stone circle, cairn	Keim, 1983	Unevaluated	No	Unknown
152/102-13	32MZ0698	Archaeological-hearth, cultural material scatter, fire cracked rock, chipped stone	Keim/Borchert, 1983	Unevaluated	No	Unknown
153/101-05	32MZ1561	Historic-WAPA transmission line	Fandrich, 2001	Not Eligible	No	1949-1951
153/101-06	32MZ1561	Historic-WAPA transmission line	Fandrich, 2001	Not Eligible	No	1949-1951
153/101-08	32MZ1561	Historic-WAPA transmission line	Fandrich, 2001	Not Eligible	No	1949-1951
153/101-16	32MZ1554	Historic-irrigation ditch, earthwork	Fandrich, 2001	Eligible	No	1935-1953, Lewis and Clark Irrigation Canal

Site File Search Results - Alternative A						
153/101-16	32MZ1561	Historic-WAPA transmission line	Fandrich, 2001	Not Eligible	No	1949-1951
153/101-17	32MZ1561	Historic-WAPA transmission line	Fandrich, 2001	Not Eligible	No	1949-1951
154/102-10	32WI0085	Archaeological-cairn	Keim, 1985	Not Eligible	No	Prehistoric
154/102-15	32WI1188	Archaeological-cairn, alignment	Eigenberger, 2011	Unevaluated	No	Unknown
154/102-15	32WI1189	Archaeological-cairn	Eigenberger, 2011	Unevaluated	No	Unknown
154/102-15	32WI1192	Archaeological-cairn	Eigenberger, 2011	Unevaluated	No	Unknown
154/102-15	32WI1193	Archaeological-cairn	Eigenberger, 2011	Unevaluated	No	Unknown
154/102-23	32WI1195	Archaeological-stone circle, cairn	Eigenberger, 2011	Unevaluated	No	Unknown
154/102-23	32WI1214	Archaeological-stone arc	Eigenberger, 2011	Unevaluated	No	Unknown
154/102-36	32WI0302	Archaeological-stone circle, chipped stone, possible earthworks	Blikre, 1987	Unevaluated	No	Unknown
155/100-04	32WIx0481	Historic-site lead: mine	Kjos, 1984	Unevaluated	No	Unknown
155/100-04	32WIx0482	Historic-site lead: mine	Kjos, 1984	Unevaluated	No	Unknown
155/101-15	32WI0401	Archaeological-stone circle	Fox, 1978	Unevaluated	No	Unknown
155/101-16	32WI0012	Archaeological-stone circle, mound, cultural material scatter, bone, ceramics, faunal remains, projectile point, chipped stone	Kivett, 1948	Unevaluated	No	Late Prehistoric, Plains Nomadic: side notched projectile point
155/101-16	32WI1045	Archaeological-stone circle, cairn	Hiemstra, 2008	Unevaluated	No	Unknown
155/101-16	32WIx0141	Archaeological-site lead: cultural material scatter	Benson, 1980	Unevaluated	No	Unknown
155/101-16	32WIx0142	Historic-site lead: mine	Benson, 1980	Unevaluated	No	Unknown
155/101-17	32WI0266	Archaeological-stone circle, cairn	Persinger, 1986	Unevaluated	No	Unknown

Site File Search Results - Alternative A						
155/101-17	32WIx0143	Archaeological-site lead: cultural material scatter	Benson, 1980	Unevaluated	No	Unknown
155/102-36	32WIx0151	Archaeological-site lead: cultural material scatter	Benson, 1980	Unevaluated	No	Unknown
155/102-36	32WIx0152	Historic-site lead: mine	Benson, 1980	Unevaluated	No	Unknown
155/102-36	32WIx0484	Historic-site lead: quarry/mine	LCT, 1990	Unevaluated	No	Unknown
156/100-34	32WI0075	Historic-depression, cultural material scatter, glass, metal	Borchert, 1983	Unevaluated	No	Historic homestead-1913
156/100-36	32WI1185	Historic-well, depression, dump, foundation, cultural material scatter, metal, rubber, wood	Bluemle, 2011	Not Eligible	No	Historic farmstead
157/094-20	32MNx0485	Archaeological-site lead: cultural material scatter	Benson, 1980	Unevaluated	No	Unknown

APPENDIX O - REPRESENTATIVE LIST OF WILDLIFE AND FISH SPECIES IN PROJECT AREA

Representative List of Wildlife and Fish Species Observed or Known to Occur near the Proposed Project

Scientific Name*	**Common Name***
Mammals	
Sorex Cinereus	masked shrew
Myotis lucifugus	little brown myotis
Myotis septentrionalis	northern myotis
Myotis evotis	long-eared myotis
Lasionycteris noctivagans	silver-haired bat
Eptesicus fuscus	big brown bat
Lasiurus borealis	red bat
Lasiurus cinereus	hoary bat
Sylvilagus floridanus	eastern cottontail
Sylvilagus nuttallii	Nuttall's cottontail
Lepus townsendii	white-tailed jackrabbit
Eutamius minimus	least chipmunk
Sciurus niger	fox squirrel
Spermophilus tridecemlineatus	thirteen-lined ground squirrel
Spermophilus richardsonii	Richardson's ground squirrel
Spermophilus franklinii	Franklin's ground squirrel
Cynomys ludovicianus	black-tailed prairie dog
Thomomys talpoides	northern pocket gopher
Perognathus fasciatus	olive-backed pocket mouse
Castor canadensis	beaver
Peromyscus maniculatus	deer mouse
Peromyscus leucopus	white-footed mouse
Onychomys leucogaster	northern grasshopper mouse
Clethrionomys gapperi	southern red-backed vole
Microtus pennsylvanicus	meadow vole
Microtus ochrogaster	prairie vole
Ondatra zibethicus	muskrat
Rattus norvegius	Norway rat
Mus musculus	house mouse
Zapus hudsonius	meadow jumping mouse
Zapus princeps	western jumping mouse
Erethizon dorsatum	porcupine
Canis latrans	coyote
Vulpes vulpes	red fox
Procyon lotor	raccoon
Mustela nivalis	least weasel
Mustela frenata	long-tailed weasel
Mustela vison	mink
Taxidea taxus	badger

Mephitis mephitis	striped skunk
Lutra canadensis	river otter
Felis concolor	mountain lion
Felis rufus	bobcat
Cervus elaphus	elk
Odocoileus hemionus	mule Deer
Odocoileus virginianus	whitetail deer
Antilocapridae americana	pronghorn
Bison bison	bison
Ovis canadensis	bighorn sheep
Reptiles and Amphibians	
Scaphiopus bombifrons	plains spadefoot toad
Bufo woodhousei	Woodhouse's toad
Bufo cognatus	great plains toad
Bufo hemiosphrys	Canadian toad
Rana pipiens	northern leopard frog
Rana sylvatica	wood frog
Pseudacris triseriata	western chorus frog
Ambystoma tigrinum	tiger salamander
Phrynosoma douglassi	short-horned lizard
Sceloporus graciosus	sagebrush lizard
Chrysemys picta belli	western painted turtle
Chelydra serpentina	common snapping turtle
Thamnophis sirtalis	common garter snake
Thamnophis radix	plains garter snake
Opheodrys vernalis	smooth green snake
Heterdon nasicus	western hognose snake
Pituophis catenifer	bullsnake
Coluber constrictor	racer
Crotalus viridis	prairie rattlesnake
Birds	
Perdix perdix	gray partridge
Tympanuchus phasianellus	sharp-tailed grouse
Phasianus colchicus	ring-necked pheasant
Meleagris gallopavo	wild turkey
Zenaida macroura	mourning dove
Ardea herodias	great blue heron
Botaurus lentiginosus	American bittern
Nycticorax nycticorax	black-crowned night heron
Aechmophorus occidentalis	western grebe
Podiceps nigricollis	eared grebe
Grus canadensis	sandhill crane
Fulica americana	American coot
Charadrius melodus	piping plover
Charadrius vociferus	killdeer
Recurvirostra americana	American avocet

Phalaropus tricolor	Wilson's phalarope
Larus delawarensis	ring-billed gull
Sterna hirundo	common tern
Chlidonias niger	black tern
Sternula antillarum	least tern
Bartramia longicauda	upland sandpiper
Actitis macularia	spotted sandpiper
Catoptrophorus semipalmatus	willet
Limosa fedoa	marbled godwit
Tringa melanoleuca	greater yellowlegs
Branta canadensis	Canada goose
Aix sponsa	wood duck
Anas crecca	green-winged teal
Anas discors	blue-winged teal
Anas americana	American widgeon
Aythya valisineria	canvasback
Aythya americana	redhead
Anas strepera	gadwall
Anas platyrhynchos	mallard
Oxyura jamaicensis	ruddy duck
Anas clypeata	northern shoveler
Anas acuta	northern pintail
Tyrannus tyrannus	eastern kingbird
Tyrannus verticalis	western kingbird
Tachyceneta bicolor	tree swallow
Hirundo rustica	barn swallow
Progne subis	purple martin
Eremophila alpestris	horned lark
Parus atricapillus	black-capped chickadee
Sitta carolinensis	white-breasted nuthatch
Troglodytes aedon	house wren
Turdus migratorius	American robin
Sialia sialis	eastern bluebird
Lanius ludovicianus	loggerhead shrike
Toxostoma rufum	brown thrasher
Bombycilla cedrorum	cedar waxwing
Cyanocitta cristata	blue jay
Vireo gilvus	warbling vireo
Carduelis tristis	American goldfinch
Dendroica petechia	yellow warbler
Pheucticus melanocephalus	black-headed grosbeak
Spizella passerina	chipping sparrow
Sturnella neglecta	western meadowlark
Icterus galbula	northern oriole
Quiscalus quiscula	common grackle
Agelaius phoeniceus	red-winged blackbird

Cathartes aura	turkey vulture
Haliaeetus leucocephalus	bald eagle
Aquila chrysaetos	golden eagle
Circus cyaneus	northern harrier
Accipiter cooperii	cooper's hawk
Buteo swainsoni	Swainson's hawk
Buteo jamaicensis	red-tailed hawk
Falco columbarius	merlin
Falco sparverius	American kestrel
Falco mexicanus	prairie falcon
Asio otus	long-eared owl
Asio flammeus	short-eared owl
Bubo virginianus	great-horned owl
Athene cunicularia	burrowing owl
Otus asio	eastern screech owl
Fish	
Esox lucius	northern pike
Sander vitreus	walleye
Sander Canadensis	sauger
Perca flavescens	yellow perch
Etheostoma nigrum	johnny darter
Micropterus salmoides	largemouth bass
Micropterus dolomieu	smallmouth bass
Lepomis macrochirus	bluegill
Pomoxis nigromaculatus	black crappie
Pomoxis annularis	white crappie
Morone Chrysops	white bass
Aplodinotus grunniens	freshwater drum
Ictalurus punctatus	channel catfish
Ameiurus melas	black bullhead
Polyodon spathula	paddlefish
Lepisosteus platostomus	shortnose gar
Oncorhynchus mykiss	rainbow trout
Salmo trutta	brown trout
Salvelinus namaycush	lake trout
Oncorhynchus tshawytscha	chinook salmon
Lota lota	burbot
Catostomus commersonii	white sucker
Ictiobus cyprinellus	bigmouth buffalo
Moxostoma macrolepidotum	shorthead redhorse
Cyprinus carpio	common carp
Pimephales promelas	fathead minnow
Semotilus atromaculatus	creek chub
Notemigonus crysoleucas	golden shiner

Osmerus mordax	rainbow smelt

* Species lists were generated from data gathered from the USGS Northern Prairie Wildlife Research Center Species Lists (2006) and from North Dakota Game and Fish Department's publications of *Raptors of North Dakota* (Hagen and Grondahl, undated), *Songbirds of North Dakota* (Grondahl and Gomes, undated), *Marshbirds and Shorebirds of North Dakota* (Gomes, undated), *Small Mammals of North Dakota* (Grondahl, undated), and *Reptiles and Amphibians of North Dakota* (Hoberg and Gause, undated).

APPENDIX P - U.S. FOREST SERVICE SENSITIVE WILDLIFE SPECIES

SENSITIVE SPECIES LIST Forest Service, Region 1 Februrary 2011	**States Where Sensitive (a)**				State Ranking				Forests Where Species is Known (K) or Suspected (S) to Occur													**Comments**
	MT	**ID**	**ND**	**SD**	MT	ID	ND	SD	B/D	BRT	CLW	CUS	DPG	FLAT	GAL	HEL	IPNF	KOOT	L&C	LOLO	NEZ	
BIRDS																						
American peregrine falcon (*Falco peregrinus anatum*)	X	X	X	X	S3	S2B	S1	SX	K	K		K		K	K	K	K	K	K	K	K	Federally delisted on August 25, 1999. USFWS monitoring of status for 5-year intervals after delisting. Species of Concern in MT, State Endangered in SD. ND CWCS Level 3 spp.
Baird's sparrow (*Ammodramus bairdii*)			X	X	S3B		SU	S2B SZN				K	K									MT CFWCS as a Priority 2 spp. Listed in SD CWCS, and as a Level 1 species in ND CWCS.
Bald eagle (*Haliaeetus leucocephalus*)	X	X	X	X	S3	S3B S4N	S1	S1B S2N	K	K	K	K	K	K	K	K	K	K	K	K	K	Federally delisted on June 28, 2007. USFWS monitoring for 5-year intervals after delisting. State Threatened in SD. ND CWCS Level 1 spp.
Black-backed woodpecker (*Picoides arcticus*)	X	X			S3	S3		S3	K	K	K	K		K	K	K	K	K	K	K	K	Species of Concern in MT, and in MT CFWCS as a Priority 2 spp. Listed in SD CWCS, and as a Level 1 species in ND CWCS.
Black swift (*Cypseloides niger*)		X			S1B	S1B											K				S	Colonial nester with few known nesting sites. IPNF has known nesting sites.
Blue-gray gnatcatcher (*Polioptila caerulea*)	X				S2B			S1B SZN				K										Species of Concern in MT, and in MT CFWCS as a Priority 2 spp. South end of Priors Mtns. in MT.
Burrowing owl (*Athene cunicularia*)	X		X	X	S3B	S2B	SU	S3 S4B SZN				K	K						S			Species of Concern in MT, and in MT CFWCS as a Priority 1 spp. Listed in SD CWCS, and as a Level 2 species in ND CWCS.
Common loon (*Gavia immer*)	X	X			S3B	S1B S2N	S4	S1B S3						K			K	K		K	S	Species of Concern in MT, and in MT CFWCS as a Priority 1 spp. ID CWCS spp.
Flammulated owl (*Otus flammeolus*)	X	X			S3B	S3B		S1B SZN	K	K	K			K	S	K	K	K	S	K	K	Species of Concern in MT, and in MT CFWCS as a Priority 1 spp. ID CWCS spp.
Greater prairie chicken (*Tympanuchus cupido*)			X		SX		S2	S4					K									Listed in SD CWCS, and as a ND CWCS Level 2 spp.

SENSITIVE SPECIES LIST Forest Service, Region 1 Februrary 2011	States Where Sensitive (a)				State Ranking				Forests Where Species is Known (K) or Suspected (S) to Occur													Comments
	MT	**ID**	**ND**	**SD**	MT	ID	ND	SD	B/D	BRT	CLW	CUS	DPG	FLAT	GAL	HEL	IPNF	KOOT	L&C	LOLO	NEZ	
BIRDS continued																						
Greater sage-grouse *(Centrocercus urophasianus)*	X		X	X	S2	S2	SU	S2	K			S	K						S			Species of Concern in MT, and in MT CFWCS as a Priority 1 spp. Listed in SD CWCS, and as a Level 2 species in ND CWCS. No breeding sites on BDNF.
Harlequin duck *(Histrionicus histrionicus)*	X	X			S2B	S1B			K		K	K		K	K	S	K	K	K	K	K	Species of Concern in MT, and in MT CFWCS as a Priority 1 spp. ID CWCS spp.
Loggerhead shrike *(Lanius ludovicianus)*			X	X	S3B		SU	S3				K	K									Species of Concern in MT, and in MT CFWCS as a Priority 2 spp. ND CWCS Level 2 spp.
Long-billed curlew *(Numenius americanus)*			X	X	S3B	S2B	S2	S3B SZN				K	K								S	Species of Concern in MT, and in MT CFWCS as a Priority 1 spp. SD CWCS
Mountain quail *(Oreortyx pictus)*		X				S1															K	ID CWCS spp.
Pygmy nuthatch *(Sitta pygmaea)*		X			S4	S2		S2 S3			K						K				K	MT CFWCS Priority 2 spp. ID CWCS spp.
Sprague's pipit *(Anthus spragueii)*			X	X	S3B		S3	S2B SZN					K									Species of Concern in MT, and in MT CFWCS as a Priority 2 spp. Listed in SD CWCS, and as a Level 1 species in ND CWCS.
Trumpeter swan *(Cygnus buccinator)*	X				S3	S1B S2N	SX	S3	K						K							Species of Concern in MT, and in MT CFWCS as a Priority 2 spp. Listed in
White-headed woodpecker *(Picoides albolarvatus)*		X			SNA	S2															K	ID CWCS spp.
MAMMALS																						
Black-tailed prairie dog *(Cynomys ludovicianus)*	X		X	X	S3		SU	S4				K	K									Species of Concern in MT, and in MT CFWCS as a Priority 1 spp. ND CWCS
Bighorn sheep *(Ovis canadensis)*	X	X	X	X	S4	S1	S2		K	K		K	K	K	K	K		K	K	K	K	MT CFWCS as a Priority 3 spp.

SENSITIVE SPECIES LIST Forest Service, Region 1 Februrary 2011	States Where Sensitive (a)				State Ranking				Forests Where Species is Known (K) or Suspected (S) to Occur													Comments
	MT	**ID**	**ND**	**SD**	MT	ID	ND	SD	B/D	BRT	CLW	CUS	DPG	FLAT	GAL	HEL	IPNF	KOOT	L&C	LOLO	NEZ	
MAMMALS continued																						
Fisher *(Martes pennanti)*	X	X			S3	S1	S2		K	K	K			K		K	K	K	K	K	K	Species of Concern in MT, and in MT CFWCS as a Priority 2 spp. ID CWCS spp.
Fringed myotis *(Myotis thysanodes)*		X			S3	S2		S2	K		K	K	K			K	K	K	K		K	Sub Species of Concern does not occur on FS in SD.
Gray wolf *(Canis lupus)*	X	X			S4	S2			K	K	K	K	K	K	K	K	K	K	K	K	K	Delisted in Idaho and Montana in 2011. However, wolves remain federally listed in North and South Dakota.
Great Basin pocket mouse *(Perognathus parvus)*	X				S2 S3				S													Species of Concern in MT, and in MT CFWCS as a Priority 1 spp. At periphery of range on BDNF.
Long-eared myotis *(Myotis evotis)*				X	S4		SU	S1	K	K	K	K	K	K	K	K	K	K	K	K	K	MT CFWCS Priority 3 spp. ND CWCS Level 3 spp. Limited distribution, but does occur on NFS lands based on survey results.
Long-legged myotis *(Myotis volans)*				X	S4		SU	S5	K	K	K	K	K	K	K	K	K	K	K	K	K	MT CFWCS Priority 3 spp. ND CWCS Level 3 spp. Limited distribution, but does occur on NFS lands based on
North American wolverine *(Gulo gulo luscus)*	X	X			S3	S2			K	K	K	K		K	K	K	K	K	K	K	K	Species of Concern in MT, and in MT CFWCS as a Priority 2 spp. ID CWCS spp.
Northern bog lemming *(Synaptomys borealis)*	X	X			S2	S1			K	K				K		S	K	K	K	K		Species of Concern in MT, and in MT CFWCS as a Priority 1 spp.
Pallid bat *(Antrozous pallidus)*	X				S2	S1						K										Species of Concern in MT, and in MT CFWCS as a Priority 1 spp.
Pygmy rabbit *(Brachylagus idahoensis)*	X				S3	S2			K													Species of Concern in MT, and in MT CFWCS as a Priority 1 spp.
Spotted bat *(Euderma maculatum)*	X				S2	S3			K			K										Species of Concern in MT, and in MT CFWCS as a Priority 1 spp.
Towsend's big-eared bat *(Corynorhinus townsendii)*	X	X		X	S2	S3		S2 S3	K	K	K	K	K	K	K	K	K	K	K	K	K	Species of Concern in MT, and in MT CFWCS as a Priority 1 spp. SD CWCS spp. ID CWCS spp. Occurs on Nez

SENSITIVE SPECIES LIST Forest Service, Region 1 Februrary 2011	States Where Sensitive (a)				State Ranking				Forests Where Species is Known (K) or Suspected (S) to Occur													Comments
	MT	**ID**	**ND**	**SD**	MT	ID	ND	SD	B/D	BRT	CLW	CUS	DPG	FLAT	GAL	HEL	IPNF	KOOT	L&C	LOLO	NEZ	
White-tailed prairie dog *(Cynomys leucurus)*	X				S1							K										Species of Concern in MT, and in MT CFWCS as a Priority 1 spp.
AMPHIBIANS																						
Coeur d'Alene salamander (*Plethodon idahoensis)*	X	X			S2	S2				K	K						K	K		K	K	Species of Concern in MT, and in MT CFWCS as a Priority 1 spp. ID CWCS spp.
Great Plains toad *(Bufo cognatus)*	X				S2		SU	S5				K										MT CFWCS Priority 2 spp. Probable reduction in occurance/range.
Northern leopard frog *(Rana pipiens)*	X				S1-w S4-e	S2	SU	S5		S		K		S	K	K		K	K	S		Species of Concern in MT, and in MT CFWCS as a Priority 1 spp.
Plains spadefoot (*Spea bombifrons*)	X				S3		SU	S5				S				K						MT CFWCS Priority 2 spp. ND CWCS Level 1 spp. Probable reduction in occurance/range.
Western toad *(Bufo boreas)*	X	X			S2	S4			K	K	K	K		K	K	K	K	K	K	K	K	Species of Concern in MT, and in MT CFWCS as a Priority 1 spp. Loss of breeding sites is ongoing.
REPTILES																						
Greater short-horned lizard (*Phrynosoma hernandesi*)	X				S3		SU	S2				K							S			Species of Concern in MT, and in MT CFWCS as a Priority 2 spp. ND CWCS Level 2 spp.
Milk snake *(Lampropeltis triangulum)*	X				S2			S4				K										Species of Concern in MT, and in MT CFWCS as a Priority 1 spp.
Ringneck snake *(Diadophis Punctatus)*		X				S2		S2			K										S	ID CWCS spp. Unconfirmed occurance on NFS lands on Nez Perce NF.
Western hognose snake *(Heterodon nasicus)*	X				S2		SU	S5				K										Species of Concern in MT, and in MT CFWCS as a Priority 1 spp. ND CWCS
INSECTS																						
Arogos skipper *(Atrytone arogos iowa)*			X		SNR		SU	S2					K									

SENSITIVE SPECIES LIST Forest Service, Region 1 Februrary 2011	States Where Sensitive (a)				State Ranking				Forests Where Species is Known (K) or Suspected (S) to Occur													Comments
	MT	**ID**	**ND**	**SD**	MT	ID	ND	SD	B/D	BRT	CLW	CUS	DPG	FLAT	GAL	HEL	IPNF	KOOT	L&C	LOLO	NEZ	
INSECTS continued																						
Broad-winged skipper *(Poanes viator)*			X				S2	S2					K									
Dakota skipper (*Hesperia dacotae)*			X	X			S2	S2					K									
Dion skipper *(Euphyes dion)*			X				S1						K									
Mulberry wing *(poanes massasoit)*			X				S2	S1					K									
Ottoe skipper *(Hesperia ottoe)*			X	X	S2-w S3-e		SU	S2					K									Species of Concern in MT. SD CWCS spp.
Powesheik skipper *(Oarisma powesheik)*			X	X			SU	S2					K									SD CWCS spp.
Regal fritillary *(Speyeria idalia)*			X				S2	S3					K									SD CWCS spp.
Tawny crescent *(Phyciodes batessi)*			X		S2-w S3-e		S3	S2					K									

(a) Species are listed as Sensitive by State. The State where a species is listed as Sensitive is indicated by an "X" in the State/species column. A species iedntified as Sensitive within a State, will be considered as Sensitive on all Units within the state where it occurs, unless described otherwise.

(b) National Forest (Grasslands) where a species is known or suspected to occur, within States where a species is listed as Sensitive, are identified by shading and either a known "K" or suspected "S" in the Forest/species column.

CWCS = Comprehensive Wildlife Conservation Strategy

CFWCS = Comprehensive Fish and Wildlife Conservation Strategy

SD bird species may have two state ranks, one for breeding (S#B) and one for nonbreeding seasons (S#N)

APPENDIX Q - SPECIAL STATUS VEGETATION AND SURVEY REQUIREMENTS

1. **Contractor Qualifications**

a. A degree in Botany or Plant Ecology, or thoroughly demonstrated botanical experience and knowledge to accurately inventory and document plant species and vegetation conditions.

b. Demonstrated skill in plant identification, use of plant taxonomic keys, and rare plant surveys. Knowledge of flora and habitat types of the northern Great Plains.

c. Ability to analyze the effects of a proposed project on botanical resources through knowledge of ecological theory and plant community dynamics in response to disturbance.

d. Ability to prepare technical reports and apply Forest Service procedures and directives in the preparation of BEs.

e. Ability to apply Standards and Guidelines identified in the Dakota Prairie Grasslands Land and Resource Management Plan (2001) to proposed projects.

2. **Survey Protocol**

Sensitive plant surveys must be conducted in a manner that provides a high probability of locating any sensitive or watch plant species that may be present. The survey botanist must obtain an accurate map of the site and proposed areas of disturbance from the permit applicant, and the field site must be accurately marked or flagged prior to the survey. All habitat likely to be disturbed by the proposed project must be systematically surveyed. Refer to survey intensity levels in the *Field Guide for Plant Survey* manual, and the article *Rare Plant Surveys: Techniques for Impact Assessment*, by James R. Nelson, from the Natural Areas Journal (Vol. 5, No. 3).

The following guidelines must be followed when conducting plant surveys.

a. Sensitive plant surveys must be conducted when sensitive species are most identifiable, such as during periods of flowering or phenological stages that facilitate their discovery. Compromises inevitably occur because there are fourteen sensitive plant species with different periods of growth and flowering. However, survey periods of May 15 through September 15 span a period of active growth or identifiable litter for most sensitive plant species on the LMNG. These dates encompass the acceptable survey season unless otherwise specified by the Forest Service.

b. Survey botanists must be familiar with characteristics of the twenty-four watch species listed for the LMNG and document any occurrences in the same manner as sensitive plant species. A determination of effects for watch plant species is not required within a BE unless one of the species is encountered.

c. Sensitive plant surveys must be discontinued during adverse weather conditions such as drought or plant-killing frost, and reasonable effort must be given to revisiting sites at a more appropriate time when these situations occur. If in doubt, the Forest Service botanist should be contacted.

d. Developments such as roadways and utility lines must be surveyed a minimum distance of 125 feet on each side of the centerline of disturbance, while a minimum of ten acres must be surveyed around well sites, stock tanks, or similar points of development. The total area of survey is referenced as the ***project area***.

e. If a sensitive or watch plant species is discovered within an area that would be adversely affected by the project, the surveyor must contact the Forest Service within seven days. If the occurrence is not reported within seven days it could result in delaying the concurrence of the survey and BE until the next year's survey season.

If a sensitive plant discovery is made within an area that would be directly disturbed by the project, there is a high potential that the project will be redesigned to alleviate adverse effects to the sensitive/watch plant species. In such cases, it may be appropriate for the contract botanist to survey potential alternate routes or site locations. However, it is the contractor's responsibility to coordinate project location adjustments with Forest Service personal and company representatives requesting the survey to ensure that alternate project locations will be acceptable.

f. The contractor must complete a *Sensitive/Watch Plant Population Survey Form* whenever a sensitive or watch plant species is discovered. Copies of the completed form must be submitted to the Forest Service botanist and the North Dakota Natural Heritage Program. Include a topographic map (maximum scale of 1:24,000) that delineates the plant population. Photographs and any additional notes on the occurrence should also be included.

g. Any collections of sensitive or watch plant species must be approved in a Forest Service permit. 36CFR261.9(d) prohibits "removing any plant that is classified as a threatened, endangered, sensitive, rare, or unique species", with a fine in ND of $100. Details of collection will be outlined in the permit that can be obtained at a local Forest Service office. However, it is important to evaluate the effect of collecting on potentially rare or small plant populations. If in doubt, collect the smallest quantities possible and/or only portions of individual plants. If there is a question about the possible identification of a sensitive species, the surveyor should contact the local Forest Service Botanist.

The collection of any plant species for personal use (not for resale) and not covered under 36CFR261.9(d) also requires a Forest Service permit,. A Forest Products Free Use Permit to collect plant specimens for personal use or species identification can be obtained at a local Forest Service office, free of charge.

h. A *Site and Setting Field Form* and *Plant Survey Form* must be completed for every proposed project for which a field survey is conducted. Latitude and longitude in degrees, minutes, and seconds, in **NAD83 datum**, must be recorded for each site. The datum used, including anything other than NAD83, must be recorded.

g.

h. Prominent plant communities across the survey site must be verbally (written description) or graphically identified with respect to their location of occurrence within the area of the proposed action. Habitat locations with the potential to support sensitive plant populations must be verbally or graphically identified. The occurrence of any invasive plant species within the project area must also be accurately identified.

i.

j. Invasive species are defined as non-native species that have the capacity to displace native species. On the LMNG, invasive species include those on the North Dakota noxious weed list such as leafy spurge and Canada thistle, as well as palatable species such as sweet clover, crested wheatgrass, Kentucky and Canada bluegrass, and smooth brome. See the attached list of invasive plant species that must be identified if occurring on a project site.

i. An assessment must be conducted for cumulative affects to vegetation resources. It is suggested that a 0.5 mile radius extending from all areas of likely disturbance associated with the project be used as the ***analysis area*** for cumulative effects. However, other areas or distances could be used if they logically represent past, present, and reasonably foreseeable future affects surrounding the project area.

An intensive ground survey of the analysis area is not expected, but the amount and type of active and reclaimed roads, well sites, utility lines, and other developments, must be estimated within the analysis area. These estimates are derived from a combination of field observations during survey work, aerial photographs, USGS quadrangle maps, and numerous GIS layers provided by the Forest Service that depict vegetation types and infrastructure developments. Observed plant compositions with respect to these developments must be discussed.

j. All activities on National Forest System lands are required to conform to the Federal Code of Regulations and applicable laws. It is the responsibility of surveyors to be aware of any special orders for the Dakota Prairie Grasslands or individual Ranger Districts in effect. Contact the local Ranger District for information on special orders or to obtain any required permits.

Off-road permits and collection permits must be retained at all times while on National Forest System lands.

3. Biological Evaluation / Report Protocol

The following information must be included in the BE and/or any forms specified for completion.

a. The BE must have a date and contain the name, address, and contact information of the company submitting the report. The project name should be identified on the cover page and the beginning of the BE/report. If the BE/report is acting on the behalf of another company for a lease or permit application with the Forest Service, the applicants name and contact information must be included.

b. The proposed action must be identified, i.e. construction of a well pad and 1.1 miles of access road, or upgrading of an existing two-track road to serve as the access road, etc. This includes the manner of action, i.e. a trackhoe will be used to dig a 6 feet wide trench or a dozer will blade 10 acres to remove the A soil layer and level the site. A full description of the action is required for adequate environmental effects analysis. Without this description it may be assumed there is no knowledge of the proposed action and the effects analysis is incomplete.

c. A legal description by Section, Quarter Section, Township, and Range, of the proposed project location. Include a legible topographic view of the project area with a scale no smaller than 1:24,000. We suggest providing larger scale maps and aerial or orthoquad maps of the project area.

d. The date of the field survey and name of the botanist(s) must be identified, along with the type of survey methodology utilized. The Site and Setting Survey Form must be included in the BE/report or attached as an appendix.

e. The current list of LMNG Sensitive and Watch plant species and a brief description of the preferred habitat for each sensitive species must be included in the BE/report or appendix.

f A site-specific narrative description of the habitat types and existing vegetation communities found within the survey area. The description must be logical and cohesive, such that the reader is provided with an accurate picture of vegetation composition and conditions within and around the project area. Dominant and co-dominant species by life form within distinct community types must be identified. Aspects, topographic positions, and dominant soil textures should be included in these descriptions.

g A complete floristic list of all plant species identified during the field survey must be provided. A field checklist is acceptable. A completed copy of the *Sensitive/Watch Plant Population Survey Form* is required if any new populations are discovered. Unoccupied but apparently suitable habitat for sensitive plant species must be identified with respect to its location within the project area.

h The occurrence and extent of invasive species within the project area must be discussed. It is particularly important to identify areas where project disturbances are likely to intersect with invasive plant communities. Maps of invasive species distributions across the project area are very helpful.

i Determination of Effects: Effects to sensitive plant species fall into the following categories. Contractors must utilize these categorical statements rather than paraphrase.

1. No impact
2. May impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species.

3. Will impact individuals or habitat with a consequence that the action may contribute to a trend towards federal listing or cause a loss of viability to the population or species.
4. Beneficial impact.

See Section 4 for discussion on determinations.

A summary table of determinations should be included in the BE/report

The BE must provide a logical context for the determination of effects, considering ecological principles of habitat fragmentation, population dynamics, and viability. The absence of sensitive plant species in the project area does not necessarily equate to no impact. If suitable but unoccupied habitat exists for a particular sensitive plant species that is likely to be disturbed by the project, the determination will usually fall under Category 2 due to decreased habitat for dispersal. However, rationale for Category 2 should also include reasons why the project would not contribute to federal listing. For example, there may be documented populations in other areas of the LMNG that would not be affected, habitat within the project area is marginal, suitable habitat that would not be disturbed is extensive immediately adjacent to the project area, etc.

Direct and indirect effects of the proposed project on native plant communities and habitats must also be addressed in the BE. Examples of these effects include direct disturbance, habitat fragmentation, invasive plant expansion, invasive weed control treatments, decreased plant diversity, and loss of unique habitat unlikely to be reclaimable to pre-disturbance conditions.

An analysis of the cumulative effects must be addressed with respect to past, present, and reasonably foreseeable future effects. This entails an analysis of land use practices on the apparent condition and character of native prairie communities across the analysis area. A one-half mile radius around the project site should be used unless a more logical and defendable analysis area can be identified. Recorded field observations from the *Site and Setting Form* will include the presence and present vegetative characteristics of various active or reclaimed developments and other land use influences such as livestock grazing, agricultural lands, or invasive weed occurrences. GIS layers will be helpful in quantifying the land area that has been influenced by these activities, as well as the potential contribution of the proposed project and its effects. Contractors may not have complete knowledge or access to data sets of past, current, and future land use practices, but they should carry the analysis as far as possible from observations within the analysis area and data sets to which they have access.

j. Design Criteria: The report should include suggested design criteria to alleviate adverse effects and avoid unnecessary disturbances to native plant communities. Examples include recommendations for avoiding impacts to certain plant communities or species, or incorporating the control of invasive species within the scope of project development and design.

k. Bibliography of literature or references cited. Include only those cited in the text of the report.

4. BE Determination Language

a. *No Impact.*

A determination of "No Impact" for sensitive species occurs when a project or activity will have no environmental effects on habitat, individuals, a population or a species. If any "effects" are listed for a sensitive species in the NEPA document, then a "No Impact" conclusion is not appropriate.

b. *May Impact Individuals Or Habitat, But Will Not Likely Contribute To A Trend Towards Federal Listing Or Cause a Loss of Viability To the Population or Species.*

Impacting of individuals or habitats of sensitive species should be given careful consideration. The loss of populations or metapopulations is often the basis for eventual species extinction. Rationale should be provided regarding why the effects would not contribute to federal listing.

c. *Will Impact Individuals Or Habitat With A Consequence That The Action Will Contribute To A Trend Towards Federal Listing Or Cause a Loss of Viability To the Population or Species.*

Loss of individuals or habitat can be considered significant when the potential effect may contribute to a trend toward federal listing. The loss of individuals is particularly serious when there are few populations and/or few individuals within populations. For these situations, any effects to the species may lead to a loss of viability and contribute towards federal listing.

Projects or activities that adversely affect many individuals of a species with limited population numbers, or even a few individuals with a limited number of small populations should probably receive this conclusion.

d. *Beneficial Impact.*

Projects or activities that are designed or happen to benefit sensitive species should receive this conclusion.

Sensitive Species

NRCS Code	Scientific Name	Common Name	Conserv. Ranking	Documented Habitat on the LMNG
CHSU2	*Chenopodium subglabrum*	smooth goosefoot	G2G4/S1	Sandbars , terraces, and dune complexes along rivers and creeks. Exposed sandy substrates in uplands, blowouts, outcrops, colluvium, etc.
COPA3	*Collinsia parviflora*	blue lips	G5/S2	Woody understories, including green ash/elm draws, Rocky Mountain juniper, mesic shrub communities, and occasional xeric shrub communities.
CRTO4	*Cryptantha torreyana*	Torrey's cryptantha	G5/S1	Dry plains, rock outcrops, escarpments, pine slopes.
ERCE2	*Eriogonum cernuum*	nodding buckwheat	G5/S1	Exposed sand substrates with low plant cover in grasslands, hillsides, sandstone outcrops.
ERVI14	*Eriogonum visheri*	Dakota buckwheat	G3/S2S3	Relatively exposed clay/silt substrates with low plant cover such as outwash zones around eroding buttes, saddles, steep convex slopes, erosional breaks on prairie slopes. Occasional populations among dense saltgrass communities.
ESMI3	*Escobaria missouriensis*	Missouri foxtail cactus	G5/SNR	Prairie slopes and plains, stony to loamy to clayey short-grass to mixed-grass prairies. Also reported in woodlands of ponderosa pine or Quercus spp.
LEMO4	*Leucocrinum montanum*	sand lily	G5/S2	Generally shortgrass communities with fine textured substrates but also found in crested wheatgrass communities. Reported from open coniferous woodlands and hillsides, sagebrush scrub, and sandy flats, but common name seems to be a misnomer. ,..
MEPU3	*Mentzelia pumila*	dwarf mentzelia	G4/S1	Scoria exposures and colluvium with low plant cover. Also reported on slopes and sandy plains; occasionally on hard clays and rocky soils.
PHAL3	*Phlox alyssifolia*	alyssum-leaved phlox	G5/S1S2	Sandy or gravelly soil on and around Bullion Butte. Also reported on clay banks and limestone ridges of open prairie.
PIFL2	*Pinus flexillis*	limber pine	G5/S1	Semi-arid exposed rocky ridges and foothills in the Limber Pines RNA, likely of native-American origin.
POAC5	*Populus x acuminata*	lanceleaf cottonwood	HYB/S2	Mesic woody draws, often with springs/seeps, occasional near springs on open hillsides. Floodplains and stream banks.
SPAI	*Sporobolus airoides*	alkali sacaton	G5/S2	Secondary succession on clay outwash where tolerant of saline conditions, also on dry to moist sandy or gravelly soil.
TOHO	*Townsendia hookeri*	Hooker's Townsendia	G5/S1	Low to moderate plant cover on dry plains, hillsides, gravelly benches and weathered scoria, but often clay matrix subsoil.
TOEX2	*Townsendia exscapa*	Easter daisy	G5/SNR	Dry plains and hillsides, often with loamy or increased soil development and increased pant cover relative to T. hookeri.

Watch Species

NRCS Code	Scientific Name	Common Name	Conservation Ranking
AGEX	*Agrostis exarata*	spike bentgrass	G5/S1
ASAU4	*Astragalus australis* *(Astragalus aboriginum)*	Indian milkvetch	G5/S2S3
ASCR3	*Astragalus drummondii*	Drummond's milkvetch	G5/S1
ASVE5	*Astragalus vexilliflexus*	bentflower milkvetch	G4/S3
EPPY4	*Epilobium pygmaeum* [*Boisduvalia glabella*]	smooth spike-primrose	G5/S1S2
VRCA5	*Bromus carinatus*	mountain brome	G5/S1
CASI12	*Carex siccata* (*Carex feonea)*	dry spike sedge	G5/SNR
CASCS8	*Carex scirpoidea* (*Carex scirpiformi)*	bulrush sedge	G5/S1S2
CLCOT	*Clematis Columbiana var. tenuiloba* (*Clematis tenuiloba)*	rock clematis	G5?T4?/S1
ERCI4	*Erigeron divergens*	spreading fleabane	G5/S1
ERRA2	*Erigeron radicatus*	taproot fleabane	G3G4/S1
FRPU2	*Fritillaria pudica*	yellow fritillary	G5/SH
MYAPM	*Myosurus apetalus* var. *montanus*	bristly mousetail	G5T3T5/S1
OELA	*Oenothera laciniata*	cutleaf evening primrose	G5/SA?
ORLUL2	*Orobanche ludoviciana ssp. Ludoviciana* *(Orobanche multiflora)*	Louisiana broomrape	G5/S1
OXSE	*Oxytropis sericea*	white locoweed	G5/S1
PHPA29	*Phemeranthus parviflorus* (*Talinum parviflorum*)	prairie fameflower	G5/S2
PODI	*Potamogeton diversifolius*	pondweed	G5/S2S3
PODI2	*Potentilla diversifolia*	varileaf potentilla	G5/S1
POJA2	*Populus x jackii*	Balm-of-Gilead	GNA/SNR
SITR3	*Sibbaldiopsis tridentata* (*Potentilla tridentata)*	shrubby fivefingers	G5/S1
RACA4	*Ranunculus cardiophyllus*	heartleaf buttercup	G4 S1
ROCA	*Rorippa calycina* persistent	persistent sepal yellowcress	G3/SH
SMEC	*Smilax ecirrhata*	upright carrionflower	G?/S1S2

SENSITIVE/WATCH PLANT POPULATION SURVEY FORM

DATE OF SURVEY: ____/____/____ OBSERVER(S): ____

LOCATION/POSITION TITLE (Forest/District of observer(s)): ____________________________________

TAXONOMY: FAMILY: ________________________ SCIENTIFIC NAME: __________________________

LOCATION (**ATTACH COPY OF PERTINENT TOPOGRAPHIC MAP SECTION, WITH POPULATION LOCATIONS):

COUNTY: ________________________________ USGS QUAD: ______________________________

TOWNSHIP: __________ RANGE: ___________ SEC.(S): __________ 1/4 SEC.: ______________________

LATITUDE:__________________________ LONGITUDE:_________________________________
(degrees, minutes, seconds, with NAD83 Datum)

OR UTM at Zone 13 Northing ________________________ Easting ___________________________

ELEVATION (at population center (and range if known)): ____

NATIONAL FOREST: ______LMNG__________________ RANGER DISTRICT: _______________________

LAND OWNERSHIP/MANAGEMENT (IF NOT FS):____

SITE NAME (usually based on an adjacent landmark): ______________________________________

HABITAT:

ASPECT (S, SE, NNW, etc.): ________________ % SLOPE: ____________________________________

LIGHT EXPOSURE (open, shaded, etc.): ____

TOPOGRAPHIC POSITION (crest, midslope, bottom, etc.): ___________________________________

MOISTURE (typically xeric versus mesic versus wetland etc, do not reflect current/recent precipitation conditions)
____

VEGETATION STRUCTURE WITH POPULATION AREA:

TOTAL TREE COVER (%) ______________________TOTAL SHRUB COVER (%)___________________
TOTAL FORB COVER (%) ______________________TOTAL GRAMINOID COVER (%) _______________
TOTAL MOSS/LICHEN COVER (%) _______________TOTAL BARE GROUND (%) __________________

ASSOCIATED PLANT COMMUNITY (dominant species):____________________________________
____
____
____
____
____

HABITAT TYPE (if known): ____

SOIL TYPE/TEXTURE (include type of bedrock, if known): ____________________________________

POPULATION SIZE:

ESTIMATED # OF INDIVIDUALS (or exact count, if feasible; if plants are spreading vegetatively, indicate number of aerial stems): ____

OF SUBPOPULATIONS (if applicable): ____

SIZE OF POPULATION AREA (acres): ____

BIOLOGY:

PHENOLOGY (% flower, fruit, dispersed fruit, vegetative): ____

ANY SYMBIOTIC OR PARASITIC RELATIONSHIPS?: ____

EVIDENCE OF DISEASE, PREDATION OR INJURY?: ____

EVIDENCE OF SEED DISPERSAL AND ESTABLISHMENT: ____
____
____

DOCUMENTATION:

PHOTOGRAPH TAKEN? (if so, indicate photographer and repository): ____________________________________
____

SPECIMEN TAKEN? (if so, list collector, collection #, and repository): ____________________________________
____

IDENTIFICATION (list name of person making determination, and/or name of flora or book used):______________________
____

ECODATA PLOT NUMBER (generally completed by FS): ____

EVIDENCE OF DISTURBANCE: ____
____
____

MEASURES FOR PROTECTION:____
____
____
____
____

INVASIVE / NOXIOUS PLANT SPECIES
TO BE REPORTED WHEN OCCURRING ON A
5. PROJECT SURVEY SITE

FORBS	
Artemisia absinthium	Absinth Wormwood
Carduus acanthoides	Musk Thistle
Cardaria draba	Hoary Cress
Carduus nutans	Plumeless Thistle
Centaurea diffusa	Diffuse Knapweed
Centaurea maculosa	Spotted Knapweed
Centaurea repens	Russian Knapweed
Centaurea solstitalis	Yellow Starthistle
Cirsium arvense	Canada Thistle
Convolvulus arvensis	Field Bindweed
Euphorbia esula	Leafy Spurge
Cynoglossum officinale	Houndstongue
6. *Hyoscyamus niger*	Henbane
Lythrum salicaria	Purple Loosestrife
Melilotus spp.	Yellow or White Sweetclover
Sonchus spp.	Sowthistle
Tamarix spp.	Saltcedar
GRASSES	
Agropyron cristatum	Crested Wheatgrass
Agropyron elongatum	Tall Wheatgrass
Agropyron intermedium	Intermediate Wheatgrass
Agropyron repens	Quackgrass
Bromus inermis	Smooth Brome
Bromus japonicus	Japanese Brome
Bromus tectorum	Downy Brome / cheatgrass
Poa Pratensis	Kentucky bluegrass
Poa compressa	Canada bluegrass

SITE AND SETTING FORM

Site and Setting Form for Inventory Information

***SITE ID* ®**
***DATE (MMDDYYY)* ®**
Project Name
Site Sample Type ®

***LAST* Name®**	***FIRST* Name ®**	
Ownership ®		
Region ® 01	**National Forest/Grassland ® 18**	**District ®**
State North Dakota	**County Number®**	**County Name**

Location Information

USGS Quad Name		
Township / Range / Section		
Q SEC	**QQ SEC**	**QQQ SEC**

Geodetic Datum NAD83 is required			
Lat dms:	**Degrees ______ N**	**Minutes __ __**	**Seconds __ __.__ __**
Long dms:	**Degrees _______ W**	**Minutes __ __**	**Seconds __ __.__ __**

Existing Vegetation Information

Please enter major dominance types found on the project area.

Dominant Life Form ®
Dominance Type
Dominance Type
Dominance Type
Dominance Type

Potential Vegetation Information

Habitat Type Name
Habitat Type Name
Habitat Type Name
Habitat Type Name
Habitat Type Name
Habitat Type Name

Description of past & current land use practices including reclaimed or active oil wells, roads, utility corridors, misc. developments, and apparent livestock grazing patterns. Include observations of species composition in regards to native versus non-native (invasive).

Estimate current acreage or mileage of active and reclaimed access roads, utility corridors, or other developments within ½ mile radius of project area. Document source of data as observed or compiled from GIS software and/or aerial photographs.

ACTIVE

RECLAIMED

Other Comments

Plant Survey Form

Area Surveyed __ __ __ __ __ __ __ __ ®	**Unit of Measure ______________________________®**
Survey Method____________________________®	**Survey Type____________________________________**

Invasive Plants and Noxious Weeds

Species:	**Extent (area):**
Description & Location:	
Species:	**Extent:**
Description & Location:	
Species:	**Extent:**
Description & Location:	
Species:	**Extent:**
Description & Location:	

Plant Species List (use additional format if needed)

Plant Name	Comments

USFS DPG Site and Setting Form Field Guide

Using the form in the Field

The Site and Setting Form will be used to record information on the location, site, and ecological setting.

Site ID [Var char 2(30)] ***Required***

Filled in by District Botanist

Date [Date (12)] ***Required***
Record the calendar month, day, and year the site was visited.

Code	Description
01/23/1984	January 23, 1984

Project Name Code (10-VarChar) Required
Use the code "O&G-survey" for botany surveys for oil and gas facilities and associated pipelines and roads.

Code	Project Name
O&G-survey	List project or company name, including well/pipeline name etc.

Site Sample Type (4-Char) Required
Record site sample type. For oil & gas associated surveys it should be FLGE.

Site Sample Type	Description
FLGE	Flora-general description

Examiner's Last, First Name and Middle Initial [Varchar 2(40)] ***Required***
Record the examiner's last, and first name is required. The middle initial is optional.

Last Name	First Name	Middle Initial
MacDonald	John	Q

Ownership (10-VarChar) Required. Record the landownership where the site is located. In the case of multiple ownerships, record the landownership where the preponderance of the site is located.

CODE	DESCRIPTION
USFS	U.S.D.A. Forest Service
PRIV	Private
STDL	State Land Dept.
OTH	Other
BLM	Bureau of Land Management

Region (2-Num) Required. Record 01 for Region One.

Region	Description
01	R 1 - Northern Region

National Forest/Grassland (2-Num) **Required.** Record 18 for the DPG.

National Forest/Grassland	Description
18	Dakota Prairie Grasslands

District (2-Num) **Required.** Record the Ranger District number where the site is located.

District Code	Description
07	Medora Ranger District
08	McKenzie Ranger District

State (7-VarChar) **Required.** Record the code for the state in which the site is located.

State	State Name
ND	North Dakota

County Number (7-VarChar) **Required and County Name** (255 VarChar)

County Number	County Name
007	Billings
033	Golden Valley
053	McKenzie
087	Slope

USGS Quads Name (8 Num, 40 VarChar). Record the USGS Quads Name where the site is located.

USGS Quad Name
Pretty Butte

Township/Direction and Range/Direction (60 VarChar). Record the Township and Direction and the Range and Direction where the site is located.

Township/Dir & Range/Dir	Description
7 N 14 E	Township 7 North Range 14 East

Section (3 VarChar). Record the Section where the site is located.

Section Code	Description
16	Section 16

Quarter Section (3 VarChar). Record the ¼ section subdivision where the site is located.

Q Section	Description
NE	NW ¼ of Section 16, T.7 N., R.69W. of 6th P.M

Quarter, Quarter Section (3 VarChar). Record the ¼¼ section subdivision where the site is located.

Quarter, Quarter Section	Description
SE	SW ¼ of NW ¼ of Section 16, T.7 N., R.69W. of 6th P.M

Quarter, Quarter, Quarter Section (3 VarChar). Record the ¼¼¼ section subdivision of the site.

Quarter, Quarter, Quarter Section	Description
SW	SE ¼ of SW ¼ of NW ¼ of Section 16, T.7 N., R.69W. of 6th P.M

Latitude and Longitude (Degrees, minutes, seconds)

Datum (6 VarChar) Record the geodetic datum for the Latitude and Longitude coordinates.

Datum	Description
NAD-83	North American Datum of 1983

Latitude (degree, minute, second) (9 VarChar)
Record the site latitude as measured by a Global Positioning System (GPS). Latitude consists of a 2-Character "degree", a 2-Character "minute", and a 4 character, 2 decimal "second". **(Default North Latitudes.)**

Latitude	Description
422006.07	Degree, minutes, seconds

Longitude (degree, minute, second) (10 VarChar)
Record the site longitude as measured by a GPS. Longitude consists of a 3-Character "degree", a 2-Character "minute", and a 4 character, 2 decimal "second". **(Default West Longitudes.)**

Longitude Code	Description
1051052.06	Degree, minutes, seconds

Dominant Life Form **(2, 50** VarChar) **®.** Dominant life form on the site, transect or polygon. Dominant life form is defined as the characteristic form or appearance of a species at maturity.

Dominant Life form	Description	Corresponding PLANTS Life form
FB	Forb/herb	FB
GR	Graminoid	GR
NP	Nonvascular Plant	NP
SH	Shrub	SH
SS	Sub shrub	SS
TR	Tree	TR
UK	Unknown	

Dominance Type
Enter the dominance types using a naming convention that uses two dominant species for that type.

Dominance Type (examples)
Agropyron smithii/Bouteloua gracilis
Agropyron cristatum/Stipa comata

Habitat Type Code and Habitat Type Name (30, 240 VarChar)
The code associated with a habitat type. These codes are for regionally stewarded PNV habitat classification codes. The collective area which one plant association occupies or will come to occupy as succession advances.

LMNG Habitat Type Names
Agropyron smithii-Stipa viridula
Agropyron smithii-Stipa viridula-Bouteloua gracilis
Agropyron smithii-Stipa comata
Andropogon scoparius-Carex filifolia
Andropogon gerardii
Calamovilfa longifolia-Carex
Distichlis spicata
Puccinellia nuttalliana-Distichlis spicata
Stipa comata-Carex filifolia
Artemisia arbuscula-Bouteloua gracilis
Artemisia cana-Agropyron smithii
Artemisia tridentata wyomingensis-Agropyron smithii
Artemisia tridentata wyomingensis-Agropyron spicatum
Atriplex confertifolia-Artemisia tridentate wyomingensis
Juniperus horizontalis-Andropogon scoparius
Potentilla fruticosa-Andropogon scoparius
Rhus aromatica-Agropyron spicatum
Rhus aromatica-Muhlenbergia cuspidate
Sarcobatus vermiculatus-Agropyron smithii
Sarcobatus vermiculatus-Agropyron spicatum
Shepherdia argentea
Symphoricarpos occidentalis
Quercus macrocarpa/Corylus sp.
Quercus macrocarpa/Prunus virginiana
Populus tremuloides/Prunus virginiana
Fraxinus pennsylvanica/Prunus virginiana
Fraxinus pennsylvanica/Ulmus americana/Prunus virginiana
Fraxinus pennsylvanica/Symphoricarpos occidentalis
Juniperus scopulorum/Oryzopsis micrantha
Juniperus scopulorum/Agropyron spicatum
Pinus flexilis/Agropyron spicatum
Pinus ponderosa/Prunus virginiana
Pinus ponderosa/Juniperus communis

Pinus ponderosa/Agropyron spicatum
Pinus ponderosa/Carex heliophilia

Plant Survey Form

7. **Area Surveyed [Numeric (12,2)] *Required.*** Enter the number of acres or hectares in the survey area.

Area Surveyed
1,250

Survey Area Unit of Measure [Varchar 2(12)] ***Required***
The *Survey_Area* can be measured either in acres or hectares. Enter either hectares or acres in this field, acres are the default value for this field.

Code	Description
Acres	Acres surveyed
Hectares	Hectares surveyed

Survey Method [Varchar 2(20] ***Required***
Enter the method used for the survey. The three survey methods are recognized are observed, aerial and satellite imagery.

Code	Description
Observed	Surveys that were conducted using direct observation. They could have been completed on horseback, by vehicle, walking or helicopter. This is the default value.

Survey Type [Varchar2 (20,0] ***Required***
Enter the type of survey that was conducted. Enter one or more of the following. You may enter up to three survey types.

Code	Description
Aquatic	Aquatic surveys are confined to surveys within waterbodies such as streams, lakes, ponds and irrigated canals. Vegetation can be classified as emergent, floating, hydrophytic, or submergent. For surveys that include the transition zone to uplands and areas of seasonal or periodic flooding also record riparian surveys.
Cursory	The cursory survey is appropriately used to confirm the presence of objects of interest identified in previous surveys and the prefield analysis step. By its nature, the cursory visit is rapid, but does not provide in-depth environmental information. The entire area is traversed at least once. For example, stand condition as seen in aerial photography can be verified by a cursory visit to a location. Also, a cursory visit can be used to determine if a population that had been previously cataloged at a site remains present or intact
Features	The surveyed focused on area in and adjacent to developed features such as road, trails, campgrounds, parking lots and boat launches.

Code	Description
Field Check	Field Check is where the area is given a quick “once over” but do not walk completely through the project area. The entire area is not examined.
General	The area is given a closer look by walking through the area and perimeter or by walking more than once through the area. Most of the area is examined
Focused (Intuitive Controlled)	The intuitive controlled survey is the most commonly used and most efficient method of surveying. During pre-field analysis, potential suitable habitat is identified for each species of interest and the survey effort is focused in those areas. This method requires adequate knowledge of suitable habitat in order to accurately select the areas of focused search. When conducting intuitive controlled surveys, an area somewhat larger than the identified suitable habitat should be searched to validate current suitable habitat definitions.
Random	Random surveys employ an undirected traverse through a project area. They are employed either when there is inadequate natural history information about a species to discern its suitable habitat and the surveyor is simply searching for occurrences, or when a target species is very abundant within a search area and the surveyor is attempting to make estimates of population parameters such as intra-patch variations in density or the occurrence of predation or herbivory. However, a stratified random survey may be more efficacious in these cases.
Riparian	These are surveys that follow the shoreline of waterbodies such as lakes, streams and rivers. Riparian areas are defined as those areas that form the transition between permanently saturated wetlands and upland areas. For plants or areas that are obligatory in standing or moving water use aquatic survey.
Stratified Random	The stratified random survey is most often used within known population areas of target species or when an area of unknown suitability to be surveyed is relatively large. Stratified random surveys employ a series of randomly selected plots of equal size within a project area that are each thoroughly searched for target species. When conducting a stratified random survey, it is important to search an adequate number of sites that are of sufficient size to represent an adequate sample.
Systematic	The systematic survey is typically used in limited areas where the likelihood of occurrence of a target species is evenly distributed throughout the survey area. Systematic surveys are often employed either within focused search areas (e.g., stratified random and intuitive controlled methods), or when a proposed project is likely to produce significant habitat alterations for species that are especially sensitive to the proposed activities.

Invasive Plants and Noxious Weeds: Enter the scientific names of the invasive species or noxious weeds observed in the project area and their estimated extent in acres or square meters.

Plant Species List. List the scientific name of plant species observed in the project area.

APPENDIX R - 100 SPECIES OF CONSERVATION PRIORITY FOR NORTH DAKOTA

100 Species of Conservation Priority for North Dakota

Level I Species	Level II Species	Level III Species
horned grebe	northern pintail	whooping crane
American white pelican	canvasback	peregrine falcon
American bittern	redhead	Brewer’s sparrow
Swainson’s hawk	northern harrier	McCown’s longspur
ferruginous hawk	golden eagle	smooth softshell turtle
yellow rail	bald eagle	false map turtle
willet	prairie falcon	northern prairie skink
upland sandpiper	sharp-tailed grouse	northern sagebrush lizard
long-billed curlew	greater prairie chicken	arctic shrew
marbled godwit	greater sage grouse	western small-footed myotis
Wilson’s phalarope	piping plover	long-eared myotis
Franklin’s gull	American avocet	long-legged myotis
black tern	least tern	plains pocket mouse
black-billed cuckoo	short-eared owl	hispid pocket mouse
Sprague’s pipit	burrowing owl	sagebrush vole
grasshopper sparrow	red-headed woodpecker	eastern spotted skunk
Baird’s sparrow	loggerhead shrike	gray wolf
Nelson’s sharp-tailed sparrow	sedge wren	chestnut lamprey
lark bunting	dickcissel	silver lamprey
chestnut-collared longspur	Le Conte’s sparrow	central stoneroller
Canadian toad	bobolink	hornyhead chub
plains spadefoot toad	common snapping turtle	pugnose shiner
smooth green snake	short-horned lizard	blacknose shiner
western hognose snake	redbelly snake	roseyface shiner

black-tailed prairie dog

sturgeon chub

sicklefin chub

pearl dace

blue sucker

pygmy shrew

Richardson’s ground squirrel

swift fox

river otter

black-footed ferret

paddlefish

pallid sturgeon

silver chub

northern redbelly dace

flathead chub

trout-perch

threeridge

wabash pigtoe

mapleleaf

black sandshell

creek heelsplitter

pink heelsplitter

finescale dace

yellow bullhead

flathead catfish

logperch

river darter

pink papershell

APPENDIX S - BIOLOGICAL ASSESSMENT

(To be provided by Basin Electric)

APPENDIX T - BIOLOGICAL EVALUATION

(To be provided by Basin Electric)

APPENDIX U - LOAD PROJECTIONS STUDY

(To be provided by Basin Electric)

APPENDIX V - TREE AND SHRUB REPLACEMENT PLAN

Tree and Shrub Mitigation Specifications

Inventory

1. Trees and shrubs anticipated to be cleared, including those that are considered invasive species or noxious weeds (e.g., *Caragana arborescens*, *Elaeagnus angustifolia*, *Rhamnus cathartica*, *Tamarix chinensis*, *T. parviflora*, *T. ramosissima*, *Ulmus pumila*), must be inventoried before cutting. The inventory must record the location, number, and species of trees and shrubs.

2. In windbreaks, shelterbelts and other planted areas, trees or shrubs anticipated to be cleared, regardless of size, must be inventoried for replacement.

3. In native growth areas, trees anticipated to be cleared that are 1 inch diameter at breast height (dbh) or greater must be inventoried for replacement.

4. In native growth areas, shrubs anticipated to be cleared in the permanent right-of-way must be inventoried for replacement.

5. In native growth areas outside the permanent right-of-way, shrubs must be cut flush with the surface of the ground, taking care to leave the naturally occurring seed bank and root stock intact. If soil disturbance is necessary, the native topsoil must be preserved and replaced after construction. Shrubs must be allowed to regenerate naturally where native topsoil is preserved and replaced. Where native topsoil is not preserved and replaced, shrubs anticipated to be cleared must be inventoried for replacement.

6. In native growth areas, trees and shrubs may be inventoried by actual count or by a sampling method that will properly represent the woody vegetation population. A sampling plan developed by the company, filed with the North Dakota Public Service Commission (Commission) and approved prior to the start of construction must define the sampling method to be used for trees, for tall shrubs and for low shrubs. The data from the sample plots must be extrapolated to the total acreage of the wooded area to be cleared to determine the species and quantity of trees and shrubs to be replaced.

Clearing for Construction

7. Trees and shrubs must be selectively cleared, leaving mature trees and shrubs intact where practical.

8. The maximum width of clear cuts through windbreaks, shelterbelts and all other wooded areas is 50 feet, unless otherwise approved by the Commission.

9. If the area of trees or shrubs actually cleared differs from the area inventoried, the difference in number of trees and shrubs to be replaced must be noted on the inventory.

Replacement

10. Prior to tree and shrub replacement, documentation identifying the number and variety of trees and shrubs removed, as well as the mitigation plan for the proposed number, variety, type, location and date of replacement plantings, must be filed with the Commission for approval.

11. Two 2-year-old saplings must be planted for every one tree removed. Two shrubs (stem cuttings) must be planted for every one shrub removed.

12. Except in the case of invasive or noxious species, trees and shrubs must be replaced by the same species or similar species, suitable for North Dakota growing conditions as recommended by the North Dakota Forest Service. Invasive or noxious species must be replaced by similar non-invasive or non-noxious species suitable for North Dakota growing conditions as recommended by the North Dakota Forest Service.

13. Landowners must be given the option of having replacement trees and shrubs planted on the landowner's property, either on or off the right-of-way. The landowner must also be given the opportunity to waive those options in writing in order to have replacement trees and shrubs planted off the landowner's property.

14. At the conclusion of the project, documentation identifying the actual number, variety, type, location and date of the replacement plantings must be filed with the Commission.

15. Tree and shrub replacements must be inspected annually, in September, for three years. The first annual inspection must be at least one year from the anniversary date of the original plantings. A report of each annual inspection must be submitted to the Commission by October 1 of each year, documenting the condition of plantings and any woodlands work completed as of September of each year. If after the third annual report the survival rate is less than 75%, the Commission may order additional planting(s).

Burns & McDonnell World Headquarters
9400 Ward Parkway
Kansas City, MO 64114
Phone: 816-333-9400
Fax: 816-333-3690
www.burnsmcd.com

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