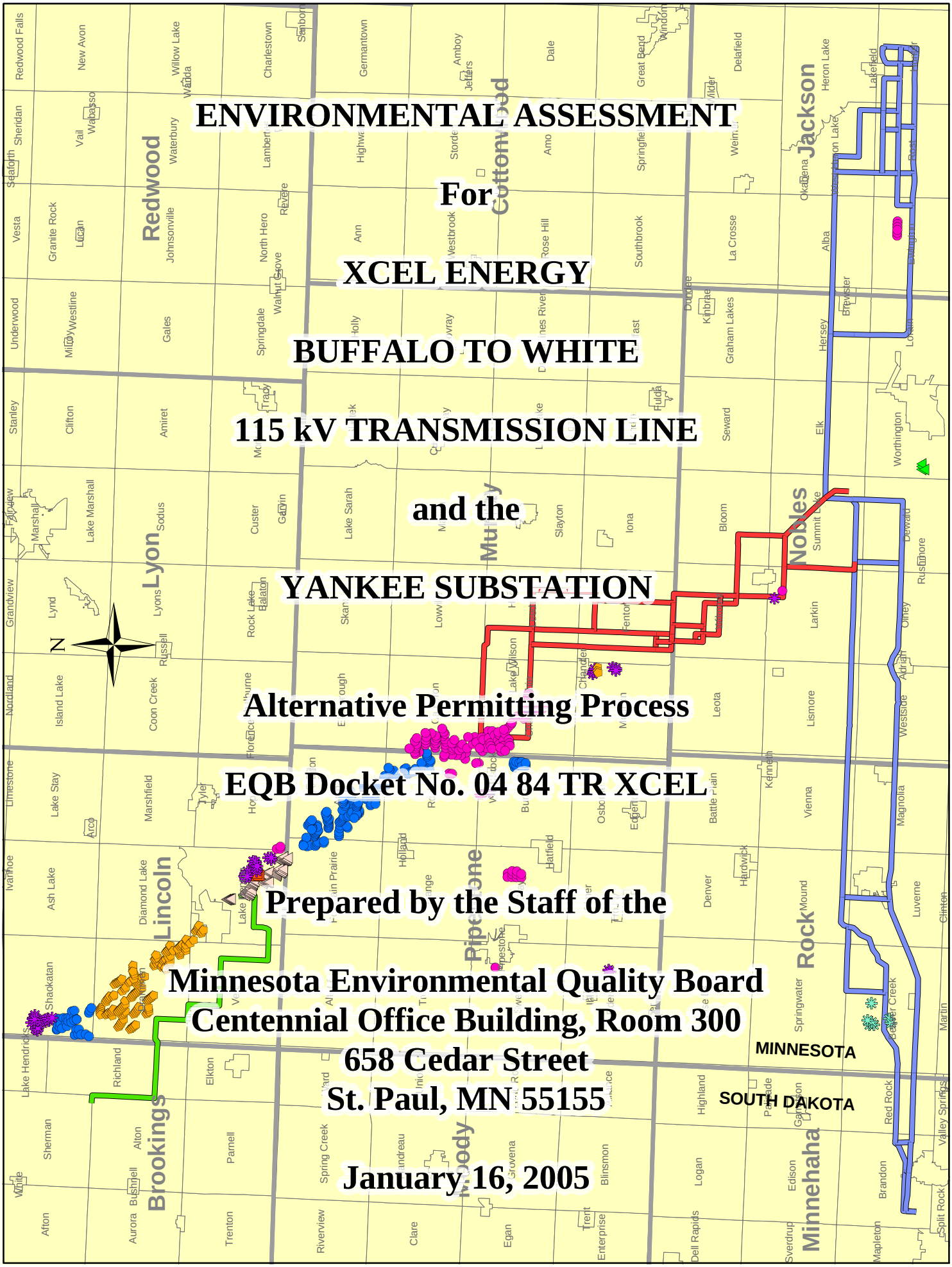
ENVIRONMENTAL ASSESSMENT
For
XCEL ENERGY
BUFFALO TO WHITE
115 kV TRANSMISSION LINE
and the
YANKEE SUBSTATION
Alternative Permitting Process
EQB Docket No. 04 84 TR XCEL
Prepared by the Staff of the
Minnesota Environmental Quality Board
Centennial Office Building, Room 300
658 Cedar Street
St. Paul, MN 55155
January 16, 2005
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MINNESOTA
SOUTH DAKOTA

Table of Contents

TABLES

FIGURES

APPENDICES

APPENDIX A—ENVIRONMENTAL ASSESSMENT SCOPING ORDER

APPENDIX B—COMMENT LETTERS

APPENDIX C—ROUTE SEGMENT IMPACT TABLES

APPENDIX D—ROUTE SEGMENT LOCATION MAP AND AERIAL PHOTOS

1.0 Overview

The Project Northern States Power Company, d/b/a Xcel Energy, is proposing to own, construct, and operate a 115 kilovolt (kV) high voltage transmission line from the existing Buffalo Ridge Substation, located south and east of Lake Benton in Lincoln County, Minnesota, to the existing White Substation in Brookings County, South Dakota. The line will be approximately 28 miles in length, of which approximately 18.6 miles will be in Minnesota. As part of the project, Xcel Energy will expand the Buffalo Ridge Substation.

In addition, Xcel Energy is proposing to construct a new substation along this line that will be called the Yankee Substation. Xcel Energy is also requesting authorization to reroute approximately 1.9 miles of the existing Lake Yankton-Pipestone 115 kV line to remove the line from the Hole-in-the-Mountain Wildlife Management Area and the Nature Conservancy's Hole-in-the-Mountain Prairie.

Route Permit. Xcel Energy is required to obtain a Route Permit from the EQB identifying the route along which the new transmission line can be built. Minnesota Statutes section 116C.57, subd. 2. The Route Permit will also identify the site or sites needed for the proposed Yankee Substation and authorize expansion of the Buffalo Ridge Substation.

The Process. An application for a Route Permit for a proposed new High Voltage Transmission Line (HVTL) is considered by the Environmental Quality Board in accordance with the requirements of Minnesota Rules Chapter 4400. These rules require that a number of procedural steps be followed in considering any transmission line project, including providing public notice of the project and holding a public information meeting shortly after a permit application is submitted, preparing an Environmental Assessment (EA), holding a public hearing after the EA is completed, and bringing the matter to the EQB for a final decision.

Certificate of Need. In March 2003, the Minnesota Public Utilities Commission issued a Certificate of Need for this new line. PUC Docket No. E-002/CN-01-1958. The issue of need will not be examined in this proceeding before the EQB.

Environmental Assessment. As part of its review of an application for a Route Permit, the EQB is required to prepare a document called an Environmental Assessment (EA). Minnesota Statutes section 116C.575, subd. 2, part 4. In the EA, the EQB evaluates the potential impacts of the project along the route proposed by the applicant and along possible alternative route segments that are identified. The EA also discusses ways to mitigate these potential impacts.

The public is given an opportunity to participate in the development of the scoping decision, which identifies the routes and impacts that will be evaluated in the EA.

Major Issues. The EQB must determine the appropriate route for the new transmission line. The EQB must evaluate any alternative routes or route segments authorized by the EQB Chair scoping order. In addition, the EQB must determine which of the five possible sites for the new Yankee Substation should be chosen. The EQB may also include conditions in the Route Permit it issues if certain conditions are found to be necessary and appropriate.

Public Hearing. The EQB is required to hold a public hearing on the application for a route permit. Minnesota Statutes section 116C.575, subd. 6. The hearing is scheduled for February 3, 2005, at 2:00 p.m. & 7:00 p.m., Midwest Center for Wind Energy, 2390 Lincoln County Highway 1, Hendricks, MN.

A member of the EQB staff will preside at the hearing. Interested persons will have an opportunity at the hearing to ask questions about the project and to make comments that will become part of the administrative record. The EQB staff will ensure that the record created at the hearing is preserved and transmitted to the Board. The final decision on the issuance of the permit will be made by the EQB. It is anticipated that this matter will come before the EQB for a final decision at its monthly meeting in March 2005.

Further Information. Persons interested in receiving future notices regarding this matter can register their names on the EQB webpage at http://www.mnplan.state.mn.us/mailinglist.html or by contacting Larry Hartman, Environmental Quality Board, 658 Cedar Street, Centennial Building, Room 300, St. Paul, Minnesota 55155, phone (651) 296-5089, e-mail:

larry.hartman@state.mn.us

Finally, many of the documents of interest regarding this matter, including this Environmental Assessment, are available online at: http://www.eqb.state.mn.us/Docket.html?Id=7768. The final Route Permit issued to Xcel Energy will also appear on this webpage.

2.0 Introduction

Xcel Energy, has made a joint application to the Minnesota Environmental Quality Board (EQB) for a Route Permit authorizing construction of a HVTL and the Yankee Substation pursuant to the provisions of the Power Plant Siting Act (Minnesota Statutes Sections 116C.51 to 116C.69).

2.1 Project Description

Xcel Energy, is proposing to own, construct, and operate a 115 kilovolt (kV) HVTL between the existing Buffalo Ridge Substation, located south and east of Lake Benton in Lincoln County, Minnesota, a new Yankee Substation in Lincoln County, and another new substation that will tie into the exisitng White Substation in Brookings County, South Dakota. Xcel Energy is also requsting authorization to reroute approximately 1.9 miles of the existing Lake Yankton-Pipestone 115 kV line to make it possible to remove a 1.4 mile segment of that line from the Hole-in-the-Mountain Wildlife Management Area and the Nature Conservancy's Hole-in-the-Mountian Prairie. These improvements are collectively referred to througout the EA as "the Project."

2.2 Project Purpose

This proposed 115 kV HVTL and three other HVTL projects, which were authorized by the Minnesota Public Utilities Commission (PUC) as part of the 2003 Certificate of Need, are intended to provide transmission outlets for existing and proposed wind generation from the Buffalo Ridge area in southwestern Minnesota. See Figure A and discussion in section 3.1. This proposed transmission line application is the fourth of four Xcel Energy transmission line proposals authorized by the PUC on March 11, 2003. See PUC *Order Granting Certificates of Need Subject to Conditions* (PUC Docket No. E-002/CN-01-1958).

2.3 Sources of Information

Much of the information used in this EA is derived from documents prepared by Xcel Energy and its consultants. These include, the "Application for Certificate of Need (CON) and Draft Environmental Report", December 26, 2001, and the "Xcel Energy Application to the Minnesota Environmental Quality Board for a Route Permit", dated August 10, 2004, hereinafter referred to as the "Permit Application." The entire Xcel Energy route permit application, maps, appendices and other documents may be viewed at the EQB website at link:

http://www.eqb.state.mn.us/Docket.html?Id=7768.

Discussion of Electromagnetic Field (EMF) issues came primarily from the white paper developed by the Minnesota Interagency Task Force led by the Minnesota Health Department, hereinafter known as "EMF White Paper." Other information sources include Environmental Assessments prepared by EQB staff on other transmission line projects.

First hand information was gathered by MEQB staff field inspection in September 2004 and review of aerial photography along the proposed route and alternative route segment.

3.0 Regulatory Framework

In Minnesota, most of the larger HVTL projects go through a two stage regulatory process. First, application is made to the PUC for a Certificate of Need (CON). If the CON is granted, the utility must then obtain a Route Permit from the EQB. The Route Permit determines where the HVTL will be located.

3.1 Certificate of Need Requirement

The PUC must have granted a utility a CON before any EQB route permit is issued. See Minnesota Statutes section 216B.243 and Minnesota Rules Chapter 7849.0120. In preparing its CON application for this project, the applicant evaluated several transmission system alternatives, each capable of improving transmission outlet capacity for wind powered electrical generation.

Public hearings on the CON application were held in May, June and July of 2002 in southwestern Minnesota and in St. Paul. On March 11, 2003, the PUC determined that Xcel Energy demonstrated the need for four transmission facilities to move 825 MW of wind generation from Buffalo Ridge and granted certificates of need to Xcel Energy to build four HVTLs. PUC Docket No. E-002/CN-01-1958.

The proposed Buffalo-White 115 kV Transmission Line is the last of the of the four approved transmission lines that will be built pursuant to the PUC's March 11, 2003, Order. The other three proposed transmission lines include:

- A new 345 kV transmission line connecting the Lakefield Junction Substation to the Split Rock Substation in South Dakota (currently before the EQB as Docket No. 03-73-TR-XCEL and online at:

  http://www.eqb.state.mn.us/Docket.html?Id=6466

- A new 115 kV transmission line connecting a new Nobles County Substation, located on the Lakefield Junction-Split Rock 345 kV line, with a new Fenton Substation and the existing Chanarambie Substation on Buffalo Ridge (currently before the EQB as Docket No. 03-73-TR-XCEL and online at: http://www.eqb.state.mn.us/Docket.html?Id=6466; and

- A new 161 kV transmission line extending from the Lakefield Junction Substation in Jackson County to the Fox Lake Substation in Martin County. This project was granted a route permit by the EQB in September 2004. EQB Docket No. 03-64-TR-XCEL at:

  http://www.eqb.state.mn.us/Docket.html?Id=3843

Issuance or denial of certificates of need shall be the sole and exclusive prerogative of the Public Utilities Commission and those determinations and certificates shall be binding upon other state departments and agencies, regional, county, and local governments and special purpose government districts. See Minnesota Statutes section 216B.243. subd 7.

The Power Plant Siting Statute (Minnesota Statutes section 116C.53 subd. 2**)** states: "When the Public Utilities Commission has determined the need for the project under section 216.B243 or 216B.2425, questions of need, including size, type, and timing; alternative system configurations; and voltage are not within the board's siting and routing authority and must not be included in the scope of environmental review conducted under sections 116C.51 to 116C.69."

3.2 Route Permit Requirement

Minnesota Statutes sections 116C .57 subd. 2 states that "No person may construct a high voltage transmission line without a route permit from the Environmental Quality Board." Minnesota Statutes section 116 C.57 subd. 2a. states, "Any person seeking to construct a large electric power generating plant or a high voltage transmission line must apply to the board for a site permit or a route permit." A "High Voltage Transmission Line" means "a conductor of electric energy and associated facilities designed for and capable of operation at a nominal voltage of 100 kilovolts or more" according to Minnesota Statutes section 116C.52 subd 4. The proposed Xcel Energy 115 kV HVTL between the Buffalo Ridge Substation in Lincoln County, Minnesota, and the White Substation in Brookings County, South Dakota, and the other associated facilities proposed as part of the project meet this definition. Xcel Energy also proposes to construct a new 115 kV Yankee Substation approximately midway along the new Buffalo Ridge to White transmission line and a 1.9 mile reroute of the existing Lake Yankton-Pipestone 115 kV transmission line.

On August 10, 2004, Xcel Energy applied to the EQB for a route permit for the proposed 115 kV power line and associated facilities.

In this instance, Xcel has requested that the EQB review this project under the "Alternative Permitting Process" which is a 6 month review process for transmission lines between 100 kV and 200 kV (Minnesota Statutes section 116C.576). See Minnesota Rules parts 4400.2000 through 4400.2950 for applicable requirements of this process to the proposed transmission line project.

3.3 Environmental Assessment

For this project, and all other transmission projects using the alternative route permitting process the EQB prepares an Environmental Assessment. The EA contains information on the human and environmental impacts and methods to mitigate impacts of the proposed project. The EA is the only state environmental review document required to be prepared on the project by the EQB.

The EA will assist the board in making its decision on exactly what route and substation site or sites to approve and what conditions to attach to the final permit. The route permit issued by the EQB at the conclusion of this review process will specify conditions to minimize impacts of the proposed HVTL and associated facilities.

The EQB held a public meeting on this project, as required by Minnesota Rules part 4400.2500, in the Lincoln County project area on September 22, 2004. This meeting provided the public with an opportunity to learn about the proposed project, to suggest other route alternatives, and to identify concerns that should be addressed by the EQB in the EA. Public comments on the scope of the EA were accepted until October 25, 2004. Copies of the five comment letters received by the EQB are included in Appendix B.

After consideration of the public comments, the Chair of the EQB issued a Scoping Order on November 1, 2004. A copy of this order is in Appendix A.

Xcel Energy's proposed route (segments A, B, C, D, E, and F in Minnesota), and one alternative route segment, segment J, included in the scope of the EA are the only routing options being reviewed in this EA, along with Xcel Energy's proposed five substation sites. The route segments and substation sites are shown in Figure 1. Detailed descriptions of the route segments and substation sites are provided in Section 5. Maps and aerial photos of the proposed route segments and substation locations are included in Appendix D.

3.4 Public Hearing

Minnesota Statutes section 116C.57 subd. 2d. requires the EQB to hold a public hearing once the EA has been completed. This hearing will be held in Lincoln County and conducted by a member of the EQB staff. Interested persons may comment upon the environmental assessment at the public hearing.

Persons may testify at the hearing without being first sworn under oath. The EQB staff shall ensure that the record created at the hearing is preserved and transmitted to the EQB.

Comments received on the EA shall become part of the record in the proceeding but the Board is not required to revise or supplement the EA document. A final decision on a route permit will be made by the EQB at an open meeting within a couple of months after the public hearing, depending on scheduling opportunities.

3.5 Issues Outside EQB Authority

The EQB will not, as part of this environmental review, consider whether a different size or different type of transmission line should be built instead of the 115 kV Buffalo to White connection. Nor will the EQB consider the no-build option or other system alternatives.

4.0 Proposed Project

The proposed 115 kV transmission line and associated facilities will connect the Buffalo Ridge Substation in Lincoln County Minnesota, on the east and the White Substation in Brookings County, South Dakota on the west. The proposed route segments (A, B, C, D, E, F and J) and five proposed Yankee Substations sites that are being considered for this project are shown in Figure 1 and described in greater detail in section 5 of this EA.

Except for approximately a 0.5 mile portion along 140th street (route segment E), the entire length of the proposed routes and route segments will follow existing road and transmission line rights-of-way (ROW). Where the project parallels a road, the required ROW width will be 42.5 feet from the edge of the road (ROW). See Figure 2. When the transmission line requires all new right-of-way, the ROW width will be 75 feet. See Figure 3.

The Project will also include minor improvements to the Buffalo Ridge Substation located in the Northwest Quarter of Section 22 of Lake Benton Township, in Lincoln County, Minnesota, and the White Substation, located in the Southeast Quarter of Section 36 of White Township in Brookings County, South Dakota. Xcel Energy will construct, own, operate and maintain a short connection between the new Xcel Energy 345/115 kV substation located adjacent to the Western Area Power Administration (WAPA) 345/115 kV White Substation.

The proposed Project will support the development of wind energy in southwest Minnesota and eastern South Dakota.

4.1 Transmission Structures

Xcel is proposing to use single pole, galvanized steel, single and double circuit davit arm structures for the proposed transmission line. Single circuit structures are expected to be used for the majority of the route for reliability reasons. Xcel Energy anticipates that the tangent single circuit structures will be embedded directly into the soil, while double-circuit, angle and dead-end structures will be erected on concrete foundations approximately five to eight feet in diameter. The single circuit structures (See Figure 4), will have an average height of approximately 80 feet and an average span of 400 feet. The double circuit structures (See Figure 5), will have an average height of approximately 90 feet and an average span of 600 feet.

Certain portions of the route will be designed to accommodate existing distribution lines and 34.5 kV wind feeder lines as an underbuild to consolidate lines. Structures may have provisions

for either single circuit 34.5 kV underbuild (See Figure 6) or double circuit 34.5 kV under build (See Figure 7). Near the Yankee Substation the new 115 kV line will be designed as a new multiple circuit structure configuration to avoid transmission line congestion from any new or existing wind feeder lines and 115 kV or higher voltage transmission lines that that will also tie into the Yankee Substation in the future. Xcel Energy would like to have the flexibility to determine which portions of the route should have provisions for under build once the route and substation site are determined. In some cases where the underbuild takes place, some of the existing structures will be removed and supported on the new structures. However, some of the existing structures will remain in place to carry the existing distribution or wind feeder lines.

4.2 Conductors

Xcel Energy proposes using a bundled 795-kcmil 26/7 (Drake) aluminum core steel supported (ACSS) conductor for the transmission line. A bundled conductor configuration consists of two conductors spaced approximately 18 inches apart at the end of each insulator string. The bundled 795 ACSS conductors are rated for 600 MVA. The capacity of the bundled conductors is 3,000 amps. Average loading when the line is commissioned in 2006 is expected to be 540 amps.

Xcel Energy concluded that using bundled 795 ACSS conductors for each phase, is the better electrical solution for the Nobles to Fenton and Buffalo Ridge to White 115 kV lines in light of the expected demand for transmission access due to continued development of the wind resource in southwestern Minnesota and southeastern South Dakota.

This change to bundled conductors was prompted by the dramatic increase in wind generation interconnection requests near the proposed route for this line. With larger and larger turbines becoming the norm, the total megawatts to be interconnected along these lines is increasing even though the number of turbines or density of the turbines anticipated remains about the same. At typical Buffalo Ridge turbine densities, it is likely that more megawatts of production capacity will develop along the Buffalo Ridge to White 115 kV line than can be accommodated with a 310 MVA line. By using bundled conductors, rather than a single conductor, more megawatts of wind generation will be able to be interconnected along the 115 kV line. This design modification reflects the existing signed contracts Xcel Energy has with wind developers and other projects in the Midwest Independent System Operator (MISO) queue for interconnection studies.

By order dated July 13, 2004, the PUC approved the use of bundled 795 ACSS conductors which will double the capacity of the line. Adding a second conductor per phase adds approximately $50,000 to $100,000 per mile to the cost of the proposed line. In contrast, a completely new line on new right-of-way would cost approximately $360,000 per mile to construct.

4.3 Shield Wire

For lightning protection, Xcel Energy will use 3/8-inch EHS 7-stranded steel shield wire.

4.4 Transmission Line Right-of-Way Acquisition

Once the route permit is issued for the Project, Xcel Energy will initiate direct contact with landowners. Xcel Energy will consult with the landowners to discuss the Project in detail prior to conducting any necessary surveys and soil investigations. As the design of the line proceeds, contacts with the owners of affected properties will continue, and Xcel Energy will begin the negotiation and acquisition phase to obtain the necessary land or easement rights for the facilities.

During the acquisition phase, individual property owners will be advised as to the construction schedules, needed access to the site and any vegetation clearing required for the Project. The ROW will be cleared of the amount of vegetation necessary to construct, operate and maintain the proposed transmission line. It is standard practice to remove any vegetation that at a mature height would be a danger to the line. Also, any vegetation that is in the way of construction equipment may have to be removed.

Some structure locations may require soil analysis to assist with the design of the line. Xcel Energy will inform the landowners at the initial survey consultation that these borings may occur. An independent geotechnical testing company will take and analyze these borings. Survey crews will contact Gopher State One Call and will work with local utilities to identify underground utilities along the route to minimize conflicts with or impacts to existing utilities along the route.

Where possible, staging and lay down areas will be located within the ROW and limited to previously disturbed or developed areas. When additional property is temporarily required for construction, temporary limited easements (TLEs) may be obtained from landowners for the duration of construction. TLEs will be limited to special construction access needs or additional staging or lay down areas required outside of the proposed transmission line ROW.

4.5 Construction Procedures for this Transmission Line

Xcel Energy plans to begin construction once required approvals are obtained and easement acquisition is completed. A detailed construction schedule will be developed based upon availability of crews, outage restrictions for lines that may be affected, weather conditions and any restrictions placed on certain areas for minimizing impacts from construction.

The proposed 115 kV transmission line will be constructed at-grade for the majority of the ROW. Generally, moderately sloping terrain conditions have minimal impact on site access by most construction equipment. Flat, level terrain conditions are preferred at, and immediately around, the structure foundation location.

Each steel pole structure will require a hole drilled 12 to 30 feet deep and approximately four to eight feet in diameter, depending upon structure type. Any excess soil will be removed from the site unless otherwise requested by the landowner. The majority of structures will be direct-embedded in the soil and will require holes approximately 12 to 16 feet deep and four feet in diameter, depending upon the structure type. Double circuit, angle and dead-end structures will be anchored by a concrete foundation and would require deeper holes, approximately 15 to 25 feet for single circuit structures and 20 to 30 feet for double circuit structures. Structures located in poor or wet soil conditions may require a specially engineered foundation, such as a steel caisson that would be vibrated into the ground. Wooden poles may be used in isolated areas, such as wetlands.

Poles will be delivered to either the staked location or a Project storage yard. If the poles are delivered to the location where they will be installed, they will be placed on the ROW out of the clear zone of any adjacent roadways or designated pathways. Insulators and other hardware will be attached while the pole is on the ground. The pole will then be lifted, placed and secured on the foundation by a crane or similar heavy-duty equipment.

Once the structures have been erected, conductors will be installed by establishing stringing setup areas within the ROW. The stringing setup areas will usually be established every two miles Conductor stringing operations will also require brief access to each structure to secure the conductor wire to the insulators or to install shield wire clamps once final sag is established. Temporary guard or clearance poles will be installed as needed over existing distribution or communication lines, streets, roads, highways, railways or other obstructions after any necessary notifications are made and permits obtained. This ensures that conductors will not obstruct traffic or contact existing energized conductors or other cables.

4.6 Right-of-Way Restoration Procedures

During construction, crews will attempt to limit ground disturbance wherever possible. Upon completion of construction activities, landowners will be contacted to determine if any additional restoration due to construction is necessary. Disturbed areas will be restored to their original condition to the maximum extent practicable and as negotiated with the landowner. Post-construction reclamation activities include the removing and disposing of debris, dismantling all temporary facilities (including staging and lay down areas), leveling or filling tire ruts, employing appropriate erosion control measures and reseeding areas disturbed by construction activities with vegetation similar to that which was removed.

4.7 Right-of-Way Maintenance Procedures

Xcel Energy will periodically use the ROW to perform inspections, maintain equipment and make repairs over the life of the line. Normal ROW inspection will occur by aerial patrol. Field inspection on foot will be done on an as-needed basis. Xcel Energy will also conduct routine maintenance approximately every five years to remove undesired vegetation that may interfere with the safe and reliable operation of the proposed transmission line.

4.8 Substations

Substations serve two essential functions in a power system. Substations interconnect transmission lines and transformers and change voltages from one transmission level to another, or to a sub-transmission level. Transmissions lines are typically connected to the substation bus which in turn connects the line to the various other components in the substation.

The proposed Project will also include modifications to the existing Buffalo Ridge and White substations, and construction of the new Yankee Substation in Verdi or Drammen Township, and construction of a new substation near the White Substation in South Dakota that will tie into to White Substation.

Xcel Energy has requested that the EQB permit the expansion and improvements at the Buffalo Ridge Substation and construction of the new Yankee Substation as part of the route permit application in Minnesota. Xcel Energy plans to design the proposed Yankee Substation and Buffalo Ridge Substation to provide for future expansion.

4.9 Buffalo Ridge Substation

The Buffalo Ridge Substation is located southeast of the city of Lake Benton, in the NW ¼ of Section 22 in Lake Benton Township. The substation is owned and operated by Xcel Energy. Xcel Energy will convert this substation into a 115 kV ring. The proposed work at this substation will consist of:

- Installation of two new 115 kV circuit breakers;
- Installation of one new 115 kV line termination; and
- Upgrading to a three-position 115 kV ring bus. Existing breaker will be reused and will remain in its location.

The Buffalo Ridge Substation site will be expanded by grading and fencing approximately 30,000 square feet (approximately 0.7 acres) immediately north and east of the existing site. The area to be used for the expansion is already owned by Xcel Energy. The proposed upgrade to the Buffalo Ridge Substation will be laid out to accommodate additional lines or transformers for additional wind generation in the future.

4.10 Yankee Substation

Xcel Energy will construct a new Yankee Substation approximately midway along the new Buffalo Ridge to White transmission line. Xcel Energy is considering five sites for the substation. The Yankee Substation will be located on a 40 acre parcel in section 29, 30 or 31 of Drammen Township or section 5 or 6 of Verdi Township. Xcel Energy anticipates that approximately five acres will be graded and fenced initially and up to 12 acres may potentially be developed if the substation is expanded in the future. Xcel Energy has talked to several landowners who are interested in selling property for the substation and those sites are included in the proposed substation sites. Xcel Energy expects to continue discussions with those landowners over the next few months for the substation prior to the permit being issued for this Project.

Xcel Energy has requested flexibility in siting the proposed Yankee Substation. Xcel Energy will be discussing substation sites with landowners as the approval process proceeds

The Yankee Substation will be designed to accommodate the Buffalo Ridge to White 115 kV line, up to four future HVTLs and up to twelve 34.5 kV wind collector lines.

Potential plans for the initial and ultimate substation layout is detailed in Appendix E of Xcel Energy's application which is at:

http://www.eqb.state.mn.us/pdf/FileRegister/buffaloridgewhite/appE.pdf

4.11 Substation Property Acquisition Procedures

Buffalo Ridge Substation

All improvements at the Buffalo Ridge Substation will occur on property that is currently owned by Xcel Energy.

Yankee Substation

Xcel Energy anticipates acquiring a parcel of up to 40 acres for the Yankee Substation to provide additional buffer and flexibility for routing transmission lines and wind collection feeders in and out of the Yankee Substation. Xcel Energy anticipates the substation will later be expanded, as necessary, to meet the outlet needs of additional wind development.

4.12 Substation Construction Procedures

Construction on the substations will begin once the final designs are complete and any necessary property is acquired. The construction schedules will be developed based upon availability of crews, outage restrictions for any transmission lines that may be affected, weather conditions, spring load restrictions on roads, and any restrictions placed on certain areas for minimizing permanent impacts from construction.

Approximately five acres of land will be graded to construct the Yankee Substation. Xcel Energy anticipates that up to 12 acres may eventually be graded if additional 115 kV and 345 kV lines are required. Once the site is graded, a perimeter fence will be installed to secure the site and concrete foundations will be poured to support the substation equipment and control house. At that point, erection of the control house and substation equipment would commence.

4.13 Substation Restoration Procedures

Upon completion of construction activities, Xcel Energy will restore the areas around the substation sites. Post-construction reclamation activities will include the removing and disposing of debris, dismantling all temporary facilities (including staging areas), employing appropriate

erosion control measures and reseeding areas disturbed by construction activities with vegetation similar to that which was removed. Where appropriate, Xcel Energy will incorporate methods to screen the final site.

4.14 Substation Maintenance Procedures

Xcel Energy will periodically perform inspections, maintain equipment and make repairs over the life of the substation. Xcel Energy will also conduct routine maintenance as required to remove vegetation that may interfere with the safe and reliable operation of the substation.

5.0 Proposed Route Segments and Yankee Substation Sites

The EA Scoping Order identified the following route segments (A, B, C, D, E, F and J) to be evaluated in the EA. See Figure 1. Route segment E and J are the only proposed interchangeable route segments. They both begin and end at the same points as shown in Figure 1.

If the proposed transmission line required all new right-of-way, a 75 foot wide ROW would be necessary. However, since nearly all of the route segments being considered in this EA parallel existing electric transmission line and road rights-of-way, the right-of-way requirement is normally 42.5 feet rather than 75 feet. By sharing with other existing rights-of-way, the acreage per mile is reduced from 9.09 acres per mile to 5.15 acres per mile for the proposed transmission line project. Except for a 0.5 mile portion of Route Segment E along 140th Street the entire length of all the other route segments follows existing road and transmission line rights-of-way.

5.1 Xcel Energy Route Selection Process

In identifying a transmission line route for the proposed Xcel Energy Buffalo – White 115 kV transmission line project, Xcel Energy analyzed the study area for route attributes based on opportunities to:

- Share corridors and ROW with existing transmission lines by double circuiting or paralleling an existing line;
- Minimize impacts to reliability (i.e., consider if existing lines can be taken out of service for construction;
- Parallel roads, to help decrease the amount of ROW required (the road that requires the least amount of clearing is normally chosen);
- Parallel field lines, property lines, or railroads, where access is adequate and the transmission line would cause minimal conflicts; and
- Minimize the length of the transmission line to reduce the impact area and costs for the Project.

Xcel Energy also avoided to the extent possible, areas where an HVTL could create significant impacts. These areas include:

- High density residential areas;
- Areas where clearances are limited because of trees or nearby structures; and
- Environmentally sensitive sites such as: wetlands; archaeologically significant sites; areas with threatened, endangered and species of special concern; areas of significant biological or cultural significance; wildlife management areas and protected state and federal lands.

For the Buffalo Ridge to White transmission line, the primary routing considerations were:

- Using existing linear corridors: Xcel Energy uses existing corridors to the extent possible to ensure good access to the line and minimize impacts to adjacent land uses.
- Minimizing impacts to residences: Xcel Energy attempted to minimize impacts to residences to the extent possible by routing through areas with sufficient setbacks from the line and avoiding areas that would require significant tree clearing.
- Minimizing environmental impacts to the Hole-in-the-Mountain area: Xcel Energy has minimized impacts to the Hole-in-the-Mountain WMA and the Hole-in-the-Mountain Prairie by proposing to parallel existing road ROW and by removing a 1.4 mile portion of the existing Lake Yankton – Pipestone 115 kV transmission line from the Hole-in-the-Mountain WMA and Hole-in-the-Mountain Prairie.
- Siting of Yankee Substation: Part of the PUC's CON order requires Xcel Energy to provide access to the transmission system for small locally-owned wind generators. In order to fulfill this obligation, Xcel Energy sited the proposed Yankee Substation in an area that is accessible to small wind developers. After discussions with small wind developers in the area Xcel Energy identified potential sites in southwestern Drammen Township and northwestern Verdi Township.
- Minimizing impacts to agriculture by paralleling road ROW or consolidating facilities where feasible.

5.2 Route Segment Descriptions

This section provides detailed information on all of the proposed route segments. See Appendix C.1 through C.5 for information on specific route segment characteristics and features crossed. Table 1 provides a summary of the route segments and the potential for double circuiting with other transmission lines, wind feeder lines and distribution lines. See Appendix D for route segment map and aerial photos.

Table 1
Route Segment Descriptions
and
Preliminary Locations of Line and Underbuild Considerations

Route Segment	Route Segment Description	Length (miles)	Transmission Line Structure Type (Underbuild type is preliminary and may change)	Side of Road for Transmission Line	Notes
A	From Buffalo Ridge Substation along CR 108 to Lincoln CR 9	1.0	Single circuit 115 kV line with single circuit 34.5 kV underbuild	East	Kenetech/FP&L line to be underbuilt on new 115 kV line
	CR 9 to point where 34.5 kV line crosses to south side	1.5	Single circuit 115 kV line	South	
	From point where 34.5 kV line crosses to south side to US 75	0.5	Single Circuit 115 kV line with double circuit 34.5 kV underbuild	South	Xcel Energy would prefer wider corridor designation here in case Xcel Energy needs to build south and parallel of exisitng double circuit wind feeder line.

Route Segment	Route Segment Description	Length (miles)	Transmission Line Structure Type (Underbuild type is preliminary and may change)	Side of Road for Transmission Line	Notes
B	US 75	0.2	Single Circuit 115 kV line	East	Reroute section of existing 115 kV line
C	From US 75 to Lincoln County 9	1.0	Double Circuit 115 kV line	East	No underbuild
	From Lincoln County 9 to where new line would meet the Lake Yankton – Pipestone 115 kV transmission line	0.7	Double circuit 115 kv line with single circuit underbuild Xcel Energy requests the fexibility to use H-frame or special structures (wood or steel) here to accommodate the tie with the existing 115 kV transmission line. Xcel Energy may also need the ability to modifiy up to three structures on the existing 115 kV line to the south.	North (Changed from application)	Double circuit 34.5 kV line is on south side. Distribution line is on north. Xcel Energy designated south side in application. Xcel Energy is proposing to use the north side now, but would prefer flexibility on this section in case in some areas Xcel Energy may need to be located on south side.
D	From intersection of new line & Lake Yankton – Pipestone 115 kV transmission line along CR 9 to 160th Avenue	1.3	Single Circuit 115 kV line with single circuit underbuild of distribution line	North	See comment above on Section C

Route Segment	Route Segment Description	Length (miles)	Transmission Line Structure Type (Underbuild type is preliminary and may change)	Side of Road for Transmission Line	Notes
D	From CR 9 & 160th Avenue, along 160th Avenue for one mile	1	Single Circuit 115 kV line with double circuit underbuild	West (changed from Appllication)	Xcel would like flexbility along 160th Avenue to switch from one side of the road to the other if it appears to make sense and would provide that information to EQB prior to construction.
E	Along 160th Avenue up to140th Street	2.0	Single Circuit 115 kV line with single or double circuit underbuild	West side (changed from application)	Dckt 34.5 kV feeder is on east side. OTP 41.6 kV line is on west side for last mile. The locations of the lines change and it is difficult to determine which side is best without more detailed information.
	Along 140th Street to 130th Avenue	3.0	Single Circuit 115 kV line	North for first 1.5 miles and then south	Underbuild appears to not be required here
	Along 130th Avenue to 160th Street	2.0	Single circuit 115 kV line with single circuit 34.5 kV underbuild	West	Would accommodate feeder lines to/from Yankee
	Along 160th Street to 120th Avenue (CSAH1)!	1.0	Single circuit 115 kV line with single circuit 34.5 kV underbuild	South	Would accommodate feeder lines to/from Yankee

Route Segment	Route Segment Description	Length (miles)	Transmission Line Structure Type (Underbuild type is preliminary and may change)	Side of Road for Transmission Line	Notes
F	Along 120th Avenue/CSAH 1 to CSAH 13	2.0	Single Circuit 115 kV line Designed for double circuit 34.5 kV underbuild	West	Would accommodate feeder lines to/from Yankee
	Along CSAH 13 to SD/MN Border	1.4	Single Circuit 115 kV line Designed for double circuit 34.5 kV underbuild	South	Would accommodate feeder lines to/from Yankee
J	Along 120th Street to CSAH 1	4	Single Circuit 115 kV line	North/South	No unberbuild
J	Along CSAH 1 between 120th and 160th Street	4	Single Circuit 115 kV line	East/West	

Route Segment A (See Appendix D.1 and Air Photos-Appendix D.2)

Route Segment A (length -- 2.9 miles) starts on the east side of the existing Buffalo Ridge Substation as a single circuit line, then proceeds south and west around the south side of the Buffalo Ridge Substation to the east side of County Road (CR) 108, and immediately adjacent to the east side of CR 108, proceeding south for approximately one mile to a point where it intersects with the south side CR 9 ROW. Where CR 108 and CR 9 intersect, the line will proceed westward, adjacent to the south side of CR 9 ROW (120th Street) for approximately two miles to US Highway 75.

Route segment A will require a right-of-way 42.5 feet in width, totaling approximately 15.1 acres because it can overhang on CR ROW. Route Segment A will require approximately 39 transmission structures, temporarily impacting a total of approximately 7.13 acres. The long-term impact on agricultural land will be about 0.05 acres for this route segment.

All of the land along Route Segment A is agricultural land, primarily corn, beans and hay.

One farmstead and one set of grain storage facilities are within 300 feet of the road ROW; however, they will not be directly affected by the proposed transmission line alignment.

Route Segment A will cross two small protected wetlands. One is near the intersection of CR 108 and CR 9 in the southwest corner of Section 22 in Lake Benton Township and the other one is on the south side of CR 9 in section 28.

There are two existing 34.5 wind collector lines along CH 108. The east side of CR 108 carries the collector line from the first commercial wind farm built in 1994, the 25 Megawatt (MW) Kenetech Buffalo Ridge Wind Plant, now owned by Florida Power and Light (FP&L). The west side of CR 108 carries a double circuit 34.5 kV collector line from the 107.5 Megawatt NSP Phase II Wind Farm built by Zond in the late 1990's and the Lakota Ridge and Shaokatan Hills wind facilities, which are between 10 and 12 megawatts and were also built in the late 1990's.

Between the Buffalo Ridge Substation and CR 9, Xcel Energy will design the proposed transmission line to support an underbuild of the existing Kenetech/FP&L wind feeder line and keep it on the east side of CR 108. From the intersection of CR 108 and CR 9, Xcel Energy's existing double circuit 34.5 kV wind collector line is located on the north side of CR 9 for approximately 1.5 miles. The last half mile of the double circuit wind collector is located on the south side of CR 9. Xcel will consider rebuilding this one-half mile of double circuit 34.5 kV line on the proposed 115 kV Buffalo Ridge to White transmission line or possibly locate the 115 kV line adjacent to, but on the south side of the double circuit 34.5 kV feeder line.

Xcel Energy anticipates that up to three structures on the existing Lake Yankton to Pipestone 115 kV line near the Buffalo Ridge Substation may need to be modified or moved to accommodate the Buffalo Ridge – White 115 kV line. Xcel Energy has requested flexibility in making modification to the Lake Yankton – Pipestone 115 kV line in the vicinity of the Buffalo Ridge Substation to accommodate the Project.

Route Segment B (See Appendix D.1 and Air Photos-Appendix D.2)

Route Segment B (length -- 0.2 miles) reroutes the existing Lake Yankton – Pipestone 115 kV transmission line to the south along the east side of US 75. The Lake Yankton – Pipestone 115 kV line then joins the new Buffalo Ridge – White 115 kV line. Route Segment B allows Xcel Energy to remove a 1.4 mile segment of the Lake Yankton – Pipestone 115 kV line from the Hole-in-the-Mountain Wildlife Management Area (1.25 miles) and the Nature Conservancy's

Hole-in-the Mountain Prairie (0.15 miles).

Route Segment B would require a 42.5 foot wide ROW and two to three transmission line structures. The structures would be located in agricultural and grassland, just north of the intersection of CR 9 and Highway 75. Less than one acre of new ROW is needed for this route segment.

Route Segment C (See Appendix D.1 and Air Photos-Appendix D.3)

Route Segment C (length -- 1.7 miles) is proposed as a double circuit 115 kV line, which would support the 1.4 mile reroute of the Lake Yankton – Pipestone 115 kV line. Route Segment C would proceed south along the east side of US Highway 75 for approximately one mile until turning west along the north side of Lincoln County State Aid Highway No. 9 (CSAH) (110th Street) for approximately 0.7 miles until it intersects the existing Lake Yankton – Pipestone 115 kV transmission line. This part of the line may be built as a double circuit 115 kV line with a single circuit underbuild. When the double circuit 115 kV line meets the existing Lake Yankton – Pipestone 115 kV line, it will split off and rejoin the existing Lake Yankton – Pipestone 115 kV transmission line alignment that continues in a southwesterly direction to Pipestone.

The ROW needed for Route Segment C is 42.5 feet if it is immediately adjacent to Highway 75 and CR 9 (110th Street) ROW. About 9 acres of new ROW is needed for this route segment. The land uses crossed by this route segment include grasslands (62%) and agricultural (38%).

This route segment would require approximately 15 transmission line structures. Route segment C would temporarily impact about 5 acres of land and have a long-term impact on about 0.02 acres of land.

Xcel Energy's double circuit wind feeder line is located on the west side of US Highway 75 and on the south side of CR 9 (110th Street). Xcel Energy also has an overhead distribution line along the north side of CR 9 (110th Street).

One residence is located along the west side of US 75, near Route Segment C where it turns west to parallel the north side of CR 9. One protected wetland would be crossed where the proposed line intersects the Lake Yankton – Pipestone 115 kV transmission line. This protected wetland is also crossed by Xcel Energy's double circuit wind feeder lines built on wooden structures. If the proposed double circuit 115 kV line is built on the north side of CR 109, the double circuit wind feeder line on the south side of CR 9 will not need to be relocated until final plans are made for

modifications to CR 9.

A comment letter for the Lincoln County Highway Department, dated October 25, 2004 noted "concerns that the transmission line is designed and built to allow for future roadway improvements." See Appendix B.1. This concern applies to Route Segments C and D. Xcel Energy will work with the Lincoln County Highway Department to coordinate transmission line design requirements with future roadway improvements.

The Department of Natural Resources, letter dated October 25, 2004, (See Appendix B.2-B.2.2) noted concerns about CR 9, the possibility of relocating CR 9 south to an alignment on the Lincoln and Pipestone County Line. In order to coordinate the various interests, the DNR, Lincoln County Highway Department and Xcel will need to coordinate their respective activities with one another.

Xcel Energy would like route flexibility in this area to be on either side of the road based on needs of the Lincoln County Highway Department and the DNR Hole-in-the-Mountain Wildlife Management Area. Xcel Energy would also like the flexibility to use H-frame structures (wood or steel) or another type of structure to accommodate the tie into to the existing 115 Lake Yankton - Pipestone 115 kV line as it continues south. Xcel Energy would also like the flexibility to modify up to three structures where the proposed line ties into the Lake Yankton – Pipestone 115 kV line south of CR 9 to accommodate the tie in.

Route Segment D (See Appendix D.1 and Air Photos-Appendix D.3)

Route Segment D (length -- 2.3 miles) continues west as a single circuit 115 kV line with a single circuit underbuild along the north side of Lincoln CR 9 (110th Street) for approximately 1.3 miles before turning north for one mile along the west side of 160th Avenue, until it intersects with 120th Street. Between 110th Street and 120th Street along the west side of 160th Street the line would be designed as a single circuit 115 kV line with a single circuit or double circuit underbuild. Xcel Energy would like route flexibility in this route segment to be on either side of the road.

Xcel Energy's double circuit wind feeder line continues west along the south side of CR 9 to 160th Avenue. There is an electric distribution line on the north side of CR 9. Between 110th Street and 120th Street along 160th Avenue, Xcel Energy's double circuit wind feeder line is located on the east side of 160th Avenue and on the west side there is an overhead transmission distribution line.

A ROW of 42.5 feet would be needed for this segment which would result in acquisition of 11.7 acres of land. Route Segment D would have approximately 30 transmission line structures. Construction would temporarily impact approximately 5.53 acres and have a long-term impact on 0.04 acres of land.

Two homes are within 300 feet of the route alignment. One on the north side of 110th Street in Section 25 of Verdi Township and the other is on the east side of 160th Avenue along the west side of Section 25. There is also an active gravel operation on the south side of 110th Street. Locating the transmission line along the west side of 160th Avenue, just south of 120th Street may require partial clearing in the wind break that parallels the west side of 160th Avenue.

A small portion Route Segment D, borders the south side of the DNR Hole-in-the-Mountain Wildlife Management Area. Because of the presence of electric transmission line rights-of-way on both sides of CR 9, coupled with plans to possibly rebuild CR 9, the existing wind feeder and distribution lines in Route Segments C and D along CR 9, may need to be relocated. Xcel is requesting routing flexibility in this area to allow coordination with the Lincoln County Highway Department and the Department of Natural Resources.

Route Segment D would also cross Flandreau Creek in Section 30 of Lake Benton Township and one unnamed stream in Section 25 of Verdi Township. Protected wetlands associated with Flandreau Creek will also be crossed. The existing Xcel Energy distribution and wind feeder lines cross the wetlands, Flandreau Creek and an unnamed stream. In the low wet areas the existing wind feeder line structures (guyed poles) are deeper than normal because of poor soil conditions. This would make it difficult to modify the lines while they are energized and may down time for the wind generators, if the transmission line structures are relocated.

Route Segment E (See Appendix D.1 and Air Photos-Appendix D.4, D.5, and D.6)

Route Segment E (length -- 8 miles) begins at the intersection of 160th Avenue and 120th Street along the west side of 160th Avenue and continues northward for two miles as a single circuit 115 kV line with a single circuit underbuild. The existing double circuit wind feeder is located on the west side of 160th Street for approximately one-half mile before crossing over to the east side of 160th Street for approximately 1.5 miles. Between 130th and 140th Street, Ottertail Power has an overhead distribution line on the west side of 160th Avenue.

Route Segment E at the intersection of 160th Avenue and 140th Street, turns west and proceeds along the north side of Lincoln CR 119 (140th Street) for approximately 1.7 miles before crossing to the south side of Lincoln CR 119 (140th Street) for approximately 1.3 miles.

Route Segment E, between 160th Avenue on the east and 130th Avenue on the west does not require any underbuild for this portion of the route segment. The next 3 mile portion of Route Segment E proceeds north for two miles along the west side of 130th Avenue and west for one mile along the south side of 160th Street, which is also the Verdi and Drammen Township boundary.

The last three miles of Route Segment E could be designed as a single circuit 115 kV line with a 34.5 underbuild, to support additional wind feeder lines from wind development projects that will be built in this area. This could be done as a single circuit or double circuit underbuild and will depend somewhat on future wind development plans in the area.

Route Segment E would parallel existing road rights-of-way for nearly all of its distances, requiring a ROW of 42.5 feet, except the one-half mile that would follow an abandoned road (140th Street) which will require a 75 foot wide ROW.

This route segment would require 43 acres of new ROW. Approximately 106 transmission lines structures would be required for this segment. Nearly all of the land crossed by route segment E is agricultural land. Approximately 20 acres of land would be temporarily affected by construction of the transmission line and on a long-term basis 0.15 acres.

There are three homes within 300 feet of this 8 mile long route segment. There is a cemetery located on the south side of 140th Street in Section 15 of Verdi Township and another small family cemetery in Section 8 of Verdi Township. Both Spring and Medary Creek are crossed.

Route Segment F (See Appendix D.1 and Air Photos-Appendix D.6 & D.7)

Route Segment F (length -- 3.4 miles) proceeds north and follows the west side of CSAH 1 for two miles, then proceeds west along the south side of CSAH 13 for approximately 1.4 miles to the South Dakota border. This proposed route segment would be designed as a single circuit 115 kV line with a double circuit 34.5 kV underbuild to support wind development in South Dakota that could feed into the Yankee Substation.

Route Segment F requires a ROW 42.5 foot wide ROW. This route segment would require approximately 45 structures. Construction will impact on a temporary basis approximately 8.3 acres of land and 0.06 acres on a long-term basis. Nearly all of the land along this route segment is agricultural land.

One residence is within 300 feet of, which is located in section 19 of Drammen Township. There is one abandoned residence in the southeast corner of Section 30 in Drammen Township. In the northeast-northeast one-quarter of Section 30 there is a wooded site, suitable for building.

Route Segment J (See Appendix D.1 and Air Photos-Appendix D.4, D.5 & D.6)

Route Segment J (length -- 8 miles) is an alternative to Route Segment E, and the only route segment that is different from Xcel Energy's route proposal. Route Segment J would parallel 120th Street proceeding west for four miles, then north along County State Aid Highway (CSAH) 1 for a distance of four miles. Route Segment J, like Route Segment E would require approximately 106 structures. Construction would temporarily impact approximately 20 acres of land and 0.15 acres on a long-term basis.

This route segment would be built as a single circuit line and require a right-of-way of 42.5 feet when it is immediately adjacent to road ROW. Route Segment J may have to cross from one side of the road to the other to avoid any direct impact on the on the nine farm residences within 300 feet of the existing road ROW. Five of them are adjacent to 120th Street and four are along Lincoln County Highway 1.

Approximately 86 percent of the land crossed is agricultural and the other 14 percent is grassland and residential. Route Segment J would cross six different protected wetlands. Route Segment J would also require the clearing of more vegetation than Route Segment E. Most of the vegetation clearing will require the cutting of trees that provide shelterbelts for the farmsteads along 120th Street and Lincoln County Highway 1.

5.3 Yankee Substation

5.4 Yankee Substation and Xcel Energy Location Selection Criteria

After Xcel Energy identified possible transmission line routes, Xcel also considered several criteria in identifying proposed sites for the Yankee Substation along the proposed transmission

line route using general substation location criteria and criteria specific to the requirements of the Yankee Substation which includes the following:

- Proximity to primary roads: Substation construction requires use of large and heavy equipment, both for construction and for transporting equipment, such as transformers, to be installed at the substation. Smaller roads are often not adequately rated for the heavy equipment required. Such roads would need to be upgraded prior to construction, or maintained during and after construction to repair any damage caused by heavy equipment. Access after construction is also important for maintenance and operation. All of the substation sites under consideration are adjacent to CSAH 1, a primary road.
- Proximity to transmission lines: Xcel Energy wishes to minimize length of the transmission interconnection between the line and the substation. The sites under consideration for the Yankee Substation are all located near the proposed Buffalo Ridge to White 115 kV transmission line.
- Minimize impacts to residences: As with the routing process for transmission lines, Xcel Energy attempts to minimize substation impacts to residences. The primary impacts associated with substations are noise. All the substation sites under consideration for the Yankee Substation are located at least 1,100 feet from residences to minimize impacts (See Table 5, page 39).
- Avoid locating substations in low areas, wetlands, waterways and wildlife areas. Xcel Energy tries to avoid these sensitive areas, as they pose problems both for construction and operation of a substation. None of the substation sites under consideration are located in low areas, wetlands or wildlife areas. None of the substation sites under consideration are located adjacent to a waterway.
- Availability of a suitably sized parcel: Xcel Energy prefers to purchase sufficient land to construct the substation, provide for future expansion if necessary and provide for a buffer from residences. In the Buffalo Ridge area, a buffer between the substation operations and wind development is also desirable. Xcel Energy prefers to purchase a single parcel, rather than aggregate multiple smaller parcels for substation sites. In this case, all of the sites under consideration are large enough to meet Xcel Energy's needs.

- Availability of a willing seller: Xcel Energy prefers to work with willing sellers. Xcel Energy has been in contact with property owners of all the sites under consideration and is confident that the Company will be able to acquire the needed property through voluntary purchase. We will be discussing the purchase of a substation site with several interested landowners over the next few months and will inform EQB staff if we come to agreement with a landowner.

In addition to Xcel Energy's general substation siting criteria, criteria specific to the Yankee Substation were:

- Site near wind farm projects: Xcel Energy has consulted with wind developers in the Project area to locate the Yankee Substation in an area that maximizes interconnection opportunities and minimizes costs.

5.5 Yankee Substation Sites

Five proposed sites for the Yankee Substation have been identified by Xcel Energy in its route permit application. These five sites are also identified in the Scoping Order (See Appendix A) and discussed in the following text. See Figure 1, Appendix D.1 and Air Photos-Appendix D.11 for proposed Yankee Substation Sites. The Yankee Substation Sites under consideration are summarized in Table 2.

Table 2
Proposed Yankee Substation Sites

Site	Township Name	Section
1	Drammen	NE ¼ Sec 30
2	Drammen	SW ¼, Sec 29
3	Drammen	SE ¼, Sec 31
4	Verdi	NE ¼ Sec 6
5	Verdi	NW ¼, Sec 5

All five of the Xcel Energy proposed Yankee Substation sites are proposed on open agricultural land adjacent to a paved roadway CSAH 1) for access purposes. The five proposed sites are proposed on parcels that vary from 1,850 feet to 1,900 feet in elevation. Sites 3, 4, and 5 are located in close proximity to one another and share very similar characteristics.

Site one is located on a site that might require more cut and fill or grading work than sites 2, 3, 4 and 5. Site two appears to be surrounded by higher ground around on the north and east. A new tile outlet is located near site 2, to provide drainage for adjacent fields that are on higher ground.

Sites 3, 4, and 5 are further away from homes and might provide better access for any future wind feeder lines (34.5 kV) or HVTLs that might be built between the proposed Yankee Substation and other existing or proposed substations that may be necessary as a result of continued wind energy development in southwestern Minnesota or southeastern South Dakota.

6.0 Potential Impacts of the Project and Mitigative Measures

6.1 Introduction

This section describes the potential impacts on resources and mitigation measures to minimize impacts from construction, operation and maintenance of the proposed transmission line and associated substation facilities.

The construction of a transmission line involves both short-term and long-term impacts. An impact is a change in the status of the existing environment as a direct or indirect result of the proposed action. Direct impacts are caused by the action and occur at the same time and place. Indirect impacts are caused by the action and occur later or are farther removed in distance, but are still reasonably foreseeable. Impacts may be negative (adverse) or positive (beneficial) and temporary (short-term) or permanent or long-lasting. Short-term impacts are generally associated with the construction phase of the Project and can include crop damage, soil compaction, and noise. Long-term impacts can exist for the life of the Project and may include land use restrictions or modifications. Measures that would be implemented to reduce, minimize, or eliminate potential impacts will be taken and they are discussed under the appropriate topic and highlighted as necessary in Section 8.

It may be possible to lessen or "mitigate" potential impacts by adjusting the proposed route, selecting a different type of structure or pole, using different construction methods, or implementing any number of post-construction practices. The EQB can require the route permit applicant to use specific techniques to mitigate impacts or require certain mitigation thresholds or standards to be met through permit conditions.

Regardless of the route that is ultimately selected, there are a number of potential impacts associated with HVTLs that must be taken into account on any transmission line project. Minnesota Rules part 4400.3150 A through N, identifies fourteen factors that the EQB must consider when designating a route for a high voltage transmission line. At the EQB public information and scoping meeting, and during the comment period, interested persons expressed concerns about several issues related to this project. These issues are discussed in the following sections.

6.2 Existing Rights-of-Way

Minnesota Rules, part 4400.3150 requires the EQB to consider fourteen factors when designating a route for a HVTL. One of these fourteen factors (J) directs the Board to consider use of existing transportation, pipeline, and electrical transmission system or rights-of-way; while another factor (H) directs the Board to consider the use or paralleling of existing rights-of-way, survey lines, natural division line, and agricultural field boundaries.

A common method for mitigating impacts is corridor or right-of-way sharing. The advantages of ROW sharing include: a) reducing the amount of new right-of-way required; b) concentrating linear land uses and reducing the number of new corridors; and c) creating an incremental, rather than a new impact**.** See Appendix C.1 and C.5.

6.3 Land Use

The Project area has some of the highest elevations in Minnesota, with a topography characterized by rolling hills. The most significant physiographic feature is the Buffalo Ridge, a weathered terminal moraine feature, oriented northwest to southeast through the Project area. The proposed route segments proceed through rolling hills and farmland typical of Southwestern Minnesota and eastern South Dakota. Land use in the area is predominantly agricultural with occupied and abandoned farmsteads scattered throughout the area. The major crops in the Project area are corn and soybeans. Because of the rolling hills and steeper slopes of the Buffalo Ridge, a number of pasture and Conservation Reserve Program tracts are also found in the Project area. Despite the predominance of agricultural land uses, significant areas, most notably DNR's Hole-in-the Mountain WMA and the Nature Conservancy's Hole-in-the-Mountain Prairie area, are maintained as natural grasslands. Operating gravel pits are located in Section 36 of Verdi Township and opposite the White substation. Appendix D.10 presents a general land use map of the project area with the location of the proposed route segments.

6.4 Potential Impacts on Farming Operations

Land use features crossed or adjacent to the proposed route segments are limited to existing roadways, transmission line rights-of-way, agricultural lands, scattered farmsteads, wetlands and stream crossings.

The Project will result in permanent and temporary impacts to farmland. Permanent impacts will result from the construction of the new Yankee Substation, the expansion of the Buffalo Ridge

Substation and pole placement along the lands that the transmission line is built on. Xcel Energy estimates permanent impact to agricultural lands at approximately 13 acres for the entire Project (12 acres for the Yankee Substation, 0.7 acres for expansion of the Buffalo Ridge Substation; and 0.3 acres from permanent pole placement. During construction, temporary impacts such as soil compaction and crop damages are likely within the working right-of-way and along any temporary work space. The construction phase of the transmission line will temporarily affect approximately 50 acres of land.

The type of structures used affects the amount of cropland lost by the presence of the structures in the field. The amount of cropland lost is smallest with tubular steel towers and higher with H or K frame wooden structures. In this case the single pole structures will be used, unless H frame wooden structures or other types of structures would lessen the impacts in such areas as wetlands.

Farmers will have to take the structures into account when conducting normal farming operations. It will take additional time to work around the structures. Increased passes with farm equipment around the structures can lead to increased compaction in nearby tilled areas. The structures can cause damage to farm equipment if there is a collision.

Weed problems normally occur around transmission line poles where weed control through cultivation is not practical. These areas must be hand sprayed to prevent propagation and spread of weeds through the field. The extra time and labor involved in the hand operations will raise production costs slightly.

The aerial application of pesticides is made more difficult by the presence of a transmission line.

6.4.1 Mitigative Measures

The proposed route segments minimize impacts to farmland by paralleling existing road rights-of-way wherever it is possible. Xcel Energy will place structures approximately five feet from the edge of the road rights-of-way and field margins to minimize the loss of farmland, and to ensure access to the land near the poles. See Figure 8 for example of pole placement along road right-of-way and adjacent lands. Xcel Energy will compensate landowners for crop damages and soil compaction that occurs as the result of the proposed project. Soil compaction will be addressed by compensating landowners to repair the ground or by using contractors to come in and chisel plow the disturbed area.

6.5 Human Settlement

The transmission line primarily crosses through areas zoned agriculture. Farmsteads, both occupied and abandoned, are scattered along the route segments being considered. None of the route segments being considered will require removal of any buildings or the taking of homes. The Environmental Impact Table in Appendix C indicates that Xcel Energy's s preferred route (Segments A, B, C, D, E and F) would be within 300 feet of eight residences. A route using segments A, B, C, D, J and F would be within 300 feet of fifteen residences. Route segment E has three homes within 300 feet of it and route segment J is within 300 feet of nine residences.

High voltage transmission lines may cause a variety of potential impacts on the human, rural, and or urban environment. Generally, the impacts are confined to the right-of-way and land immediately adjacent to the right-of-way.

The main types of potential impacts on human settlement that have been attributed to HVTLs are people's concerns about the proximity of these facilities to homes, farmsteads, businesses or other commercial activities.

This proposed transmission line project will have not have a significant impact on human settlement patterns.

Activities during construction of the transmission line also constitute a temporary negative impact in areas of human settlement and activities. These include the traffic, noise, dust and physical disruption which can occur with any construction project.

HVTL facilities, wherever they are located, cause some changes in the existing natural environment. As noted earlier, these changes can be brought about by the construction process, the physical presence of the line, operation, maintenance and repair of the facilities, or by management of the transmission line right-of-way. The level of impact varies both with the type of activity, and with the nature of the existing environmental features.

Displacement of a business or home would occur only if the final location of the transmission line would be too close and NESC requirements could not be met. The NESC identifies minimum vertical and horizontal clearances from a conductor to a building or structure. In most cases, the transmission structure can be located or configured to accommodate NESC minimum clearances to buildings. In some situations, minor changes in the line route can avoid a particular building or structure. There is no building along the route segments proposed for this Project

that would require relocation due to the new transmission line and associated substation facilities. Displacement of any residential homes or businesses is not anticipated.

6.6 Public Health and Safety

Proper safeguards will be implemented for construction and operation of the facility. The Project will be designed with the local, state, NESC and Xcel Energy standards regarding clearance to ground, clearance to crossing utilities, clearance to buildings, strength of materials and ROW widths. Xcel Energy construction crews and/or contract crews will comply with local, state, NESC and Xcel Energy standards regarding installation of facilities and standard construction practices. Established Xcel Energy and industry safety procedures will be followed during and after installation of the transmission line. This will include clear signage during all construction activities.

The proposed transmission line will be equipped with protective devices to safeguard the public from the transmission line in the unlikely event that an accident occurs and a structure or conductor falls to the ground. The protective devices are breakers and relays located where the line connects to the substation. The protective equipment will de-energize the line in the unlikely event that such a situation occurs. In addition, the substation facility will be fenced and access limited to authorized personnel. The costs associated with these measures have not been tabulated separately from the overall Project costs since these measures are standard practice for Xcel Energy.

6.6.1 Mitigative Measures

Xcel Energy's design and construction standards incorporate safeguards to human health and safety. There are no additional mitigative measures necessary to address human health and safety. See discussion of electrical and magnetic fields beginning at section 6.13.

6.7 Noise

Noise is comprised of a variety of sounds of different intensities, across the entire frequency spectrum. Humans perceive sound when sound pressure waves encounter the auditory components in the ear. These components convert these pressure waves into perceivable sound. Transmission conductors and transformers at substations produce noise under certain conditions. The level of noise or its loudness depends on conductor conditions, voltage level and weather conditions.

Noise is measured in units of decibels (dB) on a logarithmic scale. Because human hearing is not equally sensitive to all frequencies of sound, certain frequencies are given more "weight." The A-weighted (dBA) scale corresponds to the sensitivity range for human hearing. Noise levels capable of being heard by humans are measured in dBA, the A-weighted sound level recorded in units of decibels. A noise level change of 3-dBA is imperceptible to human hearing. A 5-dBA change in noise level, however, is clearly noticeable. A 10-dBA change in noise levels is perceived as a doubling of noise loudness, while a 20-dBA change is considered a dramatic change in loudness. Table 3 shows noise levels associated with common, everyday sources, and places the magnitude of noise levels discussed here in context.

Table 3
Common Noise Sources and Levels

Sound Pressure Level	Typical Sources
120	Jet aircraft takeoff at 100
110	Same aircraft at 400 feet
90	Motorcycle at 25 feet
80	Garbage disposal
70	City street corner
60	Conversational speech
50	Typical office
40	Living room (without TV)
30	Quiet bedroom at night

Source: Environmental Impact Analysis Handbook, ed. by Rau and Wooten, 1980

Minnesota Rule 7030.0040 establishes standards to regulate noise levels by land use types. Land uses such as picnic areas, churches or commercial land are assigned to an activity category based

on the type of activities occurring in each respective land use. Activity categories are then sorted based on their sensitivity to traffic noise. The Noise Area Classification (NAC) is listed in the Minnesota Pollution Control Agency (MPCA) noise regulations (Minnesota Rule 7030.0050) to define the categories. Table 4 identifies the established noise standards for daytime and nighttime grouped by NAC.

Table 4
Noise Standards by Noise Area Classification

Noise Area Classification	Daytime		Nighttime	
	L_{50}	L_{10}	L_{50}	L_{10}
1	60	65	50	55
2	65	70	65	70
3	75	80	75	80

6.7.1 Potential Impacts

There will be two potential sources of audible noise from the Project; the conductors and the new Yankee Substation. Although improvements will be made at the existing Buffalo Ridge and White substations, existing noise levels will not increase at either of these locations.

Conductor Noise

The noise levels from the proposed line are comparable to the existing noise levels and will not have a significant impact on humans or the environment. Noise emission from a transmission line occurs during heavy rain and wet conductor conditions. In foggy, damp, or rainy weather conditions, power lines can create a crackling sound due to the small amount of electricity ionizing the moist air near the wires. During heavy rain the general background noise level is usually greater than the noise from the transmission line and few people are out near the line. As a result, people do not normally notice audible noise from a transmission line during heavy rain. During light rain, dense fog, snow, and other times when there is moisture in the air, transmission lines will produce audible noise at approximately household background levels. During dry weather, audible noise from transmission lines is barely perceptible.

Corona on transmission line conductors can generate electromagnetic noise that can cause interference with radio waves (primarily with AM radio stations and the video portion of TV signals) depending on the frequency and strength of a radio and television signal. Although

radio and television interference sometimes occurs, Xcel Energy investigates all such problems and corrects those problems caused by Xcel Energy facilities. Xcel Energy does not expect that there will be any impacts from the operation of the new line.

Substation Noise

Generally, noise levels during operation and maintenance of a substation are minimal. Transformers at substations produce noise under certain conditions. The level of noise, or its loudness, depends on conductor conditions, voltage level and weather conditions. The Project will not add any transformers to either Buffalo Ridge or White substations. As proposed, the new Yankee Substation will contain four transformers. Xcel Energy anticipates adding two new circuit breakers to the Buffalo Ridge substation and one new circuit breaker to the White substation. Xcel Energy does not anticipate that the addition of this equipment will increase the noise level at either location. The new Yankee substation and improvements at all substations will be designed and constructed to comply with state noise standards.

Residences are the nearest receptors to the substations and would fall under NAC 1. The nearest receptor to the Buffalo Ridge Substation is a residence located approximately 1,280 feet west of the substation.

The nearest receptors to each of the proposed Yankee Substation sites are homes. Table 5 identifies the location of noise receptors in relation to each alternative substation site.

Table 5
Location of Noise Receptors by Substation Site

Site	Nearest Receptor	Distance	Direction
1	Home	1,110	NW
2	Home	2,700	E
3	Home	4,160	N
4	Home	4,200	S
5	Home	4,175	SW

Because of the considerable distance from all potential substation sites to nearby receptors, impacts from noise will be minimal.

6.7.2 Mitigative Measures

No mitigative measures are necessary since there will be nominal corona or noise impacts from the Project. If radio or television interference occurs because of the power line, Xcel Energy will work with the affected landowner to mitigate the problems so that reception is restored.

Transformers located at the substations will comply with all industry noise standards; no further mitigation will be required.

6.8 Public Services

The project area is served by two rural water systems (Lincoln-Pipestone Rural Water and Brookings-Duel Rural Water). There are numerous water pipelines in the area, normally located adjacent to road ROW, but on private land. The Lincoln-Pipestone Rural Water system has a 10-inch water pipeline made out of plastic that is located on the south side of CR 9, between CR 108 and Highway 75, which is on the same side of the road as Route Segment A.

Xcel Energy's proposed 115 kV line and associated facilities will also be located in the telephone exchange area of Interstate Telecommunications Cooperative, Inc., located in Clear Lake, South Dakota. In an October 14, 2004, letter, Jerry Heiberger, General Manager of ITC (See Comment letter in Appendix B.5-B.5.2) commented as follows:

> ITC believes the proposed transmission line will interfere with the telecommunication services offered by ITC to its customers, because the proposed Xcel transmission line system is to be located along the same right-of-way as the telecommunications system presently in place for ITC and currently serving the cooperatives customers. Accordingly, the primary purpose of this letter is to advise the Environmental Quality Board that if the design of the wind plant collector system and related power system to be installed and operated by Xcel is not coordinated closely with the existing ITC telecommunications system, then the services provided by ITC to its customers will probably be disrupted by interference. Indeed, the customers of ITC located in and around Lake Benton, Minnesota, have reported either interference or noise disrupting their telephone services whenever there is wind collected by the current Xcel transmission line system. The current wind plant collection system was installed without any coordination by Xcel with ITC, and the interference of noise currently caused by the harvested wind remains a current problem for ITC customers in the area of Lake Benton, Minnesota.

The institute of electronic and electrical engineers has developed standards that directly address noise induced by power system onto telecommunication system. These standards measure, predict and provide potential remedies for these interference issues provided both the power company and telecommunication company apply these standards before the power systems are designed and installed.

If the standard IEEE 776 is required in the permit issued by the Environmental Quality Board and Xcel closely coordinates its design of the wind facility with the telecommunications system of ITC, then inductive interference may be avoided. Standard IEEE 776 gives explicit guidance to avoid such interference. Furthermore, ITC would like to review and work with Xcel to avoid potential inductive interference by applying standard IEEE 776, plus other related IEEE standards.

6.8.1 Mitigative Measures

Xcel Energy will work with the Lincoln -Pipestone Rural Water and Brookings-Duel Rural Water to avoid or mitigate any project related impacts on the rural water systems.

Xcel Energy will also work with ITC to design and install the transmission line to avoid any inductive interference and in conformance with all IEEE or other applicable standards designed to reduce interference.

6.9 Visual

Transmission lines and substations alter the visual landscape. Visual impacts, to a certain extent, differ according to an individual's values.

6.9.1 Potential Impacts

The proposed transmission line will be single steel poles between 80 and 90 feet tall depending upon the segment spaced approximately 400 to 600 feet apart. The ROW required for the transmission line is approximately 75 feet when the transmission line runs cross-country or 42.5 feet when the transmission line parallels existing road ROW, as it does for most of its length. The proposed line will contrast with the open agricultural areas that dominate the landscape in the Project area and will be visible to those traveling on highways, county and township roads.

Isolated trees may need to be removed for the Project, but the proposed line will not require large-scale tree clearing. The Project landscape is already dotted with wind turbines and 34.5 kV feeder lines, reducing the potential for visual intrusion from the Project. Turbines near the route are approximately two times as tall as the transmission line poles that will be used for the project and for most of the route the visual impact from the transmission line will not be significant.

The area where the aesthetic impact from the route will be noticeable is in the Hole-in-the Mountain WMA and Prairie area. The Project would remove approximately 1.4 miles of the existing Lake Yankton – Pipestone 115 kV transmission line in the Hole-in-the-Mountain WMA. Removal of this manmade feature would enhance the natural character of the DNR's Hole-in-the-Mountain WMA and the Nature Conservancy's Hole-in-the-Mountain Prairie.

The new line constructed to the east and the south of the WMA will produce some visual impact to the DNR Hole-in-the Mountain WMA and a minimal visual impact to the Nature Conservancy's Prairie area.

Substations

The visual impact from the expansion of the Buffalo Ridge Substation will not be significant. The Yankee Substation will require the development of approximately five to twelve acres of land that is currently farmed, and the area will change from cultivated fields to a more industrial character.

6.9.2 Mitigative Measures

Routing the line parallel to existing road and distribution ROW will help to minimize the Project's visual disruption to the landscape. Where possible, the transmission line will parallel existing road ROW. Nearly the entire length of the proposed route segments parallels existing road ROW.

The removal of approximately 1.4 miles of the existing Lake Yankton – Pipestone 115 kV transmission line from the Hole-in-the-Mountain WMA and Prairie would enhance the natural character of the DNR's Hole-in-the-Mountain WMA and the Nature Conservancy's Hole-in-the-Mountain Prairie. Xcel Energy estimates that these mitigative measures will add approximately $393,000 to the Project cost; approximately $49,000 to remove this portion of the Minnesota Valley – Pipestone and approximately $344,000 more than the cost of a single circuit line to construct a 1.9 mile double circuit segment around the Hole-in-the-Mountain area.

Although the new line will be a contrast to surrounding land uses, Xcel Energy has identified routes that utilize existing corridors to the greatest extent practicable. Xcel Energy will work with landowners to identify concerns related to the transmission line and visual concerns.

The proposed Yankee Substation sites are located in a sparsely populated area to minimize visual impact. The Yankee Substation will also be designed to accommodate additional transmission lines which may include up to four 115kV lines and 12 wind feeder lines.

6.10 Socioeconomic

6.10.1 Potential Impacts

Short-term impacts to socioeconomic resources will be relatively minor. The construction, operation and maintenance of the transmission line will not have a significant effect on agricultural operations. Xcel Energy estimates that approximately 58 acres of agricultural land will be temporarily impacted by the Project and 13 acres will be permanently removed from production. Project construction will not cause additional permanent impacts to other industries within the Project area.

The relatively short-term nature of the Project construction and the number of workers who will be hired from outside of the Project area should result in short-term positive economic impacts in the form of increased spending on lodging, meals and other consumer goods and services. Xcel Energy anticipates that the Project will create temporary construction jobs that will provide a one-time influx of income to the area, but no new permanent jobs.

There will also be some long-term beneficial impacts from the new lines and Yankee Substation. These benefits include an increase to the counties' tax base resulting from the incremental increase in revenues from utility property taxes based on the value of the Project. The availability of reliable power in the area will have a positive effect on local businesses and the quality of service provided to the general public. This transmission line will improve the capability of local wind generators to transport energy generated in the region. This in turn may increase the amount of wind development in the area and will contribute to the local economy through easement dollars and taxes generated due to wind farm construction and operation. The establishment of this area of Minnesota as an important producer of alternative energy sources, primarily wind, may also spur the development of wind-related businesses in the area, in turn contributing to economic growth in the region.

Once the HVTL is operational, its socioeconomic effects are generally negligible except for increases in the local tax base. The effect on the local tax base is proportional to the size of an area's tax base valuation after the construction of the HVTL. In rural areas with relatively small tax bases, the added valuation resulting from transmission lines can be significant. The exact amount of taxes contributed to the local economy by a HVTL depends on several factors, including the original cost of the line, the proportion of original cost within a specific taxing unit, and the apportionment by the Minnesota Department of Revenue on Xcel's apportionable value based on the Project's original costs. The Minnesota Department of Revenue's utility company valuation rules specify the formula for apportioning the Minnesota apportionable value. See Minnesota Rules, Chapter 8100.

6.10.2 Mitigative Measures

Socioeconomic impacts resulting from the Project will be primarily positive with an influx of wages and expenditures made at local businesses during the Project construction and increased tax revenue over the life of the Project. By supporting the existing wind generation in Lincoln County and the surrounding area, the Project will help to retain the jobs that have been created through wind development.

6.11 RECREATION

There are a variety of outdoor recreational opportunities in the Project area, including: cross-country and downhill skiing, snowmobiling, biking, hiking, canoeing, boating, fishing, camping, equestrian riding, swimming, hunting and nature observation. Appendix D shows the locations of recreation and wildlife areas within the proposed Project vicinity. The Hole-in-the-Mountain Prairie, managed by the Nature Conservancy, is located near the Project corridor. There are two WMA's located within one mile of the proposed route segments. The Prairie Highland Loop bike trail is a 68-mile that runs between Lake Benton and Split Rock State Park. The route uses existing highways and county roads, and parallels the proposed route for a portion along Lincoln CR 9 between US 75 and the Buffalo Ridge Substation.

6.11.1 Potential Impacts

No direct impacts to area recreation are anticipated. The proposed transmission line will be visible from the Hole-in-the-Mountain Prairie, the Hole-in-the Mountain and Altona WMA's and the Prairie Highland Loop bike trail in the Lake Benton area but will not interfere with the use of those recreational resources.

6.12 Archaeological and Historic Resources

6.12.1 Potential Impacts

Xcel Energy sent a letter to the Minnesota State Historic Preservation Officer (SHPO) requesting a review of the proposed Project for known archaeological and historic resources within the Project area. The SHPO responded that a search of the current SHPO databases did not identify any known historical or architectural resources within one mile of the proposed route. Five archaeological site locations were identified within one mile of the proposed route. A copy of the SHPO response is attached in Appendix H of Xcel Energy's route permit application.

The database search represents only known and recorded archaeological sites and historic architectural properties from the current SHPO databases and does not include an assessment for archaeological site potential or provide a listing of all potential historic architectural properties. Xcel Energy will evaluate whether further investigation of these sites is necessary. No impacts are anticipated; therefore, no mitigation is needed.

6.13 Electric and Magnetic Fields

An operating high voltage alternating current overhead high voltage transmission line has associated electric and magnetic fields (EMF). Both are capable, through different "coupling" mechanisms, of inducing static charges and/or currents in nearby conductive objects. With respect to public health and safety, the electrical field is a predominant concern during normal operations; only during a line to ground fault (a short circuit between a conductor and the ground) is the magnetic field of major concern. The normal magnetic field can, however, interfere with telephone and railroad communications equipment near the line.

The voltage of the transmission line, current flow in the conductors, weather conditions and the design of the transmission line cause electrical environmental effects.

Electric and magnetic fields arise from the flow of electricity and the voltage of a line. The intensity of the electric field is related to the voltage of the line and the intensity of the magnetic filed is related to the current flow through the conductors.

In the Lakefield-Fox Lake 161 kV transmission line matter (EQB Docket No. 03-64—TR-XCEL), Judge Allan W. Klein found that there was "insufficient evidence to demonstrate a cause and effect relationship between EMF exposure and any adverse health effect." ("Report and Recommendations," July 1, 2004, p17) For further findings, see the report at:

www.eqb.state.mn.us?Docket.html?Id=3843.

The EQB adopted this finding in its final action. "Findings of Fact, Conclusions and Order," September 19, 2004, p1).

6.13.1 Electric Fields

Voltage on any wire (conductor) produces an electric field in the area surrounding the wire. The electric field associated with a high voltage transmission line extends from the energized conductors to other nearby objects such as the ground, towers, vegetation, buildings and vehicles. The voltage that the electric field will induce on an object depends on the size of the object, the strength of the field, and how well the object is grounded. The electric field from a power line gets weaker as one moves away from the line. Nearby trees and building material also greatly reduce the strength of power line electric fields.

Xcel Energy calculated the electric fields for all of the various transmission line design options for this project, and they are shown in Table 6. The calculated maximum electric field at mid-span, one meter above the ground level, is 0.87 kV per meter for the proposed 115/115 kV double circuit configurations. This number is significantly less than the maximum limit of 8 kV per meter that has been a permit condition imposed by the MEQB in other HVTL route permits. This standard was implemented to prevent serious hazard from shocks when touching large objects, such as tractors, parked under larger transmission lines (500 kV). See "Public Health and Safety Effects of High Voltage Overhead Transmission Lines" prepared by Robert S. Banks, Minnesota Department of Health, 1977.

These values assume a specific design and may change slightly for other line designs. These ground level field strengths decrease with increased line height; therefore, these maximums would occur generally only near the center of each span, where the conductor is closest to the ground. The minimum ground clearance is 26 feet (or more) at maximum operating temperature. Also, the ground level electric field decreases with an increased distance from the line.

An electric field can induce voltage on conductive objects. The principal known problem with this induced voltage is with large metallic objects such as farm equipment, vehicles, structures with large metal components, wire fences, etc. If such an object is not adequately grounded when a person touches it, a current can flow through the person's body to the ground. This can, depending on the circumstances, be potentially hazardous or simply result in an annoying shock

similar to “carpet shock.” For lines operating at 230 kV or below, this is not generally regarded to be a problem.

Table 6
Calculated Electric Fields (kV/m) for Proposed 115 kV Transmission Line Designs
(3 feet above ground)

Type		Voltage	Distance to Proposed Centerline								
			-300'	-200'	-100'	-50'	0'	50'	100'	200'	300'
Single Circuit Single Steel Pole Davit Arm	115 kV	120 kV	.009	0.02	0.1	0.4	0.8	0.5	0.1	0.03	0.01
	115kV w/Single Circuit 34.5 kV Underbuild	120/36kV	.01	0.03	0.10	0.31	0.40	0.12	0.12	0.03	0.01
	115 kV w/Double Circuit 34.5 kV Underbuild	120/36/36kV	0.01	0.02	0.11	0.36	0.15	0.39	0.13	0.03	0.01
Double Circuit Single Steel Pole Davit Arm	115/115 kV Single Steel Pole Davit Arm	120/120 kV	.01	.02	.04	0.13	0.87	0.1	.01	.01	.01
	115/115 kV w/ Single circuit 34.5 kV Underbuild	120/120/36 kV	.01	.01	.03	.17	.39	.14	.01	.01	.01
	115/115 kV w/ Double Circuit 34.5 kV Underbuild	120/120/ 36/36 kV	.01	.02	.03	.12	.18	.10	.01	.01	.01

Other concerns relating to the electric fields are the possibility of accidental fuel ignition from a spark and possible long-term health effects from long-term exposure to these low strength fields.

6.13.2 Magnetic Fields

Current passing through any conductor, involving a wire, produces a magnetic filed in the area around the wire. The magnetic field associated with a high voltage transmission line surrounds the conductor and decreases rapidly with increasing distance from the conductor. The magnetic field is expressed in units of magnetic flux density, expressed as gauss (G).

The magnetic field associated with transmission line operation can induce currents and voltage in long, parallel conductors such as fences or telephone cables. The induced voltage is dependent on line geometry, the current carried on the line, the distance to the conducting object, the length of parallel, the grounding of the conducting object, and the shielding of the conducting object.

Xcel has also calculated the magnetic fields for all of the various transmission line design options for this project, and they are shown in Table 7. According to Xcel Energy, the maximum calculated ground level magnetic field produced by the normal operating current is 87 milligauss for the single pole davit arm, 115 kV line. Under peak operating conditions this increases from 87 to 146 milligauss. There are no recognized Minnesota standards for magnetic fields. The State of Florida requires the magnetic field at the edge of the right-of-way to be less than 150 mG for a 69 to 230 kV transmission line; and the state of New York limits the magnetic field at the edge of the right –of-way to less that 200 mG.

The one situation representing a potential public safety hazard is associated with a line-to-ground fault (a short circuit between a conductor and the ground, which causes extremely high and unequal currents to flow in the conductors). This high current induces hazardous voltages on parallel conductors for as long as the fault continues. Normally such a fault will cause the line to be disconnected from its power supply within about one-fourth of a second.

The operation of telephone cables and other cable communication systems can be affected by both the magnetic fields occurring during normal operations and the much larger magnetic fields occurring during a fault.

Table 7
Calculated Magnetic Flux Density (milligauss) for Proposed
115 kV Transmission Line Designs (3 feet above ground)

Structure Type		Condition	Amps	Distance to Proposed Centerline								
				-300'	-200'	-100'	-50'	0'	50'	100'	200'	300'
Single Circuit Single Steel Pole Davit Arm	115 kV	Average	540	1.1	2.6	10	30	87	32	11	3.1	1.4
		Peak	900	1.9	4.3	16	50	146	53	18	5.2	2.4
	115kV w/Single Circuit 34.5 kV Underbuild	Average	540/350	0.8	1.7	6.3	20	73	18.4	6.1	1.6	0.7
		Peak	900/700	1.3	2.9	11	36	134	32	10	2.8	1.3
	115 kV w/Double Circuit 34.5 kV Underbuild	Average	540/350/350	0.8	1.7	5.9	17	49	16	6.0	1.7	0.8
		Peak	900/700/ 700	1.3	2.9	10	29	89	28	10	2.9	1.3
Double Ciruit Single Steel Pole Davit Arm	115/115 kV	Average	540/46	0.8	1.8	6.8	21	50	13	4.9	1.5	0.7
		Peak	900/76	1.3	2.9	11	36	83	22	8.2	2.4	1.1
	115/115 kV w/Single circuit 34.5 kV Underbuild	Average	540/46/350	0.8	1.8	7.2	23	61	11	4.5	1.4	0.7
		Peak	900/76/700	1.3	3.1	12	40	112	19	7.5	2.4	1.1
	115/115 kV w/ Double Circuit 34.5 kV Underbuild	Average	540/46/350/350	0.8	1.7	6.5	18	31	11	4.4	1.4	0.6
		Peak	900/76/350/350	1.3	2.9	11	30	59	18	7.3	2.3	1.1

6.13.3 Electric and Magnetic Fields and Public Health

Unless otherwise noted, the discussion in this section is taken from an EQB staff prepared "*Environmental Assessment for Great River Energy 115 Proposal Plymouth-Maple Grove*," (EQB Docket No. 03-65-TR-GRE PMG, dated February 29, 2004).

The Minnesota Department of Health maintains a web page with information about electric and magnetic fields. The following five statements are found at http://www.health.state.mn.us/divs/eh/radiation/emf/index.html[1]

> "Even though electric and magnetic fields are present around appliances and power lines, more recent interest has focused on the potential health effects of magnetic fields. This is because some epidemiological studies have suggested that there may be an association between increased cancer risks and magnetic fields."

Interagency White Paper on EMF

In 2002, Minnesota formed an Interagency Working Group to evaluate the body of research and develop policy recommendations to protect the public health from any potential problems resulting from HVTL EMF effects. The Working Group consisted of staff from the Department of Health, the Department of Commerce, the Public Utilities Commission, the Pollution Control Agency, and the Environmental Quality Board. The Department of Health coordinated the activities of the Working Group.

In September 2002, the Working Group published its findings in a White Paper on Electric and Magnetic Field (EMF) Policy and Mitigation Options (hereinafter "White Paper").[2] The following quote from the White Paper summarizes the findings of the Working Group:

> "Research on the health effects of EMF has been carried out since the 1970's. Epidemiological studies have mixed results – some have shown no statistically significant association between exposure to EMF and health effects, some have shown a weak association. More recently, laboratory studies have failed to show such an association, or to establish a biological mechanism for how magnetic fields may cause cancer. A number of scientific panels convened by national and

[1] Minnesota Department of Health Website http://www.health.state.mn.us/divs/eh/radiation/emf/index.html

[2] A White Paper on Electric and Magnetic Field (EMF) Policy and Mitigation Options, Minnesota State Interagency Working Group on EMF Issues, September 2002, http://www.health.state.mn.us/divs/eh/radiation/emf/emfrept.pdf

> international health agencies and the United States Congress have reviewed the research carried out to date. Most concluded that there is insufficient evidence to prove an association between EMF and health effects; however many of them also concluded that there is insufficient evidence to prove that EMF exposure is safe."[3]

Given the questions and controversy surrounding this issue, several Minnesota agencies that regularly deal with electric generation and transmission formed an Interagency workgroup to provide information and options to policy-makers. Based on its review the Work Group believes the most appropriate public health policy is to take a prudent avoidance approach to regulating EMF.[4] Policy recommendations of the Work-Group include:

- apply low-cost EMF mitigation options in electric infrastructure construction projects,
- encourage energy conservation,
- encourage distributed generation,
- continue to monitor EMF research,
- encourage utilities to work with customers on household EMF issues and
- provide public education on EMF issues.[5]

The Minnesota Department of Health made the following statement in the "White Paper":

> "The Minnesota Department of Health concludes that the current body of evidence is insufficient to establish a cause and effect relationship between EMF and adverse health effects. However, as with many other environmental health issues, the possibility of a health risk from EMF cannot be completely dismissed. The uncertainty surrounding EMF health effects presents a difficult context in which to make regulatory decisions. This approach suggests that one should avoid any activity or exposure about which there are questions of safety or health, at least to the extent that an activity can be avoided easily or cheaply. "[6]

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[3] "White Paper" pg. 1
[4] "White Paper", pg. 2
[5] Ibid, pg. 2
[6] Ibid, pg. 36

Other EMF Studies

Recent studies of potential human health effects from transmission line EMF done in California[7] and for the Arrowhead line EIS in Wisconsin[8] have shown the same conclusions of no discernible health impacts from power lines. Both of these studies recommend the general precaution of minimizing unnecessary contact and advise prudent avoidance to EMF exposure.

The 1999 National Academy of Science report from its National Research Council found,

"No clear, convincing evidence exists to show that residential exposures to electric and magnetic fields (EMFs) are a threat to human health. After examining more than 500 studies spanning 17 years of research, the committee said there is no conclusive evidence that electromagnetic fields play a role in the development of cancer, reproductive and developmental abnormalities, or learning and behavioral problems. Specifically, no conclusive and consistent evidence shows that exposures to residential electric and magnetic fields produce cancer, adverse neurobehavioral effects, or reproductive and developmental effects. Committee chair Charles F. Stevens, investigator, Howard Hughes Medical Institute, and professor, Salk Institute, La Jolla, Calif. said Research has not shown in any convincing way that electromagnetic fields common in homes can cause health problems, and extensive laboratory tests have not shown that EMFs can damage the cell in a way that is harmful to human health."[9]

EMF Standards

"Electric utilities have a variety of methods for reducing EMF exposures when they upgrade or install transmission and distribution lines. The main methods for mitigating EMF include increasing distance from the line, using phase cancellation, shielding, and limiting voltage and current flow levels."[10]

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[7] California Department of Health , California EMF Program (2002), An Evaluation of Possible Risks from Electric and Magnetic Fields (EMFs) from Power Lines, Internal Wiring , Electrical Occupations and Appliances AND Policy Options in the Face of Possible Risks from Power Frequency Electric and Magnetic Fields (EMF) pg. 383

[8] Arrowhead-Weston Transmission Project, Final Environmental Impact Statement (EIS) Wisconsin Public Service Commission, Oct 10, 2000 pg 5-21

[9] National Academy of Science, National Research Council, Stevens, et al, 1999, Possible Exposure to Residential Electric and Magnetic Fields pg. 132

[10] "White Paper" pg. 2

As indicated in its application, Xcel Energy provides information to the public, interested customers and employees for them to make an informed decision about EMF. Xcel Energy will provide measurements for landowners, customers and employees who request them. In addition, Xcel Energy has followed the "prudent avoidance" guidance suggested by most public agencies. This includes using structure designs that minimize magnetic field levels and siting facilities in locations with the fewest number of people living nearby. See permit application p. 31.

These standards are designed to minimize human exposure from electric and magnetic fields.

EMF field strength decreases with increasing distance from the line. This design standard provides significant protection from electric fields for every homeowner adjacent to the proposed transmission line, even those within 30 to 40 feet of the line or right-of-way. This electric field density charge limit standard is more than sufficiently protective of human health impacts from EMF for the lower voltage 161 kV line proposed for this project.

> "Currently there are no federal or state *health-based* exposure standards for magnetic fields. This is due to the fact that there is inadequate scientific evidence to develop a health-based standard. References to safe/unsafe magnetic field levels in studies are not health-based standards; they are arbitrary exposure cut off points used by researchers, and they provide no scientific basis to evaluate or estimate potential health risks."[11]

On the basis of the most current information available and the expert advice of the Interagency workgroup on EMF lead by the Minnesota Department of Health, the EQB has not established any standard or regulatory limit on magnetic fields from HVTLs.

[11] Minnesota Department of Health Website
http://www.health.state.mn.us/divs/eh/radiation/emf/index.html

6.14 STRAY VOLTAGE

Stray voltage is defined as a natural phenomenon that can be found at low levels between two contact points in any animal confinement area where electricity is grounded. Electrical systems, including farm systems and utility distribution systems, must be grounded to the earth by code to ensure continuous safety and reliability. Inevitably, some current flows through the earth at each point where the electrical system is grounded and a small voltage develops. This voltage is called neutral-to-earth voltage (NEV). When a portion of this NEV is measured between two objects that may be simultaneously contacted by an animal, it is frequently called stray voltage. Stray voltage is not electrocution, ground currents, EMFs or earth currents.

Stray voltage has been raised as a concern on some dairy farms because it can impact operations and milk production. Problems are usually related to the distribution and service lines directly serving the farm or the wiring on a farm affecting farm animals that are confined in areas of electrical use. In those instances when transmission lines have been shown to contribute to stray voltage, the electric distribution system directly serving the farm or the wiring on a farm was directly under and parallel to the transmission line. These circumstances are considered in installing transmission line and can be readily mitigated. The new 115 kV transmission line is not proposed to run parallel to any existing distribution line for long distances. Therefore, no stray voltage issues are anticipated with this Project.

6.15 Natural Resources

HVTL facilities, wherever they are located, cause come changes in the existing natural environment. As noted earlier, these changes can be brought about by the construction process, the physical presence of the line, operation, maintenance and repair of the facilities, or by management of the transmission line right-of-way. The level of impact varies both with the type of activity, and with the nature of the existing environmental features.

6.15.1 Potential Impacts on Air Quality

Temporary impacts will occur in areas where Xcel Energy is actively constructing the transmission line. The project would generate localized pollutant emissions from the construction equipment over the entire construction duration, approximately 12 months. Vehicular emissions associated with maintenance and repair of the transmission line would be the only long-term source of emissions during the operational phase of the project.

Use of construction equipment and emissions from motor vehicles would also adversely affect air quality because mobilization of the workforce and materials for construction would emit pollutants that would contribute to existing levels.

Exhaust emissions from primarily diesel equipment will vary according to the phase of construction but will be minimal and temporary.

There will be no impact on air quality during operation of the lines.

Dust emissions (fugitive dust) would be caused by construction activities especially during site preparation and installing structure foundations, when travel would occur on unpaved roads and surfaces that would create fugitive dust. The magnitude of these emissions is influenced heavily by weather conditions and the specific construction activity taking place. Xcel Energy will employ best management practices to minimize the amount of fugitive dust created by the construction process. Fugitive dust may be controlled by spraying the working area when conditions are warranted.
There will be no significant adverse impacts to the surrounding environment because of the short and intermittent nature of the motor vehicle emissions and dust-producing construction phases.

6.15.2 Water Quality

The Project is located in the Redwood River, Big Sioux River (Medary), and Big Sioux River (Pipestone) major surface water watersheds. Individual stream and ditch crossings are listed in Table 8. The last column of the table indicates whether the body of water crossed is identified as a DNR Public Water (PWI) on the Public Waters Inventory Maps. Public waters are designated to indicate those lakes, wetlands and watercourses over which the DNR has regulatory jurisdiction. The statutory definition of public waters can be found in Minnesota Statutes section 103G.005, Subdivisions 15 and 15a. There are no USFWS Waterfowl Production Areas near the route segments.

Xcel Energy's proposed Route the line will span eight wetlands identified by the National Wetlands Inventory (NWI). Four of those wetlands are located along route segment E. Route Segment J crosses six wetlands. A route using route segment A, B, C, D, J and F would cross ten wetlands.

Many of these wetlands are hydrologically connected to area rivers and streams. The wetlands identified on the NWI maps do not necessarily represent the actual wetlands subject to protection under Section 404 of the Clean Water Act and under the Minnesota Wetland Conservation Act.

Xcel Energy will restore impacted areas within the Hole-in-the Mountain WMA using native vegetation seeding in consultation with the DNR.

Xcel Energy provides erosion control methods to be implemented to minimize runoff during substation construction. Xcel Energy will acquire a National Pollutant Discharge Elimination System (NPDES) permit, including development and implementation of a Stormwater Pollution Prevention Plan (SWPPP) for the Yankee Substation. Improvements at the Buffalo Ridge Substation will disturb less than one acre and will not require a NPDES permit.

6.15.3 Potential Impacts

During construction there is the possibility of sediment reaching surface waters as the ground is disturbed by excavation, grading and construction traffic. However, once the Project is completed, it will have no impact on surface water quality.

Temporary impacts to wetlands may occur if these areas need to be crossed during construction of the transmission line. Permanent impacts to wetlands are possible along segments C and E. Xcel Energy will attempt to span any wetlands along these segments. Use of H-frame structures will allow for a longer span, 900 feet, than the single steel poles. However, due to the width of the wetlands, spanning them may not be an option. If this is the case, it is anticipated that a maximum of two poles may be placed in these wetlands, resulting in approximately 120 ft^2 (0.003 acres) of permanent impact.

Table 8
Water Crossings by Segment

Segment	Waterbody Name	# of Crossings[1]	Public Water
A	Tributary to East Branch of Flandreau Creek	1	X
C	Flandreau Creek	1	X
C	Tributary to Flandreau Creek	1	X
D	Tributary to Willow Creek	1	
E	Spring Creek	1	X
E	Tributary to Spring Creek	1	
E	Medary Creek	1	X
E	Tributary to Medary Creek	9	X (3 crossings)
F	Tributary to Medary Creek	4	X (1 crossing)
J	Unnamed Creek	3	
J	Willow Creek	1	X
J	Spring Creek	1	X
J	Medary Crreek and Tributaries	5	X

[1] Indicates multiple crossings of the same stream.

6.15.4 Mitigative Measures

Xcel Energy will maintain sound water and soil conservation practices during construction and operation of the Project to protect topsoil and adjacent water resources and minimize soil erosion. Practices may include containing excavated material, protecting exposed soil and stabilizing restored soil. Xcel Energy will avoid major disturbance of individual wetlands and drainage systems during construction. This will be done by spanning wetlands and drainage systems where possible. When it is not possible to span the wetland, Xcel Energy will draw on several options during construction to minimize impacts:

a) When possible, construction will be scheduled during frozen ground conditions.

b) Crews will attempt to access the wetland with the least amount of physical impact to the wetland (i.e., shortest route).

c) The structures will be assembled on upland areas before they are brought to the site for installation.

d) When construction during winter is not possible, construction mats will be used where wetlands would be impacted.

6.16 Flora

Much of the land adjacent to the proposed Route is cultivated land. The areas known as Hole-in-the-Mountain WMA and Prairie are an obvious exception to the surrounding agricultural land and is representative of what was historically part of the prairie grassland region of Minnesota. Other areas that may contain native species are areas near streams and rivers.

Typically the cultivated landscape includes crops such as corn and soybean. The field margins are populated primarily by common weeds such as brome grass, ragweed's, thistles, stinging nettle, smartweeds and others. There are several well-established woodlots that are associated with homesteads along the proposed route segments. These woodlots are comprised of trees typical of the Project area, such as evergreens, ash and box elder.

Hole-in-the-Mountain WMA and Prairie are primarily a dry prairie (southwest) hill subtype but also has portions that could be classified as mesic prairie. Typically dry prairies can be characterized as having big bluestem present in the community, with mid-height and short grasses and sedges dominating, whereas mesic prairies are dominated primarily by grasses. Typical species found in dry prairies are porcupine grass, little bluestem*m*), side-oats grama, prairie june-grass), and sun-loving sedge. For the hill subtype, prairie dropseed, Indian grass, and big bluestem are important species. Forbs that are common in this type of prairie are goldenrods, purple coneflower, aromatic aster, plains paintbrush, small white beard-tongue, locoweed, and milk-vetch, among others. Mesic prairies typically have grasses such as big bluestem, prairie dropseed, little bluestem, porcupine grass, switchgrass, and prairie cordgrass.

The Hole-in-the-Mountain WMA and Prairie has ten species of trees and shrubs, 200 species of wildflowers, and over 60 species of grasses, sedges, and rushes. These lands were historically grazed by sheep and cattle, and the upland flats were cultivated. Within these areas the DNR has identified a well-established sedge meadow. Sedge meadows are dominated by sedges that grow on saturated soils. Grasses may also be present in these habitats.

On the west side of the railroad near the Hole-in-the-Mountain areas, there are documented railroad prairie fragments. These fragments were identified as part of a state-wide project documenting prairies in railroad rights-of-way. The edge of Segment D will parallel with these documented fragments for approximately 1800 feet.

The Hole-in-the-Mountain WMA and Prairie both have several types of documented flora listed as State endangered, threatened or special concern species. Details on these species are presented in Xcel Energy's route permit application at Section 4.9.

6.16.1 Potential Impacts

Flora within habitats along most of the Project route segments are typical of what will be found in an agricultural setting. Since the Project will occur along roads and agricultural lands that have been previously disturbed, no impacts to native vegetation are anticipated. Mitigative Measures

6.16.2 Mitigative Measures

Xcel Energy has discussed impacts associated with the Project in the Hole-in-the-Mountain area with DNR and Nature Conservancy representatives. See Xcel Energy route permit application (Sections 5.1.1 and 5.2.2). Xcel Energy continues to work with these parties to minimize and avoid impacts to sensitive flora along this portion of the Route. Xcel Energy will survey the route for threatened and endangered species and will span any areas to minimize the number of poles within these lands and will survey the route for threatened and endangered species in the locations where the poles will be constructed. Areas disturbed due to construction activities will be restored to pre-construction contours and will be seeded with a seed mix recommended by the local DNR management.

6.17 Removal Procedures for Existing Lines

The proposed route involves relocating a 1.4 mile portion of the existing Lake Yankton – Pipestone 115 kV transmission line currently located in the Hole-in-the Mountain Wildlife Management Area (WMA) and the Hole-in-the-Mountain Prairie. The existing line, which is built on wooden H-frame structures, will be de-energized and removed once the new line is constructed. Xcel Energy's standard procedure for taking out existing wood structures is to remove conductors from the affected portion of the line and then cut the poles off approximately five feet above the ground. Once the poles are cut down, crews move in to pull out the portion of the pole remaining in the ground.

In their July 28, 2004, comment letter, DNR staff requested that Xcel undertake removal of the existing line when the ground is frozen and shear the poles off at ground level without pulling out the poles. See Appendix H of Xcel Energy Route Permit application at:

http://www.eqb.state.mn.us/pdf/FileRegister/buffaloridgewhite/appH.pdf

Xcel Energy will continue to work with the Department of Natural Resources to determine the best procedure and most suitable access route for removing the existing line to ensure that impacts to the area are minimized. Xcel Energy will use special construction mats to minimize soil compaction in sensitive areas.

6.18 Fauna

Although most of the land adjacent to the proposed route is cultivated, there are several WMA's and a native prairie restoration in the Project area that provide habitat to a variety of animal species.

Most of the route is adjacent to cultivated land, which does not provide cover for the common organisms known to inhabit Minnesota. The primary habitats in these areas that would be used by organisms known to occur in this region are fallow farm fields, fencerows, and woodlots. A list of organisms known to occur in habitats of this region of Minnesota is included in the Xcel Energy route permit application as Appendix J.

The Hole-in-the-Mountain WMA and Prairie provide a large prairie remnant habitat for organisms dependent on plant species found in the prairie. Both the DNR and the Nature Conservancy have worked to restore and maintain these areas as habitat for fauna dependent upon prairie. Butterflies are a good example of the types of organisms that are dependent on the prairie to survive both in the larval and adult stages of their life. The larvae of butterflies use their host plant as a food source during their development. Table 14 in Xcel Energy's route permit application identifies the endangered, threatened and special concern butterfly species that have been identified in these managed areas, the preferred habitat of the adult and the host plant that is important for the larvae's survival.

6.18.1 Potential Impacts

There is minimal potential for the displacement of wildlife and loss of habitat from construction of the Project. Wildlife that inhabits natural areas could be impacted in the short term within the immediate area of construction. The distance that animals will be displaced will depend on the species. Additionally, these animals will be typical of those found in agricultural and urban settings, and should not incur population level effects due to construction.

Impacts to the butterflies known to occur within the Hole-in-the-Mountain Prairie and WMA are possible. These butterflies could be impacted either physically or by damaging their habitat or

host plant during construction. No impacts are anticipated after the transmission line has been installed.

Raptors, waterfowl and other bird species may also be affected by the construction and placement of the transmission lines. Avian collisions are a possibility after the completion of the transmission line. Waterfowl are typically more susceptible to transmission line collision, especially if the line is placed between agricultural fields that serve as feeding areas, or between wetlands and open water, which serve as resting areas.

Additionally, electrocution of large birds, such as raptors, is a concern related to distribution lines. Electrocution occurs when birds with large wingspans come in contact with either two conductors or a conductor and a grounding device. Xcel Energy transmission line design standards provide adequate spacing to eliminate the risk of raptor electrocution. As such, electrocution is not a concern related to the proposed Project.

Raptors may use the davit arm transmission structures as perches while scouting for food. Concerns have been raised in some circumstances that the raptors could impact the prairie nesting bird population due to this. There are few studies on this issue and no consistent position by the agencies. The proposed route segments do not go through any major prairie bird nesting area and should not provide an opportunity for raptors to predate those types of birds more than normal.

6.18.2 Mitigative Measures

Xcel Energy representatives met and corresponded with staff from the Minnesota DNR and the Nature Conservancy about routing issues in the vicinity of the Hole-in-the-Mountain area.

To mitigate possible impacts to the butterfly populations in the Hole-in-the-Mountain areas, Xcel Energy will identify and avoid areas known to be important to species at the site. Additionally, Xcel Energy will use construction mats to avoid compacting the soils. Areas disturbed due to construction activities will be restored to pre-construction contours and will be seeded with a DNR recommended seed mix.

Xcel Energy has been working with various state and federal agencies over the past twenty years to address avian issues. The primary methods Xcel Energy uses to address avian issues for transmission projects include:

- Working with the DNR to identify any areas that may require marking transmission line shield wires and/or to use alternate structures to reduce the likelihood of collisions; and,
- Attempting to avoid areas known as major flyways or migratory resting spots. These sites are identified through consultation with the local resource agencies managing those areas.

Xcel Energy has had success in reducing collisions on transmission lines by marking the shield wires with swan flight diverters (SFD). SFDs are preformed spiral shaped devices made of polyvinyl chloride that are wrapped around the shield wire. Xcel Energy will work with the DNR and the Nature Conservancy to determine whether SFDs or other types of avian collision markers should be used when the line is constructed.

Since the transmission line will not go through any major prairie bird nesting areas, measures to minimize raptor perching on this line will not be pursued.

6.19 Rare and Unique Natural Resources

In Xcel Energy's route permit application, Table 15 lists the rare or unique resources identified within one mile of the Project area. These resources were identified using the DNR Natural Heritage Database.

Many of the rare and unique resources identified within the Project area are associated with remnants of prairie land, which were once abundant in this area of Minnesota. Approximately 99 percent of the prairie that was present in the State before settlement has been destroyed and one-third of Minnesota's endangered, threatened and special concern species are dependent on the fragments of prairie that remain.

The Project is located within a "known concentration" area of Blanding's Turtles, a state threatened species.

6.19.1 Potential Impacts

A search of the DNR's Minnesota Natural Heritage Database identified 13 instances of threatened species, one instance of an endangered species and 29 areas of special concern within one mile of the proposed route segments. Most of the instances identified by the Natural

Heritage Database occur within the DNR's Hole-in-the-Mountain WMA and the Hole-in-the-Mountain Prairie managed by the Nature Conservancy. Topeka Shiners, a federally-listed endangered species, have been identified in area creeks and were also identified by the Minnesota Natural History Database as occurring within one mile of the proposed route. The Project will span all creeks in the area, and measures will be taken so there will be no impact to the endangered species. No impacts to rare and unique resources are anticipated for the proposed Project

In a comment letter on the Project dated June 1, 2004 (See Appendix H of Xcel Energy route permit application), DNR staff expressed concern that the Project may impact prairie communities in the Hole-in-the Mountain area. The DNR letter also noted the presence of Topeka Shiners within several streams that will be crossed by the proposed Project and identified the eastern half of the Project area as within a "known concentration" of Blanding's Turtles.

The project will cross portions of Medary Creek and its tributary that are listed as Critical Habitat for Topeka Shiners. Topeka Shiners are declining due to water quality changes in habitat due to sedimentation from accelerated soil runoff. Final Designation of critical habitat occurred on July 27, 2004 (50 CFR Part 17) for the Topeka Shiners in Minnesota. Critical habitats are areas designated by the U.S. Fish and Wildlife service that contain habitat essential for the conservation of a threatened or endangered species that may require special management considerations. The specific reaches of Medary creek that will be crossed are Reach 1a (Medary Creek) and Reach 1b (Unnamed Tributary). Reach 1a is the area from the Minnesota/South Dakota border in Section 13, Township 109N, and Range 47W and extends to Section 30, Township 110N, Range 46W. Reach 1b is a tributary of Medary Creek and extends from it's confluence in Section 18, Township 109N, Range 46W to Section 30, Township 110N, Range 46W.

Impacts to the turtles typically occur through loss of habitat and road kills during seasonal movements between April and November, peaking between June and July and again in September and October. Other potential impacts are by unintentionally trapping turtles in trenches that are created during construction and by not removing fencing (such as silt fencing) near these known concentrations of turtle nests prior to turtle hatchlings leaving the nest.

6.19.2 Mitigative Measures

Once the route alignment is established, Xcel Energy will work with Minnesota DNR representatives to minimize impact on sensitive natural resources. Xcel Energy will survey for

rare and unique natural resources along new right-of-way within the DNR and the Nature Conservancy parcels. Xcel Energy will reseed disturbed areas within the DNR and the Nature Conservancy parcels with native species. Xcel Energy does not anticipate that additional mitigative measures will be necessary.

Xcel Energy will attempt to span any habitats where aquatic organisms and native prairie fragments have been recorded or could inhabit. All other rare and unique resources will be avoided to the greatest extent practicable. As described in its route permit application in Sections 3.1.5 and 4.7.2.2, Xcel Energy will maintain sound water and soil conservation practices during construction and operation of the Project to protect topsoil and adjacent water resources and minimize soil erosion. The DNR had suggested that any disturbed soil near prairie areas be revegetated with prairie species native to Minnesota. Xcel Energy will work with the DNR to comply with this request where appropriate.

In general, Xcel Energy does not place structures in streams or cross streams with mechanical equipment. Mitigative measures for Topeka shiners will involve measures that will reduce or prevent the amount of sediment reaching adjacent waterways and may include:

- Minimizing removal of riparian vegetation. If vegetation must be removed, Xcel Energy will mulch disturbed soils and reseed or stabilize soils promptly following construction to prevent erosion of the stream bank.
- Implement the use of erosion and sediment prevention measures such as silt fences.
- When construction operations occur over the waterway, Xcel Energy will ensure that the operations are controlled in a manner to prevent materials from falling into the water body. If materials do fall into the water, they will promptly be removed by hand or by equipment working from the stream banks.

Specific mitigative measures related to Blanding's turtles include:

- Xcel Energy will survey the route to determine if any Blanding's turtles or their habitat is present along the route.
- Crews will be provided information on Blanding's turtles and their habitats. Measures to protect the turtles and their young during nesting and during movements will be provided. This will include reminders that during April and November (especially June, July, September and October) turtles may be

present on-site. Also that the DNR flyer for Blanding's Turtles will be provided to all employees working on the Project.

- Employees will be informed to be avoid turtles along the utility access and maintenance roads to reduce road kill potential.
- In turtle habitat and presence locations identified during surveys, areas disturbed during construction will be returned to original grade to ensure that any trenches that may have been created will not trap turtles.
- Turtle habitat areas will be revegetated with native grasses and forbs.

7.0 Feasibility

Transmission Lines

All of the route segments evaluated are feasible to build and present few if any significant problems. The only routing alternatives where a comparison can be made are between route segment E and J. Both route segments are 8 miles in length. Route segment J is closer to a more homes and crosses more streams than route segment E. Route segment E offers more opportunities for double circuiting and is closer to future wind projects that are expected to be located in the area.

Substations

Of the five Yankee Substation sites, there is little difference between sites 3, 4 and 5. All three of these sites are located near the intersection of CSAH 1 and 160th Street. Sites 3, 4, and 5 are actively farmed, not close to homes and are on level sites. Sites one and two are closer to homes than sites three, four and fives. Site 1 may require more cut and fill. Site 2 has higher ground to the north and east and may present more constraints for getting additional transmission lines in and out of the site area. There is also a new tile line outlet in the area that drains the higher ground around the site.

8.0 Summary of Mitigation Measures

8.1 National Electric Safety Code

Utilities must comply with the most recently published edition of the National Electric Safety Code, as published by the Institute of Electrical and Electronics Engineers, Inc., and approved by the American National Standards Institute when constructing new facilities or reinvesting capital in existing facilities. See Minnesota Statute section 326.243 and Minnesota Rules part 7826.0300 Subpart 1.

The National Electric Safety Code is a voluntary, utility-developed set of standards intended to ensure that the public is protected. The NESC covers electric supply stations and overhead and underground electric supply and communication lines, and is applicable only to systems and equipment operated by utilities or similar systems on industrial premises. For more information go to:

http://standards.ieee.org/faqs/NESCFAQ.html#q1

Xcel will design the proposed transmission line, substation modifications and all other associated facilities to meet or exceed all relevant state codes and those of the NESC. Xcel Energy adheres to or exceeds NESC standards regarding clearances to ground, clearances to crossing utilities, clearance to buildings, right-of-way widths, erecting power poles, and stringing transmission lines.

Appropriate standards will be met for construction and installation, and all applicable safety procedures will be followed after installation. The proposed transmission line will be equipped with protective devices to safeguard the public from the transmission line if an accident occurs and a structure or conductor falls to the ground. The protective equipment would de-energize the line when an event occurred. In addition, the substation facilities will be fenced and access restricted.

The proposed transmission line will be designed to meet or surpass all relevant state codes, the North American Electric Reliability Council (NERC) standards and Xcel Energy standards. Appropriate standards will be met for construction and installation and all applicable safety procedures will be followed during and after installation.

Xcel Energy construction crews or an Xcel Energy contractor will comply with local, state, National Electric Safety Code (NESC) and Xcel Energy standards regarding clearance to ground,

clearance to crossing utilities, clearance to buildings, ROW widths, erection of power poles and stringing of transmission line conductors.

8.2 Other

The only identified environmental effects that cannot be avoided are primarily short-term during the construction of the line.

Native vegetation will be maintained within the designated route that is compatible with the operation and maintenance of the transmission line.

Soils will be revegetated as soon as possible to minimize erosion or some other method will be used during construction to prevent soil erosion.

During construction temporary guard or clearance poles are installed at crossings to provide adequate clearance over other utilities, streets, roads, highways, railroads, or other obstructions after any necessary notifications are made or permit requirements met to mitigate any concerns with traffic flow or operations of other utilities.

Minor changes in the designated route can avoid a particular building or structure.

If radio or television interference occurs because of the presence of the transmission line, Xcel will mitigate the problems so that reception is restored.

Poles will be placed close to edge of road rights-of-way to ensure minimal loss of farmland, where possible.

Xcel will attempt to construct the transmission line before crops are planted.

Xcel will compensate farmers to repair compacted lands or employ contractors to chisel plow the right-of-way.

Xcel will implement practices during construction to prevent sediment from entering surface waters.

Transmission line structures will not be placed in wetlands, unless they cannot be spanned.

Where possible, construction crews will avoid crossing wetlands. Where such crossings are necessary, construction mats will be used to decrease compaction.

Crossing of streams with equipment will be avoided to the greatest extent practicable.

Xcel Energy will maintain sound water and soil conservation practices during construction and operation of the transmission line to protect topsoil on adjacent water resources and minimize soil erosion.

Erosion control measures will be implemented to minimize runoff during construction. Specific measures will be determined once the final design of the route is complete and a field review is made to determine any areas of concern. Measures such as silt fencing, straw bale fencing, mulching, seeding or mesh fabric overlay would be installed when and where appropriate. Access routes to structure locations will be reviewed prior to the mobilization of equipment so erosion concerns can be avoided or minimized. Construction crews exercise caution when equipment is within fifty feet of streams and rivers and will not drive equipment through streams or rivers that the transmission line crosses.

9.0 Required Permits and Approvals

The EQB route permit is the only State permit required for routing of the high voltage transmission line. However, other permits and approvals are required for certain activities and they are identified in Table 9.

Table 9
Permits that May be Required

Permit	Jurisdiction
Local Approvals	
Road Crossing Permits	County, Township, City
Lands Permits	County, Township, City
Building Permits	County, Township, City
Over-width Loads Permits	County, Township, City
Driveway/Access Permits	County, Township, City
State of Minnesota Approvals	
Route Permit Application (Alternative	EQB
Utility Permit (highway crossings)	MNDOT
License to Cross Public Waters	MN-DNR Division of Lands and
NPDES Permit	MPCA
Section 401 Water Quality Certification	MPCA
State of South Dakota Approvals	
SD PUC Permit	SD PUC
Federal Approvals	
Section 404 Approval	U.S. Army Corps of Engineers

9.1 Local Approvals

Road Crossing Permits

These permits may be required to cross or occupy county and township ROW.

Lands Permits

These permits may be required to occupy county, township, and city lands, watershed districts and other properties owned or regulated by these entities.

Building Permits

These permits may be required by the local jurisdictions for substation modifications and construction.

Over-width Loads Permits

These permits may be required to move over-width loads on county, township, or city roads.

Driveway/Access Permits

These permits may be required to construct access roads or driveways from county, township, or city roadways.

9.2 State of Minnesota Permit and Approvals

Route Permit (Alternative Process)

A HVTL cannot be constructed without a route permit approved by the EQB. A route permit under the Alternative Process requires the applicant to be eligible as outlined in Minnesota Rules part 4400.2000.

Utility Permit

A permit from the MNDOT is required for construction, placement, or maintenance of utility lines to be placed adjacent or across the highway ROW. These permits will be acquired once the line design is completed.

License to Cross Public Waters

The Minnesota DNR Division of Lands and Minerals regulates utility crossings over, under, or across any state land or public water identified on the Public Waters and Wetlands Maps. A license to cross Public Waters is required under Minnesota Statute, Section 84.415 and Minnesota Rules, Chapter 6135. Xcel Energy works closely with the DNR on these permits and will file for them once the line design is complete.

NPDES Permit

A National Pollutant Discharge Elimination System (NPDES) permit is required for storm-water discharges associated with construction activities disturbing soil and equal to or greater than one acre in an area. A requirement of the permit is to develop and implement a Storm-water Pollution Prevention Plan (SWPPP), which includes Best Management Practices (BMPs) to minimize discharge of pollutants from the site. Xcel Energy will apply for an NPDES permit for work at the Yankee Substation. Work at the Buffalo Ridge Substation will impact less than one acre, and will not trigger the NPDES permit.

9.3 State of South Dakota Permits and Approvals

SD PUC Permit

A permit from the South Dakota Public Utilities Commission (SD PUC) will be required for the new 345/115 kV substation that will be built adjacent to the White Substation as a part of this Project. The SD PUC requires that all associated facilities (substations greater than 250 kV) apply for a permit as outlined in South Dakota Codified Law 49-41B-11.

9.4 Federal Approvals

Section 404 Approval

Xcel Energy requires Section 404 approval from the U.S. Army Corps of Engineers when filling of a wetland or water of the United States is required. Section 404 approvals are not expected to be required for this project.

Section 401 Certification

Xcel Energy requires a Section 401 Water Quality Certification when federal approval for the project is obtained (i.e. Federal Energy Regulatory Commission permits or Army Corps of Engineers Individual Permit).

The applicant must apply for and obtain all permits required for project completion. The following state, county and local permits may be required for this project: