MINNESOTA DEPARTMENT OF COMMERCE
ENERGY FACILITY PERMITTING

ENVIRONMENTAL ASSESSMENT

ORONO SUBSTATION EXPANSION AND NEW 115KV TRANSMISSION LINE PROJECT

MPUC Docket No. E002/TL-11-223

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MINNESOTA DEPARTMENT OF COMMERCE

RESPONSIBLE GOVERNMENT UNIT

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ABSTRACT

Pursuant to the provisions of Minnesota Statutes, chapter 216E, Xcel Energy (applicant) filed a high-voltage transmission line route permit application with the Minnesota Public Utilities Commission (Commission) on June 7, 2011, for a proposed 115 kilovolt (kV) transmission line and modifications to the existing transmission lines and substations.

Xcel Energy proposes to construct the Orono Substation Expansion and new 115 kV Transmission Line Project (Project). As proposed, the Project would replace the existing 69 kV Orono Substation with a new 115 kV substation at the same location, but with a larger footprint. The Project would connect the upgraded substation to the existing Xcel Energy 115 kV transmission line 0831 through a new double circuit 115 kV transmission lines of approximately 0.4 miles. The Project, as proposed, would also relocate approximately 0.2 miles of single circuit 115 kV transmission line. While not part of the Route Permit requested by Xcel Energy, approximately 400 feet of the existing Great River Energy 69 kV transmission line BD would be rerouted around the new Orono Substation.

Minnesota Department of Commerce Energy Facilities Permitting (EFP) is tasked with conducting environmental review of the applications for transmission line route permits. The intent of this environmental assessment document and the environmental review process is to inform the public, the applicant, and decision-makers of the potential impacts from the proposed project and possible mitigations for those impacts.

Persons interested in these matters can register their names on the project contact list at http://energyfacilities.puc.state.mn.us/Docket.html?Id=32082 or by contacting: Suzanne Steinhauer, Energy Facility Permitting, 85 7th Place East, Suite 500, St. Paul, Minnesota, 55101, phone: (651)-296-2888, email: suzanne.steinhauer@state.mn.us.

Documents related to this project can be found at the above website or also by going to: https://www.edockets.state.mn.us/EFiling/search.jsp and entering "11" for Year and "223" for Number, under search criteria.

Acronyms, Abbreviations and Definitions

ACSS	Aluminum Conductor Steel Supported
BMP	best management practice
BNSF	Burlington Northern and Santa Fe
BPA	Bonneville Power Association
Commission	Minnesota Public Utilities Commission
dB	decibels
dB(A)	A-weighted sound level recorded in units of decibels
EFP	Department of Commerce Energy Facilities Permitting
ELF	Extra Low Frequency
EPRI	Electric Power Research Institute
EMF	electromagnetic field
EPA	United States Environmental Protection Agency
FEMA	Federal Emergency Management Agency
GPS	Global Positioning System
GRE	Great River Energy
HVTL	high voltage transmission line
Hz	Hertz
kV	kilovolt
kV/M	Kilovolt per meter
kWh	Kilowatt hour
MDH	Minnesota Department of Health
mG	milligauss
Mn DNR	Minnesota Department of Natural Resources
Mn DOT	Minnesota Department of Transportation
MPCA	Minnesota Pollution Control Agency
MW	Mega Watt
NAC	noise area classification
NERC	North American Electric Reliability Council
NESC	National Electrical Safety Code
NEV	Neutral-to-Earth Voltage
NIEHS	National Institute of Environmental Health Sciences
NPDES	National Pollutant Discharge Elimination System
NWI	National Wetland Inventory
OHWL	Ordinary High Water Level
ppm	parts per million
ROW	Right-of-Way
SHPO	State Historic Preservation Office
SWPPP	Stormwater Pollution Prevention Plan
UHF	Ultra High Frequency
USACE	United States Corp of Engineers
USFWS	United States Fish and Wildlife Service
WHO	World Health Organization

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1 INTRODUCTION

Xcel Energy (applicant) has made application to the Minnesota Public Utilities Commission (Commission) for a route permit under the alternative permitting process of the Power Plant Siting Act (Minnesota Statute 216E). The route permit application is for the replacement of the existing 69 kV Orono Substation with a larger 115 kV substation at the same site and for the construction of approximately 0.4 miles of double circuit 115 kV transmission line, and relocation of approximately 0.2 miles of single-circuit 115 kV transmission line.

Xcel Energy proposes to construct the Orono Substation Expansion and new 115 kV Transmission Line Project (Project). The Project is located entirely within the city of Orono in Hennepin County. As proposed, the Project would replace the existing 69 kV Orono Substation with a new 115 kV substation at the same location, but with a larger footprint. The Project would connect the new substation to the existing Xcel Energy 115 kV transmission line 0831 through a new double circuit 115 kV transmission lines of approximately 0.4 miles. Xcel Energy also proposes to relocate approximately 0.2 miles single circuit 115 kV transmission line as part of the Project. While not part of the Route Permit requested by Xcel Energy, approximately 400 feet of the existing Great River Energy (GRE) 69 kV transmission line BD would be rerouted around the expanded Orono Substation.

Xcel Energy proposes to use steel single-pole structures with spans of approximately 300 to 500 feet between poles; structure heights are anticipated to range from 70 to 90 feet for the single-circuit structures to 75 to 115 feet for the double-circuit structures. Xcel Energy is requesting a route width of approximately 400 feet, or 200 feet either side of the proposed alignment shown in the Application maps. The anticipated right-of-way for the new transmission line would be 75 feet. Xcel Energy estimates the total Project cost to be approximately $5.3 million dollars.

Energy Facility Permitting (EFP) staff is tasked with conducting environmental review of applications for high-voltage transmission line route permits. The intent of the environmental review process is to inform the public, the applicant, and decision-makers about potential impacts and possible mitigation measures for a proposed high-voltage transmission line project.

This environmental assessment (EA) covers the environmental review requirements in accordance with the Scoping Decision Document for this EA, and as outlined in Minnesota Rules 7850, for the proposed project and route permit application as follows:

Section 1.0 - Introduction

Section 2.0 – Describes the regulatory framework associated with the project, which includes information on the certificate of need criteria, route permit requirements, and the alternative permitting processes.

Section 3.0 – Provides a detailed description of the Project as proposed by Xcel Energy and the Baker Park Reserve Route Alternative. Alternatives proposed, but not carried forward for detailed analysis are also described here.

Section 4.0 – Describes the methods used when constructing the transmission line along with clean-up and restoration, maintenance procedures, and utility rights-of-way acquisition.

Section 5.0 – Details the potential impacts of the proposed project to human and natural environments and identifies measures that could be implemented to avoid, minimize or mitigate any potential adverse impacts.

Section 6.0 – Lists additional permits that may be required for the proposed project.

Section 7.0 – Provides a comparison of the routes analyzed in this EA.

Section 8.0 – References

Much of the information used in this EA is derived from documents prepared by Xcel Energy. These include Xcel Energy's *Route Permit Application for the Orono substation Replacement and New 115 kV Transmission Line Project*, June 7, 2011, along with the emails and requests for information. Discussion of electromagnetic field issues came primarily from the white paper developed by the Interagency Task Force led by the Minnesota department of Health (MDH), the National Institute for Environmental Health Sciences (NIEHS), and the World Health Organization (WHO). Additional information comes from earlier EFP environmental review documents in similar dockets, other state agencies such as the Minnesota Department of Natural Resources (MnDNR) and the Minnesota Pollution Control Agency (MPCA). Section 8.0 provides a listing of additional references used in the preparation of this EA.

2 REGULATORY FRAMEWORK

In Minnesota, no person may construct a high-voltage transmission line without a route permit from the Public Utilities Commission under Minnesota Statute 216E.03, subdivision 2. A high-voltage transmission line is defined as a conductor of electric energy and associated facilities designed for and capable of operation at a nominal voltage of 100 kV or more and is greater than 1,500 feet in length. Associated facilities of the transmission line include buildings, equipment, and other physical structures that are necessary to the operation of a high-voltage transmission line.

2.1 Certificate of Need

Pursuant to Minnesota Statute 216B.243, subdivision 2, "No large energy facility shall be sited or constructed in Minnesota without the issuance of a certificate of need by the Commission." In the case of a high-voltage transmission line, a large energy facility is defined as, (1) any high-voltage transmission line with a capacity of 200 kV or more and greater than 1,500 feet in length, and (2) any high-voltage transmission line with a capacity of 100 kV or more with more than ten miles of its length in Minnesota or that crosses a state line.

The project as proposed, a 115 kV transmission line with a length of less than one mile, does not qualify as a large energy facility and a certificate of need is not required.

2.2 Alternative Permitting Process

The proposed project is eligible for consideration under the alternative permitting process (Minnesota Rule 7850.2800) of the Power Plant Siting Act (Minnesota Statute 216E.04). The alternative permitting process is shorter than the full permitting procedures and does not require the applicant to propose alternative sites or routes to the preferred site or route, but does require the applicant to disclose rejected route alternatives and an explanation of why they were rejected.

2.3 Route Permit Application

The applicant filed a route permit application with the Commission for the Project on June 7, 2011. The Commission accepted the application as complete in an order issued on June 30, 2011. Under the alternative permitting process, the Commission has six months to issue a route permit from the date a route permit application is deemed complete. The Commission may extend this time limit for up to three months for just cause or upon agreement of the applicant.

2.4 Public Information and Scoping Meeting

EFP staff held a public information and environmental assessment scoping meeting on August 10, 2011, at the Orono City Hall in Orono, Minnesota, as required by Minnesota Rule 7850.3500. The meeting provided the public an opportunity to learn about the proposed project and the state's high-voltage transmission line route permitting process, review the applicant's route permit application, ask questions, and submit comments.

A court reporter was present at the public meeting and transcribed questions asked and comments made by the public, as well as responses from EFP staff and Xcel Energy (Department of Commerce, 2011a). Approximately seven members of the public attended the meeting.

A public comment period, ending on August 26, 2011, also provided the public an opportunity to submit comments on issues and alternative routes for consideration in the scope of the EA. Four

comment letters were received by the close of the comment period (Department of Commerce, 2011b). Xcel Energy also submitted a comment letter after the close of the public comment period addressing alternative routes and substation sites proposed during the scoping period (Xcel Energy, 2011b). After consideration of the public comments the deputy commissioner of the Department of Commerce issued the scope of the EA on September 12, 2011. The EA scoping decision document is included in **Appendix A**.

2.5 Environmental Assessment

An EA must be prepared for all high-voltage transmission projects being reviewed under the alternative permitting process. The procedures EFP staff must follow in preparing the EA are described in Minnesota Rule 7850.3700. The EA contains information on the human and environmental impacts of the proposed project as identified in the scoping decision document. It also addresses required methods to mitigate such impacts for all routes considered. The EA is the only state environmental review document required to be prepared for this project.

Upon completion of the EA, continuing procedural steps include: providing notice on the availability of the EA, scheduling and providing notice of a public hearing in the area where the project is located, and bringing the matter to the Commission for a final decision. An example of a route permit issued by the Commission for a high-voltage transmission line is provided in **Appendix D**.

Copies of the route permit application and other documents relevant to the process are available for viewing and downloading on the Commission website at: http://energyfacilities.puc.state.mn.us/Docket.html?Id=32082 or the eDockets website at: https://www.edockets.state.mn.us/EFiling/search.jsp, enter "11" for Year and "223" for Number, under search criteria.

3 PROPOSED PROJECT

Xcel Energy proposes to construct 0.6-miles of 115 kV overhead transmission line. The proposed route can be divided into two segments. The first segment consists of approximately 0.4 miles of new double-circuit 115 kV transmission line. The second segment would move approximately 0.2 miles of single circuit 115 kV transmission line from its existing alignment on two residential parcels in the Huntington Farm neighborhood onto property owned by the Hunt Farm Home Owners Association and adjacent to the Burlington Northern and Santa Fe (BNSF) railroad.

3.1 Purpose and Need

Xcel Energy states in its route permit application that Project is proposed to improve local and system reliability, reduce the risk of overloads, and allow for additional load growth in the future. The Project is one of several transmission upgrades planned in the west metro area in response to historical and anticipated load growth. As a result of load growth, many 69 kV facilities are being upgraded to 115 kV.

The current Orono Substation is a single 22 MVA bank transformer distribution substation supplied by 69 kV transmission sources. The Orono Substation is currently fed at 69 kV from two directions: Dickinson and Crow River from the west and Medina from the east. Planned upgrades anticipate conversion of the existing 69 kV line between the Medina and Plymouth Substations to 115 kV (Xcel Energy and Great River Energy, 2011). This conversion will require removal of the 115/69 kV transformer at the Medina Substation due to the substation footprint. The loss of the 115/69 kV transformer means that the eastern source feeding the Orono Substation will be lost, resulting in a radial feed (only one source) into the substation. Radial loads have lower reliability than those with two sources (Xcel Energy, personal communication, November 4, 2011).

Due to the loss of the 115/69 kV connection at Medina, there is not enough capacity on the 69 kV system to support the load in the area. If the Crow River 69 kV line were to be taken out of service, either through a system fault or inadvertent breaker operation, the result would be low voltages and system overloads. Xcel Energy planning criteria require voltages on the transmission system to stay at 90 percent of nominal voltage and lines are required to be loaded to less than 100 percent of their emergency capacity after a contingency. Leaving the Orono Substation on the 69 kV system would violate both of these Xcel Energy criteria (Ibid.).

3.2 Project Location

The proposed project would be located in the northeastern portion of the city of Orono in Hennepin County, Minnesota. Both the Xcel Energy Proposed Route and the Baker Park Reserve Route Alternative are located in Township118N, Range 23W, Sections 29, 30, and 32. A depiction of the route is shown in **Figure 1**.

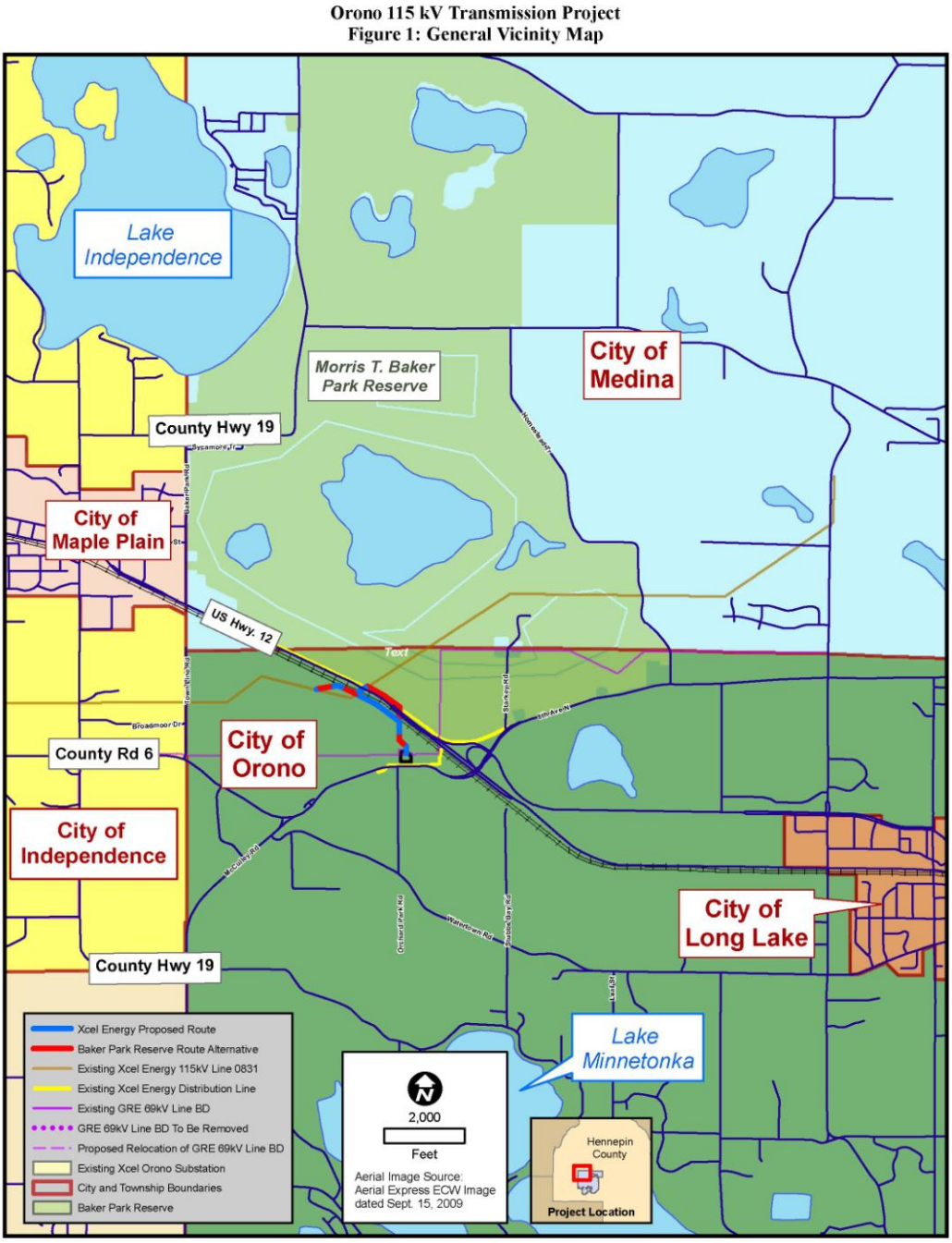
3.3 Route Descriptions

General overview maps of the routes and detailed depictions of each route are shown in **Figure 1** and in **Appendix B**. Descriptions of the routes analyzed in this EA are provided below.

Xcel Energy Proposed Route

Xcel Energy proposes to construct a new 0.4-mile long 115 kV overhead transmission line to be located in the northeastern part of the city of Orono. As described in the route permit application

Figure 1: General Vicinity Map



the new transmission line route would exit an expanded Orono Substation, head north for 866 feet as a double circuit line and then turn to the northwest along the southern edge of the BNSF railroad right-of-way for approximately 1,205 feet to the existing 115 kV transmission Line 0831. At this point, the Project would replace three existing transmission structures and approximately 1,030 feet of single circuit 115 transmission Line 0831with two new structures and approximately 1,095 feet of single circuit 115 kV transmission line, re-routing the existing line off of two residential parcels and onto adjacent Hunt Farm Home Owners Association property adjacent to the BNSF railroad. A new double-circuit corner structure would connect the single- and double-circuit portions of the project. The Project would also install fiber optic ground wire along the entire length of the Project (Xcel Energy, June 7, 2011).

Xcel Energy proposed the route because it believed that the proposed route best met the following primary objectives:

- Maximize use of existing Xcel Energy Property;
- Minimize land use impacts by routing along transportation corridors and existing distribution and transmission lines to reduce the amount of new right-of-way required;
- Minimize land use impacts by routing along natural corridors, field line, and property lines, where an existing corridor (e.g. fence line, drainage ditch, access road) is present;
- Minimize use of new right-of-way;
- Minimize impacts to residences;
- Minimize impacts to public resources, including Baker Park Reserve; and
- Minimize impacts to environmental and sensitive resources. (Ibid.)

Baker Park Reserve Route Alternative

The application identified two routes that crossed portions of the Baker Park Reserve; these were ultimately rejected by Xcel Energy in favor of the Proposed Route. During the scoping process, members of the public requested further evaluation of a route alternative that minimized impacts to private property by shifting the route burden to public lands. The Baker Park Reserve Alternative to be evaluated in the EA is the same as Alternative Route 2 described in Appendix G of the Route Permit Application. The Baker Park Reserve Alternative follows the same route as the Proposed Route for the first 866 feet out of the substation, but continues northward for approximately 326 feet across the BNSF Railroad, U.S. Highway 12, and an existing Xcel Energy distribution line. Upon exiting U.S. Highway 12 right-of-way, the route enters the Three Rivers Park District's Baker Park Reserve. From here the route continues westerly approximately 974 feet across Baker Park Reserve property connecting to existing Xcel Energy 115 kV transmission Line 0831. The route would then cross back over to the south side of U.S. Highway 12. As with the Xcel Energy Proposed Route described above this alternative would also include the relocation of transmission line 0831. The total length of this alternative with the relocation of Transmission Line 0831 is approximately 0.6 miles.

3.4 Alternatives Proposed but not Evaluated in Detail

During the scoping process, four site alternatives to expanding the Orono Substation were proposed (Department of Commerce, September 7, 2011b). None of the proposed alternative substation sites was chosen for further evaluation in the EA.

- *Alternative Substation Site 1*: This site is comprised of three small parcels owned by the Minnesota Department of Transportation (MnDOT) between U.S. Highway 12 and Sixth Avenue South and is zoned the same as Xcel Energy's current substation site. These parcels are not large enough for development of the proposed substation of 1.6 acres and additional area necessary for setbacks. The actual developable area of these parcels is likely to be further reduced based on observed wetlands on the parcels and possible additional setbacks or buffers from U.S. Highway 12. The estimated length of transmission line from this site is approximately 0.54 miles, or approximately 0.15 miles more than Xcel Energy's proposed route.

- *Alternative Substation Site 2*: This site is comprised of three parcels owned by the Park Gun Club. This site is zoned as "Rural Residential, one home to 2 acres." The Park Gun Club is a nonconforming use in that location and is prevented from making any changes to its current use, including the layout of the shooting range. It does not appear that there is sufficient space within the parcel to locate both the gun club with its current layout and the substation, resulting in a likely displacement of Gun Club. Orono zoning does not permit gun clubs within the city; the club would not be able to re-locate within Orono. Anecdotal information indicates that gun clubs are very difficult to locate within metropolitan areas. The estimated length of transmission line from this site is approximately 0.76 miles, or approximately 0.4 miles more than Xcel Energy's proposed route.

- *Alternative Site 3*: This site is owned by the city of Orono. The site is zoned as "RR-1B," allowing one home per two acres. This 39 acre property was donated to the city in 2000 for use as a passive natural environmental park; the donation specified restrictive covenants limiting improvements to the park to allow only for passive recreational uses. The city's 2030 Land Use Plan identifies this site as "Park, Recreation, and Open Space." The parcel is bounded to the north by several residential lots. Routing would require avoidance of the cloverleaf intersection of U.S. Highway 12 and Wayzata Boulevard. The estimated length of transmission line from this site is approximately 0.5 miles, or approximately 0.1 miles longer than Xcel Energy's proposed route.

- *Alternative Site 4*: This privately-owned site is zoned as "RR-1B," allowing one home per two acres. The site is identified on the City's 2030 Land Use Plan as "High Density Residential." Depending upon the location of a substation on this parcel, use of this site would require approximately 6,500 feet of new double-circuit 115 kV transmission line, or approximately 3,400 feet more than the Proposed Route. As with Alternative Site 3, use of this site would require routing around the cloverleaf intersection of U.S. Highway 12 and Wayzata Boulevard. The estimated length of transmission line from this site is approximately 1.31 miles, or approximately 0.9 miles more than Xcel Energy's proposed route.

All of the alternative substation sites would also require acquisition of new land by Xcel Energy for the substation and easements for additional transmission line to meet the purpose and need of the Project. Although no routes for the additional transmission to the alternate substation sites were developed, it appears that the alternate sites would require approximately 800 to 4,900 feet of additional double circuit 115 kV transmission compared to Xcel Energy's proposed route. Development of a new substation site would also require re-location of two existing electric distribution lines in addition to the transmission, resulting in additional impacts to new landowners.

For the above reasons, the Department concluded that further evaluation of these alternative routes would not assist in the Commission's final decision on the route permit application.

3.5 Route Width

Xcel Energy is requesting a 400 foot route width for the entire length of the proposed transmission line route. Xcel Energy has identified the extent of the requested route as 200 feet on each side of the proposed route alignment for construction of new structures and conductors, as well as on each side of the existing Line 0831 from Structure 076 to Structure 078 for replacement of Structures 076, 077, and 078 and for replacement of existing structures on residential properties. Xcel Energy also requests a route of up to 120 feet on each side of the proposed Orono Substation expansion area (Xcel Energy, personal communication, November 22, 2011).

3.6 Right-of-Way

As indicated in the route permit application, the proposed transmission line will generally require a right-of-way (ROW) of up to 75 feet (37.5 feet on either side of centerline). Xcel Energy indicates in its application that the Project may be designed to fit within a narrower right-of-way in locations with existing rights-of-way or other engineering or site considerations.

Xcel Energy indicates in its Route Permit Application that where the Project parallels a roadway or railroad, Xcel Energy anticipates placing poles approximately 5 to 10 feet within private ROW, overlapping approximately 30 feet of anticipated right-of-way with road or railroad right-of-way. As discussed in Section 5.8, compliance with Orono's Shoreland Overlay District would require that poles be placed a minimum of 30 feet outside of road ROW; this setback provision does not apply to railroad ROW.

Approximately 1,795 feet of the proposed route parallels the BNSF Railroad. Approximately 590 feet of the Baker Park Reserve Alternative Route parallels the BNSF Railroad, and approximately 1,205 feet parallels U.S. Highway 12 (Xcel Energy, personal communication, October 17, 2011). Xcel Energy has been in conversation with BNSF since the fall of 2010 to discuss routing options of the Project. Current design anticipates placement of poles five feet outside the BNSF right-of-way on the south side of the tracks. Xcel Energy applied to BNSF for a wire crossing for the Project in April, 2011. BNSF issued a Certificate of Occupancy for a rebuild of the existing crossing between Structures 076-1 and 076 and for the paralleling of transmission and railroad rights-of-way on June 24, 2011 (Xcel Energy, personal communication, October 13, 2011).

When the transmission line would be located on private property in areas such as open fields or scattered forest land, an easement for the entire ROW (up to 75 feet) would be acquired from the affected landowner(s). The 866 feet of both routes that is located on the Orono substation site owned by Xcel Energy would not require acquisition of new right-of-way. Xcel Energy anticipates that approximately 2,270 feet of new ROW would need to be acquired to construct the Project (Xcel Energy, June 7, 2011).

Table 1, below, summarizes the type of right-of-way followed by each of the two routes being evaluated.

Table 1: Percent and Type of Right-of-Way Followed

Route	Existing Right-of-Way Type and Miles Followed			Total Length
	BNSF RR	U.S. Highway 12	New/Cross Country	
Proposed Route	0.34 miles, 57 percent	N/A	0.25 miles (0.16 miles, 866 feet on Xcel Energy Property)	0.59 miles
Baker Park Reserve Alternative	N/A	0.25 miles	0.16 miles (all on Xcel Property)	0.41 miles

3.7 Conductors

High-voltage transmission line circuits generally consist of three phases, each at the end of a separate insulator, and physically supported by structures or poles. A phase consists of one or more conductors (single, double, or bundled). A typical conductor is a cable consisting of aluminum wires stranded around a core of steel wires. Shield wires are strung above the phases to prevent damage from potential lightning strikes. The shield wire may also include a fiber optic cable that allows for substation protection equipment to communicate with other substation terminals on the line.

The phases for this project would be constructed with three single steel supported aluminum conductors (ACSS) which each consist of a single conductor comprised of seven steel core strands surrounded by 26 outer aluminum strands. The separate conductors are 795,000 circular mils or approximately 1.092 to 1.139 inches in diameter. The ground to conductor height depends on overall topography and man-made obstacles and will meet or exceed the minimum clearance requirements of the National Electric Safety Code (NESC). Two $3/8^{th}$ inch diameter extra high strength steel, seven strand shield wires will be installed to protect from lightning strike. Ultimately, the transmission line would be three-phase, 60 hertz (Hz), alternating current line.

3.8 Structures

Xcel Energy proposes to use a combination of three different structure types (**Table 2**). All of the proposed structures would be single pole structures constructed of galvanized or weathering steel with heights of between 70 and 115 feet, depending upon the structure type and location (Xcel Energy, June 7, 2011, and Xcel Energy, personal communication, October 13, 2011). All structures are anticipated to be self-supporting; Xcel Energy does not anticipate use of structures requiring guy wires (Xcel Energy, personal communication, November 4, 2011). Examples of the structure proposed structure types are shown in **Figure 2.**

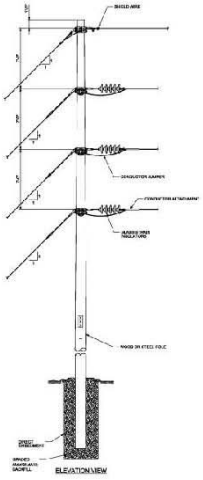
Table 2: Transmission Structure Specifications

Line Type	Structure Type	Structure Material	Location	Estimated Foundation Diameter (feet)	Structure Base Diameter (inches)	Structure Height (feet)	Span Between Structures (feet)
115 kV Single-Circuit	Single Pole Vertical Configuration with Post Insulators	Galvanized Steel, or Weathering Steel	Replaces Structure 077	5 - 7	36-42 angle structures	70 - 90	300 – 500
115 kV Single-Circuit	Single Pole, Cross Arm Y-Frame	Galvanized Steel, or Weathering Steel	Replaces Structures 076 and 078	6-8	36-48	70 - 90	300 – 500
115/115 kV Double-Circuit	Single Pole Davit Arm	Galvanized Steel or Weathering Steel	New Structures 076-1 to 076-5	6 - 8	36-48	75 - 115	300 – 500
115/115 kV Double-Circuit with Distribution Underbuild	Single Pole Davit Arm	Galvanized Steel or Weathering Steel	Alternate Structures 076-1 & 076-2	6 - 8	36-48	75 - 115	300 – 500

Source: Xcel Energy, June 7, 2011; Xcel Energy, personal communication, October 13, 2011

Figure 2: Proposed Structure Types

Double-Circuit 115/115 kV Structure



Vertical Corner or Deadend Structure

115 kV Y-Frame Structure

115 kV HP Single-Circuilt

115 kV Single-Circuit Steel Davit Arm Structure

115 kV Double-Circuit Steel Davit Arm Structure with Underbuild

3.9 Associated Facilities and Substations

The project would include replace the existing 69 kV Orono Substation with an expanded 115 kV substation at the same location. The Project would also modify Xcel Energy's existing transmission line 0831 by replacing a 1,030-foot single-circuit section with a new 1,020- foot single-circuit section. The Project would install a 2,160-foot segment of new double circuit 115 kV/115 kV transmission line between the Orono Substation and transmission line 0831. The replacement substation will not have 69 kV transmission equipment; as a result GRE's existing 69 kV Line BD will be re-routed around the replacement substation (Xcel Energy, June 7, 2011).

3.10 Cost

As provided in the route permit application, transmission line costs would vary depending on the structure type, the height and diameter and composition of the structures, the number of structures per mile, labor and hardware costs. The line construction costs include the cost of structures, insulators, conductors, and labor as well as any costs of equipment that will be used to construct the new line, but do not include right-of-way acquisition costs. Construction costs also include modifications to the Orono Substation. The estimated project costs are summarized in **Table 3**.

Table 3: Estimated Project Costs

Route	Proposed Route	Baker Park Reserve Alternative
New Transmission Line	$1.2 million	$1.3 million
Orono Substation Removal and Replacement	$4.1 million	$4.1 million
Total Project Cost	$5.3 million	$5.4 million

Source: Xcel Energy, June 7, 2011; Xcel Energy, personal communication, October 13, 2011.

Xcel Energy indicates that operating and maintenance costs for the transmission line will be nominal for several years, since the transmission line will be new and would require minimal vegetation maintenance. Xcel Energy's typical annual operating and maintenance costs, for 115 kV transmission lines in its Upper Midwest system, incorporating line and inspections, vegetation management, and maintenance and repairs as needed, are approximately $300 to $500 per mile of transmission line right-of-way. Transmission line inspections are typically performed by airplane or helicopter on a regular basis. Inspections of substations and other equipment are generally performed on an annual or semi-annual basis depending on the type of equipment. Maintenance and repairs to substations are performed on an as-needed basis with costs varying from substation to substation (Xcel Energy, 2011a).

4 FACILITY CONSTRUCTION

Project construction would begin after the appropriate federal, state, and local permits and approvals are issued. Xcel Energy would need to acquire property rights-of-way, complete soil investigations, and develop the final detailed design. The precise timing of construction would take into account the required permits and their conditions, system loading issues, existing transmission line outage restrictions, construction constraints, weather, road restrictions, mitigation or impact minimization, and availability of work force and materials. Details regarding Xcel Energy's construction practices are provided in Section 5.0 of the *Route Permit Application*.

As indicated in the route permit application, Xcel Energy designs and constructs transmission lines following construction and mitigation methods based on past experiences and in compliance with permit conditions, industry standards, and environmental factors. These practices address right-of-way clearance, staging, erecting transmission structures, and stringing transmission lines. Practices to mitigate potential construction impacts are established based on permit requirements, construction schedules, geology and topography, maintenance guidelines, inspection procedures, and encountering of sensitive environments or species and are discussed in Section 5 of this document.

Xcel Energy states that the proposed transmission line would be designed to meet or exceed local and state codes, the NESC, North American Electric Reliability Corporation (NERC) requirements and Xcel Energy standards. This includes standards relating to clearances to ground, clearance to crossing utilities, clearance to buildings, clearances over roadways, and right-of-way widths.

4.1 Utility Right-of-Way Easement Acquisition

Should the Commission select a route and issue a route permit, Xcel Energy's easement acquisition process would begin early in the detailed design phase. The Commission is not involved in the easement acquisition process.

Two portions of the Project would not require acquisition of new rights-of-way. The reconstruction between structures 076 and 076-1 over the BNSF railroad and U.S. Highway 12 would follow existing rights-of-way. The replacement substation and the first 866 feet of the transmission line would be constructed on property currently owned by Xcel Energy.

Where the transmission line would require new right-of-way, the easement acquisition process begins early in the detailed design phase. Utilities typically acquire easement rights, not fee title from landowners to accommodate transmission lines. The easement acquisition process can typically be broken down into the following steps:

Title examination. Following identification of a route in a route permit, Xcel Energy will perform a public records search of the land involved in the project to identify all persons and entities that may have a legal interest in the real estate upon which the Project will be built. A title report is then developed for each parcel to determine the owner(s) of record of the property, and to gather information regarding easements, liens, restrictions, encumbrances, and other conditions of record.

Initial contact. A right-of-way representative contacts each property owner or the property owner's representative along the route identified in the route permit to discuss the Project and how it may impact each parcel and also seeks information about any construction concerns specific to the landowner.

Initial transmission line survey. Xcel Energy provides notification to property owners along the permitted route requesting permission for survey crews to conduct preliminary survey work on the property. The survey is performed to establish the right-of-way boundaries, locate natural and man-made features along and within the right-of-way, establish the transmission centerline and determine elevations for use during detailed design. Permission may also be requested at this time to obtain soil samples to assess soil conditions and to determine appropriate foundation design.

During the initial survey the survey crew, with permission of the property owner, may place surveyor's stakes to mark the tentative or anticipated structure locations, thereby allowing the landowner to see where the structures may be located on the property. The right-of-way boundary may also be delineated showing the area that is required for safe operation of the transmission line.

Easement acquisition. Xcel Energy collects land value data and based on the impact of the easement or purchase to the market value of each parcel develops a fair market value offer. The offer of compensation is based on the specific attributes of each property, the amount of easement area, design of the transmission line, and other factors, as appropriate.

The right-of-way agent will then contact the property owner(s) to present the easement offer and discuss the amount of just compensation for the rights to construct, operate, access, and maintain the transmission facilities within the easement area. The landowner is then allowed time to consider the offer and to present any additional material that the property owner believes is relevant to determining the property's value. Almost any aspect of the easement is negotiable (Minnesota Department of Commerce, 2011c)

Eminent domain. If a negotiated settlement cannot be reached, it may be necessary for the applicant to file for eminent domain, pursuant to Minnesota Statute Chapter 117. In the eminent domain process, a judicial proceeding would commence to determine the scope of the applicant's easement and an independent commission would determine the value of the easement taken. Under Minnesota Statute 117.036, subdivision 2(a), Xcel Energy, as the acquiring authority, must obtain at least one appraisal for the property proposed to be acquired if it intends to use eminent domain proceedings to acquire a right-of-way. If the landowner desires a second opinion on the fair market value of the property, the landowner may have an appraisal made and receive reimbursement from the applicant per Minnesota Statute 117.036 subdivision 2(b).

Pre-construction owner contact. Prior to construction, the right-of-way agent would contact the owner of each parcel along the route to discuss the construction schedule and any additional requirements not discussed during the time of the easement acquisition. To ensure safe construction and operation, special consideration may be needed for fences, crops, or livestock. In each case the right-of-way agent assists in coordinating the process.

4.2 Transmission Line Structures

Construction of the transmission line would require the acquisition and preparation of rights-of-way for the transmission line, establishment of work and staging areas, installation of new single pole tangent and specialty structures, removal and reconstruction of portions of existing transmission lines, installation of safety structures at road and other utility crossings.

Construction equipment typically used on a transmission project would include tree removal equipment, mowers, cranes, backhoes, digger-derrick line trucks, track-mounted drill rigs, dump trucks, front end loaders, bucket trucks, bulldozers, flatbed tractor-trailers, flatbed trucks, pickup trucks, concrete trucks and various trailers.

Transmission line structures are generally designed for installation at existing grades. However, along areas with more than 10 percent slope, working areas may have to be graded level or fill would be brought in to create working pads. If the landowner permits, Xcel Energy prefers to leave the leveled working pads in place for future maintenance activities, as necessary. If the landowner does not agree, Xcel Energy will grade the site back to its original condition and any imported fill is removed from the area.

Typically existing roads or trails that run parallel or perpendicular to the proposed route are used to access the actual transmission line right-of-way. Where use of private field roads or trails is necessary, permission from the property owner would be obtained by Xcel Energy prior to access. In some cases, new access roads or temporary lay down areas may be required due to problematic structure locations, when no current access is available, or existing access is inadequate for the heavy equipment used in construction. Should these areas fall outside the right-of-way, temporary easements would be arranged with the affected landowner. These temporary easements are not typically part of the route permit issued by the Commission for high-voltage transmission lines.

Staging areas are often established for a project to provide a location to deliver and store materials required for construction. Xcel Energy anticipates using the Orono Substation site or other nearby Xcel Energy substation sites as staging areas for the Project. If needed, additional temporary staging areas outside the transmission line right-of-way or at non-Xcel Energy sites will be obtained through rental agreements.

Transmission line structures are typically delivered to their staked location or to a designated staging area depending on delivery and contractor availability. If the poles are delivered to a staked site, they are typically designed for the specific site location at which they are to be constructed and are placed along the right-of-way out of the clear zone of any adjacent highways or designed pathways and marked for visibility.

One of the structures is considered to be a "tangent" structure, or in a straight line with both its adjacent structures. Xcel Energy anticipates that this structure would be direct embedded. Direct embedding would generally require an excavation of a three to four foot diameter hole at least 15 feet deep or greater, depending on soil conditions and other factors. The poles are typically framed with insulators and hardware on the ground and then lifted and placed in the hole via a bucket truck or a crane, depending on the weight of the structure. The poles would be backfilled with native soils or crushed rock depending on soil and design conditions. In lowland areas, a galvanized steel culvert may be also inserted for pole stability due to poor soil capacity. Any excess soil would be thin spread or removed from the site as required.

Seven of the eight proposed structures for the Project are angle structures and would be set on drilled pier concrete foundations to support the higher stress. The drilled pier would typically have a diameter of six to eight feet and typically require an excavation depth of approximately 25 feet, depending on soil conditions and design requirements. The excavation is filled with concrete and a concrete foundation is set, the pole or structure is then bolted to the foundation.

Special construction techniques to minimize impacts to environmentally sensitive areas, such as wetlands, are discussed in Section 5.0 of this document. Xcel Energy indicates in its route permit application that environmentally sensitive areas and wetland areas may require special construction techniques beyond what is described above.

4.3 Conductors

Once the structures have been erected, conductors and shield wires are installed by establishing stringing setup areas within the right-of-way. Stringing operations require brief access to each structure to secure the conductors wire to the insulators or the shield wire to shield wire clamps once final sag is established. These stringing setup areas are typically located every two miles along the project right-of-way. The wires are pulled with a rope lead that connects to every structure through a dolly attached at the insulator/clamp location.

Temporary guard or clearance poles are installed at crossings to provide adequate clearance over other utilities, streets, roads, highways, railroads, or other obstructions. Necessary notifications are made or permit requirements are followed, to mitigate any concerns with traffic flow or operations of other utilities.

4.4 Orono Substation

Replacement of the existing 69 kV Orono Substation with an expanded 115 kV Orono Substation would take place in the southwest portion of the 16 acre parcel owned by Xcel Energy. The site of the expanded 115 substation will encompass the existing 69kV site. No additional land would need to be acquired or rights-of-way obtained for the proposed substation work. A schematic of the replacement substation is included in **Appendix B**, **Figure B-5**.

Xcel Energy will grade a total area of approximately 1.6 acres, for the substation and re-aligned access road to ensure both a stable base for the substation equipment and proper drainage and runoff control (Xcel Energy, personal communication, October 31, 2011). Based on preliminary grading plans for the substation site, Xcel Energy estimates that grading would require approximately 15,700 cubic yards of cut and, depending upon the dimensions of a berm that may be constructed at the substation site, between 3,800 and 6,100 cubic yards of fill (Xcel Energy, personal communication, November 18, 2011). A stormwater pond will be installed in accordance with the Stormwater Pollution Prevention Plan (SWPP) prepared for the Project. During grading, the driveway will also be rerouted to end at the entrance to the replacement substation. Following grading a perimeter fence would be installed to contain the substation equipment. After installation of the fence, concrete foundations would be placed to support the substation equipment and gravel laid throughout the fenced area. After the surface area is prepared, substation components would be delivered on tractor-trailer trucks and installed on their foundations.

The termination structure for Great River Energy's 69 kV transmission line will be removed, but switchgear from the existing 69 kV substation will be reused in the replacement substation. During construction a mobile substation will be installed to ensure that service is maintained until the 115 kV source is energized.

Transmission facilities at the replacement Orono Substation will consist of:

- A new 115-13.8 kV substation with a 28 mega volt ampere (MVA, 118-14.3 transformer;

- Two 115 kV line terminations, each with a motor –operated transmission line switch with a quick-break line dropping whip;
- One single-phase coupling capacitor voltage transformer with carrier accessories;
- A 2000 amp wave trap with line tuner; and
- Three 76 kV maximum continuous operating voltage station class surge arresters.

Xcel Energy has or will prepare the required SWPPP and obtain a National Pollutant Discharge Elimination System (NPDES)/State Disposal System (SDS) construction stormwater permit from the Minnesota Pollution Control Agency (MPCA). Erosion control methods, described in Section 5.11 will be utilized to minimize runoff during substation construction.

Upon completion of construction activities, Xcel Energy would restore the site. Post-construction reclamation activities 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.

4.5 Relocation of Line 0831

The Project would relocate a 1,030-foot portion of Xcel Energy Transmission Line 0831 to HFHOA property.

Clearing of trees and vegetation within the existing ROW will be conducted as needed for removing the transmission structures, conductors and related equipment. Xcel Energy will minimize access area and removal work areas to only that needed for the work. Xcel Energy has indicated that their intention is to conduct the removal work during frozen ground conditions if possible to minimize disturbance to soil. In wet areas, Xcel Energy may also install construction mats to access the removal locations (Xcel Energy, personal communication, November 11, 2011).

Xcel Energy will remove above and below ground sections of the transmission structures in the planned removal area. Below ground sections of the transmission structures will be removed from the ground. Supports and guying above ground will be removed with the transmission structures and underground sections will be removed. While not expected for this Project, if concrete foundations are encountered at structures to be removed, the structure above the concrete base will be removed and then the concrete foundation removed to approximately four feet below ground surface. Holes, ruts or other areas disturbed by the removal work will be backfilled with soil and seeded to re-establish vegetation.

Construction of the relocated portion of this line would follow transmission construction procedures described in Sections 4.2 and 4.3 of this document. Mitigation strategies for both line removal and construction are discussed in Section 5.0 of this document.

4.6 Great River Energy 69 kV Transmission Facilities

The Project will remove 69 kV transmission facilities from the substation and the GRE 69 kV transmission line will be re-routed around the replacement substation. Xcel Energy and GRE will coordinate to modify the 115 kV remote end relay settings at Crow Rivers and Medina Substations. The 69 kV termination structure and associated foundations will be removed and a short segment of 69 kV transmission line will be constructed around the replacement substation. All work on the GRE facilities for this project will be completed on the 16 acre parcel owned by Xcel Energy.

4.7 Clean-up and Restoration

Construction areas would be disturbed during the normal course of work, which can take several weeks in any one location. As construction on each parcel is completed, disturbed areas would be restored to their original condition. Practices to mitigate potential construction impacts would follow permit requirements and be based on construction schedules, geology and topography, maintenance guidelines, inspection procedures, and presence of sensitive environments or species.

Upon completion of construction, disturbed areas would be restored to their original condition to the maximum extent practicable. If damage has occurred to fences or drain tiles, Xcel Energy would reimburse the landowner(s) for the damages sustained (Xcel Energy, June 7, 2011). Xcel Energy may employ an outside contractor to restore the damaged property to as near its original condition as is possible. Areas with significant soil compaction and disturbance from construction activities along the proposed transmission line route may require assistance in re-establishing the vegetation stratum and controlling soil erosion. Construction and post-construction reclamation activities would include but are not limited to removing and disposing of debris (including personal liter); dismantling staging areas; restoring temporary workspaces, access roads, abandoned right-of-way and other public or private lands affected by construction of the transmission line; employing erosion control, such as silt fences, hay bales, seed blankets, or hydro seeding; and hand-planting disturbed areas with native vegetation.

Landowners would be contacted by an Xcel Energy representative at the close of construction activities to determine whether any damage has occurred as a result of the project. Areas damaged during construction activities will be restored to their pre-construction condition to the extent possible or Xcel will reimburse the landowner for damages sustained that are not repaired. Upon completion of construction cleanup and restoration of damaged areas, landowners would notify Xcel Energy of any outstanding construction damage that has not been remedied.

HVTL Route Permits issued by the Commission require the permittee to notify the Commission in writing 60 days after completion of all restoration activities and also require the permittee to compensate landowners for any yard/landscape, soil compaction, drain tile, or other property damages that may occur during construction.

4.8 Maintenance Procedures

Transmission infrastructure has few mechanical elements and is designed and constructed to withstand weather events that are normally encountered. Although infrequent, transmission lines are taken out of service by protective relay equipment when a fault is sensed on the system or for scheduled maintenance outages. As a result, Xcel Energy estimates the average annual availability of transmission infrastructure exceeds 90 percent.

Routine maintenance and inspections are performed over the life of the facility to ensure its continued integrity. Annual inspections of the transmission facilities are usually done by aerial means. Periodic access to the transmission line rights-of-way and substations would be required to perform on-ground inspections and conduct routine maintenance or repairs. Inspections would be limited to the acquired right-of-way and areas where obstructions or terrain require access off the easement.

The transmission line rights-of-way are managed to remove vegetation that has the potential to interfere with the operation and maintenance of the line. The applicant would conduct vegetation surveys and remove undesired vegetation that may interfere with the operation of the transmission line. Typical vegetation maintenance for a 115 kV transmission line is on a three to seven year cycle dependent on vegetation growth and weather events. Vegetation management generally includes a combination of mechanical, hand clearing, and herbicide application to remove or control the growth of vegetation in or impinging upon the right-of-way.

Herbicide application would be applied following U.S. Environmental Protection Agency (EPA) and state agency regulations and is applied by licensed applicators.

Substations require a certain amount of maintenance to keep them functioning in accordance with accepted operating parameters and NESC and NERC requirements. Transformers, circuit breakers, batteries, protective relays, and other equipment need to be serviced periodically in accordance with the manufacturer's recommendation. The site itself must be secure, kept free of vegetation, and proper drainage must be maintained.

5 POTENTIAL IMPACTS & MITIGATION MEASURES

The construction of a transmission facility involves both short- and long-term impacts. An impact is a change to the pre-construction environment as a direct or indirect result of the proposed action and may be positive or negative. 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 in time, but are still reasonably foreseeable.

This section describes the potential impacts on resources and the possible mitigation measures intended to avoid, minimize, or mitigate impacts caused by the construction and future operation and maintenance of the proposed transmission facility.

5.1 Environmental Setting

The Project is composed of both the substation site and the route. The substation site is located on an open upland area bounded by the BNSF railway to the north, Hennepin County Road 6 to the south, and the Huntington Farm neighborhood to the west.

The Xcel Energy Proposed Route is located on the Orono substation site owned by Xcel Energy, and then on Hunt Farm Home Owners Association property, just outside or the BNSF railroad right-of-way for the majority of the route. The Baker Park Reserve Route Alternative follows the Xcel Energy Proposed Route, and then crosses over the BNSF railroad and U.S. Highway 12 to parallel along the north side of U.S. Highway 12, just outside of MnDOT right-of-way.

The Project is located within the Big Woods Ecological Subsection of the Eastern Broadleaf Forest Province of the Ecological Classification System developed by MnDNR and the United States Forest Service. The Ecological Classification System was developed to identify, describe, and map progressively smaller areas of land with increasingly uniform ecological features. The Big Woods subsection is characterized by circular, level topped hills bounded by smooth side slopes. The Mississippi River is the eastern border of this subsection. The area was previously occupied by oak woodland and basswood forest, with characteristic trees being elm, basswood, sugar maple and bur oak (MnDNR, 2011a). Although land use in this subsection is predominantly cropland, pasture, upland forest and wetland, land use in the area immediately surrounding the Project is predominated by rural residential, undeveloped wetland and woodland, transportation, and regional parkland.

5.2 Socioeconomic

A review of the 2010 U.S. Census data shows Orono to have a lower minority population and higher median income than both Hennepin County and Minnesota. Population and economic characteristics from the 2010 U.S. Census are shown in **Table 4**.

Table 4: 2010 Population Characteristics

Category	Minnesota	Hennepin County	City of Orono
2000 Population	4,919,492	1,164,200	7,538
2010 Population	5,303,925	1,152,425	7,437
Percent Change 2000-2010	7.8	3.2	-1.3
Non-white, Non-Hispanic or Latino Origin, 2010 Population (percent)	14.7	25.6	3.5
Median Household Income (average over 2001-2009)	$55,621	$61,651	$114,702[a]
Percent Below Poverty Level (average 2005 - 2009)	10.9	11.9	1.4
Land Area (sq. miles)	79,727	554	15.98
Population Density (person/sq. mile)	66.6	2,082	465.3

Source: U.S, Census Bureau, 2011

Xcel Energy anticipates that construction of the transmission line would require approximately 6-25 workers over the course of approximately eight weeks. Xcel Energy also anticipates that construction of the substation would occur over the course of 9-12 months, with an average work force of approximately six workers (Xcel Energy, personal communication, October 13, 2011). It is not expected that additional permanent jobs will be created the Project.

Construction of the Project should also result in small, short-term positive economic impacts in the form of increased spending for lodging, meals and other consumer goods and services as well as purchase of some construction material. Short-term economic benefits from increased economic activity during the construction phase of the Project are likely to be absorbed within the larger Twin Cities metro economy and not limited to the immediate project area.

No disproportionate impacts on minority or low-income populations are anticipated.

Long-term socioeconomic effects from the Project would include an increase to the county's tax revenues as a result of the value of construction and the increased value of utility property resulting from the Project. In addition to the relatively small increase to county tax revenues, the Project would improve the overall transmission stability and ensure voltage stability.

Mitigation Measures

The socio-economic impacts from the Project are likely to be mostly positive, no additional mitigation measures are proposed.

5.3 Human Settlement

Transmission lines have the potential to produce impacts to human settlement resulting from possible displacement of homes or businesses, aesthetics, and potential impacts to property values. Regulators and utilities try to select routes that avoid residences as much as possible to minimize impacts to residents and businesses. Specifically, Minnesota Statute 216E.02, subd. 1 provides that, "… the commission shall locate transmission lines in a manner that minimize adverse human and environmental impact while insuring continuing electric power system reliability and integrity and insuring that electric energy needs are met and fulfilled in an orderly and timely fashion."

Proximity to Homes and Businesses and Displacement

Transmission line facilities require certain clearances from buildings for safe operation of the transmission line. The required clearances are defined in the NESC and Xcel's standard engineering and design practices. As indicated in the route permit application, Xcel would acquire a right-of-way of 75 feet for the project, but has indicated that the project may be designed to overlap with existing transportation ROWs, thereby requiring less right-of-way while still satisfying the needs of the project.

Displacement can occur when a structure is located within the proposed right-of-way for a new transmission line facility.

The two routes evaluated would both parallel and follow existing railroad and road rights-of-way for a significant portion of their respective routes. Following the existing transportation rights-of-way helps the routes stay away from homes. For both routes the nearest home to the substation is approximately 180 feet south of Xcel Energy's property boundary (Xcel Energy, personal communication, October 18, 2011), and the nearest home to the transmission line is 275 feet (Xcel Energy, personal communication, November). One unoccupied outbuilding is 86 feet south of the proposed alignment (Xcel Energy, personal communication, November 17, 2011).

Based on a review of aerial photographs and a site visit, the routing and construction of the transmission line and associated facilities will not require the displacement of any homes or businesses.

Property Values

One of the first concerns of many residents near existing or proposed transmission lines is how that proximity to the line could affect the value of their property. Research on this issue does not identify a clear cause and effect relationship between the two. Instead, the presence of a transmission line becomes one of several factors that interact to affect the value of a particular property.

Because of the large number of factors that influence the value of a specific property, it is very difficult, if not impossible, to predict the effect that a specific transmission facility would have on a specific property. The Public Service Commission of Wisconsin addressed the issue of changes in property value associated with high-voltage transmission lines in their Final Environmental Impact Statement on the Arrowhead – Weston Electric Transmission Line Project (Public Service Commission of Wisconsin, 2000). Their analysis of the relationship between property values and transmission lines looked at approximately 30 papers, articles and court cases covering the period from 1987 through 1999.

The Wisconsin analysis identified two types of property value impacts that property owners may experience: (1) potential economic impact associated with the amount paid by a utility for a right-of-way easement, and (2) potential economic impact regarding the future marketability of the property.

The Arrowhead – Weston Electric Transmission Line Project Final EIS provides the following six general observations from the studies it evaluated.

- The potential reduction in sale price for single family homes may range from 0 to 14 percent.

- Adverse effects on the sale price of smaller properties could be greater than effects on the sale price of larger properties.

- Other amenities, such as proximity to schools or jobs, lot size, square footage of a house and neighborhood characteristics, tend to have a much greater effect on sale price than the presence of a power line.

- The adverse effects appear to diminish over time.

- Effects on sale price are most often observed for property crossed by or immediately adjacent to a power line, but effects have also been observed for properties farther away from the line.

- The value of agricultural property is likely to decrease if the power line poles are placed in an area that inhibits farm operations.

Aesthetics

The Project crosses a mixture of wooded and wetland areas. Depending upon the route, land uses are a mixture of utility, transportation, undeveloped residential and a regional park. The Project is located near a residential development, and a portion of the route would cross property that is owned by the homeowners association and maintained as undeveloped. U.S. Highway 12, a 4-lane limited access highway, and the BNSF railway pass through the northern portion of the route, while Hennepin County Road 6 is located to the south. There are two existing transmission lines near the Project area. Xcel Energy's 115 kV Line 0831enters the Project area from the west. The structures for this line in the area are H-frame wood pole structures of approximately 60 - 75 feet. GRE's 69 kV BD line currently enters the Orono substation. The structures on the GRE 69 kV transmission line are wood single pole structures with heights of approximately 60 feet.

The Project would introduce several changes to the existing landscape: an expanded substation, a new segment of double circuit 115/115 kV transmission line, relocation of a segment of single-circuit 115 kV transmission line, and relocation of a segment of 69 kV transmission line near the expanded substation. The existing 0.1 acre Orono Substation would be replace by a new substation with a fenced area of approximately 1.2 acres. The new substation would contain approximately eight pieces of electrical equipment and a new structure to house electrical control panels. The height of the new equipment would be approximately 13-18 feet. Installation of the expanded substation would also entail removal of scattered pockets of existing trees and other vegetation west and north of the existing substation location.

The Project would consist of single and double-circuit 115 kV structures. All structures would be constructed of galvanized or weathering steel. As proposed, the Project would install five new double-circuit structures with heights of 75 to 115 feet, two cross-arm Y structures with heights of 70 to 90 feet and one single circuit structure with height of 70 to 90 feet (Xcel Energy, September 7, 2011). Structures are show in **Figure 2**. The installation of the transmission line would require tree clearing within an approximately 75-foot right-of-way. Estimates of vegetation clearing are provided in **Section 5.14**.

The Project would be visible to residents in the Project area as well as those travelling through along U.S. Highway 12 and Hennepin County Road 6/6th Avenue North. The Orono Substation,

although significantly larger, is somewhat screened from the housing to the west by a hill or berm along the west side of Xcel Energy's property. The Project's transmission structures would contrast with the existing shorter wood transmission structures in the area.

The substation would include appropriate and sufficient lighting within the substation area in the event of an emergency during low light or night time conditions. During normal operation all of the substation lights will be left off and the substation will be dark, unless required by local units of government for other purposes such as security. During emergencies lights would be needed to facilitate the safety of personnel if work occurs in low light or after sunset; routine maintenance work is typically scheduled during daytime hours (Xcel Energy, personal communication, November 10, 2011). Transmission structures are not lit.

Mitigation Measures

The primary mitigation strategy to minimize impacts to homes and businesses is avoidance through routing. No additional mitigation is proposed.

The use of a property for a transmission facility does transfer ownership of one of the bundle of property rights from the property owner to the easement holder. This loss of a portion of the potential use of the property requires compensation of the property owner for the use of the property. Any potential impacts of property values would typically be mitigated through negotiation in an easement agreement between the applicants and the landowner.

The use of double-circuit structures minimizes the number of structures and the width of right-of-way needed for the transmission portion of the Project, although the double-circuit structures are taller.

Xcel Energy has stated it intends to minimize vegetation clearing to the extent possible and to work with landowners to identify visual concerns related to the Project and to develop suitable mitigation measures. Xcel Energy's current substation plans include building the substation partially into the adjacent hillside and establishing prairie landscaping and trees along the western edge of Xcel Energy's property (**Appendix C**). Xcel Energy is currently discussing with residents of the Hunt Farm neighborhood the possible addition of a berm along the western edge of the property to provide screening of the substation for residents of the neighborhood (Xcel Energy, June 7, 2011).

5.4 Noise

Noise is measured in units of decibels (dB), or sound pressure level. The sound pressure level for purposes of human hearing is measured with the A-weighted decibel scale or dB(A). In general terms, a noise level change of 3 dB(A) is imperceptible to human hearing, a 5 dB(A) change is clearly noticeable, and a 10 dB(A) change is perceived as a doubling of noticeable sound. Cumulative noise increases occur on a logarithmic scale. Potential noise associated with the proposed project includes sources associated with construction and long-term operation of the proposed project. Estimates of some common sources of noise are presented in **Table 5**.

Table 5: Common Noise Sources and Average Sound Levels

Noise Source	Sound Pressure Level (dBA)
Jet Engine (at 25 meters)	140
Jet Aircraft (at 100 meters)	130
Rock and Roll Concert	120
Pneumatic Chipper	110
Jointer/Planer	100
Chainsaw	90
Heavy Truck Traffic	80
Business Office	70
Conversational Speech	60
Library	50
Bedroom	40
Secluded Woods	30
Whisper	20

Source: Minnesota Pollution Control Agency, 2008

Noise standards in Minnesota have been established and are defined in Minnesota Rule 7030 and regulated by the MPCA. The Noise Control Requirement states that noise contributors shall comply with the Noise Area Classifications (NAC) established in Minnesota Rules part 7030.0040, which are shown in **Table 6**. The NAC is based on land use activity at the location of the receiver. For example, household units are defined under NAC (1), bus passenger terminals are defined under NAC (2), and transportation right-of-way is defined under NAC (3). NAC (1) also includes other noise-sensitive areas such as medical and other health services, religious services, educational services and camping areas.

Table 6: Noise Area Classifications

NAC	Day (7 a.m. – 10 p.m.)		Night (10 p.m. – 7 a.m.)	
	L_{50}	L_{10}	L_{50}	L_{10}
1	60	65	50	55
2	65	70	65	70
3	75	80	75	80

Notes: Minnesota Rules part 7030 uses the decibel A-weighting network and applies statistical sound levels (L-Level Descriptors) to account for changes in sound levels over a period time as shown. The L_{10} is defined as the noise level exceeded 10 percent of the time, or for six minutes in an hour. The L_{50} is the noise level exceeded 50 percent of the time, or for thirty minutes in an hour. The L_5 is the noise level exceeded five percent of the time, or for three minutes in an hour.

The Project would result in short-term noise from the construction phase of the Project as well as noise from the conductors and substation once the Project is in operation.

Construction Noise

Short-term exceedance of daytime noise standards would be intermittent and temporary in nature. Noise from general construction noise are expected to occur during daytime hours as the result of heavy equipment operation and increased vehicle traffic associated with the transport of equipment and construction personnel to and from the work area.

Conductor Noise

Transmission conductors can produce noise under certain conditions. The level of noise depends on conductor conditions, voltage level, and weather conditions. In foggy, damp, or rainy weather, transmission lines can create a crackling sound due to the small amount of electricity ionizing the moist air near the conductors, or corona discharge. In practice, noise levels produced by 115 kV transmission lines are generally less than outdoor background levels and, therefore, are not usually audible.

The worst-case scenario is when the conductor is exposed to heavy rain conditions (one inch per hour). However, during heavy rain the background noise level of the rain is typically greater than the noise from the transmission line. As a result, people do not normally hear noise from a transmission line during heavy rain. Sound emanating from conductors would typically be noticed during light rain, dense fog, snow, and other times when there is moisture in the air; transmission lines would produce audible noise approximately equal to household background levels.

Xcel Energy calculated the estimated audible noise that may be produced from the proposed transmission line using the Bonneville Power Administration (BPA) CFI8X model. To ensure that the noise was not under-predicted the worst-case scenario was used as the benchmark. The anticipated noise levels derived from the modeling are presented in **Table 7**.

Table 7: Calculated Transmission Line Audible Noise Levels (3.28 feet above ground)

Structure Type	Audible Noise Levels at Edge of Right-of-Way (dBA)	
	L_5	L_{50}
Single Pole Vertical Configuration with Post Insulators, 115 kV Single-Circuit	14.5	11.0
Single Pole Davit Arm 115 kV / 115 kV Double-Circuit	23.3	19.8
Single Pole Davit Arm 115 kV/115kV Double Circuit with Distribution Under Build	23.3	19.8
Single Pole, Cross Arm, Y-Frame Structure 115 kV Single-Circuit	15.8	12.3

Source: Xcel Energy, June 7, 2011; Xcel Energy, personal communication, November 7, 2011. Calculations were performed using the EPRI Enviro software and the BPA standard method of calculation.

Substation Noise

Noise associated with substations includes the operation of transformers and switchgear. The transformers produce a constant low-frequency humming noise while the switchgear produces an impulsive or short duration noise during infrequent activation of the circuit breakers.

The distance between the Xcel Orono Substation property boundary to nearby homes are approximately 180 feet to the south, across County Road 6, and approximately 270 feet to the west (Xcel Energy, personal communication, October 13).

Xcel Energy proposes to install a 28MVA distribution transformer that is currently in storage. Future plans anticipate upgrading the 28MVA transformer to 50MVA and eventually adding a second 50 MVA transformer; the date of the upgrade and addition is dependent upon customer load growth demands (Xcel Energy, personal communication, November 21, 2011).

Xcel Energy is currently conducting a noise assessment of the Orono Substation site. Because no noise level data is available from Xcel Energy records or from the manufacturer of this transformer Xcel Energy is using an assumed 75 to 78 dBA noise level range at the transformer location.

Mitigation Measures

HVTL route permits require compliance with state noise standards established by the MPCA. The Project will be designed and constructed to comply with state noise standards established by MPCA during operation of the transmission line and substation.

Construction activities would also need to comply with MPCA noise standards. Construction work would generally be limited to daytime hours, between 7 a.m. and 10 p.m on weekdays. Occasionally there may be construction outside of these hours or on a weekend if it becomes necessary to work around customer schedules or line outages. Heavy equipment would be equipped with sound attenuation devices such as mufflers to minimize noise levels (Xcel Energy, personal communication, November 14, 2011).

Xcel Energy has stated their intent to file the results of the substation noise assessment to the Project docket once the results are available. Depending on the results of the noise assessment, additional corrective steps may be required to ensure compliance with the state noise standard. Xcel Energy has also committed to performing actual sound measurements of the transformer once it is installed to confirm compliance with the state noise standard (Xcel Energy, personal communication, November 21, 2011).

5.5 Public Health and Safety

Generally human health and safety issues related to transmission projects can be grouped into issues associated with construction and those associated with the operation and maintenance of the Project.

As with any construction project involving heavy equipment and high-voltage electrical facilities, there are safety issues during construction. Potential health and safety impacts would be injuries related to worker falls, falling equipment and electrocution.

Potential health and safety impacts associated with the operation phase of the proposed Projects include: electrocution or injury from equipment failure, injuries associated with unauthorized access to energized transmission equipment, health impacts from electric or magnetic fields associated with operation of the Projects, and stray voltage.

Equipment failure and unauthorized access to transmission equipment

Electric transmission lines, and their associated facilities, carry electricity at a very high voltage. This high voltage is transformed at distribution substations down to the voltage that is used by most customers at their homes.

Under certain conditions, high voltage transmission lines or high voltage substation equipment may fail. These failures are most commonly a result of extreme weather or electric circuit overloading. If equipment fails, injury or death may occur as a result.

Unauthorized access to transmission equipment by persons who are not trained to work with high voltage equipment can result in serious injury or death.

Electric and Magnetic Fields

Wherever there is electricity there are electric and magnetic fields (EMF). Electric and magnetic fields are not only created by high-voltage transmission and distribution lines, but also by home appliances, electronics, cell phones, wireless networks, fluorescent lights, and wiring configurations in homes, businesses, and schools. As a result, we are all exposed on a daily basis to a complex mix of electric and magnetic fields at many different frequencies (WHO, 2002).

Electric and magnetic fields are invisible just like radio, television, and cellular phone signals, all of which are part of the electromagnetic spectrum. The frequency of transmission line EMF in the United States is 60 hertz and falls in the extremely low frequency (ELF) range of the electromagnetic spectrum (any frequency below 300 hertz). By comparison, cellular phone communications operate at frequencies almost one billion times higher than EMF resulting from electric power (Long Island Power Authority, 2005).

Natural and human-made electric and magnetic fields are, in fact, present everywhere in our environment. The Earth's natural static background electric field is approximately 120 to 150 volts per meter (V/m). Natural electric fields are also produced by the local build-up of electric charges in the atmosphere that are associated with thunderstorms. The Earth itself has a magnetic field that ranges from approximately 300 to 700 milligauss (mG), the field is a steady-state or static (zero hertz) magnetic field, but has similar characteristics to the magnetic fields emanating from human-made sources.

Electric and magnetic fields created by humans include X-rays and magnetic resonance imaging (MRIs) machines, electric and magnetic passenger trains, electric cars, and cellular telephones. The general wiring and appliances located in a typical home can produce an average background magnetic field of 0.5 mG to 4 mG (EPA, 1992).

Electric and magnetic fields arise from the voltage and the flow of electricity (current) through a conductor. The intensity of the electric field is related to the voltage of the line and the intensity of the magnetic field is related to the electric current. The electric field associated with high-voltage transmission lines "extend" from the energized conductors to other nearby objects whereas the magnetic field "surrounds" the conductor. Together, these fields are generally referred to electric and magnetic fields or EMF. A summary of electric and magnetic field properties is summarized in **Table 8**.

Table 8: Summary of Electric and Magnetic Field Properties

Electric Fields	Magnetic Fields
Electric fields arise from voltage.	Magnetic fields arise from current flows.
Their strength is measured in kilovolts per meter (kV/m).	Their strength is measured in milligauss (mG) or microtesla (μT).
An electric field can be present even when a device is switched off.	Magnetic fields exist as soon as a device is switched on and current flows.
Field strength decreases with distance from the source.	Field strength decreases with distance from the source.
Most building materials shield electric fields to some extent.	Magnetic fields are not attenuated by most materials.

Source: WHO, 1999

This section of the EA specifically addresses electric and magnetic fields produced through transmission of electric power at 60 Hz or cycles per second.

Electric Fields

Electrical fields are created by voltage. Voltage can be described as the potential difference between two points and will always try to drive an electric current. The voltage on any conductor produces an electric field that extends from the wire in all directions. The intensity of electric fields is

associated with the voltage of the transmission line and is measured in kilovolts per meter (kV/m). Some typical electric field strengths measured near common household appliances are presented in **Table 9**.

Table 9: Typical Electric Fields (kV/m) from Common Home and Business Appliances

Source	Electric Field Strength (at a distance of 30 cm)
Iron	0.12
Refrigerator	0.12
Toaster	0.08
Coffee machine	0.06
Vacuum cleaner	0.05

Source: WHO, 1999.

Transmission line electric field levels are typically greatest near the center of the line right-of-way with levels decreasing as one moves away from the central alignment. The electric field associated with a high-voltage transmission line may extend from the energized conductors to other nearby objects such as the ground, towers, vegetation, buildings, and vehicles. These objects are commonly referred to as "screeners". The screening effect associated with these and other objects reduce the strength of transmission line electric fields.

On the whole, scientific evidence indicates that chronic exposure to electric fields at or below levels traditionally established for safety does not cause adverse health effects. Safety concerns related to electric fields are sufficiently addressed by adherence to the Institute of Electrical and Electronics Engineers (IEEE) and NESC standards.

There are currently no federal guidelines on the strength of electrical fields beneath high-voltage transmission lines. However, six states have established their own regulations or guidelines with regard to transmission line electric fields (**Table 10**).

Table 10: State Established Electric and Magnetic Field Standards and Guidelines

State	Electric Field (kV/m)		Magnetic Field (mG)
	Within Right-of-Way	Edge of Right-of-Way	Edge of Right-of-Way
Florida	8[a]	2	150[a] (max load)
	10[b]	---	200[b] (max load)
	---	---	250[c] (max load)
Massachusetts	---	---	85[g]
Minnesota	8	---	---
Montana	7[d]	1[e]	---
New Jersey	---	3	---
New York	11.8	1.6	200 (max load)
	11[f]	---	---
	7[d]	---	---
Oregon	9	---	---

Source: MSH, 2002 and NIEHS, 2002

[a] 69 kV to 230 kV transmission lines
[b] 500 kV transmission lines
[c] 500 kV transmission lines on certain existing ROW
[d] maximum for highway crossing
[e] may be waived by the landowner
[f] maximum for private road crossings
[g] a level above 85 mG is not prohibited, but may trigger a more extensive review of alternatives.

In addition to the state guidelines identified above, there are a number of national and international boards, committees, and commissions that have recommended electric field exposure guidelines or thresholds for 60 hertz high-voltage transmission lines. **Table 11** summarizes the suggested electric field guidelines from a number of these internationally recognized organizations.

Table 11: Electric and Magnetic Field Guidelines from Internationally Organizations

Organization	Electric Field (kV/m)		Magnetic Field (mG)	
	General Public	Occupational	General Public	Occupational
IEEE	5	20	9,040	27,100
ICNIRP	4.2	8.3	830	4,200
ACGIH	---	25	---	10,000/1,000[a]
NRPB	4.2	---	830	4,200
European Union	4.2	---	830	---

Source: IEEE – Institute of Electrical and Electronics Engineers, ICNIRP – International Commission on Non-Ionizing Radiation Protection, ACGIH – American Conference of Industrial Hygienists, NRPB – National Radiological Protection Board

[a] for persons with cardiac pacemakers or other medical electronic devices.

Estimated electrical fields at maximum operating voltage for the proposed project, as provided by the applicant, are presented in **Table 12**. The expected electric fields for the structure type and voltage proposed have been calculated at various distances from the centerline.

Table 12: Calculated Electric Fields (kV/m) for Proposed Orono 115 kV Transmission Line (3.28 feet above ground)

Structure Type	Maximum Operating Voltage (kV)	Distance to Proposed Centerline (feet)												
		-300	-200	-100	-75	-50	-25	0	25	50	75	100	200	300
Single Pole H-Post Vertical 115 kV Single Circuit	121	.011	.021	.043	.037	.037	.338	1.09	.668	.130	.030	.049	.025	.012
Single Pole Davit Arm 115 kV/115kV Double Circuit	121	.002	.005	.011	.005	.071	.341	.437	.341	.071	.005	.011	.005	.002
Single Pole Davit Arm 115 kV/115kV Double Circuit w/ Dist. Under Build	121	.002	.004	.004	.014	.088	.278	.107	.294	.089	.014	.004	.004	.002
Single Pole Y-Frame 115 kV Single Circuit	121	.005	.015	.104	.215	.507	.977	.295	.977	.507	.215	.104	.015	.005

Source: Xcel Energy, 2011a, and Xcel Energy, personal communication, November 22, 2011.

* Maximum operating voltage is the nominal voltage plus five percent (i.e. 115 kV + 5.75 = 121 kV).

The closest home to the transmission line is approximately 275 feet. The highest calculated electric field directly under the transmission line is 1.09 kV/m. As indicated by the applicant in the route permit application and subsequent information, the highest calculated electric fields at 100 and 200 feet from transmission centerline would be 0.104 kV/m and 0.025 kV/m, respectively (Xcel Energy, personal communication, November 22, 2011). These electric field strengths are within the range of

electric fields generated by other common household/business sources and well below the various state and international organization established guidelines.

The maximum calculated electric field on the entire length of project, directly beneath transmission centerline at 3.28 feet above ground is estimated to be 1.09 kV/m. This maximum calculated electric field is approximately 14 percent of the 8 kV/m guideline historically recommended by the Minnesota Environmental Quality Board (EQB) and the Commission in other route permit proceedings and again, well below any of the national and international recognized electric field guidelines as identified in **Tables 10** and **11**.

Magnetic Fields
Electric current passing through a conductor produces a magnetic field in the area surrounding the wire. Similar to electric fields, magnetic fields are strongest near the conductor and diminish with distance. Magnetic fields, however, are not shielded by most common materials and easily pass through them. The magnetic field may also be called magnetic flux density and is measured in units of milligauss (mG) or microtesla (μT).

We encounter magnetic fields from every-day things such as radar and microwave towers, television and computer screens, motors, fluorescent lights, microwave ovens, cell phones, electric blankets, house wiring and hundreds of other common electrical devices.

The general wiring and appliances located in a typical home can produce an average background magnetic field of 0.5 mG to 4 mG (EPA, 1992). A U.S. government study conducted by the EMF Research and Public Information Dissemination Program determined that most people in the United States on average are exposed to magnetic fields of 2 mG or less daily, and varies by individual (NIEHS, 2002). **Table 13** summarizes the average level of magnetic fields of common appliances.

Table 13: Typical Magnetic Fields (mG) of Common Appliances

Source	Distance from Source			
	0.5 foot	1 foot	2 feet	4 feet
Baby Monitor	6	1	-	-
Computer Displays	14	5	2	-
Fluorescent Lights	40	6	2	-
Copy Machines	90	20	7	1
Microwave Ovens	200	4	10	2
Electric Pencil Sharpeners	200	70	20	2
Vacuum Cleaner	300	60	10	1
Can Opener	600	150	20	2
Color Televisions	NA	7	2	-

Source: NIEHS, 2002

The study of cancer in relation to ELF magnetic fields has been a topic of study since the late 1970s. Since that time there have been several epidemiological studies that have explored the possible association of not only cancer risks, including brain tumors, leukemia, and breast cancer, but other potential human maladies including mental health issues. Studies have focused on both occupational exposures for individuals working in electrical industries and public exposures for children and adults living and working around common magnetic field sources (in-home wiring, transmission lines, home and office appliances/equipment). The results of the various studies conducted over the last three decades, specifically those regarding the relationship between EMF and childhood leukemia and other cancer risks, have been mixed; some have found an association while others have not (National Cancer Institute, 2005).

Where there is association suggested in epidemiological studies, it is usually very near the statistical threshold of significance. However, when these studies are repeated in a laboratory, the results have not reproduced or identified a biological mechanism to support a link between health impacts and magnetic fields. Researchers continue to look at magnetic fields until more certain conclusions can be reached.

In a 2007 report the World Health Organization (WHO) concluded that, although some studies have noted a weak statistical link between exposure to EMF and incidence of childhood leukemia, laboratory evidence does not support these findings and that a similar link has not been noted with other types of cancer:

> *… epidemiological evidence is weakened by methodological problems, such as potential selection bias. In addition, there are no accepted biophysical mechanisms that would suggest that low-level exposures are involved in cancer development. … Additionally, animal studies have been largely negative. Thus, on balance, the evidence related to childhood leukaemia is not strong enough to be considered causal. … Regarding long-term effects, given the weakness of the evidence for a link between exposure to ELF [extremely low frequency] magnetic fields and childhood leukaemia, the benefits of exposure reduction on health are unclear.* (WHO, 2007)

Although scientists are still debating whether EMF is a hazard to health, at the current time in the United States, there are no federal standards for occupational or residential exposure to magnetic fields. Florida, New York, and Massachusetts are the only three states in the country that have set standards for magnetic field exposure (**Table 10**). These standards were not in response to health-based analysis, but rather on maintaining transmission systems within historic levels.

The International Commission on Non-Ionizing Radiation Protection (ICNIRP) has developed occupational and residential guidelines for EMF exposure (**Table 11**). The exposure guidelines established by the ICNIRP have typically been the guidelines adopted by most countries and organizations. They have also concluded that available data regarding potential long-term effects, such as increased risk of cancer, is insufficient to provide a basis for setting exposure restrictions.

Xcel Energy prepared estimates of magnetic fields for the structure type and voltage at both average and peak system conditions have been calculated at various distances from the centerline, as presented in **Table 14**.

Table 14: Calculated Magnetic Fields (mG) for Proposed Orono 115 kV Transmission Line (3.28 feet above ground)

Segment	System Condition	Current (Amps)	Distance to Proposed Centerline (feet)												
			-300	-200	-100	-75	-50	-25	0	25	50	75	100	200	300
Single Pole H-Post Vertical 115 kV Single Circuit	Peak	250	0.44	0.95	3.14	4.83	8.04	14.30	22.62	19.15	10.94	6.32	3.95	1.09	0.49
	Average	150	0.26	0.57	1.89	2.90	4.82	8.58	13.57	11.49	6.37	3.79	2.37	0.65	0.29
Single Pole Davit Arm 115 kV/115kV Double Circuit	Peak	250	0.04	0.11	0.69	1.38	3.18	7.86	12.82	7.74	3.08	1.33	0.66	0.10	0.04
	Average	150	0.02	0.07	0.42	0.83	1.91	4.72	7.69	4.64	1.85	0.80	0.39	0.06	0.02
Single Pole Davit Arm 115 kV/115kV Double Circuit w/ Dist. Under Build	Peak	250	0.85	1.57	5.06	8.37	16.37	39.44	69.82	35.80	12.38	5.22	2.60	0.40	0.21
	Average	150	0.81	1.50	4.77	7.84	15.28	37.17	67.02	34.09	11.81	5.08	2.61	0.45	0.22
Single Pole Y-Frame 115 kV Single Circuit	Peak	250	0.44	1.00	3.91	6.64	12.95	27.41	38.42	27.68	13.22	6.85	4.08	1.09	0.50
	Average	150	0.26	0.60	2.35	3.99	7.79	16.67	24.0	16.84	7.95	4.11	2.45	0.66	0.30
Note: The assumed peak and average line loading assumed for these calculations is the estimated flow of 50MVA.															

Source: Xcel Energy, June 7, 2011; Xcel Energy, personal communication, November 22, 2011

The maximum estimated magnetic field generated by the proposed transmission line would be 38.42 mG directly below a 115 kV/115 kV double-circuit transmission centerline at 3.28 feet above ground, significantly below the 830 mG general public magnetic field guideline established by ICNIRP. The right-of-way required for the proposed project is 75 feet (37.5 feet on each side of centerline); the highest estimated magnetic field at a distance of 75 feet from the transmission line centerline would be approximately 1.3 to 1.4 mG. At 300 feet from the transmission centerline the magnetic field level drops to a maximum of 0.5 mG, at the lower end of the average background magnetic field of a typical home of 0.5 mG to 4 mG (EPA, 1992).

Based upon current scientific evidence, no adverse effects from electric fields or magnetic fields on health are expected for persons living or working at locations along or near the proposed project.

The Commission has consistently found that there is insufficient evidence to demonstrate a causal relationship between EMF exposure and any adverse human health effects. Below are some references to recent Commission proceedings relating to high-voltage transmission lines and the issue of electric fields and magnetic fields:

> *120. The absence of any demonstrated impact by electric field and magnetic field exposure supports the conclusion that there is no demonstrated impact on human health and safety. No adverse effects from electric fields and magnetic fields on health are expected for persons living or working at locations along or near the proposed Project.* (Minnesota Public Utilities Commission, 2010, Finding 120)

> *40. The issue of electric and magnetic fields was discussed in the environmental assessment. A number of national and international health agencies (The Minnesota Department of Health, The World Health Organization, The National Institute of Environmental Health Sciences) have generally concluded in their research that there is insufficient evidence to prove a connection between electric and magnetic fields exposure and health effects. Research has not been able to establish a cause and effect relationship between exposure to magnetic fields and human disease, nor a plausible biological mechanism by which exposure to electric and magnetic fields could cause disease. No Minnesota regulations have been established pertaining to magnetic*

fields from high voltage transmission lines. (Minnesota Public Utilities Commission, 2009, Finding 40)

To assist the public in understanding this issue, the applicant may provide information to the public, interested customers and employees. The information may references studies and provides data to help explain the relative impact of transmission line exposure to other common EMF exposures, and allow individuals to make informed decisions regarding EMF.

Stray Voltage

Stray voltage is an extraneous voltage that appears on grounded surfaces in buildings, barns and other structures, including utility distribution systems. Sources of stray voltage include a variety of on-farm wiring and grounding problems and off-farm problems related to connections on the electric distribution system. Sometimes a small voltage can develop at these grounding points and flow through the earth. This voltage is called a neutral-to-earth voltage (NEV). More precisely, stray voltage is a small voltage that is measured between two points that animals such as livestock can simultaneously come into contact with. When an animal simultaneously contacts these points a small current will flow through the animal (Fick and Surbrook, n.d.). These NEV currents may contribute to an excess of acceptable current in a livestock contact area on an adjoining farm. As such, stray voltage has primarily been raised as a concern on dairy farms because it may impact operations and milk production. Stray voltages are low-level voltages and should be distinguished from shocks felt by humans. Stray voltages are not lethal.

Stray voltage is by and large an issue associated with electrical distribution lines. Transmission lines do not create stray voltage as they do not directly connect to businesses, residences, or farms.

Stray voltage (NEV) sources can be reduced in three fundamental ways: reduce the current flow on the neutral system; reduce the resistance of the neutral system; or improve the grounding of the neutral system. Making good electrical connections and making sure that these connections are maintained by the proper choice of wiring materials for wet and corrosive locations will reduce the resistance of the grounded neutral system and thereby reduce NEV levels.

As indicated by Xcel Energy in its route permit application, should a customer suspect that stray voltage/NEV is a concern on their property, they can call the Xcel Energy stray voltage hotline (651-779-3131) and discuss the situation with an Xcel Energy technician or engineer. If warranted, an on-farm investigation will be scheduled. Xcel Energy will conduct an investigation of the distribution utility system serving the farm and the farm wiring and discuss the preliminary results with the customer. In most instances, recording volt meters will be set to measure activity over several days. Upon completing the analysis, an Xcel Energy engineer or technician will call the farmer to discuss the results (Xcel Energy, 2011a).

Induced Voltage/Contact Voltage

The electric field from a transmission line in some instances can reach a nearby conductive object, such as a vehicle or a metal fence, which is in close proximity to the transmission line. This may induce a voltage on the object, which is dependent on many factors, including the weather conditions, object shape, size, orientation, capacitance and location along the right-of-way. If these objects are insulated or semi-insulated from the ground and a person touches them, a small current would pass through the person's body to the ground. This touch may be accompanied by a spark

discharge and mild shock, similar to what can occur when a person walks across a carpet and touches a grounded object or another person.

The major concern with induced voltage is the current that flows through a person to the ground when touching the object, not the level of the induced voltage. Most shocks from induced current are considered more of a nuisance than a danger, but to ensure the safety of persons in the proximity of high-voltage transmission lines, the NESC requires that any discharge be less than 5 milliAmperes. In addition, the Commission's electric field limit of 8 kV/m was designed to prevent serious hazard from shocks due to induced voltage under high-voltage transmission lines. Proper grounding of metal objects under and/or adjacent to the transmission line is the best method of avoiding these shocks.

Xcel has indicated that farm equipment, passenger vehicles, and trucks may be safely used under and near power lines. The power lines will be designed to meet or exceed minimum clearance requirements over roads, driveways, cultivated fields, and grazing lands specified by the NESC. Recommended clearances within the NESC are designed to accommodate a relative vehicle height of 14 feet (Xcel Energy, 2011a).

Implantable Devices

Implantable medical devices such as pacemakers, defibrillators, neurostimulators, and insulin pumps may be subject to interference from strong electric and magnetic fields. Most of the research on electromagnetic interference and medical devices is related to pacemakers. According to a 2004 Electric Power Research Institute (EPRI) report, implantable cardiac devices are much more sensitive to electric fields than to magnetic fields. In the report, the earliest interference from magnetic fields in pacemakers was observed at 1,000 mG, far greater than the magnetic fields associated with high-voltage transmission lines (EPRI, 2004). Therefore, the focus of research has been on electric field impacts.

Electric fields may interfere with an implanted cardiac device's ability to sense normal electrical activity in the heart if the electric field intensity is high enough to induce body currents strong enough to cause interaction. In the unlikely event a pacemaker is impacted, the effect is typically a temporary asynchronous pacing (commonly referred to as reversion mode or fixed rate pacing). The pacemaker returns to its normal operation when the person moves away from the source of the interference.

Medtronic and Guidant, manufacturers of pacemakers and implantable cardioverter/ defibrillators, have indicated that electric fields below 6 kV/m are unlikely to cause interactions affecting operation of modern bipolar devices (Department of Commerce, 2009). Older unipolar designs, however, are more susceptible to interference from electric fields with research suggesting that the earliest evidence of interference occurred in electric fields ranging from 1.2 to 1.7 kV/m (Toivonen et al, 1991). These initial interaction levels are significantly higher than 1.09 kV/m maximum electric field predicted for this project. The risk of interference inhibition of unipolar cardiac pacemakers from high-voltage power lines in everyday life is small (Scholten et al, 2004).

There would be no anticipated permanent impacts on implantable medical devices as a result of the proposed project.

5.6 Air Quality

Air quality emissions directly related to high-voltage transmission lines are negligible amounts of ozone and oxides of nitrogen caused by the corona effect. The other potential air quality issues are associated with construction activities, such as fugitive dust and exhaust emissions from construction equipment.

Ozone and Nitrogen Oxides

Corona discharge is energy loss that physically creates very small amounts of sound, radio noise, heat, and chemical reactions of the air near a conductor, and is a phenomenon associated with all transmission lines. Under certain conditions, the localized electric field near an energized conductor can become strong enough to produce a tiny electric discharge that can ionize air close to the conductors. Several factors contribute to corona discharge, including conductor voltage, shape and diameter, and surface irregularities that can affect a conductor's electrical surface gradient such as scratches, nicks, dust, or water drops. In the case of air quality, this partial discharge of electrical energy can produce very tiny amounts of ozone and nitrogen oxide with ozone being the primary oxidant.

Ozone also forms naturally in the Earth's lower atmosphere from lightning discharges and from reactions between solar ultraviolet radiation and air pollutants such as hydrocarbons from auto emissions. Typical rural ambient levels are around 10 to 30 parts per billion (ppb) at night with peaks of 100 ppb and higher (EPRI, 1982). In urban areas, concentrations greater than 100 ppb are common.

The natural production rate of ozone is directly proportional to temperature and sunlight and inversely proportional to humidity. Therefore, humidity, the same factor that increases corona discharges from transmission lines, inhibits the production of ozone. Ozone is a very reactive form of oxygen and combines readily with other elements and compounds in the atmosphere. Because of its high reactivity, ozone is relatively short-lived. The state and federal government both have regulations regarding permissible concentrations of ozone and oxides of nitrogen: Minnesota sets an ozone limit of 0.08 parts per million (ppm) as the highest eight hour average (Minnesota Rule, part 7009.0800), and the federal limit is 0.075 ppm as the fourth-highest eight hour daily maximum average (40 CFR, Part 50).

Calculations according to the BPA Corona and Field Effects Program Version 3 for a standard single-circuit 115 kV project predicted a maximum concentration of 0.006 ppm near the conductor and 0.002 ppm at one meter above ground during foul weather or worst case conditions with rain at one inch per hour. During a mist (rain at 0.01 inch per hour) the maximum concentrations decreased to 0.0002 ppm near the conductor and 0.0001 ppm at one meter above ground level. (United States Department of Energy, BPA)For both cases, the ozone levels are below federal standards. Studies designed to monitor the production of ozone under transmission lines have been unable to detect any increase attributable to the transmission line facility.

Construction/Fugitive Dust

There would be limited emissions from vehicles and other construction equipment and fugitive dust from right-of-way clearing during construction of the Project. Temporary air quality impacts are expected to occur during this phase of activity. The magnitude of emissions is influenced heavily by weather conditions and the specific construction activity taking place. Exhaust emissions from primarily diesel equipment would vary according to the phase of construction but would be minimal

and temporary. Adverse impacts to the surrounding environment would be minimal because of the short and intermittent nature of the emission and dust-producing construction phases. The Project is not anticipated to result in any permanent impacts on air quality.

Mitigation Measures

As a standard HVTL Permit condition, construction activities must follow best management practices (BMPs) to control air emissions (fugitive dust). Petroleum based dust suppressants may not be used. Construction vehicles with excess tailpipe emissions would not be operated until repairs to the vehicle could be made. The disturbed area for each route would be minimized.

As there are no significant impacts to air quality anticipated, no mitigation beyond these BMPs are proposed.

5.7 Transportation and Utilities

The proposed route alignments for both routes anticipate overlapping with existing railroad or high ROWs. No direct impacts to utilities are anticipated from the Project, although the Project would enhance the reliability of the transmission grid. Potential interference with communication sources is discussed in Section 5.18.

Transportation

U.S. Highway 12 provides a major east-west corridor to the western Twin Cities Metropolitan area. U.S. Highway 12 widens from two to four lanes at the eastern edge of the Project, approaching the intersection with Hennepin County Road 6 (also known as 6th Avenue North in this area). MnDOT has completed the U.S. Highway 12 Bypass project adjacent to and north of the Project; no additional work in this area is planned at this time. Hennepin County Road 6 borders the Project to the south and east.

No new transportation facilities will be required for the Project. Delivery of Project components, such as poles and conductors, may have temporary impacts along U.S. Highway 12. Construction crews may use portions of the road shoulder while poles are installed and conductors are strung.

The Project will cross the U.S. Highway 12 at least once. In both routes evaluated, the current crossing would be used. If the Baker Park Reserve Alternative were selected, the route would also cross the highway proceeding north from the substation to the Baker Park Reserve and parallel U.S. Highway 12. If the Project is located along the Baker Park Reserve Route Alternative, Xcel Energy's preference is to locate transmission structures approximately 10 feet north of MnDOT right-of-way (Xcel Energy, personal communication, October 13, 2011) along the Baker Park Reserve Alternative, however, as discussed in Section 5.8, Orono's shoreland overlay zoning would require a setback of 30 feet from road rights of way.

The BNSF Railroad parallels the south side of U.S. Highway 12 through the Project area. The Project would cross the BNSF railroad at least once, at the current crossing of Transmission Line 0831. Xcel Energy received a Certificate of Occupancy from BNSF for a rebuild of the existing crossing between Structures 076-1 and 076 and for the paralleling of transmission and railroad rights-of-way on June 24, 2011. If the Baker Park Reserve Alternative were selected, the route would also cross the railroad proceeding north from the substation to the Baker Park Reserve.

The nearest airport is Maple Airport, a private airport located approximately three miles west of the Project. It is not anticipated that the Project would impact air traffic.

Utilities

Metropolitan Council maintains a 12-inch sewer interceptor, forcemain interceptor 8352, buried approximately 12 feet between the BNSF railroad line and U.S. Highway 12. The Project will cross the Metropolitan Council forcemain interceptor 8352 at least once. In both routes evaluated, the current crossing would be used and the interceptor would be easily spanned. If the Baker Park Reserve Alternative were selected, the route would also cross the interceptor proceeding north from the substation to the Baker Park Reserve.

Both Xcel Energy and Wright-Hennepin Electric Cooperative serve Orono. The area immediately surrounding the proposed Project is served by Wright-Hennepin Electric Cooperative. The Project will not change electric service, but will increase reliability of the electric transmission grid.

Xcel Energy will not install water or wastewater facilities at the substation.

Mitigation Measures

Any crossing of U.S. Highway 12 would require approval from MnDOT. Poles would need to be placed outside the MnDOT clear zone for any road crossings or portions paralleling U.S. Highway 12. Xcel Energy would work with MnDOT to ensure that transmission structures are outside of MnDOT's clear zone and that all safety requirements are met (Xcel Energy, personal communication, October 13, 2011).

Construction of any portion of the Project would require coordination with the local jurisdiction (City or County) to minimize traffic impacts.

Signage during construction activities can help to minimize traffic disruption. Guard structures, such as temporary wood poles with a cross arm or line trucks with booms, can be used to protect traffic lanes.

The Occupancy Permit from BNSF details mitigation measures to minimize the potential for interference between the Project and the railroad.

Prior to construction the location of the Metropolitan Council forcemain interceptor 8352 will be marked to ensure that construction activities avoid the interceptor.

5.8 Zoning and Compatibility

The Orono Zoning Code, at Section 78-946, lists public service structures integral to transmitting power as an allowed conditional use within all zoning districts (Orono, n.d.). The portion of the Project on Xcel Energy's property is zoned as RR-1A, allowing one family per five acres. The remainder of Xcel Energy's Route is located in an area zoned as Planned Residential Development. The portion of the Baker Park Reserve Alternative located within the Baker Park Reserve is zoned as RR-1B, allowing one family per two acres. The Orono 2030 Land Use Plan designates the land south of U.S. Highway 12 as Rural, with one home per 5 acres, and the Baker Park Reserve as park or open space (Orono, 2010).

Because the operating voltage of the Project exceeds 23,000 volts, the Project is considered a "high-voltage transmission line" under Section 14-36 of the Orono City Code (Orono, n.d.). The City Code defines an expectation that utility service lines be placed underground to serve residential, commercial, or industrial customers in newly platted areas; however the Project is part of a regional transmission upgrade and does not directly serve end-use consumers. Section 14-66(b) specifically exempts high-voltage transmission lines from underground placement.

Orono has established a shoreland overlay district to provide appropriate standards for use and development of shorelands in order to preserve water quality as well as the economic, recreational and natural environmental values of the shorelands and waters they surround. The actual limits of the Shoreland Overlay District depend upon the ordinary high water level (OHWL) of the waterbodies in question. Although the OHWL has not been delineated the approximate boundaries of the district, based on an Orono map (City of Orono, 2011), are shown in **Appendix B (Figure B-3)**.

As shown in **Figure B-3**, several structures for both the Xcel Energy Proposed Route and the Baker Park Reserve Alternative appear to lie within Orono's Shoreland Overlay District. Under Orono's Municipal Code structures constructed within the Shoreland Overlay District must meet certain setbacks from public waters and roads. The code requires setbacks of 150 feet from the OHWL of Natural Environment lakes, including Lake Katrina and 100 feet from the OHWL of tributaries, including Painter Creek. The code also requires that structures be setback 30 feet from federal, state, county, public or private road rights-of-way.

The City's Community Management Plan (City of Orono, 2010a) addresses Private Utilities under Community Management Plan, Part 4F, Public Services Plan. Most of the language in this section addresses utility service to new developments. As noted above, the Project is part of a regional transmission grid, and does not serve a particular development.

Mitigation Measures

Because no impact to land use or zoning is anticipated, no mitigation is proposed.

Compliance with setbacks required under Orono's Shoreland Overlay District would require that structures in Baker Park Preserve be set back at least 30 feet from MnDOT ROW along U.S. Highway 12.

5.9 Recreation

Although Orono has many parks providing a variety of recreational activities, Baker Park Reserve is the recreational resource closest to the Project. Both routes would replace one structure within the Baker Park Reserve, while the Baker Park Reserve Route Alternative would result in installation of an additional three structures in the park.

The Baker Park Reserve, part of the Three Rivers Park District, is comprised of approximately 2,700 acres in the cities of Orono and Medina. The southern portion of Baker Park Reserve is north and across U.S. Highway 12 from the Proposed Route; the Baker Park Reserve Route Alternative crosses through the park for approximately 940 feet. Baker Park provides a variety of recreational activities including hiking, camping, boating and canoeing, golfing, biking, and winter sports (Three Rivers park District, 2011). The Park Gun Club is also located within the Baker Park Reserve

With the Xcel Energy Proposed Route direct impacts to Baker Park Reserve would be replacement of Structure 076 on the existing Xcel Energy Line 0831; indirect impact would be visual, although most likely limited to the western portion of the Project.

Depending upon the setback required from public road ROW, discussed further in Section 5.8, the Baker Park Reserve Alternative would be centered either 10 or 30 feet outside the U.S. Highway 12 ROW and require an acquisition of an easement of 47.5 and 67.5 feet in width. Low-growing vegetation would be allowed to repopulate the easement after the line is constructed, but trees would not be allowed to re-establish within the easement. Under this alternative approximately 0.6 to 0.9 acres of trees would be cleared, depending upon the location of the centerline in relation to MnDOT ROW (Xcel Energy, personal communications, November 16 and 28, 2011). The route in this area would not cross any of the recreational paths, but would be visible to users of the park. More detailed information on vegetation impacts in provided in 5.14. Neither route would impact the Park Gun Club.

Mitigation Measures

The Xcel Energy Proposed Alternative would not directly impact recreational resources.

The primary mitigation strategy to minimize recreation impacts is to minimize the amount of tree clearing required and to shield the route from recreational users of the Baker Park Reserve. The route for the Baker Park Reserve Alternative has been designed to overlap right-of-way with MnDOT to minimize the amount of tree clearing required.

As with any landowner, Xcel Energy would be required to compensate Three Rivers Park District or otherwise mitigate for the loss of vegetation and park land. Three Rivers Park District Policy XII states diversion of Park District property must be in the best interest of the Park District and where all other alternatives have been exhausted, and where diversion poses no threat to the Park District natural or recreation resources. Land and Water Conservation Fund rules and regulations may apply to the proposed easement area. Property acquired and/or developed using Land and Water Conservation Funds may not be wholly or partly converted to other than public outdoor recreation uses without the approval of National Park Service pursuant to Section 6(f)(3) of the Land and Water Conservation Fund Act and associated regulations. The conversion provisions of Section 6(f)(3), 36 CFR Part 59, and these guidelines apply to each area or facility for which Land and Water Conservation Fund assistance is obtained, regardless of the extent of participation of the program in the assisted area or facility and consistent with the contractual agreement between National Park Service and the State (Three Rivers Park District, personal communication, November 23, 2011).

5.10 Land Based Economies

Land use and land cover in the project area consist primarily of rural residential, undeveloped wetland and woodland, transportation and regional parkland.

While Hennepin County does have a strong agricultural base, the Project Area does not contain any cultivated lands or pastures. No impacts to Agricultural uses are anticipated.

There are no federal, state, or locally designated forests or commercial logging operations located within the Project location. Although there are forested areas along both routes, there is no forest production in the Project location. No impacts to forestry are anticipated from the Project. Vegetation clearing is discussed in Section 5.14.

Although tourism does not comprise a major portion of the economy in the immediate project area, Baker Park Reserve does offer camping and other recreational uses that might be considered tourism destinations. Impacts to recreational uses in the Baker Park Reserve are discussed in Section 5.9.

According to United States Geological Survey topographic maps the nearest mining resource, an inactive gravel pit, is located approximately four miles east of the Project. Because no existing gravel, rock, and aggregate resources are being mined within or near the project route itself, no impacts are anticipated. Because of the number of transportation resources, presence of residential areas, and the Baker Park Reserve, it is unlikely that the discovery of currently unknown mineral would result in development of such resources for extraction.

Mitigation Measures

Because no impacts to agricultural, forestry or mining resources are anticipated, no mitigation is discussed. Potential impacts to tourism are related to recreational resources, mitigation measures are discussed in Section 5.9.

5.11 Geology & Soils

Bedrock in the project area varies from 100 to 400 feet below the surface. The project area is underlain by Cambrian sandstone (MnDNR, 2011). Soils are formed in deposits of glacial till left by the Des Moines lobe. The soils in the project area are predominantly poorly drained hydric wetland soils of the Klossner, Houghton, and Muskego associations (Xcel Energy, 2011a).

No geologic impacts are anticipated from the Project. As excavation for foundations for both the substation and transmission structures would be approximately 25 feet.

Based on preliminary grading plans for the substation site, Xcel Energy estimates that grading would require approximately 15,700 cubic yards of cut and, depending upon the dimensions of a berm that may be constructed at the substation site, between 3,800 and 6,100 cubic yards of fill (Xcel Energy, personal communication, November 18, 2011). Temporary short-term disturbance of soils would result from site clearing and excavation activities at the substation site and structure locations, pulling and tensioning sites, setup areas and during transport of crews, machinery, materials and equipment over access routes (primarily along transmission right-of-way).

Construction activities can increase erosion by removing vegetation, disturbing soil and exposing sediment to the elements. The eroded soil can quickly become a sedimentation problem when wind and rain carry the soil off the construction site and sediment is deposited in surface waters unless stabilized. In addition to erosion, the hydric soils in the project area are susceptible to compaction

Mitigation Measures

Typical conditions of a high-voltage transmission line route permit require the applicant to utilize erosion control techniques throughout the duration of the project to achieve vegetation establishment and, ultimately, final stabilization. HVTL permits also typically require that contours be graded so that all surfaces drain naturally, blend with the natural terrain, and are left in a condition that will facilitate re-vegetation, provide for proper drainage, and prevent erosion. All areas disturbed during construction of the facilities must be returned to their pre-construction condition.

All construction projects disturbing one acre or more are required to apply for a construction stormwater permit through the MPCA. The permit states that prior to submitting a permit application, the owner must develop a Stormwater Pollution Prevention Plan (SWPPP) for the construction site. Xcel Energy would also be required to adhere to the terms and conditions of the National Pollution Discharge Elimination System (NPDES) permit and SWPPP. Erosion control methods and Best Management Practices (BMPs) pursuant to MPCA requirements will be utilized to minimize runoff during construction. Common mitigation measures employed in transmission projects include:

- Utilizing seed to establish temporary and permanent vegetative cover on exposed soil. The Minnesota Department of Transportation (Mn/DOT) and MnDNR has researched various seed mixes and has identified mixes for specific site characteristics and uses.

- Mulch may be applied to form a temporary and protective cover on exposed soils. Mulch can help retain moisture in the soil to promote vegetative growth, reduce evaporation, insulate the soil, and reduce erosion. A common mulch material used is hay or straw.

- Erecting or using sediment control fences that are intended to retard flow, filter runoff, and promote the settling of sediment out of runoff via ponding behind the sediment control. Examples include biorolls, sandbags, and silt fences.

- Using Erosion control blankets and turf reinforcement mats that are typically single or multiple layer sheets made of natural (wood) and/or synthetic materials that provide structural stability to bare surfaces and slopes.

Mitigation measures to minimize soil compaction include:

- Scheduling construction in areas of wet soils during frozen ground conditions.

- Using construction mats to minimize impacts to wet soils.

5.12 Water Resources

Potential impacts to both groundwater and surface water resources from transmission projects are generally related to the construction phase.

Groundwater

The project area lies within the Metro Province that is generally described as containing sand aquifers in thick sandy and clayey glacial drifts that are generally over 100 feet in depth overlying Precambrian sandstone and Cretaceous bedrock. The sedimentary bedrock underlaying this province provides good aquifer properties (MnDNR, 2011).

Groundwater information specific to the project area was obtained using information from the MnDNR Waters Division and the MDH Minnesota County Well Index. A review of well construction records in the vicinity of the Project shows wells are dug to a depth of between 100 and 200 feet (MDH, 2007).

Potential groundwater impacts from overhead transmission lines are typically associated with the construction phase of the project and may result from structure placement or sedimentation release into shallow aquifers from equipment vibration. Transmission structures will require excavation of approximately 15 to 25 feet, depending on soil conditions. As such, the placement of the transmission structures would not have an impact on the groundwater supply or domestic wells in the area of the project.

The Project would not install any wells.

Surface Water

The proposed project area is located in the Minnehaha Creek Watershed District, which is part of the Mississippi Watershed of the Upper Mississippi River Basin. The Upper Mississippi River Basin is approximately 20,100 square miles in size and stretches from the Headwaters of the Mississippi to the metro area. Drainage typically flows south towards the Mississippi River, the largest river in the watershed (MPCA, 2010).

Lakes located in the general vicinity of the project include Katrina Lake, located approximately 540 feet north of the Baker Park Reserve Route Alternative and Lake Classen, located approximately 4,000 miles east of the Project. Katrina Lake is identified as an impaired lake with a TMDL for nutrients (MPCA, 2009). Painter Creek is crossed by the Proposed Route.

Land that forms the transition from aquatic to terrestrial ecosystems along streams, lakes, and open water wetlands are known as riparian areas. The MnDNR shoreland standards define riparian areas as the land that is within 300 feet of a public waters watercourse and within 1,000 feet of the ordinary high water level of a public water, lake, pond or flowage. Orono's shoreland overlay district is discussed in Section 5.8.

During construction, there is the potential for sediment to reach surface waters due to ground disturbances vegetation clearing, excavation, grading, and construction traffic. During the operation of the Project, there is potential for runoff from the substation site to impact surface waters.

Minimum grading will be done around the pole sites. The graded area of the existing Orono Substation is approximately 0.1 acres, the graded area of the replacement substation will include approximately 1.4 acres, with an additional graded road area of approximately 0.2 acres. In addition to the graded area, a berm to the west of the substation may be constructed to provide a visual buffer between the substation and the homes to the west.

Mitigation Measures

Because no impacts to groundwater are anticipated from the Project, no Mitigation measures are proposed.

HVTL permits issued by the Commission typically require that structures be located to span watercourses, wetlands and floodplains to the extent practicable. Upon completion of construction in a specific area route permit conditions require that contours be graded so that all surfaces drain naturally, blend with the natural terrain, and are left in a condition that will facilitate re-vegetation, provide for proper drainage, and prevent erosion. All areas disturbed during construction of the facilities must be returned to their pre-construction condition.

The Orono Shoreland Overlay District, discussed in Section 5.8, requires that structures be set back a minimum of 100 feet from the OHWL tributaries such as Painter Creek.

Because construction of the Project require disturbing more than one of soil Xcel Energy will apply for a NPDES construction stormwater permit and would prepare a SWPPP. All construction projects disturbing one acre or more are required to apply for a construction stormwater permit through the MPCA. The permit states that prior to submitting a permit application, the owner must develop a SWPPP for the construction site. HVTL permits require the Permittee to employ erosion BMPs and to adhere to the terms and conditions of the NPDES permit and the Stormwater Pollution Prevention Plan (SWPP) prepared for the Project for MPCA.

Erosion control methods and BMPs pursuant to MPCA requirements will be utilized to minimize runoff during substation construction are described in Section 5.11. In addition to erosion control measures, fueling and lubricating far construction equipment away from waterways would ensure that fuel and lubricants do not enter waterways.

5.13 Wetlands and Floodplains

Wetlands provide direct benefits to the environment and vary according to the type or class of wetland and the season. Wetlands serve as floodwater detentions, provide nutrient assimilation and sediment entrapment (water quality), and provide wildlife habitat. Wetlands are either protected federally under Section 404 of the Clean Water Act or by the State of Minnesota under the Wetland Conservation Act.

Larger wetland complexes as well as small isolated wetlands are located in and around the Project site. Xcel Energy commissioned a wetland delineation of the 16 acre parcel within which the 1.2 acre Orono Substation would be located. The wetland area within the site was identified as a Type 3, Palustrine Emergent seasonally flooded (Xcel Energy, 2011a). Neither the Xcel Energy Proposed Route nor the Baker Park Reserve Route Alternative has been delineated for wetlands, information on wetlands within those routes is from the National Wetland Inventory (NWI) developed by the United States Fish and Wildlife Service (USFWS) is shown in **Table 15**. The NWI has not been field verified for the routes outside the Xcel Energy property, but does provide a good start to identify potential wetland areas.

Table 15: NWI Wetlands within the Proposed Route

Township	Range	Section	Wetland Type*	Xcel Proposed Route		Baker Park Alternative	
				75 Foot ROW	400 foot Route	75 Foot ROW	400 Foot Route
118	23	29	PEM	0.4	2.2	0.5	2.5
118	23	30	PEM	2.9	11.5	0.5	2.6
Total				3.3	13.6	1.0	5.2

* Based on the USFWS' Cowardin Classification System for wetlands.

During the construction phase of the Project, there is the potential for temporary impacts to wetlands as a result of ground disturbance related to grading, construction traffic, substation construction, and placement of the transmission line structures. Although minimal grading of areas around pole locations is expected, the substation site will be graded. Potential impacts to wetlands will be limited to the area where the structures and line will be constructed and operated (Xcel Energy, 2011a). Based on a review of NWI data, approximately 1.0 and 3.3acres of wetlands are located within the 75-foot-wide anticipated rights-of way of the Baker Park Reserve Route Alternative and the Xcel Energy Proposed Routes respectively (Xcel Energy, personal communication, November 21, 2011).

Permanent impacts to wetlands would occur where structures must be located within wetland boundaries. Xcel Energy has designed the replacement substation to avoid direct impacts to wetlands. Depending on the delineated location of wetlands and the final location of the ROW, up to five structures could potentially be placed in wetlands for both routes (**Figure B-2**). Each structure would result in approximately 50 square feet of permanent wetland impacts per structure or up to 250 square feet total (0.006 acres).

The Project may require wetland and water resource approvals from the U.S. Army Corps of Engineers (USACE), MnDNR, Hennepin County and the Minnehaha Creek Watershed District. Wetlands crossed by the Project may be jurisdictional to the USACE under Section 404 of the Clean Water Act. Once a route is finalized and permitting requirement are determined, Xcel Energy will submit the Minnesota Local/State/Federal Application Form for Water/Wetland Projects to the USACE's St. Paul District, MnDNR and, if needed, the Hennepin County Soil and Water Conservation District. Xcel Energy has stated that they anticipate that authorization for the Project from MnDNR would come, if granted, under the USACE's General Permit/Letter of Permission permitting program (Xcel Energy, 2011a). As part of the permitting process, Xcel Energy will be required to submit sufficient materials for the USACE to make its jurisdictional determination for impacted wetlands. The joint application will also be subject to MnDNR, Hennepin County Soil and Water Conservation District, and Minnehaha Creek Watershed District review and regulation under the Minnesota Wetland Conservation Act. A license from the MnDNR is required to cross public water wetlands.

Under the Clean Water Act, Section 401 water quality certification is required for activities that may result in a discharge to waters of the United State. MPCA administers Section 401 water quality certification on non-tribal lands in Minnesota. If the USACE authorizes the Project under its General Permit/Letter of Permission permitting program, the MPCA waives its Section 401 Water Quality Certification authority (Xcel Energy, 2011a).

The Project is located within the 100 year floodplains of Lake Katrina and Painter Creek mapped by the Federal Emergency Management Agency (FEMA, 2011). Although the Project would install several transmission structures in a 100 year floodplain, the function of the floodplain would not be affected.

Mitigation Measures

The Project will require a MnDNR License for Utility to Cross Protected Waters from the MnDNR Division of Waters because the Project passes over and across wetlands designated as state public waters (unnamed 27-916 W and 27-917 W). The MnDNR license to cross Protected Waters would outline mitigation measures.

Using information from the wetland delineation of the substation site, Xcel Energy has designed the substation to avoid direct impacts to wetlands from the substation. Following the issuance of a route permit Xcel Energy will perform a wetland delineation along the route to determine wetland locations and minimize impacts from the Project. Standard erosion control measures identified in the MPCA Stormwater BMP Manual, such as using silt fencing to minimize impacts on adjacent water resources would be followed (Xcel Energy, 2011a). Practices may include containing excavated material, protecting exposed soil, and stabilizing restored soil.

In its route permit application, Xcel Energy has proposed the following mitigation measures:

- Spanning wetlands to the greatest extent possible;
- Assembling structures on upland areas before they are brought to the site for installation;
- Avoid crossing wetlands with construction equipment to the extent possible;
- Construction during frozen ground conditions in wetlands to the extent possible;
- Construction crews will attempt to access the wetland with the least amount of physical impact to the wetland (i.e., shortest route) and will access poles near or in wetlands from roadways whenever possible to minimize travel through wetland areas;
- When construction during winter is not possible, construction mats (wooden mats or a composite mat system) would be used to protect wetland vegetation; and
- Use of standard erosion control measures identified in the MPCA *Stormwater BMP Manual*, such as suing silt fencing to minimize impacts on adjacent water resources. (Xcel Energy, 2011a)

Additional mitigation measures could include:

- No staging or stringing set up areas will be placed within or adjacent to wetlands or water resources, as practicable.
- Restoration of wetland vegetation as soon as possible following construction.

5.14 Flora

The proposed project is located in the Big Woods Subsection of the Eastern Broadleaf Forest Ecological Province of Minnesota (MnDNR, 2011a). At the time of European settlement, this subsection was characterized by large blocks of oak woodland and maple-bassleaf forest. Land use along the routes reviewed in this document is predominated by residential uses, which incorporates a large block of undeveloped association land, wetlands, and the Baker Park Reserve, which contains a remnant of the pre-settlement Big Woods vegetation. Rare or sensitive plant species and habitat are discussed in Section 5.16.

The Project would directly impact to vegetation would be through tree clearing. The Xcel Energy Proposed Route would remove approximately 2.2 acres of trees; depending upon the route alignment in relation to the MnDOT ROW, the Baker Park Reserve Route Alternative remove approximately 2.0 to 2.3 acres of trees (Xcel Energy, personal communications, November 16 and 28, 2011). No impacts to identified native plant communities or sensitive plant species are anticipated.

Mitigation Measures

The primary mitigation strategy to minimize impacts to vegetation is minimizing the extent of tree clearing. Xcel Energy has attempted to minimize the need for tree clearing by overlapping railroad and highway easements to the extent possible.

5.15 Fauna

Wildlife within the Project area consists primarily of deer, small mammals, waterfowl, raptors, and perching birds. These species are typical of the land use in the Project area, which is a mixture of rural residential, open wetland, and woodland within the Baker Park Reserve. Threatened and endangered species are discusses in Section 5.16.

Wildlife could temporarily be displaced and small amounts of habitat could be lost from the project area during construction. Because similar tree and wetland habitats are found adjacent to both routes evaluated, it is likely that these species will only be displaced a short distance and would not incur population level effects due to construction of the transmission line. In the case of the Project, the location is dominated by existing transportation and utility corridors as well as residences and, therefore, these species are likely already acclimatized to human development. No permanent impacts to wildlife are anticipated.

The primary potential impact presented to fauna by transmission lines is the potential injury and death of migratory birds such as raptors, waterfowl, and other large bird species. The electrocution of large birds, such as raptors, is more commonly associated with small distribution lines than large transmission lines. Electrocution occurs when birds with large wingspans come in contact with two conductors or with a conductor and a grounding device. Xcel Energy's transmission line design standards and adherence to current industry standards outlined in the *Avian Powerline Action Committee Report* (APPLIC, 2006) would provide for adequate spacing to eliminate the risk of raptor electrocution. As such, electrocution is not a concern related to the project.

Avian collisions are also a recognized possibility with the construction and placement of a new transmission line. The species of birds more commonly involved in collisions are large-bodied and have long wing spans such as swans, geese, ducks, herons, pelicans, and cranes. Collision frequency may increase when a new transmission line is located between agricultural fields that serve as feeding areas, wetlands, or open water, which serve as resting areas.

Mitigation Measures

Xcel Energy has been working with various state and federal agencies over the past 20 years to address avian issues. Company personnel work to address problem areas as quickly and efficiently as possible. In 2002, Xcel Energy Inc.'s operating companies entered into a voluntary memorandum of understanding to work together to address avian issues through its territory (Xcel Energy, 2011a).

The USFWS and MnDNR both recommend installation of bird flight diverters along the transmission line (Xcel Energy, 2011a). In most cases, the shield wire of an overhead transmission line is the most difficult part of the structure for birds to see. Xcel Energy has successfully reduced collisions on certain transmission lines by marking the shield wires with Swan Flight Diverters, which are pre-formed spiral shaped devices made of polyvinyl chloride that are wrapped around the shield wire (Xcel Energy, 2011a).

5.16 Rare and Unique Species and Habitat

The MnDNR's Natural Heritage and Nongame Research Program and the USFWS were consulted to determine the presence of any federal- and state-listed endangered, threatened, and special concern species in addition to any rare and unique native plant communities or Minnesota County Biological Survey sites within or near the proposed project area (Xcel Energy, 2011a).

The USFWS indicated in correspondence with Xcel Energy that there are no federally-listed or proposed species and/or designated or proposed critical habitat within the action area of the Project (Xcel Energy, 2011a).

As of March 31, 2011, no rare flora features have been identified along either route. The natural heritage database search did identify two native plant communities outside of the routes but within the search area (**Appendix B-5**).

Because both routes alternatives avoid known native plant communities and rare plant species, no impacts to sensitive plant communities or species are anticipated.

Trumpeter Swans were identified as being within the Project area. The greatest concern with trumpeter swans is the potential for collision with transmission lines, as discussed in Section 5.15.

Mitigation Measures

The primary technique to minimize the potential for impacts to native plant communities is avoidance through routing. Both Routes avoid impacts to identified plant communities.

As discussed in Section 5.15, installation of Bird Flight Diverters can minimize potential for avian collisions with transmission lines.

5.17 Archaeological & Historic Resources

Impacts to archaeological resources could result from construction activities along the route and could include:

- Damage to surface soils throughout the Project area from heavy rubber-tread or metal-tracked vehicle operation.
- Subsurface excavations necessary to remove old wood power poles or install new poles.
- Damage to surface soils from dragging heavy objects (e.g., power poles).
- Damage to surface soils through grubbing, stump removal and grading.

In response to a request from the Minnesota State Historic Preservation Office (SHPO), Xcel Energy commissioned a Phase Ia background research and literature review to better understand the existing archaeological and historic resources that may be affected by the Project (Xcel Energy, 2011a). The Phase Ia report did not identify any archaeological site or inventoried standing structure within either route.

No known archaeological sites were identified within the route, and the Phase Ia report anticipated that the potential for the Project to impact undiscovered archaeological sites as low because of the Project's location within the existing Orono Substation site and along existing transportation corridors or in areas already disturbed by residential development. The Phase Ia report did recommend, and the SHPO concurred, that archaeological surveys be performed in two areas within the Project area.

As no historic structures have been identified within or near either route, no physical impacts to historic standing structures in the Project area are anticipated.

Mitigation Measures
Avoidance of archaeological and historic architectural properties is the preferred Mitigation measure. The Project avoids historic architectural properties.

Although the potential for the Project to impact undiscovered archaeological sites as low because of the Project's location within the existing Orono Substation site and along existing transportation corridors or in areas already disturbed by residential development, Xcel Energy will contract for archaeological surveys to be performed in two areas within the Project area, as identified by SHPO, to identify any previously unknown archaeological resources (Xcel Energy, 2011a).

In the event of an unanticipated discovery of cultural resources during Project construction, Xcel Energy will stop construction activities and consult with a professional archaeologist and the SHPO to determine the proper course of action. If a cultural resource or feature is determined to be potentially eligible for listing on the National Register of Historic Places, it will be avoided or mitigated before construction can resume (Xcel Energy, 2011a).

5.18 Interference

The Corona from transmission line conductors can generate electromagnetic noise at frequencies that may potentially impact electronic communication and similar devices, including radios, televisions, microwave communications, and Global Positioning System (GPS)-based agricultural navigation systems. No impacts to electronic devices are anticipated as a result of the proposed project.

Radio Interference
Corona from transmission line conductors can generate electromagnetic "noise" in the radio frequency range. This noise may cause broadband interference at the same frequencies that many communication and media signals are transmitted. This noise can cause interference with the reception of these signals depending on the frequency and strength of the signal. Loose hardware on the transmission line may also cause interference.

AM radio frequency interference typically occurs immediately under a transmission line and dissipates rapidly to either side. If radio interference from transmission line corona does occur, satisfactory reception from AM radio stations can be restored by appropriate modification of (or addition to) the receiving antenna system.

FM radio receivers usually do not pick up interference from transmission lines because corona-generated radio frequency noise currents decrease in magnitude with increasing frequency and are quite small in the FM broadcast band (88-108 Mega Hertz); and the excellent interference rejection properties inherent in FM radio systems make them virtually immune to amplitude type disturbances.

Television
Both digital and satellite television are expected to have little interference from corona generated noise, but may experience other types of interference.

Compared to analog broadcasts, digital television broadcast frequencies are high enough that any electromagnetic noise currents, if they were to exist at all, would be very small.

An outdoor antenna can be used to solve issues with multipath reflections.

Satellite television is transmitted in the K_u Band of radio frequency and is not very susceptible to corona generated noise.

Line of sight for satellite television users could be obstructed by a transmission line structure. Line of sight can usually be restored by moving the consumer satellite dish to a slightly different location.

Internet and Cellular Phones

Wireless internet and cellular phones use frequencies in the ultra-high frequency (UHF) range. The specific UHF frequency used by a cellular phone would depend on the technology (global system for mobile communications (GSM), 3G, etc.) of the provider. All radio frequencies used for both cellular phones and wireless internet are high enough that the effect of corona generated noise near the line would be negligible, no impacts are anticipated.

GPS-Based Navigation Systems

Corona-generated noise and not the EMF from transmission lines could be a source of interference for GPS systems. Satellite GPS signals are broadcast at 1.57542 GHz (L1 signal) and 1.2276 GHz (L2 signal) and are high enough that they would have minimal interference. Differential correction signal beacons on the nationwide Coast Guard network transmit at frequencies around 283-325 kHz and are susceptible to electrical noise. Interference with correction signals could result in reduced accuracy while operating directly under a high-voltage transmission line.

Impacts to GPS systems are typically an issue in agricultural areas because of concerns with interference with farm machinery. The Project is not located in an agricultural area and no impacts with GPS systems are anticipated.

6 PERMITS & APPROVALS

Should a route permit be issued for the project, the applicant may be required to apply for the various local, state, and federal permits listed in this section.

Table 16: Summary of Permits and Approvals

Permit Approvals	Jurisdiction
Federal Approvals	
Section 404 Permit, Clean Water Act (Local/State/Federal Application for Water/Wetland Projects, for discharge of fill due to placement of poles in wetlands). Section 106 Review	U.S. Army Corps of Engineers
Minnesota State Approvals	
License to Cross Public Waters or State Lands	MnDNR – Lands and Minerals
Utility Permit (Road Crossing Permits to cross or occupy state trunk highway road right of way)	MnDOT
NPDES/SDS Permit (construction)	MPCA
Section 401, Clean Water Act	MPCA
Minnesota Local/Regional Approvals	
Land Permits, including road crossing/right of way permits (may be required to occupy lands such as parklands, watershed districts, and other publicly-owned land)	County, Township
Wetland Permit	County, Watershed District
Road Crossing, Over-width Loads, Driveway/Access Permits	County, Township
Driveway Permit	County, City, Township
Culvert Extension/Connection	County

7 ROUTE COMPARISONS

In the Alternative Routing Process, applicants are not required to provide any routes for review other than the route proposed in the Route Permit Application. However, the scoping process allows citizens or local units of government to propose alternatives. In this case, one route alternative investigated by Xcel Energy during their internal routing process was proposed through the scoping process and carried forward into the Scoping Decision for further consideration.

Xcel Energy proposes to construct a new 0.6-mile long 115 kV overhead transmission line to be located in the northeastern part of the city of Orono. As described in the route permit application the new transmission line route would exit an expanded Orono Substation, head north for 866 feet as a double circuit line and then turning to the northwest along the southern edge of the BNSF railroad right-of-way for approximately 1,205 feet to the existing 115 kV transmission Line 0831. At this point, the Project would replace three existing transmission structures and approximately 1,030 feet of single circuit 115 transmission Line 0831with two new structures and approximately 1,095 feet of single circuit 115 kV transmission line, re-routing the existing line off of two residential parcels and onto adjacent HDHOA property adjacent to the BNSF railroad. A new double-circuit corner structure would connect the single- and double-circuit portions of the project (**Figure 1**). The Project would also install fiber optic ground wire along the entire length of the Project.

The Baker Park Reserve Alternative, as described in Section 3, is the same as the Xcel Energy Proposed Route except that, rather than following the BNSF railroad to the northwest after it exits the Xcel Energy substation parcel it crosses the railroad and U.S. Highway 12 before turning to the northwest approximately to follow the highway right-of- way northwest for approximately 0.2 miles through the Baker Park Reserve. The anticipated centerline in this area would be located approximately 10 to 30 feet outside of the highway right-of-way and would either parallel the existing distribution line or move the existing distribution line to the new structures for this segment.

Both the Xcel Energy Proposed Route and the Baker Park Reserve Alternative would be very similar in their potential impacts to the items evaluated in this EA. Both routes are similar in length, approximately 0.6 miles in total, and vary for only approximately 0.2 miles, the Xcel Energy Alternative following the south side of the BNSF railroad and U.S. Highway 12, while the Baker Park Reserve Alternative would cross to the north side of U.S. Highway 12 before crossing back again. For both routes, the nearest homes would be approximately 180 feet from the Orono Substation and 275 feet from the single circuit portion of the transmission line. Both routes parallel existing railroad and road right-of-way for a significant portion of their respective routes and would cross the BNSF railroad and U.S. Highway 12 at least once; the Baker Park Reserve Route Alternative would have an additional crossing of the railroad and highway directly north of the substation. The disparity between routes is realized when looking at the following: transportation crossings, tree removal, wetlands, and recreation. A comparison summary of the three routes and their potential impacts is presented in **Table 17**.

Table 17: Route Comparison

Issue	Xcel Energy Proposed Route	Baker Park Reserve Route Alternative	Comparison of Routes [a]
Route Length	0.6 miles	0.6 miles	same
Effect on Human Settlement			
Distance from substation to nearest home	180 feet	180 feet	Same
Distance from substation to nearest home	275 feet	275 feet	Same
Displacement	No impact	No impact	Same
Noise	Temporary / No impact	Temporary / No impact	Same
Aesthetics	Viewshed would include new and incrementally taller transmission line structures; expanded substation	Viewshed would include new and incrementally taller transmission line structures; expanded substation	Same
Cultural Values	No impact	No impact	Same
Recreation	New structure in Baker Park Reserve within the same ROW would cause incremental change to viewshed.	Addition of approximately 940 feet of transmission line and up to 5 new structures within Baker Park Reserve; establishment of a new ROW of up to 67.5 feet. Removal of 0.6 to 0.9 acres of trees in Baker Park Reserve	Baker Park Reserve Route Alternative would have more direct impacts on Baker Park Reserve
Transportation	One crossing of BNSF Railroad and U.S. Highway 12	Two crossings of BNSF Railroad and U.S. Highway 12	Baker Park Reserve Route Alternative would one additional crossing of railroad and highway
Utilities	No impact	No impact	Same
Public Health and Safety	No impact	No impact	Same
Effects on Land Based Economies			
Agriculture	No impact	No impact	Same
Forestry	No impact	No impact	Same
Tourism	No impact	No impact	Same
Mining	No impact	No impact	Same
Archaeological Resources	No identified resources, but survey recommended at substation site	No identified resources, but survey recommended at substation site	Same
Historic Resources	No identified resources	No identified resources	Same
Effects on Natural Resources			
Air Quality	No impact	No impact	Same
Water Quality	No impact	No impact	Same
Surface Water Crossings	One crossing	One crossing	Same
Wetlands	Up to 5 structures in wetland; approximately 250 square feet of permanent impact	Up to 5 structures in wetland; approximately 250 square feet of permanent impact	Same

Issue	Xcel Energy Proposed Route	Baker Park Reserve Route Alternative	Comparison of Routes [a]
Floodplains	Located in floodplain	Located in floodplain	Same
Flora	Approximately 2.2 acres of trees removed	Depending upon alignment, Approximately 2.0 to 2.3 acres of trees removed	Similar
Fauna	Temporary / No impact	Temporary / No impact	Same
Rare and Unique Natural Resources	1 Threatened Species	1 Threatened Species	Same
Sharing of Existing Rights-of-way			
Transportation	0.34 miles (57 percent)	0.34 miles (57 percent)	Same
Electrical	0	0	Same
Cross Country	0.25 miles (42 percent)	0.25 mile (42 percent)	Same
Costs	$5.3 million for construction; $300-$500 per mile per year for maintenance	$5.4 million for construction; $300-$500 per mile per year for maintenance	Baker Park Reserve Route Alternative construction cost is approximately $100,000 more than Xcel Energy Proposed Route

8 REFERENCES

Much of the information contained within this document was provided by the applicant or the applicant's representatives in Xcel's application to the Public Utilities Commission for a route permit, June 7, 2011 (available for viewing at: http://energyfacilities.puc.state.mn.us/Docket.html?Id=32082

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