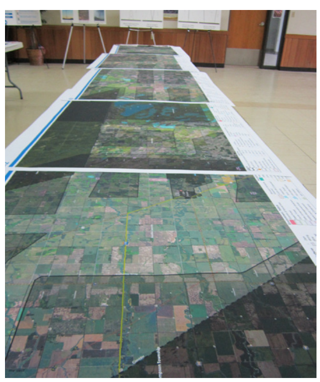
minnesota power

AN ALLETE COMPANY

GREAT NORTHERN TRANSMISSION LINE

PRESIDENTIAL PERMIT APPLICATION FOR THE UNITED STATES DEPARTMENT OF ENERGY

April 15, 2014



Presidential Permit Application

BOOK 1 of 3

This page intentionally left blank

minnesota power

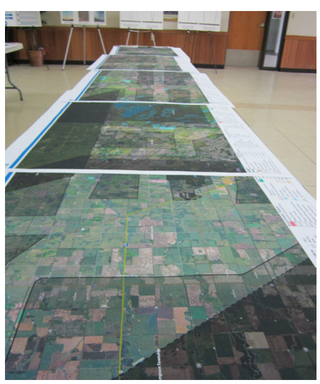
AN ALLETE COMPANY

GREAT NORTHERN

TRANSMISSION LINE

PRESIDENTIAL PERMIT APPLICATION FOR THE UNITED STATES DEPARTMENT OF ENERGY

April 15, 2014



Presidential Permit Application

BOOK 1 of 3

This page intentionally left blank

minnesota power
AN ALLETE COMPANY

30 west superior street / duluth, minnesota 55802-2093 / fax: 218-723-3955 /www.allete.com

David R. Moeller
Senior Attorney
218-723-3963
dmoeller@allete.com

April 15, 2014

Christopher Lawrence
United States Department of Energy
Office of Electricity and Energy Reliability
1000 Independence Avenue SW
Washington, DC 20585

RE: Minnesota Power's Presidential Permit Application to the United States Department of Energy for the Great Northern Transmission Line

Dear Mr. Lawrence:

Minnesota Power hereby submits its Application for a Presidential Permit with the United States Department of Energy (DOE) for the 500 kV Great Northern Transmission Line and associated facilities (Project). The Project is a high voltage transmission line between the province of Manitoba and Minnesota Power's service territory in northern Minnesota. Therefore, because this Project crosses an international border, a Presidential Permit is required from the DOE.

Since January 2012 Minnesota Power has been actively developing the Project through extensive voluntary outreach, including numerous meetings with landowners, federal, state, and local agencies and other invited stakeholders such as tribal governments and non-governmental organizations. Minnesota Power has initiated state approvals through submittal of the Certificate of Need (CN) application to the Minnesota Public Utilities Commission (MPUC) and in conjunction with this Application, will be submitting today its state Route Permit application. MPUC Docket Nos. E015/CN-12-1163 and E015/TL-14-21. Minnesota Power appreciates the DOE's role in facilitating interagency discussions prior to Minnesota Power's formal application and believes this Project can be a model for enhancing coordination and collaboration amongst Federal agencies, state, local and tribal governments, non-governmental organizations and the public.

Minnesota Power proposes to construct a 220-mile 500 kilovolt (kV) alternating current (AC) transmission line between the Minnesota Manitoba border crossing northwest of Roseau, Minnesota and the existing Blackberry Substation near Grand Rapids, Minnesota, as well as associated substation facilities and transmission system modifications at the

Blackberry Substation site, and a 500 kV series compensation station. The new substation facilities required for the Project (Blackberry 500 kV Substation) will be constructed adjacent to and east of the existing Blackberry 230/115 kV Substation. The line is expected to carry at least 750 MW to facilitate agreements and transmission service requests between Minnesota Power and Manitoba Hydro plus exports and transmission service requests by Manitoba Hydro to other utilities. Minnesota Power's agreements are for 383 megawatts (MW) by June 1, 2020 to meet the requirements of the Applicant's MPUC approved 250 MW Power Purchase Agreement (PPA) and 133 MW Renewable Optimization Agreement with Manitoba Hydro. In addition to meeting the Applicant's needs and Manitoba Hydro's exports to other utilities, the Project will support the regional electric grid. The Project facilitates an innovative wind storage provision in the PPA that leverages the flexible and responsive nature of hydropower to optimize the value of Minnesota Power's significant wind energy investments. Minnesota Power and Manitoba Hydro are also finalizing the 133 MW Renewable Optimization Agreement outlining how Minnesota Power will purchase additional energy and substantially expand its renewable energy storage opportunities with this Project.

The Project brings a host of benefits, while enabling Minnesota Power and the region to meet customer needs for power. Those benefits include, but are not limited to: enabling Minnesota Power to diversify its baseload generation portfolio and reduce the overall emissions associated with its electric supply portfolio; increasing transmission system reliability for a broad region of the upper Midwest as shown through regional reliability studies, and; supporting recent and planned industrial growth on Minnesota's Iron Range. Furthermore, the Project provides economic benefits in the form of property tax revenue, construction and maintenance jobs and increased business for hotels, restaurants, and other services along the final route.

In accordance with Executive Order 10485, as amended by Executive Order 12038, Minnesota Power is applying to the DOE for a Presidential Permit authorizing the construction, operation, maintenance, and connection of facilities for the transmission of electric energy at the international border between the United States and Canada. The enclosed Application has been prepared in accordance with the DOE's regulations and formal guidance. Minnesota Power has enclosed four paper copies and two CDs of the Application as well as the required $150 application filing fee.

Minnesota Power looks forward to continuing its active engagement for the Great Northern Transmission Line and welcomes further advancement with DOE and other stakeholders of the integrated, inter-agency process. Please contact me if you have any questions or need additional information.

Yours truly,

David R. Moeller

David R. Moeller
Senior Attorney
Minnesota Power

Table of Contents

Table of Contents (cont.)

Table of Contents (cont.)

Table of Contents (cont.)

Table of Contents (cont.)

Table of Contents (cont.)

Tables

Tables (cont.)

Tables (cont.)

Tables (cont.)

Figures

Figures (cont.)

Figure 6.25-1. County, State, and National Forest Lands 6.25-3

List of Appendices

Completeness Checklist

Under 10 C.F.R. § 205.322, every Presidential Permit application must include the following:

Application requirement		**Location in application**
	Application Fee ($150)	
Information Regarding the Applicant		
	Legal name of the applicant	Section 1.2.1
	Legal name of all partners	Section 1.2.1
	Name, title, address and phone number of person to whom correspondence should be addressed	Section 1.2.1
	Whether the applicant or its transmission lines are wholly or partly owned by a foreign government or instrumentality, or any agreement pertaining to such ownership by or assistance from any foreign government or instrumentality	Section 1.2.1
	All existing contracts between the applicant and any foreign government, or any foreign private concern, relating to any purchase, sale or delivery of electric energy	Section 1.2.1
	A showing that construction, connection, operation, or maintenance of the proposed facility is within the applicant's corporate power, and that the applicant has or will comply with all applicable Federal and State laws	Section 1.2.1
	A signed opinion of counsel	Appendix J
Information regarding the transmission lines covered by the Presidential Permit		
A technical description providing		
	number of circuits, with identification as to whether the circuits are overhead or underground	Section 5.2.1
	operating voltage and frequency	Section 5.2.2
	conductor size, type and number of conductors per phase	Section 5.2.3
	wind and ice loading design parameters	Section 5.2.8
	full description and drawing of a typical supporting structure, including strength specifications	Section 5.2.4
	structure spacing with typical ruling and maximum spans	Section 5.2.5

Application requirement		Location in application
	conductor (phase) spacing	Section 5.2.6
	designed line to ground and conductor side clearances	Section 5.2.7
	A map showing the overall system with a scale not greater than 1 inch = 40 km	Section 1.0, Figure 1-1
	A map showing the physical location, longitude and latitude of the facility on the international border, with a scale not greater than 1 inch = 25 miles, that indicates the ownership of the facilities at or on each side of the border	Section 5.0, Figure 5-1
Bulk power supply facility information		
	Data regarding the expected power transfer capability, using normal and short time emergency conductor ratings	Appendix K
	System power flow plots for the applicant's service area during heavy summer and light spring load periods, with and without the proposed international interconnection, for the in-service year and five years after the in-service year	Appendix K
	Data on the line design features for minimizing television and radio interference	Section 6.14
	Description of the relay protection scheme, including equipment and proposed functional devices	Section 5.4.4
Information regarding environmental impacts		
	Flood plains	Section 6.17
	Wetlands	Section 6.18
	Critical wildlife habitat	Section 6.19
	Navigable waterway crossings	Section 6.17
	Indian land	N/A
	Historic sites	Section 6.16
	Sites potentially eligible for listing on the National Register of Historic Places	Section 6.16
	Details regarding minimum ROW width for construction, operation and maintenance	Section 5.5.1, 5.7.1
	Threatened and endangered species	Section 6.20
	Description of practical alternatives and their environmental effects	Throughout

Application requirement		Location in application
	Signature (under oath) by officer of the applicant with knowledge of the proposal	Appendix J

This page intentionally left blank

Acronyms and Abbreviations

A

AADT	annual average daily traffic
ACHP	Advisory Council on Historic Preservation
Act	Next Generation Energy Act
AIMP	Agricultural Impact Mitigation Plan
Al	aluminum
ALJ	Administrative Law Judge
AM	amplitude modulation
ANSI	American National Standards Institute
APP	Avian Protection Plan
AREMA	American Railway Engineering and Maintenance of Way Association
ATV	all-terrain vehicle

B

BA	Biological Assessment
BGEPA	Bald and Golden Eagle Protection Act
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BMP	Best Management Practice

C

CEQ	Council on Environmental Quality
CO_2	carbon dioxide
CO	carbon monoxide
CSAH	county state-aid highway

D

DNR	Department of Natural Resources
DOC	Department of Commerce
DOE	Department of Energy
DOT	Department of Transportation
DOA	Department of Agriculture

E

ECS	Ecological Classification System
EHV	extra high voltage
EI	Environmental Inspector
EILC	Ecologically Important Lowland Conifers
EIS	Environmental Impact Statement
EMF	electric and magnetic field
EO	Executive Order
EPA	U.S. Environmental Protection Agency
EQB	Environmental Quality Board
ESA	Endangered Species Act
ESRI	

F

FA	operation with cooling fans
FAA	Federal Aviation Administration
FCC	Federal Communications Commission
Fe	iron
FM	frequency modulation
FOA	operation with fans and oil pumps

G

G	Gauss
GAP	Geographical Analysis Program
GHG	greenhouse gas
GIS	Geographic Information System
GNTL	Great Northern Transmission Line

H

H_2S	hydrogen sulfide

HCVF	High Conservation Value Forest
Hz	Hertz

I

ICD	implantable cardioverter defibrillator
ICNIRP	International Commission on Non-Ionizing Radiation Protection
IBA	Important Bird Area
IEEE	Institute of Electrical and Electronics Engineers

K

kV	kilovolt
kV/m	kilovolts per meter

L

LEP	Limited English Proficiency
Leq	Equivalent continuous sound level
LGU	Local Government Unit
LiDAR	Light Detection and Ranging
LMIC	Land Management Information Center

M

μg/m^3	micrograms per cubic meter
mA	milliAmperes
MAAQS	Minnesota Ambient Air Quality Standards
MBS	Minnesota Biological Survey
MBTA	Migratory Bird Treaty Act
MDA	Minnesota Department of Agriculture
mG	milliGauss
mg/m^3	milligrams per cubic meter
MHS	Minnesota Historical Society
MISO	Mid-Continent Independent System Operator
MNN	Minnesota Northern Railroad
MPCA	Minnesota Pollution Control Agency
MRCC	Midwestern Regional Climate Center
MW	megawatt

N

NAAQS	National Ambient Air Quality Standards
NAC-1	Noise Area Classification 1
NCDC	National Climatic Data Center
NEMA	National Electrical Manufacturers' Association
NEPA	National Environmental Policy Act
NERC	North American Electric Reliability Corporation
NESC	National Electric Safety Code
NGO	non-governmental organization
NHIS	Natural Heritage Inventory System
NHPA	National Historic Preservation Act
NIEHS	National Institute of Environmental Health Sciences
NLCD	National Land Cover Database
NO_2	nitrogen dioxide
NOI	Notice of Intent
NPC	Native Plant Communities
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places

O

O_3	ozone
OA	operation with no fans
OGF	Old Growth Forest
OHV	off-highway vehicle

P

PA	Programmatic Agreement
Pb	lead
PEM	Palustrine emergent
PFO	Palustrine forested
PM	particulate matter
PPA	Power Purchase Agreement
ppb	parts per billion
ppm	parts per million
PPSA	Power Plant Siting Act
PSS	Palustrine Scrub-shrub
PUB	Palustrine Unconsolidated Bed
PUC	Public Utilities Commission
PWI	Public Waters Inventory

R

ROC	region of comparison
ROD	Record of Decision
ROW	right-of-way

S

SFRMP	Subsection Forest Resource Management Plan
SGCN	Species of Greatest Conservation Need
SHPO	State Historic Preservation Office
SNA	Scientific and Natural Area
SO_2	sulfur dioxide
SPCC	Spill Prevention, Control, and Countermeasures
SWPPP	Storm Water Pollution Prevention Plan

T

TCP	Traditional Cultural Property
TH	trunk highway
THPO	Tribal Historic Preservation Office
TSP	total suspended particulate

U

UHI	urban heat island
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

V

VEC	valued environmental component
VHF	very high frequency
VOR	very high frequency (VHF) omnidirectional range

W

WMA	Wildlife Management Area
WPA	Watershed Protection Area

This page intentionally left blank

Executive Summary

Minnesota Power, an operating division of ALLETE, Inc. (Applicant), is applying to the Minnesota Public Utilities Commission (PUC) for a Route Permit and to the U.S. Department of Energy (DOE) for a Presidential Permit to construct the Great Northern Transmission Line (GNTL).

ABOUT THE PROJECT

The project includes a 500 kilovolt (kV) alternating current (AC) transmission line between the Minnesota-Manitoba border (border crossing) and the existing Blackberry Substation near Grand Rapids, Minnesota, as well as associated substation facilities and transmission system modifications at the Blackberry Substation site, and a 500 kV series compensation station (Project) (see Figure ES-1 below).

Construction is expected to begin by 2016 and is expected to be completed by 2020.

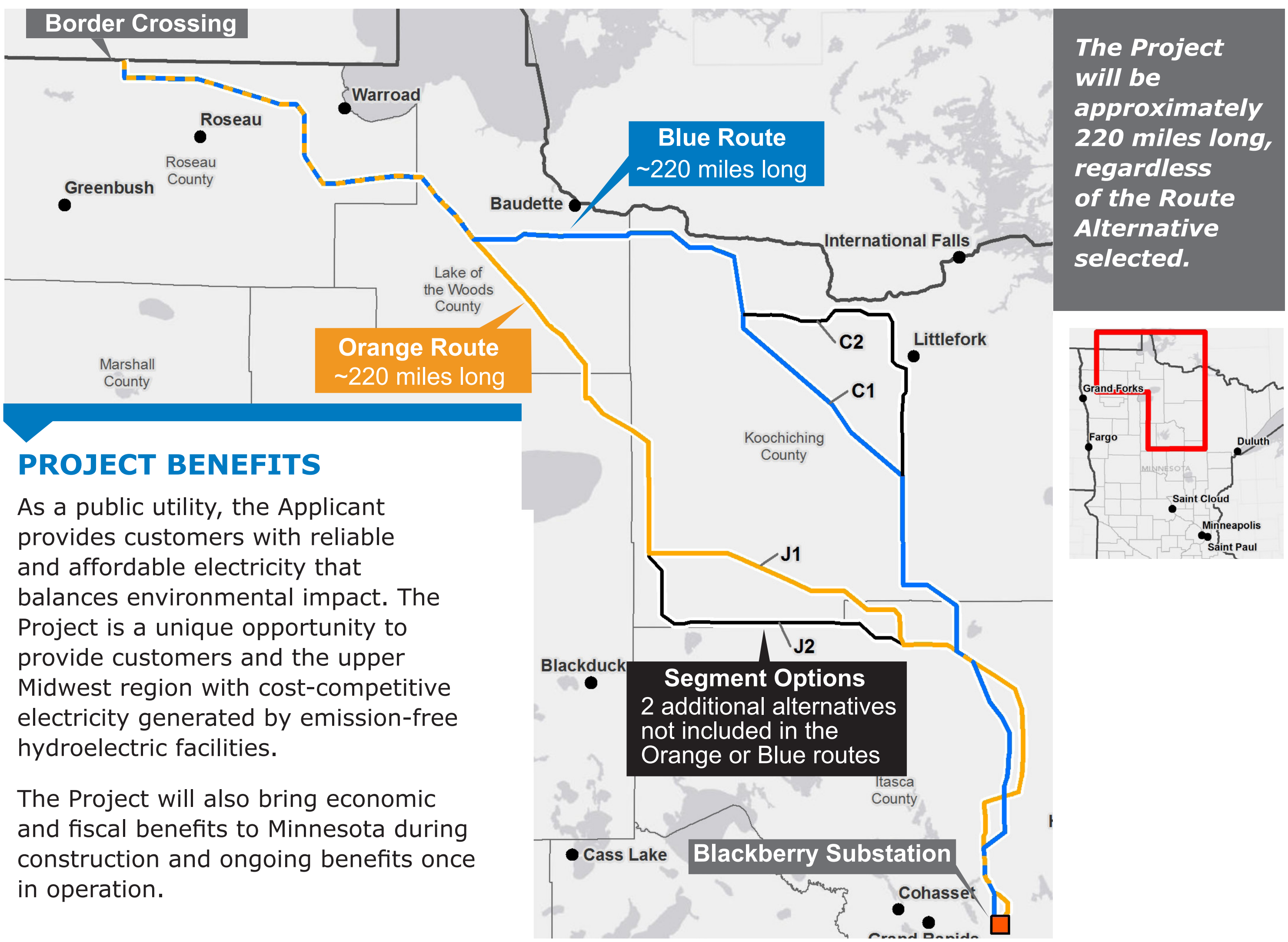
PROJECT PURPOSE AND NEED

The Project's purpose is to efficiently provide the Applicant's customers and the Midwest region with clean, emission-free energy that will:

- → Help meet the region's growing energy demands
- → Advance the Applicant's *Energy**Forward*** strategy to increase its generation diversity and renewable portfolio
- → Strengthen system reliability
- → Fulfill the Applicant's obligations under its power purchase agreements with Manitoba Hydro

all in a manner that is consistent with the Applicant's commitment to making a positive impact on communities.

FIGURE ES-1: PROPOSED ROUTE ALTERNATIVES



PROJECT BENEFITS

As a public utility, the Applicant provides customers with reliable and affordable electricity that balances environmental impact. The Project is a unique opportunity to provide customers and the upper Midwest region with cost-competitive electricity generated by emission-free hydroelectric facilities.

The Project will also bring economic and fiscal benefits to Minnesota during construction and ongoing benefits once in operation.

PUBLIC PARTICIPATION AND AGENCY COORDINATION

From August 2012 to November 2013, the Applicant organized more than 75 agency and public meetings and maintained an active online presence.

52 Public meetings

2,200+ People attended

13 Agency meetings

16 Agencies attended

1,780+ Comments received at meetings, online, or via the hotline

640+ Of comments received were mapped

From the outset of the Project development process, the Applicant recognized the importance of gathering data, input, and engaging members of the public, landowners, agencies, tribes, local government units, and non-government organizations (NGOs) in an upfront, comprehensive outreach program.

During the initial stages of Project development, the Applicant developed a strategic communication plan that identified stakeholders for the Project, along with communication tools, schedule, and approach to engage those stakeholders early and often throughout the route development process.

REGULATORY FRAMEWORK

FEDERAL PROCESS

The Department of Energy is the lead federal agency for the Project. Pursuant to Executive Order (EO) 10485 of 1953, as amended by EO 12038, and 10 Code of Federal Regulations (CFR) Section 205.320, a Presidential Permit is required for the Project because it will cross the international boundary between Minnesota and Manitoba, Canada.

Because the Project constitutes a Major Federal Action, DOE must consider the environmental effects of the Project, and reasonable alternatives to the Project, pursuant to the National Environmental Policy Act (NEPA). An Environmental Impact Statement (EIS) will be prepared in compliance with NEPA and DOE's NEPA implementing regulations, 10 CFR Part 1021.

STATE PROCESS

PUC regulates transmission line construction in Minnesota. PUC determines whether there is a need for a transmission line through its Certificate of Need process. PUC also determines the route—and any conditions it will require for the construction, operation, and maintenance of the transmission line—through its route permitting process.

The Applicant filed a Certificate of Need application for the Project with PUC October 22, 2013. The Certificate of Need application can be found on PUC's website, under MPUC Docket No. E015/CN-12-1163. The Certificate of Need establishes the size, type, and required end points of the Project.

This document is the Presidential Permit Application for authorization to construct a new transmission line and associated facilities in Minnesota.

PROJECT DESCRIPTION

Aerial view of 500kV line in Lost River State Forest, near Border Crossings A1-A3

TRANSMISSION LINE STRUCTURE TYPE

The Applicant continues to evaluate several structure types and configurations that will be used for the Project, including: a self-supporting lattice structure, a lattice guyed-V structure, and a lattice guyed delta structure. The structure details provided in Figure ES-2 and Appendix D are typical of these structure types.

The Applicant currently estimates approximately 4 to 5 structures per mile of transmission line. The type of structure in any given section of transmission line will be dependent on land type and land use.

Typical Spans: 1,000 feet - 1,450 feet

The Project structures typically will range in heights from approximately 100 feet above ground to approximately 150 feet above ground, depending on the structure type and the terrain. In some instances, such as where the Project crosses an existing transmission line, taller structures may be required.

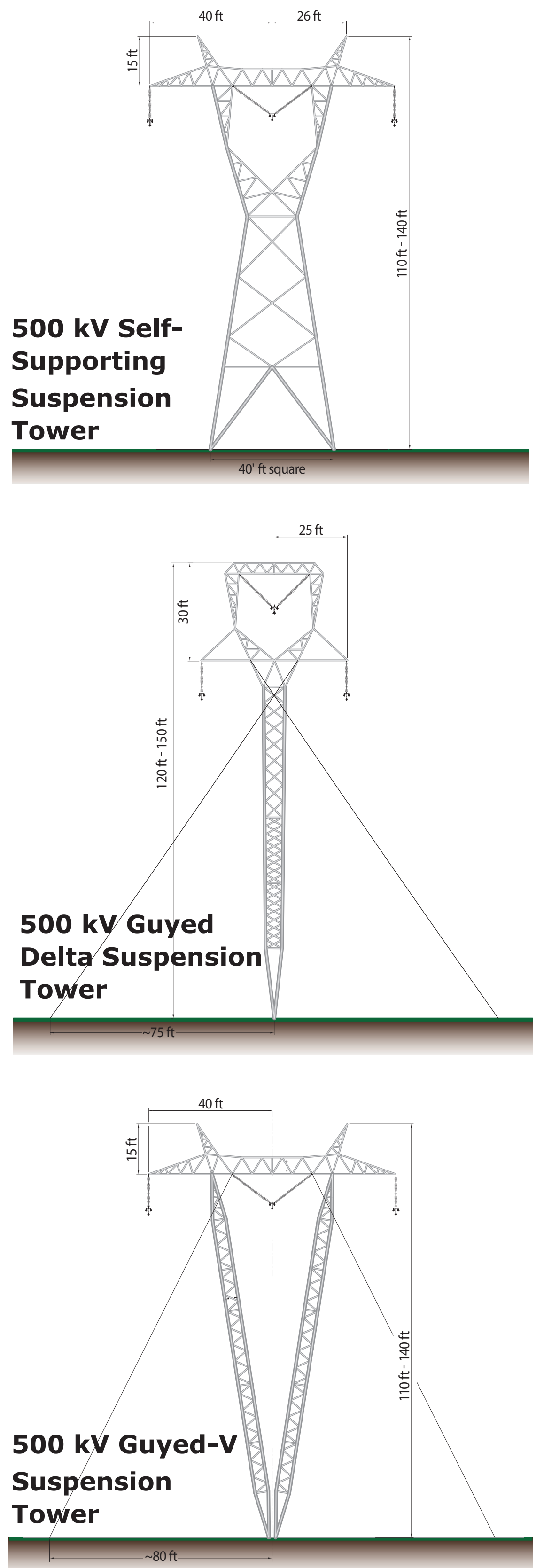
RIGHT-OF-WAY

This Project generally will require a new 200-foot-wide right-of-way (ROW) to accommodate the transmission line.

For high-voltage transmission lines, utilities acquire easement rights across certain parcels to accommodate the facilities. The evaluation and acquisition process includes title examination, initial owner contacts, survey work, document preparation, and easement purchase.

Right-of-way: 200 feet

FIGURE ES-2: STRUCTURE SCHEMATICS



PROPOSED ROUTE ALTERNATIVES

For purposes of reviewing potential environmental effects, the Applicant employed a Route Alternative that is 1,000 to 3,000 feet wide and a 200-foot wide anticipated ROW. The table below compares key conditions between the Orange and Blue Route Alternatives. The majority of the impacted land for either Route Alternative consists of woody wetlands and deciduous, evergreen, and mixed forest lands. Impacted agricultural land typically includes pasture and hay, row crops, and small grains.

	ORANGE ROUTE		BLUE ROUTE	
	220 miles long 30% parallel to existing transmission line ROW		219 miles long 38% parrellel to existing transmission line ROW	
KEY CONDITIONS EVALUATED	Within 200 ft anticipated ROW	Within 1,000-3,000 ft	Within 200 ft anticipated ROW	Within 1,000-3,000 ft
Residences	0	64	0	49
Private land	+	32%	+	36%
County land	+	18%	+	12%
State land	+	49%	+	52%
Federal land	+	1%	+	1%
Permanently impacted acreage	2115	N/A	2,327	N/A
Percentage NWI wetlands	63%	58%	69%	62%
Acres of filled wetlands estimated	+	0.56	+	0.60
Acres of permanently impacted agricultural land	+	4	+	4
Percentage of forested land	52%	55%	45%	55%

+ *Included in the value for impacts within 1,000 - 3,000 feet.*

ADDITIONAL SEGMENT OPTIONS

Two additional Segment Options—not included within the Orange Route or the Blue Route—have been identified as potential alternatives (see Figure ES-1). Potential environmental impacts of these additional Segment Options are described in each resource section (see Section 6.0).

SUBSTATION AND ASSOCIATED FACILITIES

The Project will terminate at a new substation (that is, Blackberry 500 kV Substation) located on the same site as the Applicant's existing Blackberry 230/115 kV substation. The Blackberry 500 kV Substation will be designed to accommodate the new 500 kV line, 500/230 kV transformation, existing 230 kV lines, and all associated 500 kV and 230 kV equipment. The Project also will require a 500 kV Series Compensation Station, the location of which, has not yet been determined. For purposes of the impact analysis, it was assumed that the 500 kV Series Compensation Station would be located at the Blackberry Substation site.

POTENTIAL ENVIRONMENTAL IMPACTS

The potential environmental impacts of the Project are addressed in detail in Section 6 of this Application. Table ES-1 summarizes the range of impacts that will occur for each environmental issue reviewed in that Section.

Table ES-1. Summary of Potential Environmental Impacts

Orange Route Alternative	Blue Route Alternative
Geomorphic and Physiographic Environment	
The Project will require minimal excavation or surface grading because transmission lines are constructed to conform to the local topography. Surficial deposits are generally greater than 50 feet thick and in some areas bedrock might be encountered at construction depths. The Project is not expected to have temporary or permanent impacts on the geomorphic or physiographic environment.	Same as Orange Route.
Soils	
Surface soils will be disturbed by site clearing, grading, and excavation activities at structure locations, pulling and tensioning sites, setup areas, and during the transport of crews, machinery, materials, and equipment over access routes (primarily along rights-of-way [ROWs]). During dry conditions, this disturbance will be minimal, and generally will be less invasive than typical agricultural practices such as plowing and tilling. Soil compaction may occur on access paths, and at other locations, which is the result of heavy equipment activity. Soil erosion may occur if surface vegetation is removed, especially on fine textured soils that occur on sloping topography.	Same as Orange Route
Climate	
The Project will deliver hydropower and help diversify the energy fuel supply; it is a key component in the Applicant's long-term strategy to generate or purchase low-carbon energy resources and reduce GHG emissions. Through the Project and other planned projects, the Applicant plans to significantly reduce coal-generation in its portfolio. Other Manitoba Hydro customers will see similar GHG emission reductions. The Project therefore is not expected to have any long-term direct or indirect effects on climate.	Same as Orange Route.

continued...

Table ES-1. Summary of Potential Environmental Impacts, *continued...*

Orange Route Alternative	Blue Route Alternative
Vegetation	
Permanent conversion of forests (2,745 acres) and shrublands to more open, herbaceous settings within the anticipated ROW. Open, herbaceous landcover types will remain intact following construction, except at structures. Greenfield alignment through 89.6 miles of forest with associated reduction in intact blocks of forest habitat (that is, fragmentation). Approximately 25 acres of ecologically important lowland forests, as designated by Minnesota DNR would be crossed. Temporary impacts on all vegetation types during construction due to clearing for equipment access along access paths and at structure locations. Soil compaction due to the need for access to structures. Permanent loss of vegetation at structures. Potential for spread of invasive species and edge effects, particularly in adjacent forest communities.	Conversion of forests (2,680 acres) and shrublands to more open, herbaceous settings within the anticipated ROW. Open, herbaceous landcover types will remain intact following construction except, at structures. Greenfield through 82.8 miles of forest with associated reduction in intact blocks of forest habitat (that is, fragmentation). Approximately 42 acres of ecologically important lowland forests, as designated by Minnesota DNR would be crossed. Temporary impacts on all vegetation types during construction due to clearing for equipment access along access paths and at structure locations. Soil compaction due to the need for access to structures. Permanent loss of vegetation at structures. Potential for spread of invasive species and edge effects, particularly in adjacent forest communities.
Human Settlement	
No known residences are located within the anticipated ROW. Indirect effects on residential properties may occur and will include construction related noise, potential interruptions of traffic during construction, temporary impacts on land use, and possible changes to home or property values.	Same as Orange Route
Land Use	
The Project will obtain easement rights on the anticipated ROW, thus, the land will stay in current ownership. Permanent impacts to the use of the land would only occur at the structure locations, that is, the structures would permanently restrict the owner's use. Other areas within the anticipated ROW would have fewer restrictions on use, and, therefor, were not identified as a permanent impact. Additional personal income will be generated for residents in the region and the state by circulation and recirculation of dollars paid out by the Applicant as business expenditures and state and local taxes.	The Project will obtain easement rights on the anticipated ROW, thus, the land will stay in current ownership. Permanent impacts to the use of the land would only occur at the structure locations, that is, the structures would permanently restrict the owner's use. Other areas within the anticipated ROW would have fewer restrictions on use, and, therefor, were not identified as a permanent impact.

continued...

Table ES-1. Summary of Potential Environmental Impacts, *continued...*

Orange Route Alternative	Blue Route Alternative
Land Use, *continued...*	
Permanent impacts based on land ownership types will total approximately 4 acres for state conservation land; 11 acres for other privately owned land; 9 acres for county land; 25 acres for state forest; and approximately 3 acres for WMAs. All other land ownership types will have less than one acre of permanent impact. Permanent impacts on land cover types will total approximately 4,118 acres. No effect on zoning.	Permanent impacts based on land ownership types will total approximately 5 acres for state conservation land; 12 acres for other privately owned land; 6 acres for county land; and 28 acres for state forest. All other land ownership types will have less than one acre of permanent impact. Permanent impacts on land cover types will total approximately 3,908 acres. No effect on zoning.
Environmental Justice	
The Project will not have a disproportionately high and adverse affect on minority populations, or have a high impact on any individual or population. Minority and low-income individuals may experience construction related impacts in the same manner as other individuals. These may include temporary construction impacts and operation and maintenance impacts.	Same as Orange Route.
Socioeconomic Factors	
More than 200 jobs are estimated to be directly created from construction of the Project and 73 jobs are estimated to be added in industries such as food service, healthcare, and building and professional services. It is not anticipated that the Project will create new, permanent jobs. If local contractors are used for portions of the construction, total wages and salaries paid to contractors and workers in surrounding counties will contribute to the total personal income of the region. Indirectly, the increased capability and reliability of the electric system to supply energy to commercial and industrial users might contribute to the economic growth of the region.	Same as Orange Route.

continued...

Table ES-1. Summary of Potential Environmental Impacts, *continued...*

Orange Route Alternative	Blue Route Alternative
Cultural Values	
Although survey data suggests that there is a general understanding of the need for the Project, residents may not see the value of power transmission lines if there is no direct benefit to them. If there is no direct benefit in better, more reliable energy to the communities, or if they sense it will inhibit their economic life in relation to tourism, agriculture, or decreasing land values, and inadequate compensation for use of their land, there could be adverse effects on the cultural values of pragmatism and quality of life. Game animal populations are not expected to be affected by the Project. The Project is not expected to have any negative impacts on hunting opportunities within the Route Alternative. The Project will allow local residents to continue their overall individual economic and social activities, and access to the natural environment and tourism is not expected to be permanently and negatively affected by the Project. The presence of new transmission lines will not hinder use of trails or forest areas for recreational purposes. Overall, the Project is not expected to have lasting direct effects on the values of individualism and community pride. No indirect effects on economic well-being, quality of life, and standard of living are anticipated.	Same as Orange Route
Aesthetics	
The visual profile of transmission structures and conductors may influence the perceived aesthetic quality of a view from a particular location. Where the Orange Route is adjacent to the Big Bog State Recreation Area in Beltrami County, visual impact because of structures and conductors could be long-term if they can be viewed from the boardwalk. Additional study is required to determine potential impacts at this location. There are 64 residences located within the Route Alternative, but no residences are located within the anticipated ROW. The presence of existing natural windbreaks and tree rows may reduce the visual impact of the Project to the residences. Additional visual intrusion will occur at the location where the transmission line crosses roads and trails.	The visual profile of transmission structures and conductors may influence the perceived aesthetic quality of a view from a particular location. There are 49 residences located within the Route Alternative, but no residences are located within the anticipated ROW. The presence of existing natural windbreaks and tree rows may reduce the visual impact of the Project to the residences. The primary visual intrusion will occur at the location where the transmission line crosses roads and trails.

continued...

Table ES-1. Summary of Potential Environmental Impacts, *continued...*

Orange Route Alternative	Blue Route Alternative
Noise	
Analysis results indicate that audible noise associated with the Project will be in compliance with the relevant MPCA noise standards at the edge of the Project ROW in most areas. Where the Project parallels the existing 500 kV line, the analysis results indicate that audible noise has the potential to reach 50.5 dBA on an L50 basis at the edge of the common ROW for the two lines. Based on a review of aerial photography using GIS technology, the nearest residence is approximately 2,000 feet away from the ROW. At that distance, the projected audible noise levels attributable to the Project are expected to attenuate such that they will not cause or contribute to an exceedence of the MPCA noise standards. Construction equipment, including heavy trucks and cranes, supporting equipment like air compressors and concrete mixers, and potentially even helicopters, would generate temporary noise in the area surrounding the construction site.	Same as Orange Route.
Air Quality	
No permanent or long-term effect on air quality. During construction of the Project, limited, temporary, and localized impacts on air quality might occur during construction of either Route Alternative due to the disturbance of topsoil, which raises fugitive dust particles.	Same as Orange Route.
Public Services	
Once construction is complete, the Project, including all Route Alternatives, will span all roads and therefore will not impede emergency services or otherwise result in any long-term, negative direct or indirect effects on public services. Gas pipelines are not common in the Study Area, therefore, impacts on gas and oil pipelines are not expected. The Orange Route Alternative parallels existing electrical transmission lines for approximately 66.4 miles. Construction and operation of the Project will not interfere with the operation of existing transmission lines as the appropriate separation distance will be maintained for clearance and safety issues.	Once construction is complete, the Project, including all Route Alternatives, will span all roads and therefore will not impede emergency services or otherwise result in any long-term, negative direct or indirect effects on public services. Gas pipelines are not common in the Study Area, therefore, impacts on gas and oil pipelines are not expected. The Blue Route Alternative parallels existing electrical transmission lines for approximately 84.2 miles. Construction and operation of the Project will not interfere with the operation of existing transmission lines as the appropriate separation distance will be maintained for clearance and safety issues.

continued...

Table ES-1. Summary of Potential Environmental Impacts, *continued...*

Orange Route Alternative	Blue Route Alternative
Radio, TV, Cellular Telephone	
The Applicant does not expect that radio or television interference will be an issue within the Study Area. There are no communication towers located in the anticipated ROW thus, construction of the Project will not directly affect any communication towers. No indirect impacts on omnidirectional communications are anticipated as the transmission line hardware will be designed to reduce gap discharges and corona discharges. The transmission line will be properly maintained to minimize gap discharges and corona discharges.	Same as Orange Route.
Electric and Magnetic Fields	
No direct or indirect effects attributed to electric and magnetic fields from the Project are expected.	Same as Orange Route.
Archeological and Historical Resources	
Information was obtained from existing public records recorded at the State Historic Preservation Office to evaluate potential impacts to archaeological and historic resources. A full field evaluation has not been completed. Two architectural properties are known to be present with the anticipated ROW that could be directly or indirectly affected. The anticipated ROW does not include any properties previously listed or determined eligible for the National Register of Historic Places. Possible impacts on archaeological and architectural properties, and Traditional Cultural Properties (TCPs) could result from one or more of the following: → Direct disturbance or alteration to the resource from preconstruction, construction, or maintenance activities. → Disturbance to surface soils from heavy construction vehicles, equipment, or materials. → Disturbance to surface soils through grubbing, stump removal, boulder removal, and grading. → Subsurface excavation necessary for construction.	Same as Orange Route.

continued...

Table ES-1. Summary of Potential Environmental Impacts, *continued...*

Orange Route Alternative	Blue Route Alternative
Archeological and Historical Resource, *continued...*	
→ Visual, atmospheric, or audible intrusions causing alterations to the setting, character, viewshed, or landscape of the property. → Unauthorized removal of or damage to the property by individuals made aware of the presence of such properties.	
Water Resources and Floodplains	
This section evaluated potential impacts to public water inventory (PWI) watercourses and basins, as well as floodplains. Crossings that were greater than 1,000 feet-wide may result in placement of at least one structure in the basin or floodplain. Direct impacts on surface water resources likely will occur at the unnamed PWI basin in Roseau County. The span width of the unnamed PWI basin in Roseau County is approximately 2,118 feet wide, which may require one or more structures to be placed within this basin. Direct impacts on other PWI basins or watercourses are not likely to occur since they are spannable. Indirect effects on PWI resources will include the removal of riparian or shoreline forests where present. In addition to the habitat changes this will cause, it could increase light penetration to the waterbody. These indirect effects have potential to cause increased water temperature and changes to aquatic plant community. Temporary access across PWI watercourses (see Table 6.17-2) may be required to facilitate construction of portions of this Route Alternative, especially where located in isolated areas and where access to the ROW from public roads will be limited. The Orange Route will cross four impaired waterways. Direct impacts on surface water resources are not likely to occur to Minnesota Pollution Control Agency (MPCA) impaired watercourses during construction of the Project, because the impaired water features will be avoided by spanning the transmission line over the watercourses.	This section evaluated potential impacts to public water inventory (PWI) watercourses and basins, as well as floodplains. Crossings that were greater than 1,000 feet-wide may result in placement of at least one structure in the basin or floodplain. Direct impacts on surface water resources likely will occur at the unnamed PWI basin in Roseau County and at Grass Lake in Itasca County. The span width of the unnamed PWI basing in Roseau County wetland is approximately 2,118 feet wide, which may require one or more structures to be placed within this basin. The span width of Grass Lake in Itasca County will be approximately 1220 feet, which may require one or more structures to be placed within this basin. Indirect effects on PWI resources will include the removal of riparian or shoreline forests where present. In addition to the habitat changes this will cause, it could increase light penetration to the waterbody. The Blue Route crosses Pitt Grade Creek in Lake of the Woods County, where this may be an issue. These indirect effects have potential to cause increased water temperature and changes to aquatic plant community. Temporary access across PWI watercourses (see Table 6.17-2) may be required to facilitate construction of portions of this Route Alternative, especially where located in isolated areas and where access to the ROW from public roads will be limited. The Blue Route will cross three impaired waterways. Direct impacts on surface water resources are not likely to occur to MPCA impaired watercourses during construction of the Project, because the impaired water features will be avoided by spanning the transmission line over the watercourses.

continued...

Table ES-1. Summary of Potential Environmental Impacts, *continued...*

Orange Route Alternative	Blue Route Alternative
Water Resources and Floodplains, *continued...*	
Indirect impacts that might affect turbidity and dissolved oxygen are from sediment runoff from stormwater during construction, due to the presence of exposed topsoil or disturbed vegetation within the ROW. The Orange Route will cross floodplains associated with the Roseau River/Sprague Creek, Winter Road River, Troy Creek, Rapid River (Main & North Branch), Chase Brook, Wade Brook, Tamarack River and the Prairie River In total, approximately 79,706 feet (15.1 miles, approx.) of the Orange Route is located in floodplains. Where complete avoidance of floodplains is not feasible, structure placement will have little to no effects on water flow, flood water storage capacity, or flooding in those floodplains because the volume displaced by the structures will be so small as to be negligible. Permanent impacts on groundwater resources are not anticipated to occur as a result of this Project. Temporary impacts during construction could occur if dewatering is necessary to install the transmission structures. The Project will not be expected to result in violations of groundwater quality standards. xx Approximately 1.0 mile of the Orange Route crosses the Hay Creek Impoundment Area, located within the Roseau River Watershed. The impacts on water flow, flood water storage, and flooding will be negligible due to the small volume of structures compared to the approximately 9,500-acre-feet capacity of the impoundment. Permanent impacts on groundwater resources are not anticipated to occur as a result of this Project. Temporary impacts during construction could occur if dewatering is necessary to install the transmission structures. The Project will not be expected to result in violations of groundwater quality standards.	Indirect impacts that might affect turbidity and dissolved oxygen are from sediment runoff from stormwater during construction, due to the presence of exposed topsoil or disturbed vegetation within the ROW. The Blue Route will cross floodplains associated with the Roseau River/Sprague Creek, Winter Road River, Peppermint Creek, Baudette River West Fork, Rapid River, Rapid River East Fork, Black River, Big Fork River, and Reilly Brook. In total, approximately 73,622 feet (13.9 miles, approx.) of the Blue Route are located in floodplains. Where complete avoidance of floodplains is not feasible, structure placement will have little to no effects on water flow, flood water storage capacity, or flooding in those floodplains because the volume displaced by the structures will be so small as to be negligible. Approximately 1.0 mile of the Blue Route crosses the Hay Creek Impoundment Area, located within the Roseau River Watershed. The impacts on water flow, flood water storage, and flooding will be negligible due to the small volume of structures compared to the approximately 9,500-acre-feet capacity of the impoundment. Permanent impacts on groundwater resources are not anticipated to occur as a result of this Project. Temporary impacts during construction could occur if dewatering is necessary to install the transmission structures. The Project will not be expected to result in violations of groundwater quality standards.

continued...

Table ES-1. Summary of Potential Environmental Impacts, *continued...*

Orange Route Alternative	Blue Route Alternative
Wetlands	
Direct permanent wetland impacts will occur where dredging or filling is required for structure foundation installation. The estimate of the total amount of wetlands that will need to be filled to install structures within the anticipated ROW, assuming a 1,000 foot span length is approximately 0.56 acres. The Applicant estimates that a total of approximately 5.3 acres of wetland will be filled for the construction of the Blackberry 500 kV Substation and the 500 kV Series Compensation Station. Conversion of forested wetlands is likely the greatest permanent impact on wetlands associated with the Project. Removal of trees within the ROW is required to ensure the safe and efficient operation of the transmission line. Removal of woody vegetation within a forested wetland area will not require dredging or filling, nor will it reduce overall wetland acreage, but will convert the forested wetland area to a different vegetative class and thus a different wetland type. The Orange Route will convert 1,667 acres of forested wetland. Permanent conversion of 448 acres of shrub wetlands will occur within a minimum 70-foot-wide swath beneath the transmission line conductors, additional clearing width as well as the removal of tall growing species may be necessary. Temporary wetland impacts due to construction activities will occur to wetland areas that are not permanently impacted or permanently converted to another wetland type. Temporary impacts are expected to occur in emergent (that is, palustrine emergent [PEM] type) wetlands during construction. The Orange Route would cross 117 miles of muck soils, which can be more sensitive to construction impacts. The Project has potential to impact wetlands through soil erosion and sediment deposition due to construction activities. Sedimentation in wetlands can cause changes to vegetation, with greater potential for establishment of invasive species, such as reed canary grass.	Direct permanent wetland impacts will occur where dredging or filling is required for structure foundation installation. The estimate of the total amount of wetlands that will need to be filled to install structures within a anticipated ROW, assuming a 1,000 foot span length is approximately 0.60 acres. The Applicant estimates that a total of approximately 5.3 acres of wetland will be filled for the construction of the Blackberry 500 kV Substation and the 500 kV Series Compensation Station. Conversion of forested wetlands is likely the greatest permanent impact on wetlands associated with the Project. Removal of trees within the ROW is required to ensure the safe and efficient operation of the transmission line. Removal of woody vegetation within a forested wetland area will not require dredging or filling, nor will it reduce overall wetland acreage, but will convert the forested wetland area to a different vegetative class and thus a different wetland type. The Blue Route will convert 1,908 acres of forested wetland. Permanent conversion of 419 acres of shrub wetlands will occur within a minimum 70-foot-wide swath beneath the transmission line conductors, additional clearing width as well as the removal of tall growing species may be necessary. Temporary wetland impacts due to construction activities will occur to wetland areas that are not permanently impacted or permanently converted to another wetland type. Temporary impacts are expected to occur in emergent (that is, PEM Type) wetlands during construction. The Blue Route would cross 127 miles of muck soils, which can be more sensitive to construction impacts. The Project has potential to impact wetlands through soil erosion and sediment deposition due to construction activities. Sedimentation in wetlands can cause changes to vegetation, with greater potential for establishment of invasive species, such as reed canary grass.

continued...

Table ES-1. Summary of Potential Environmental Impacts, *continued...*

Orange Route Alternative	Blue Route Alternative
Wildlife	
Wildlife management areas (WMAs) are managed to provide habitat for wildlife as well as hunting opportunities. The Orange Route includes 342 acres of WMA within the anticipated ROW. Habitat fragmentation reduces the size of contiguous blocks of forest, shrubland, wetland, prairie, and grassland. This reduces the total area of contiguous habitat available to wildlife species and increases the isolation of the habitat. In forested habitat, it leads to an increase in edge habitat that is successfully exploited by a variety of predatory and scavenging species. The Orange Route includes 89.6 miles of forest greenfield impact. Potential impacts on wildlife from the Project include the direct or indirect loss or conversion of habitat, increased habitat fragmentation, and the potential risk of avian collisions with transmission conductors and equipment. Temporary impacts may include displacement due to construction activities or compaction of grassland habitat along access roads.	Wildlife management areas (WMAs) are managed to provide habitat for wildlife as well as hunting opportunities. The Blue Route includes 114 acres of WMA within the anticipated ROW. Habitat fragmentation reduces the size of contiguous blocks of forest, shrubland, wetland, prairie, and grassland. This reduces the total area of contiguous habitat available to wildlife species and increases the isolation of the habitat. In forested habitat, it leads to an increase in edge habitat that is successfully exploited by a variety of predatory and scavenging species. The Blue Route includes 82.8 miles of forest greenfield impact. Potential impacts on wildlife from the Project include the direct or indirect loss or conversion of habitat, increased habitat fragmentation, and the potential risk of avian collisions with transmission conductors and equipment. Temporary impacts may include displacement due to construction activities or compaction of grassland habitat along access roads.
Rare and Unique Species and Communities	
There are 24 species listed as threatened, endangered, special concern, or unique resources that could occur in or near the Orange Route. Species protected by state statutes that occur within 1 mile of the Orange Route include 15 plants, 6 birds, 2 mollusks, 1 insect, and 3 terrestrial communities. One vascular plant is listed by Minnesota as endangered. Eight species are listed as state threatened. The remaining resources are listed as of special concern or unique resources. Potential impacts on rare and unique species from the Project include the direct or indirect loss or conversion of habitats and increased habitat fragmentation. Increased disturbance associated with clearing and construction related equipment that may allow invasive species to colonize previously undisturbed plant communities or increased disturbance in areas adjacent to existing transmission lines.	There are 14 species listed as threatened, endangered, special concern, or unique resources that have occurred in or near the Blue Route. Species protected by state statutes that occur within 1 mile of the Blue Route include 7 plants, 5 birds, 2 mollusks, 2 colonial waterbird sites, and 3 terrestrial communities. In general, the western side of the Blue Route Alternative, because of the dominance of tilled agriculture, contains less native habitat, and thus fewer protected species, than other parts of the route. Potential impacts on rare and unique species from the Project include the direct or indirect loss or conversion of habitats and increased habitat fragmentation. Increased disturbance associated with clearing and construction related equipment that may allow invasive species to colonize previously undisturbed plant communities or increased disturbance in areas adjacent to existing transmission lines.

continued...

Table ES-1. Summary of Potential Environmental Impacts, *continued...*

Orange Route Alternative	Blue Route Alternative
Rare and Unique Species and Communities, *continued...*	
The Orange Route crosses Watershed Protection Areas (WPAs) for calcareous fens at the Pine Creek Peatland SNA, Sprague Creek Peatland SNA, Red Lake Peatland SNA, and Lost River Peatland SNA fen complexes. A determination of potential effects on known fen complexes will require coordination with Minnesota DNR.	The Blue Alternative crosses WPAs for the Sprague Creek Peatland SNA and Pine Creek Peatland SNA, which contain calcareous fens. The WPA for the North Black River Peatland SNA and the Myrtle Lake Peatland SNA also are crossed by the Blue Route. A determination of potential effects on known fen complexes will require coordination with Minnesota DNR.
Noxious Weeds and Exotic Organisms	
Construction of the Route Alternative could lead to the introduction or spread of noxious weeds or other invasive species in an area due to ground disturbance, leaving exposed soils for extended periods, introduction of contaminated topsoil, vehicles importing weed seed from a contaminated site to an uncontaminated site and through conversion of landscape type, particularly from forested to open settings.	Construction of the Route Alternative could lead to the introduction or spread of noxious weeds or other invasive species in an area due to ground disturbance, leaving exposed soils for extended periods, introduction of contaminated topsoil, vehicles importing weed seed from a contaminated site to an uncontaminated site and through conversion of landscape type, particularly from forested to open settings
Recreation and Tourism	
Potential impacts on recreation and tourism resources might include changes to or loss of scenic resources, hunting opportunities and other wildlife recreational opportunities; impacts on water and forest resources used for recreation; temporary increase in noise levels; and increased off-highway vehicle (OHV) use following development of a new ROW. Where the Orange Route is adjacent to the Big Bog State Recreation Area in Beltrami County, visual impact because of structures and conductors could be long-term if they can be viewed from the boardwalk. Additional study is required to determine potential impacts at this location.	Potential impacts on recreation and tourism resources might include changes to or loss of scenic resources, hunting opportunities and other wildlife recreational opportunities; impacts on water and forest resources used for recreation; temporary increase in noise levels; and increased OHV use following development of a new ROW.

continued...

Table ES-1. Summary of Potential Environmental Impacts, *continued...*

Orange Route Alternative	Blue Route Alternative
Agricultural Production	
Permanent impacts on agricultural lands total approximately 4 acres. Temporary impacts on agricultural lands total approximately 79 acres. Loss of prime farmland will occur (that is, 16 acres permanently; 324 acres temporarily).	Permanent impacts on agricultural lands total approximately 4 acres. Temporary impacts on agricultural lands total approximately 90 acres. Loss of prime farmland will occur (that is, 14 acres permanently; 289 acres temporarily).
Transportation	
Temporary road closures, lane closures, and traffic detours during construction and maintenance resulting in increased traffic times. Temporary railway closures or delays due to construction of Project structures at rail crossings. The Route Alternatives have been located outside of the identified flight zones, but confirmation of impact avoidance with airport officials will be required.	Same as Orange Route.
Forestry	
Construction of the transmission line will convert 2,745 acres of forest land within the anticipated ROW to shrub and grasslands. Of this forest, 470 acres are under corporate/industrial ownership. The long-term impact of taking acreage out of forest production will be minimal because of the Project acreage is small in comparison to the regional timber resources. Additional impacts on forestlands are likely for the Blackberry 500 kV Substation and possibly the 500 kV Series Compensation Station. Based on the assumptions used for impact analysis, approximately 5 acres of forest will be affected for construction of the Blackberry 500 kV Substation and the 500 kV Series Compensation Station. Temporary impacts for construction of access roads and creation of storage and lay-down areas will be calculated following determination of the final Route Alternative.	Construction of the transmission line will convert 2,680 acres of forest land within the anticipated ROW to shrub and grasslands. Of this forest, 719 acres are under corporate/industrial ownership. The long-term impact of taking acreage out of forest production will be minimal because of the Project acreage is small in comparison to the regional timber resources. Additional impacts on forestlands are likely for the Blackberry 500 kV Substation and possibly 500 kV Series Compensation Station. Based on the assumptions used for impact analysis, approximately 5 acres of forest will be affected for construction of the Blackberry 500 kV Substation and the 500 kV Series Compensation Station. Temporary impacts for construction of access roads and creation of storage and lay-down areas will be calculated following determination of the final Route Alternative.

continued...

Table ES-1. Summary of Potential Environmental Impacts, *continued...*

Orange Route Alternative	Blue Route Alternative
Mining	
The construction of a transmission structure within an aggregate resource, potential quarry, or mining area can reduce the development potential of these resources by limiting access to the underground mining resource and limiting use of heavy mining equipment and explosives (that is, blasting) near transmission lines. One gravel pit is located within the anticipated ROW of the Orange Route. There should be sufficient room to route the final ROW to avoid the gravel pit shown in the 2013 aerial photographs. No direct impacts on aggregate mining resources are expected to occur due to construction and operation of the Project. Both Route Alternatives intersect active state non-ferrous metallic mineral leases. There are currently no active non-ferrous metallic mines on the leased land, although the potential exists for additional exploration and future mining in the Study Area. The Project has the potential to directly affect future development of metallic mineral resources.	The construction of a transmission structure within an aggregate resource, potential quarry, or mining area can reduce the development potential of these resources by limiting access to the underground mining resource and limiting use of heavy mining equipment and explosives (that is, blasting) near transmission lines. No aggregate resource, quarries or mines were identified within the anticipated ROW of the Blue Route. No direct impacts on aggregate mining resources are expected to occur due to construction and operation of the Project. Both Route Alternatives intersect active state non-ferrous metallic mineral leases. There are currently no active non-ferrous metallic mines on the leased land, although the potential exists for additional exploration and future mining in the Study Area. The Project has the potential to directly affect future development of metallic mineral resources.

PROPOSED MITIGATION

The Route Permit, Presidential Permit, and other federal and state permits will require the implementation of mitigation measures to prevent or minimize impacts on resources from the construction and operation of the Project. The Applicant has voluntarily proposed the mitigation measures for each resource area summarized in Table ES-2 below. Mitigation is not required or proposed for the following resource areas:

- → Geomorphic and physiographic environment
- → Climate
- → Environmental justice
- → Socioeconomic factors
- → Noise
- → Electric and magnetic fields

Table ES-2. Proposed Mitigation Measures

Resource	Mitigation Measures
All Resource Types	The Applicant will retain an environmental inspector (EI) during Project construction. Working on behalf of the Applicant, the EI will be responsible for understanding all of the conditions of the Project's environmental permits and to ensure that the contractors abide by these conditions.
Soils	To the extent practical, soil disturbance and excavation activities in steep slope areas will be avoided. Where disturbance and excavation cannot be avoided entirely, it will be minimized using best management practices (BMPs) such as matting, ice roads, and low ground pressure equipment to the extent practical to minimize impacts during construction. Sediment and erosion control plans will be developed that specify the types of BMPs necessary. Depending on the site, BMPs may include installation of silt fence, straw bales, or ditch blocks, and/or covering bare soils with mulch, plastic sheeting, or fiber rolls to protect drainage ways and streams from sediment runoff. Erosion control practices will be inspected during construction, especially during significant precipitation events. Soil compaction in cultivated areas will be treated and restored through tillage operations, for example using a subsoiler. Where rutting occurs, the Applicant will repair the surface and restore ground vegetation upon completion of work in a given area. All disturbed areas will be revegetated once construction is complete. Seed mixes will be specified based on site characteristics and in accordance with regulatory permits. The introduction and establishment of noxious weeds will be minimized by prompt re-vegetation of disturbed areas using regional genotype native species where appropriate or by seed based on landowner agreements.
Vegetation	All areas of ground disturbance not permanently altered will be prepared for restoration (that is, soil preparation),and reseeded with an appropriate seed mix recommended by the appropriate agency's management or according to landowner requirements (subject to other regulations and permit conditions, such as, control of noxious weeds [see Section 8.21, Noxious Weeds and Exotic Organisms]), Section 401 and Section 404 of the Clean Water Act wetlands and waters permits, or National Pollutant Discharge Elimination System (NPDES) permit required prior to construction. The Applicant will continue to coordinate with Minnesota DNR to minimize and avoid impacts on plant communities on state lands through adjustments to the anticipated ROW, permit conditions, and mitigation. Where forested areas are cleared, appropriate herbaceous native seed mixes from sources as close as possible to the Study Area will be used to re-vegetate, as rapidly as possible, to prevent encroachment by non-native and noxious weed species. Where possible, reliance on natural revegetation will be encouraged (particularly in wetland areas).

continued...

Table ES-1. Proposed Mitigation Measures, *continued...*

Resource	Mitigation Measures
Vegetation, *continued...*	Project construction will occur in wetlands and wet soils during frozen conditions to the extent practical to minimize soil compaction. Construction mats will be used to help protect wet soils where encountered during construction. Wetland protection and mitigation is discussed in Section 6.18, Wetlands. Where only portions of the HCVFs are located within the Route Alternatives, it may be possible to avoid entirely the designated HCVF by shifting the ROW within the Route Alternatives.
Human Settlement	Property or easement acquisition will be conducted in accordance with applicable state and federal regulations. During ROW acquisition, the placement of individual structures may be coordinated with property owners, to the extent practicable. The construction crews will follow local, state, and federal regulations with regard to construction noise, dust, and timing. The Project will be designed with local, state, and National Electrical Safety Code (NESC) standards regarding clearance to ground, clearance to crossing utilities, clearance to buildings, strength of materials, and ROW widths. Construction crews will comply with local, state, and NESC standards regarding installation of facilities and standard construction practices. Established Applicant and industry safety procedures will be followed during and after construction of the Project, including clear signage during all construction activities. The transmission line will be equipped with protective devices to safeguard the public if an accident occurs, such as a structure or conductor falling to the ground. The protective devices are circuit breakers and relays located where the transmission line connects to the substation. The protective equipment is designed to de-energize the transmission line should such an event occur. The substation facilities will be have appropriate signage, will be fenced, and access will be limited to authorized personnel.
Land Use	The Applicant will work with Minnesota DNR to minimize impacts on sensitive forested areas within the state forests. Areas disturbed in state forest land would be reseeded with a seed mix recommended by the appropriate agency's management. The minimum area necessary will be used for access roads. Spans will be adjusted such that structures, where practicable, will avoid open water and transportation corridors. Likewise, construction and maintenance access roads will be located to avoid or minimize impacts on these areas as well. Construction activities will be limited to the ROW, unless access permission is obtained from landowners. Fences, gates, and similar improvements that are removed or damaged would be repaired or replaced. Mitigation of potential impacts at the Blackberry 500 kV Substation will focus on selecting the appropriate location for constructing the required facilities within the site.

continued...

Table ES-1. Proposed Mitigation Measures, *continued...*

Resource	Mitigation Measures
Cultural Values	The proposed Project will include vegetative restoration using native species, to the extent practicable. Water quality impacts that may affect wild rice are not anticipated and will be minimized through the installation and maintenance of BMPs. Construction activities and timing will be announced through the Project website in an effort to minimize conflicts with local recreational activities. The Applicant expects to address issues as they might arise, using agreed-upon methods as outlined in a Programmatic Agreement document as well as through the State and National Environmental Protection Act (NEPA) scoping process.
Aesthetics	The Applicant will seek to minimize the negative visible impacts of the Project at site specific locations, such as travel ways, recreation sites, and bodies of water with access and residences. Minor shifts to the anticipated ROW will be evaluated once a Route Alternative is chosen, to further minimize impacts. Further evaluate potential visual impacts at the Big Bog State Recreation Area and work with Minnesota DNR to identify mitigation, as appropriate. Residences have been avoided and distances to residences and structures were maximized during the development of the Route Alternatives and Segment Options to the extent practical. The Project will parallel existing ROWs, to the extent practical, to minimize visual impacts on farmlands, open spaces, and recreational areas. Crossing of Water of the Dancing Sky (that is, Minnesota Highway 11) will be perpendicular to that highway and will be parallel to the existing 500 kV transmission line. To the greatest extent possible, waterways will be spanned in the same location as existing disturbances or ROWs; otherwise, the Applicant will seek to cross waterways perpendicularly to the extent practical to minimize visual effects of recreational users. In most cases, the ROW will need to remain free of trees throughout construction and operation of the Project; however, bushy shrubs and low-growing vegetation could be allowed to regenerate in portions of the ROW to reduce, though not eliminate, the visual impacts. Planting of visual screening will be considered on a case-by-case basis. The Applicant and its contractors will remove construction waste and scrap on a regular schedule or at the end of each construction phase to minimize short-term visual impacts.
Air Quality	Regular, frequent cleaning of construction equipment and vehicles on the ROW will occur. Restoration of cleared ROWs, storage areas, and access roads will minimize the extent of disturbed areas and limit the potential for dust generation. All disturbed areas will be revegetated once construction is complete.

continued...

Table ES-1. Proposed Mitigation Measures, *continued...*

Resource	Mitigation Measures
Public Services & Utility Systems	As construction progresses, information will be provided to local emergency services to inform personnel of upcoming activity and impacts of the work as well as to plan for emergency situations on the construction site, should they occur. The Applicant will coordinate and provide the necessary requirements for any short term road or lane closure with the appropriate authority, including emergency services. Prior to construction, the Gopher State One-Call utility locating service will be utilized to identify buried utilities that must be avoided during construction, including pipelines and any associated distribution lines. The Applicant will also coordinate the appropriate construction measures to protect buried pipelines or electric lines where they must be crossed by heavy equipment. If any disruptions to the electrical system are required during construction, the Applicant or the contractor will contact the appropriate utility or electric cooperative to schedule planned disruptions. The Applicant will address potential simultaneous outages of the Project and the existing 500 kV line due to weather events by developing a weather study of the Project's Study Area to define and incorporate the appropriate design considerations based on actual weather data. Based on the weather study, the design criteria for the Project may be adjusted to increase the robustness of the design for those lengths where the Project parallels the existing 500 kV transmission line. Where design criteria cannot fully address potential simultaneous outages due to weather events, as is the case with tornadoes, the Applicant will consider further mitigation as appropriate to enhance restorability. This could include more frequent use of anti-cascade towers, maintaining an increased supply of emergency spare towers, or even locating a permanent storage facility for emergency spares on or near the location where the Project parallels the existing 500 kV transmission line. The Applicant will address potential simultaneous outages of the Project and the existing 500 kV line due to lightning events by installing shield wires and single pole tripping, a protective relay scheme that allows power to continue being transferred over the line even if one of the three phases is struck by lightning. Since the majority of lightning events only affect one phase of a transmission line, single pole tripping should alleviate any concerns with simultaneous outages due to lightning. The Applicant will address potential simultaneous outages of the Project and the existing 500 kV line due to equipment failures by maintaining appropriate separation distances between the Project and the existing 500 kV transmission line. The Applicant will evaluate the steady state and dynamic performance of the regional transmission system after a simultaneous outage of the two 500 kV transmission lines for both north and south flow conditions in the electrical design optimization studies for the Project. These studies should identify any potential electrical problems with this event and if there are any reasonable electrical design considerations that will improve the performance of the system during this event.

continued...

Table ES-1. Proposed Mitigation Measures, *continued...*

Resource	Mitigation Measures
Public Services & Utility Systems, *continued...*	Once the Project is in service, the reliability impacts in the United States of a simultaneous outage of the Project and the existing 500 kV line will be addressed by modifying the existing SPS associated with the four current Manitoba to United States tie lines to include the Project and associated facilities. In the event of an unexpected simultaneous outage of the Project and the existing 500 kV line, the modified SPS will be set up to preserve the integrity of the system based on the operating studies for the Project.
Radio, Television, and Cellular Telephone	If television or radio interference is caused by the operation of the proposed facilities in those areas where good reception was available prior to construction of the Project, the Applicant will inspect and repair loose or damaged hardware in the transmission line, or take other necessary action to restore reception to the present level, including the appropriate modification of receiving antenna systems if necessary. If interference from corona discharges does occur for an AM radio station within a station's primary coverage area with good reception before the Project was built, satisfactory reception can be obtained by appropriate modification of the receiving antenna system. A two-way mobile radio located immediately adjacent to and behind a large metallic structure (such as a steel transmission line structure) may experience interference because of the signal blocking effects of the structure. Moving either mobile unit by less than 50 feet so that the metallic structure is no longer immediately between the two units should restore communications. If television interference is caused by the operation of the Project, the Applicant will inspect and repair any loose or damaged hardware in the transmission line or take other necessary action to restore reception to the present level. If necessary, the Applicant will work with tower operators to resolve any issues directly related to the Project.
Archaeological and Historic Resources	The Applicant will working with DOE and any consulting parties to develop a Programmatic Agreement (36 CFR 800.14 (b)) for the Project. The Applicant will complete cultural resource surveys and reports in accord with the Programmatic Agreement and implement avoidance and mitigation measures in accord with the Programmatic Agreement.
Water Resources and Floodplains	Utilize matting, ice roads, and low ground pressure equipment to the extent practical to minimize wetland and peatland impacts during construction. Locate structures and disturbed areas away from rivers and lakes, where practicable. Contain stockpiled material away from stream banks and lake shorelines. Install sediment and erosion control prior to construction in accordance with sediment and erosion control plans and permits. Use turbidity control methods prior to discharging wastewater from concrete batching or other construction operations to streams or other surface waters. Spread topsoil and seed in a timely manner. Restrict vehicular activity within riparian corridors.

continued...

Table ES-1. Proposed Mitigation Measures, *continued...*

Resource	Mitigation Measures
Water Resources and Floodplains, *continued...*	Minimize use of heavy equipment when clearing riparian corridors. Structures will be located outside of floodplains to the extent practicable. The Applicant will work with the jurisdictional agencies to determine the best ways to minimize impacts and create appropriate mitigation measures. To mitigate any impacts to water quality, the Applicant will implement the BMP's outlined in the SWPPP, required by the NPDES permitting process. Adjustments may be made in the field to address site specific conditions. To minimize contamination of wetlands due to accidental spilling of fuels or other hazardous substances, the Applicant will develop and implement spill prevention procedures to aid in the prevention of potential contamination due to a fuel or hazardous substance spill. Refueling will occur at sites away from wetlands and waters. Temporary impacts during construction may occur if dewatering is necessary to install the transmission structures or if pumping wells are installed to supply water for concrete batch plant operations. If dewatering or pumping is necessary, water appropriations permits will be obtained from Minnesota DNR. If the dewatered groundwater contains substantial quantities of suspended sediments, then the water will be filtered though silt fence or bio-rolls prior to discharge. The Applicant expects to avoid constructing the transmission line over existing wells. If crossing over wells cannot be avoided, the Applicant will work with existing landowners to develop appropriate mitigation measures. To minimize the potential for contamination of groundwater, SPCC plans will be developed and maintained during the construction and operation of the Project. Oil products and hazardous materials will be stored inside appropriate containment, and any spills of oil or hazardous materials will be mitigated immediately in accordance with the procedures in the SPCC plan.
Wetlands	To minimize contamination of wetlands due to accidental spilling of fuels or other hazardous substances, the Applicant will develop and implement spill prevention procedures to aid in the prevention of potential contamination due to a fuel or hazardous substance spill. Refueling will occur at sites away from wetlands and waters. The Applicant will work with the St. Paul District of USACE to develop a mitigation approach that meets the compensatory requirements of the agency. These requirements will be incorporated into the Clean Water Act Section 404 permit and Section 401 certification issued by USACE and Minnesota Pollution Control Agency prior to construction. The Applicant will avoid major disturbance of individual wetlands and drainage systems during construction. This may be done by spanning wetlands and drainage systems, where practical. The Applicant will utilize construction best management practices (BMP's) such as matting, ice roads, and low ground pressure equipment to the extent practical to minimize wetland/peatland impacts during construction. Crews will access the wetland with the least amount of physical impact on the wetland (that is, shortest practical route). Temporary impacts to wetlands will be restored to pre-construction conditions to the extent practical. Minnesota DNR PWI wetlands will be restored according to provisions in Land and Water Crossing permits. Section 6.17, Water Resources, discusses PWI wetlands.

continued...

Table ES-1. Proposed Mitigation Measures, *continued...*

Resource	Mitigation Measures
Wildlife	Surveys will be conducted prior to vegetation removal to avoid impacts on nesting birds and to avoid active nest sites of sensitive species. Appropriate construction windows will be incorporated into the construction schedule to minimize impacts on species such as bald eagle and goshawk in areas where these species are found to be present. The Applicant will work with the US Fish and Wildlife Service and Minnesota DNR to identify potential locations for line marking, such as areas of high avian use, nest sites, feeding areas, and migratory corridors. The Applicant will incorporate industry best practices, which are consistent with APLIC's 2012 guidelines. The Applicant will site the transmission line to avoid bird concentration sites, nesting areas, migratory pathways, and geographic features that act as a funnel, and avoiding habitats that act as breeding grounds or feeding areas to the extent practical.
Rare and Unique Species and Communities	If the ROW is not cleared or mowed in the fall or winter before the breeding season, a qualified biologist will conduct surveys for active nesting birds prior to construction. If active nesting locations are identified during the surveys, the Applicant proposes to avoid nest sites during the breeding season and to identify construction restraints that will avoid disturbance to nesting birds. The Applicant will conduct surveys for sensitive plants during appropriate periods of the growing season to properly identify their presence and/or absence along the selected ROW. If sensitive plants or communities are identified during surveys, individual avoidance and minimization measures will be evaluated and submitted to the appropriate regulatory agencies. The Applicant will conduct surveys for native prairie areas and other sensitive plant communities such as calcareous fens along the selected ROW. If sensitive resources are encountered, construction plans that minimize the impacts, such as shifting structure locations or implementing construction techniques that avoid or minimize impacts on these resources, will be developed and submitted to the appropriate regulatory agencies. Avoidance measures may include shifting the location of structures or implementing construction techniques that avoid and/or minimize impacts on sensitive resources.
Noxious Weeds and Exotic Organisms	Regular, frequent cleaning of construction equipment and vehicles on the right-of-way (ROW) as appropriate. Minimization of ground disturbance to the greatest degree practicable; and rapid revegetation of disturbed areas with native or appropriate non-native, seed mixes. The EI will conduct a field survey of the ROW prior to construction to identify areas that currently contain noxious weeds. Weed surveys during construction will identify infestations of the ROW and staging sites. New infestations within the ROW will be addressed and eradicated as soon as practicable in conjunction with property owners input. Construction vehicles, including the under carriage, will be inspected for weed seed and dirt prior to construction start particularly when traveling from an area identified as contaminated by noxious weeds to an uncontaminated area.

continued...

Table ES-1. Proposed Mitigation Measures, *continued...*

Resource	Mitigation Measures
Noxious Weeds and Exotic Organisms, *continued...*	The introduction and establishment of noxious weeds will be minimized by prompt revegetation of disturbed areas using regional genotype native species where appropriate or by seed based on landowner agreements. No MDA or Minnesota DNR prohibited noxious weed seeds will be allowed in any revegetation seed mix. Seed mix composition will be coordinated with Minnesota DNR on all Minnesota DNR lands. Seed mixes used for the Project will be certified as weed free. Only clean straw mulch will be used; meadow hay will not be allowed as a mulch material.
Recreation and Tourism	Constructing the Project along existing transmission ROWs could minimize impacts on existing recreational resources and tourism. Locating the Project ROW adjacent to other existing utility ROWs will help minimize impacts on previously undisturbed lands. Long-term disturbance of wildlife habitat will be minimized by paralleling existing disturbed corridors. Therefore, impacts on hunting and wildlife could be lessened as a result of these actions. In locations where the corridors will be parallel and expanded, the additional acreage will be minimal and will not greatly change the existing conditions as compared to creating an entirely new corridor in an undeveloped area. Working with landowners through the ROW acquisition process to address unauthorized access concerns. Providing information during construction to inform visitors and residents of the activities associated with the Project will provide people with advance notice of what recreational activities may be affected. Signage will be used to inform local recreational users, as appropriate. In this manner, people could plan for other activities or will be made aware of how their activities could be impacted by the construction of the Project. Further evaluate potential visual impacts at the Big Bog State Recreation Area and work with Minnesota DNR to identify mitigation, as appropriate.
Agricultural Production	The Applicant will develop an Agricultural Impact Mitigation Plan (AIMP) as generally required as a Route Permit condition. The Applicant will work with the Minnesota Department of Agriculture to ensure that appropriate mitigation efforts are included and implemented. To the extent practical, soil disturbance and excavation activities in steep slope areas will be avoided. Where disturbance and excavation cannot be avoided entirely, it will be minimized using best management practices (BMPs). Sediment and erosion control plans will be developed that specify the types of BMPs necessary. Depending on the site, BMPs may include installation of silt fence, straw bales, or ditch blocks, and/or covering bare soils with mulch, plastic sheeting, or fiber rolls to protect drainage ways and streams from sediment runoff. Erosion control practices will be inspected during construction, especially during significant precipitation events. Soil compaction in cultivated areas will be treated and restored through tillage operations, for example using a subsoiler. Construction mats will be used as appropriate.

continued...

Table ES-1. Proposed Mitigation Measures, *continued...*

Resource	Mitigation Measures
Agricultural Production, *continued...*	Where rutting occurs, the Project will repair the surface and restore ground vegetation upon completion of work in a given area. All disturbed areas will be revegetated once construction is complete. Seed mixes will be specified based on site characteristics and in accordance with regulatory permits. The introduction and establishment of noxious weeds will be minimized by prompt re-vegetation of disturbed areas using regional genotype native species where appropriate or by seed based on landowner agreements.
Transportation	The Project will be designed in accordance with National Electric Safety Code (NESC) to minimize impacts on transportation. The NESC defines the basic clearance requirements between transmission lines and transportation structures (for example, roadways and railways). The Applicant will work with state and local officials to coordinate and minimize any impacts during construction and operation of the Project. The Route Permit issued by the Minnesota Public Utilities Commission (PUC) will direct the Applicant to comply with Minnesota DOT and all applicable road authorities' management standards and policies during construction. The Route Permit also will direct the Applicant to provide written notice of construction to Minnesota DOT and applicable city, township, and county road authorities. Under the permit, the Applicant will be required to restore the ROW, temporary work space, access roads, abandoned ROW, and any other lands affected by construction. This could include the replacement of living snow fences affected by construction activities. Placement of public utilities on or near state ROW will be designed in accordance with the Utility Accommodation Section of the Minnesota DOT Utility Accommodation and Coordination Manual (Minnesota DOT 2013b). Minnesota Rules 8810.3500, Aerial Lines, requires the placement of aerial lines in the outer 5 feet of the highway ROW. This standard was incorporated into the Accommodation Policy to ensure that lines are placed do not interfere with the free and safe flow of traffic, do not impair the highway or its protected visual quality, do not conflict with any provision of federal, state, or local law, rule, or regulation, or do not unreasonably increase the difficulty or future cost of highway construction or maintenance (Minnesota DOT 2013b). Installation of additional temporary access points will be subject to review and approval of highway officials. Construction staff will implement traffic control measures in accordance with the Minnesota DOT Manual on Uniform Traffic Control Devices (Minnesota DOT 2014). Stringing of new overhead conductors over highways may require installation of temporary wooden pole guard structures or other measures to safeguard the public and construction forces during the stringing process. The Applicant will obtain the necessary permission for railroad crossings with the Railroad in accordance with the Railroad's requirements for clearances, structure placements, offsets, restoration, etc. The Applicant will work with the Railroad to coordinate construction in accordance with the Railroad's requirements. FAA and Minnesota DOT Office of Aeronautics will be notified to address compatibility of the Project with the airport. The Applicant will avoid or minimize impacts to the Piney Pinecreek Border Airport consistent with Minnesota DOT and FAA requirements, as appropriate.

continued...

Table ES-1. Proposed Mitigation Measures, *continued…*

Resource	Mitigation Measures
Transportation, *continued…*	The Applicant will work with the owners of private airstrips and with aerial applicators to minimize potential impacts, as appropriate. In areas where there may be regular use of lakes for landings and take off, the Applicant will work with those users, and determine methods to improve visibility, such as installing markers on the transmission line.
Forestry	The timber that is cleared remains the property of the landowner. To the extent practical, the Applicant will work with the landowner to determine a mutually agreeable means of disposing of the cleared material, such as chipping, burning, or stacking for landowner use or sale. Once construction is complete, the ROW will be managed to promote the establishment of forbs and grasses. Shrubs will be allowed to regenerate within the ROW as long as they do not interfere with maintenance, access, and the safe operation of the transmission line. Construction staging areas will be located and arranged in a manner to preserve trees and vegetation to the maximum extent practicable. To the extent practicable, staging areas will be restored to preconstruction conditions. Temporary access roads outside of the ROW will be required. The Applicant will work with local property owners to identify suitable access locations. Temporary roads and other temporarily impacted areas will be restored as appropriate once construction is completed. The Applicant will coordinate with regulatory agencies to identify appropriate measures to avoid and minimize effects on forest resources on federal, state, and county-owned properties.
Mining	The Applicant will work with existing mining operators and mineral lessees to identify the extent of current and planned mining operations and develop appropriate mitigation measures.

1.0 Introduction

Minnesota Power, an operating division of ALLETE, Inc., (Minnesota Power or Applicant), is applying to the U.S. Department of Energy (DOE) for a Presidential Permit to construct the Great Northern Transmission Line (Project), which includes a 500 kilovolt (kV) transmission line between a point on the Minnesota-Manitoba border northwest of Roseau, Minnesota (border crossing) and the existing Blackberry Substation near Grand Rapids, Minnesota, as well as associated substation facilities and transmission system modifications at the Blackberry Substation site, and a 500 kV series compensation station (see Figure 1-1). The Applicant previously has submitted an application for a Certificate of Need (CoN) to PUC and anticipates a decision on whether the Project is needed by May 2015, PUC Docket No. E015/CN-12-1163. Concurrent with this Presidential Permit application (Application), the Minnesota Power is applying to the Minnesota Public Utilities Commission (PUC) for a Route Permit to construct the Project.

1.1 Summary of Proposed Action

1.1.1 Transmission Line

The Applicant proposes to construct a 500 kV transmission line from the border crossing between Manitoba and Minnesota that has been jointly determined by the Applicant and Manitoba Hydro, to the Blackberry 500 kV Substation near Grand Rapids. Two Route Alternatives and several Segment Options are being proposed for consideration during the permitting process.

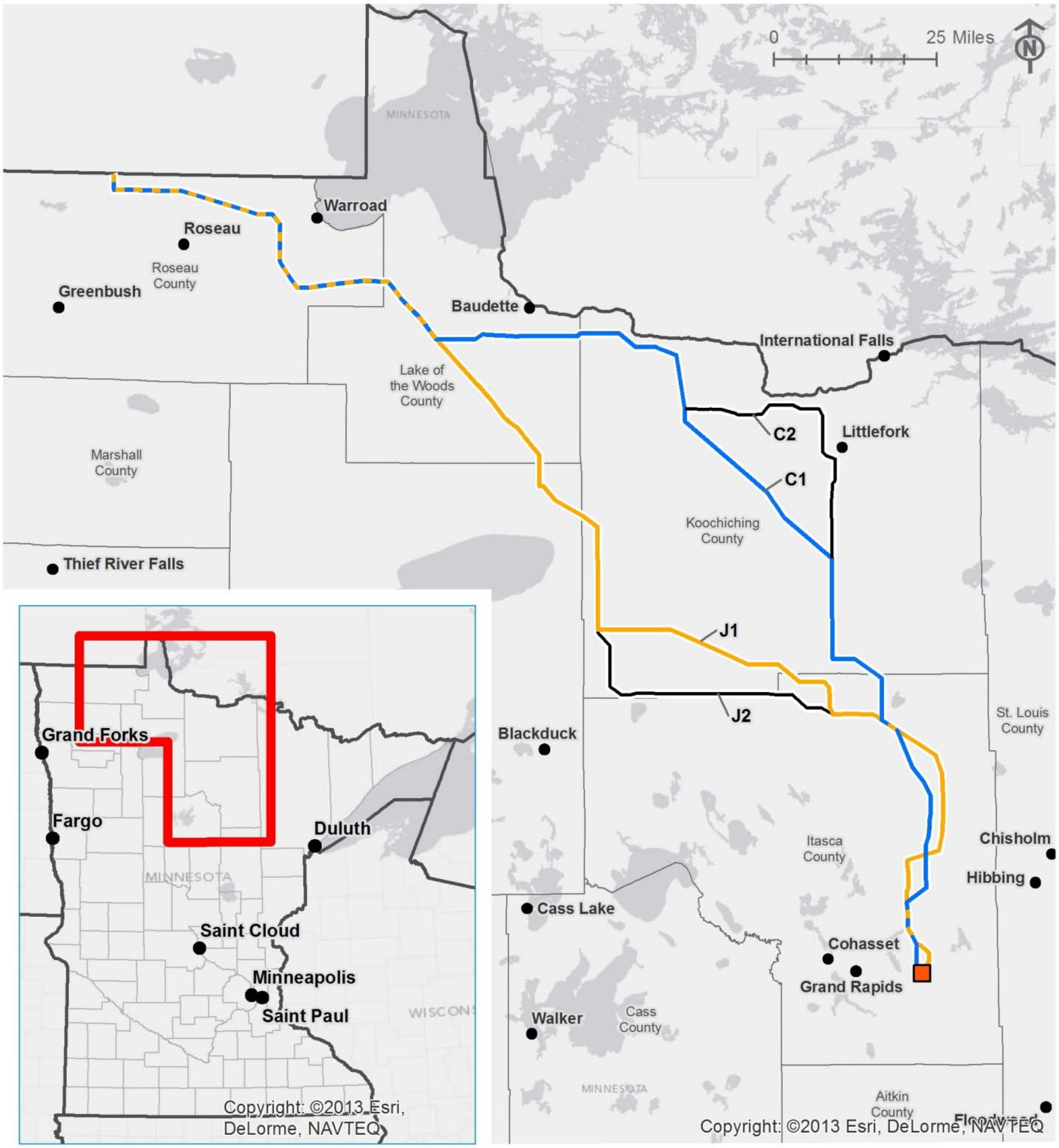
While final engineering and design have not been completed, the Project's construction likely would use steel lattice structures for the majority of the route. The anticipated right-of-way (ROW) for the 500kV transmission line is generally 200 feet wide. Ultimately, however, the ROW width will depend on the recommended clearances between the conductor and other facilities along the route. A wider ROW may be required for longer spans of the Project, at angle and corner structures, for guyed structures, or where special design requirements are dictated by topography. The Applicant will seek permanent easements providing the right to construct, operate, and maintain the transmission line along the full width and length of its ROW.

1.1.2 Associated Facilities

The site of the existing Blackberry 230/115 kV Substation near Grand Rapids will be expanded to incorporate the Blackberry 500 KV Substation, located adjacent to and east of the existing substation. The Blackberry 500 kV Substation will be designed to accommodate the new 500 kV line, 500/230 kV transformation, existing 230 kV lines, and all associated 500 kV and 230 kV equipment. Existing 230 kV and 115 kV transmission lines currently located on the property will be rerouted to accommodate the placement and electrical interconnection of the Blackberry 500 kV Substation.

minnesota power
AN ALLETE COMPANY
GREAT NORTHERN TRANSMISSION LINE

Proposed Route Alternatives Figure 1-1



Legend

- Blue Route
- Orange Route
- Segment Option
- Blackberry 500 kV Substation
- State Boundary
- County Boundary

Sources: ESRI,NLCD

\\mspe-gis-file\GISProjLarge\MinnPower\182035\map_docs\CLIENT\Route_Permit\01-1_ProposedRouteAlts.mxd

The Project will also require a 500 kV Series Compensation Station, which will be located within or adjacent to the final approved route. The 500 kV Series Compensation Station will include the 500 kV series capacitor banks necessary for the reliable operation and optimal performance of the Project, and all associated 500 kV equipment. The final location for the 500 kV Series Compensation Station will be determined by electrical design optimization studies and final route selection. Permanent impacts for the combined Blackberry 500 kV Substation and 500 kV Series Compensation Station would be 25.0 acres.

1.2 Proposed Project Ownership

1.2.1 Project Applicant

Legal Name of the Applicant

The legal name of the Applicant is Minnesota Power, an operating division of ALLETE, Inc. Minnesota Power has its principal place of business at 30 West Superior Street, Duluth, Minnesota 55802. Minnesota Power is a public utility in the State of Minnesota under Minnesota Statutes Section 216B.02.

Minnesota Power is an investor-owned utility and provides electricity in a 26,000-square-mile electric service territory located in northeastern Minnesota. Minnesota Power supplies retail electric service to 144,000 customers, and wholesale electric service to 16 municipalities, as well as some of the nation's largest industrial customers. A portion of the Project would be located in Minnesota Power's service area; Minnesota Power owns the existing Blackberry Substation.

Communications and Correspondence

All communications and correspondence regarding this Application should be addressed to the following persons:

David Moeller	Mike Donahue	Jim Atkinson
Senior Attorney	Project Manager	Environmental Manager
Minnesota Power	Minnesota Power	Minnesota Power
30 West Superior Street	30 West Superior Street	30 West Superior Street
Duluth, Minnesota 55802	Duluth, Minnesota 55802	Duluth, Minnesota 55802
(218) 723-3963	(218) 355-2617	(218) 355-3561
dmoeller@allete.com	mdonahue@mnpower.com	jbatkinson@mnpower.com

Foreign Ownership and Affiliations

The Applicant is not owned wholly or in part by a foreign government or any instrumentality thereof. The Project may include investment by Manitoba Hydro or an affiliate of Manitoba Hydro. The high-voltage transmission facilities on the Canadian side of the border will be owned and operated by Manitoba Hydro, a Provincial Crown Corporation of Canada.

Existing Contracts with Foreign Entities for Purchase, Sale, or Delivery of Electric Energy

The Applicant has executed a 250 MW power purchase agreement (PPA) with Manitoba Hydro. The Applicant has other purchase and sale agreements with Manitoba Hydro, and also has purchase and sale agreements in place with Ontario Hydro. Minnesota Power has a DOE export license valid through 2018 that covers current export sales.

Corporate Authority and Compliance with Laws

Appendix J of this Application includes an opinion of counsel and officer verification stating that the construction, connection, operation, and maintenance of the proposed Project is within the corporate power of the Applicant and that the Applicant has complied with, and if the proposed actions are performed in accordance with this Application, will comply with all pertinent federal and state laws.

1.2.2 Other Project Owners

Minnesota Power and Manitoba Hydro are still evaluating the ownership structure that fully addresses federal and state regulatory, Mid-Continent Independent System Operator (MISO), legal and tax issues. Minnesota Power will provide the DOE and PUC final ownership terms upon completion, as PUC has required in previous transmission dockets. Minnesota Power will also provide DOE and PUC updates regarding all applicable MISO facilities construction and interconnection agreements.

1.3 Minnesota Public Utilities Commission Permit Process

1.3.1 Certificate of Need

Minnesota Statutes Section 216B.243 dictates that a Certificate of Need is required for a "large energy facility" as that term is defined in Minnesota Statutes Section 216B.2421. A large energy facility includes, "any high-voltage transmission line with a capacity of 200 kilovolts or more and greater than 1,500 feet in length" (Minnesota Statutes Section 216B.2421, subdivision 2(2)). The Applicant filed an application with PUC October 21, 2013, for a Certificate of Need to construct the Project. The Certificate of Need application and associated filings can be viewed on PUC's website at https://www.edockets.state.mn.us/EFiling/, PUC Docket No. E015/CN-12-1163 ("Certificate of Need Application"). The Applicant anticipates a PUC decision on the Certificate of Need by May 2015.

1.3.2 Route Permit Process

The Power Plant Siting Act (PPSA) provides that no person may construct a high-voltage transmission line without a Route Permit from PUC (Minnesota Statutes Section 216E.03, subdivision 2). The definition of a high-voltage transmission line under the PPSA is broader than the definition of a high-voltage transmission line under the Certificate of Need statutes. Under the PPSA, a high-voltage transmission line includes a transmission line of 100 kV or more and greater than 1,500 feet in length and associated facilities (Minnesota Statute Section 216E.01; subdivision 4). The proposed Project is a high-voltage transmission line and therefore a Route Permit is required prior to construction. The Route Permit application and associated filings can be viewed on the state's eDockets website at https://www.edockets.state.mn.us/EFiling/, PUC Docket No. E015/TL-14-21.

1.4 Department of Energy Permit Process

Under Executive Order (EO) 10485, as amended, the DOE has authority to grant Presidential Permits for the construction, operation, and maintenance of electric transmission facilities for projects that cross the borders of the U.S. DOE is authorized to grant the permit if (1) it finds that the permit is "consistent with the public interest" and (2) the permit receives favorable recommendations from the State Department and Defense Department. DOE also has the power and discretion to include conditions in the permit that will ensure the protection of the public interest. According to DOE guidance, its public interest determination is based on an evaluation of "the electric reliability impacts, the potential environmental impacts, and any other factors that DOE may also consider relevant to the public interest." DOE will serve as the lead federal agency during the National Environmental Policy Act (NEPA) review of the Project.

This page intentionally left blank

2.0 Project Purpose and Need

Minnesota Power supplies retail electric service to 144,000 customers, and wholesale electric service to 16 municipalities, within a 26,000 square-mile area in northeastern Minnesota. To meet its customers' electricity needs, the Applicant operates transmission and distribution components, including 8,866 miles of transmission lines and 169 power substations including the Blackberry Substation where the Project will interconnect. The Project is an important part of the Applicant's plans to serve its customers for decades to come.

2.1 Project Description

The Project will carry hydropower generated by facilities operated by Manitoba Hydro, a Canadian electric utility. In the U.S., the Project will consist of a 500 kilovolt (kV) transmission line between the Minnesota-Manitoba border crossing northwest of Roseau, Minnesota and the existing Blackberry Substation near Grand Rapids, Minnesota, as well as associated substation facilities and transmission system modifications at the Blackberry Substation site, and a 500 kV series compensation station. The overall length of the line in Minnesota will be approximately 220 miles, regardless of the Route Alternative selected.

2.2 Purpose and Need Statement

2.2.1 Purpose of the Proposed Action

The purpose for the Project is:

> To efficiently provide the Applicant's customers and the region with clean, emission-free energy that will
> (a) help meet the region's growing energy demands
> (b) advance the Applicant's *Energy**Forward*** strategy of increasing its generation diversity and renewable portfolio
> (c) strengthen system reliability
> (d) fulfill the Applicant's obligations under its power purchase agreements with Manitoba Hydro
>
> all in a manner that is consistent with the Applicant's commitment to making a positive impact on communities.

This purpose, and the various needs to which it is responding, are discussed in more detail below.

2.2.2 Need for the Proposed Action

Efficiently providing Minnesota Power customers and the region with clean energy. The Applicant is obligated as a public utility to provide customers with reliable and affordable electricity that balances environmental impact. The Project is a unique opportunity to provide the Applicant's customers, as well as other utilities in the upper Midwest region, with electricity that is not only cost-competitive, but also generated by emission-free hydroelectric facilities. A new 500 kV line provides the most efficient means to transport this electricity to the Applicant's service territory and to the regional gird.

Meeting the region's growing energy demands. The demand for electricity in the Applicant's service area, and in the entire region, is expected to grow significantly in the coming years. Much of this growth is associated with planned mining and industrial expansion on Minnesota's Iron Range. The upgraded and expanded substation and new 500 kV transmission line from the Canadian border to the Applicant's Blackberry 500 kV Substation will provide important new capacity and energy for the electric transmission grid. The hydroelectric power imported from Canada pursuant to the Applicant's 250 megawatts (MW) Power Purchase Agreement, and new 133 MW Renewable Optimization Agreement, with Manitoba Hydro as well as other agreements Manitoba Hydro will enter into with other utilities will help to meet the projected increased need for power in the region.

*Advancing Minnesota Power's Energy**Forward** strategy.* The Applicant announced its *Energy**Forward*** resource strategy in January 2013. As a public utility in Minnesota, the Public Utilities Commission (PUC) requires that the Applicant develop a resource plan approximately every two years. In September 2013, PUC approved the Applicant's 2013 Integrated Resource Plan (PUC Docket No. E015/RP-13-53) that is based on its *Energy**Forward*** resource strategy, thus creating a roadmap to providing customers with reliable, cost-effective, and environmentally compliant power for decades to come. *Energy**Forward*** further transitions the company's energy supply mix toward one-third renewables, one-third coal, and one-third natural gas and other market resources long term through hydro and wind energy additions, coal-fired energy reductions, and a post-2020 natural gas generation resource. This Project is a central element of the *Energy**Forward*** resource strategy, delivering hydro energy resources and, pursuant to an innovative feature of the Applicant's Power Purchase Agreement with Manitoba Hydro, allowing the Applicant to use Manitoba Hydro's system to compliment the intermittent nature of its wind energy investments in North Dakota. This wind storage capacity will optimize the timing, availability, and value of power delivery for customers.

Strengthening system reliability. At present, the regional transmission system includes only one 500 kV tie line between Minnesota and Canada. The Mid-Continent Independent System Operator (MISO) has identified an unplanned outage in that line as the second largest contingency in the MISO footprint. By providing a second 500 kV tie line between Minnesota and Canada, the Project will reduce loading on the existing tie line and enhance the performance of the transmission system during this contingency.

Fulfilling obligations under power purchase agreements. The Applicant is party to a 250 MW Power Purchase Agreement (PPA), as well as an additional 133 MW Renewable Optimization Agreement with Manitoba Hydro. The 250 MW PPA has been reviewed and approved by PUC (see PUC Docket No. E015/M-11-938). The Applicant will submit the new 133 MW Renewable Optimization Agreement to PUC for approval upon the parties' finalization of terms and execution. Under the 250 MW PPA and 133 MW Renewable Optimization Agreement, the Applicant has agreed to purchase 383 MW of energy from Manitoba Hydro, which will be generated at Manitoba Hydro hydroelectric facilities. The 250 MW PPA and 133 MW

Renewable Optimization Agreement obligate the Applicant to have the Project in service on or before June 1, 2020, so it can begin these power purchases. That date corresponds with the beginning of the time period that the Applicant faces energy and capacity deficits. If the Applicant does not have the Project in service by June 1, 2020, it will not only be in breach of the 250 MW PPA and 133 MW Renewable Optimization Agreement, but it likely will be forced to purchase electricity on the market at a substantially higher cost. In addition, a failure to meet the 250 MW PPA and 133 MW Renewable Optimization Agreement's in-service date will adversely affect the infrastructure investments that Manitoba Hydro is making in Canada, including the billions of dollars it is spending to build new hydroelectric generation facilities and associated transmission facilities, including for sale to other Midwest utilities.

Making a positive impact on communities. The Applicant's shared values are central to the company and the individuals who work for the company. They distinguish the Applicant as a citizen and an employer. Among the Applicant's core values is its commitment to contribute skills, knowledge, and resources to make a positive impact on communities. In practice, that means taking the time to meet with the people in the communities that may be affected by the Project, listening to their concerns, and looking for ways to respond to those concerns. Building on this strong, values-based foundation, the Applicant will achieve the right results, the right way.

This page intentionally left blank

3.0 Agency Actions and Regulatory Approvals

This section summarizes the federal and state regulations affecting the permitting process and the required environmental documentation for the Project. Additional federal and state permits and local coordination is summarized in Table 3-1.

3.1 Federal Process

The Department of Energy (DOE) is the lead federal agency for the Project. Pursuant to Executive Order (EO) 10485 of 1953, as amended by EO 12038, and 10 Code of Federal Regulations (CFR) Section 205.320, a Presidential Permit is required for the Project since it will cross the international boundary between Minnesota and Manitoba, Canada. In accordance with EO 12038, DOE must determine whether issuance of a Presidential Permit for the construction, operation, maintenance, or connection, of facilities for the transmission of electric energy between the U.S. and a foreign country is consistent with the public interest. The Project must also obtain favorable recommendations from the Secretary of State and the Secretary of Defense (EO 10485 Section 1). Prior to issuance of a Presidential Permit, if the Project constitutes a Major Federal Action, the Project must be reviewed by DOE pursuant to the National Environmental Policy Act (NEPA). NEPA requires federal agencies to consider the environmental impacts and reasonable alternatives to Major Federal Actions. An Environmental Impact Statement (EIS) will be prepared in compliance with NEPA and DOE's implementing regulations pursuant to 10 CFR Part 1021.

The Applicant understands that DOE and the Minnesota Department of Commerce - Energy Environmental Review and Analysis (DOC-EERA) intend to jointly develop one EIS that meets both agencies' environmental review requirements to minimize duplication of effort.

The following provides a summary of the federal environmental review process under DOE regulations:

- → Hold public scoping meetings to determine the scope of the EIS.
- → Develop and publish the Draft EIS.
- → Solicit comments from the public and agencies on the Draft EIS.
- → Develop and publish the Final EIS.
- → Issue Record of Decision (ROD) on potential environmental impacts of the Project and identify mitigation measures to minimize these impacts.
- → Issue Presidential Permit

3.2 State Process

3.2.1 Minnesota Public Utilities Commission

The Minnesota Public Utilities Commission (PUC) regulates transmission line construction in Minnesota. PUC determines whether there is a need for a transmission line through its Certificate of Need process. PUC determines the route and any conditions it will require for the construction, operation, and maintenance of the transmission line through its route permitting process.

Certificate of Need

Pursuant to Minnesota Statute Section 216B.243, Subdivision 2, the Applicant filed a Certificate of Need application for the Project with PUC on October 21, 2013. PUC Docket Number E015/CN-12-1163. The Certificate of Need establishes the size, type, and required end points of the Project and must be issued prior to the issuance of a Route Permit.

Route Permit

Minnesota Statute Section 216E.03, Subdivision 2, provides that "[n]o person may construct a high-voltage transmission line without a Route Permit from the [Public Utilities] Commission. A high-voltage transmission line may be constructed only along a route approved by the Commission." Per Minnesota Statute Section 216E.01, Subdivision 4, "High-voltage transmission line means a conductor of electric energy and associated facilities designed for and capable of operation at a nominal voltage of 100 kilovolts [kVs] or more…" The Project is a 500 kV line that will be approximately 220 miles long, regardless of the Route Alternative chosen. Therefore a Route Permit from PUC is required.

Once the Route Permit application is filed, it will be reviewed by PUC for completeness (Minnesota Rule 7850.2000, Subpart 1). PUC and DOC will hold public scoping meetings on the Project within 60 days (or longer if PUC grants a variance) of finding the Route Permit application complete (Minnesota Rule 7850.2300). The purpose of the public meetings is to obtain public input on (1) the Route Permit for the Project; (2) the Route Alternatives and Segment Options; and (3) the appropriate scope of the EIS that DOC-EERA will prepare for the Project (which in this case will be prepared jointly with DOE). The DOC-EERA will then prepare a Draft EIS for the Project (Minnesota Statute Section 216E.03, Subdivision 5 and Minnesota Rule 7850.2500).

Once the Draft EIS is published, the DOC-EERA will hold an informational meeting to obtain comments on the Draft EIS (Minnesota Rule 7850.2500 Subpart 8). An administrative law judge (ALJ) will also hold public hearings and an evidentiary contested case hearing on the Route Permit application, during which interested persons can submit evidence supporting or challenging the Project as proposed. Upon closing the record, the ALJ will submit a report and recommendation to PUC on the Route Permit application (Minnesota Statute Section 2l6E.03, Subdivision 6 & 9 and Minnesota Rule 7850.2600). PUC will consider the ALJ's report and recommendation in reaching its determination whether to grant the Route Permit with or without modifications, or deny them (Minnesota Rule 7850.2700).

3.2.2 Department of Commerce – Energy Environmental Review and Analysis

Pursuant to Minnesota Statute Section 216E.03, Subdivision 5, DOC-EERA must prepare an EIS for proposed high-voltage transmission lines. Generally, an EIS considers issues relating to routing, including the use of existing rights-of-way (ROWs) and the impacts of line construction, operation, and maintenance on environmental features and human settlement. Under Minnesota law, the EIS does not address the need for the Project because that determination is handled through the Certificate of Need process. In this instance, need will be addressed in the joint state and federal EIS as part of the federal process.

DOC-EERA uses the EIS to disclose potential environmental impacts of the Project and to identify any mitigation measures required to minimize impacts of construction, operation, and maintenance of the Project. The Applicant anticipates that the EIS will be prepared jointly by DOC-EERA and DOE so that one environmental document will be developed for the Project.

The following provides a summary of the state environmental process for the Route Permit. As noted above, this process is expected to be coordinated with the federal NEPA process.

- → Review Route Permit application documenting Route Alternatives for the Project and their potential environmental impacts.
- → Hold joint public scoping meetings to obtain public and agency input on the Route Permit application and the scope of the EIS.
- → Issue decision on the scope of the EIS.
- → Develop and publish the Draft EIS.
- → Hold informational meetings to obtain comments from public and agencies on the Draft EIS.
- → Hold contested case hearing before an Administrative Law Judge (ALJ).
- → Develop and publish the Final EIS.
- → Issue recommendation on adequacy of Final EIS (to be completed by ALJ).
- → Determine the adequacy of the Final EIS, and designate the Route Alternative for the Project, which will include any conditions required for construction, operation, and maintenance to minimize environmental impacts (to be determined by PUC).

3.3 Agency Decisions

3.3.1 Federal Agency Decisions

DOE will use this Presidential Permit (Application) and the Final EIS to make a decision on whether the issuance of a Presidential Permit is consistent with the public interest.

3.3.2 Minnesota Public Utilities Commission Decisions

Decisions Being Considered in the Route Permit Application

PUC will use the Route Permit application process to identify an approved Route Alternative and develop a Route Permit with appropriate conditions.

Decisions Not Being Considered in the Route Permit Application

PUC will not use the Route Permit application to determine the need for the Project (Minnesota Statutes Section 216E.02, subdivision 2). PUC will use the Certificate of Need application, and subsequent contested case process, to determine Project need (Minnesota Statutes Sections 216B.243 and 216E.03, subdivision 1). The Route Permit applicant anticipates that the joint state and federal EIS will include information on both the project need and routing issues, to comply with the federal environmental review process (Minnesota Statutes Section 216E.02, subdivision 3).

3.4 Other Permits, Approvals, Decisions

In addition to the state Certificate of Need, Route Permit, and the joint state and federal EIS, the Applicant is actively working with local, state, and federal agencies to ensure that all other permits, approvals, and decisions that may be required for the Project are identified (see Table 3-1).

Table 3-1. Other Potential Permits and Approvals

Permit/Decision	Jurisdiction
Federal Reviews/Approvals	
Section 106 Consultation	U.S. Department of Energy
Section 10 Permit	U.S. Army Corps of Engineers
Section 404 Permit	U.S. Army Corps of Engineers
Section 7 Consultation/Biological Assessment	U.S. Department of Energy and U.S. Fish and Wildlife Service
Wildlife Permits	U.S. Fish and Wildlife Service
Permit to Cross Federal Aid Highway	U.S. Federal Highway Administration
Farmland Protection Policy Act/Farmland Conversion Impact rating	U.S. Department of Agriculture
Special Use Permit/ROW Permit or Easement	U.S. Forest Service U.S. Bureau of Land Management U.S. Fish and Wildlife Service
Obstruction Evaluation	Federal Aviation Administration
Minnesota State Reviews/Approvals	
Cultural and Historic Resources Review	State Historic Preservation Office
Utility Permit	Department of Transportation
Endangered Species Consultation/Wildlife Permits	Department of Natural Resources Ecological Services
License to Cross Public Lands and Waters	Department of Natural Resources Lands and Minerals
Public Waters Work Permit	Department of Natural Resources Waters
Water Appropriation/Dewatering Permit	Department of Natural Resources Waters
Wetland Conservation Act Permit	Board of Water and Soil Resources and/or Local Government Units
Section 401 Water Quality Certification	Pollution Control Agency
National Pollutant Discharge Elimination System Permit	Pollution Control Agency
Agricultural Mitigation Plan (part of Route Permit)	Department of Agriculture
Noxious Weed Management Plan	Department of Agriculture
Local Coordination	
Road Crossing/Right-of-Way	County, Township, City
Public Lands	County, Township, City
Overwidth Load	County, Township, City
Driveway Access	County, Township, City

3.4.1 Federal Approvals

In addition to the federal NEPA process (10 CFR 1021), the Applicant is actively working with federal agencies with respect to the following approvals that may be needed:

- → Section 106 Consultation – Section 106 of the National Historic Preservation Act, 16 United States Code (USC) Section 470f, and its implementing regulations, 36 CFR Sections 800.1–800.16, require federal agency consultation with Indian Tribes that may be affected by the Project, other appropriate parties, and the State Historic Preservation Officer (SHPO). DOE will lead this effort to the extent that it involves government-to-government consultation with Indian Tribes or the SHPO. The Applicant will complete appropriate studies and provide information and assistance to DOE, as requested.
- → Section 10 Permit – U.S. Army Corps of Engineers (USACE) regulates impacts on navigable waters of the U.S. pursuant to Section 10 of the Rivers and Harbors Act of 1899, 33 USC Section 403. The Big Fork River is classified by USACE as navigable water, and the Applicant will apply for a permit for the Project to cross it.
- → Section 404 of the Clean Water Act Permit – USACE regulates discharges of dredged or fill material into waters of the U.S. under Section 404 of the Clean Water Act, 33 USC Section 1344. The Applicant will seek a Section 404 Permit at the appropriate time.
- → Section 7 Consultation – The Applicant has initiated preliminary communications with the U.S. Fish and Wildlife Service (USFWS) regarding compliance with the Endangered Species Act (16 USC Sections 1531–1534) to assess the potential impact of the Project on protected species. DOE, as the lead federal agency for this Project, will prepare a Biological Assessment (BA), with assistance from the Applicant, to document the potential effects on protected species and consult with USFWS as required by Section 7 of the Endangered Species Act.
- → Bald and Golden Eagle Protection Act (BGEPA) – USFWS oversees compliance with BGEPA (16 U.S.C. 668-668c), which prohibits anyone from "taking" birds, nests or eggs without a permit from the Secretary of the Interior. The Applicant will work with the USFWS to avoid and mitigate potential impacts to bald eagles.
- → Migratory Bird Treaty Act (MBTA) – USFWS oversees compliance with the MBTA (16 USC 703-712. The statute makes it unlawful without a waiver to pursue, hunt, take, capture, kill or sell birds listed as migratory birds. The Applicant will work with the USFWS to avoid and mitigate potential impacts to migratory birds.
- → Permit to Cross Federal Aid Highway – Transmission line crossings of a federal highway require a use and occupancy agreement under 23 CFR Section 645.213. The Applicant will work with the Minnesota Department of Transportation (DOT) (responsible for administering the agreements) to obtain the required approvals.
- → Farmland Protection Policy Act and Farmland Conversion Impact Rating – The U.S. Department of Agriculture (USDA) oversees farmland conversions under 7 USC Sections 4201–4208. The Applicant will complete Form AD-1006 Farmland Conversion Impact Rating and provide it to the Natural Resource Conservation Service (NRCS) for review.

- → Special Use Permit – the USFWS, U.S. Forest Service (USFS), and Bureau of Land Management (BLM) require a Special Use Permit or a ROW Permit/Easement if the Project crosses land under their jurisdictions. The USFWS oversees permits across their lands under 16 USC 668dd. The USDA oversees special use permits for the USFS under 36 CFR 214 Subpart B. The U.S. Department of the Interior oversees right-of-way regulations for the BLM under 43 CFR 2800/2880. The Applicant will work with these agencies to obtain the required permit if a crossing is required.
- → Obstruction Evaluation – The Federal Aviation Administration (FAA) requires that Projects located near regulated airports evaluate their potential to obstruct air traffic. The FAA must receive prior notification regarding construction of a structure under 14 CFR Part 77. Minnesota DOT Aeronautics Division requires a permit for tall structures that penetrate imaginary surfaces; primary, horizontal, conical, approach, or transitional surfaces, as well as certain height encroachments.

3.4.2 State Approvals

Based on the proposed Project, the Applicant is actively working with state agencies with respect to the following approvals as may be required:

- → Cultural and Historic Resources Review – Minnesota Statute designates the director of the Minnesota Historical Society as the State Historic Preservation Officer (Minnesota Statute Section 138.081) and places responsibility for the historic preservation program with the Minnesota Historical Society. Coordination with program staff has been initiated on the Project regarding historic and archaeological resources.
- → Utility Permit – A permit from Minnesota DOT is required under Minnesota Rule 8810.3300 for construction, placement, or maintenance of utility lines adjacent or across highway ROW. The Applicant is coordinating with Minnesota DOT as they review the Project's Route Alternatives and Segment Options for possible permitting.
- → Endangered Species Consultation – The Minnesota Department of Natural Resources (DNR) Natural Heritage and Nongame Research Program collects, manages, and interprets information about nongame species (Minnesota Statute Section 84.0895; Minnesota Rule 6134.0100-0400 and 6212.1800-2200). Consultation with program staff has been initiated on the Project regarding rare and unique species.
- → License to Cross Public Lands and Water – Minnesota DNR's Division of Lands and Minerals regulates utility crossings over, under, or across any state land or public water identified on the Public Waters and Wetlands Maps. A license to cross public waters is required under Minnesota Statute Section 84.415 and Minnesota Rule Chapter 6135. There are areas where either the Route Alternatives or Segment Options cross public waterways, this will require a public water crossing license. The Project Route Alternatives and Segment Options will also cross state lands that will require a public land crossing license. The Applicant is coordinating with Minnesota DNR to determine necessary crossing permits.
- → Public Waters Work Permit – The purpose of this program is to regulate development activities below the ordinary high water mark of wetlands, streams, and lakes in Minnesota. Under Minnesota Statute Section 103G.245, Subdivision 1, a Public Waters

Work Permit is required for any action taken by the state, political subdivision of the state, or corporation or person that alters or develops any obstruction to public waters or changes the course of a public waterway or body. The Applicant will apply for this permit as necessary.

→ Wetland Conservation Act Permit – The Minnesota Board of Water and Soil Resources administers the state Wetland Conservation Act pursuant to Minnesota Rule Chapter 8420. The transmission line portion of the Project is expected to be exempt under Minnesota Rule 8420.0420 Subpart 6. The Applicant anticipates that impacts related to the Blackberry 500 kV Substation will require a permit. The Applicant will apply for this permit (which is applied for jointly with a Section 404 Clean Water Act Permit from USACE) as necessary.

→ Section 401 Water Quality Certification – Minnesota Pollution Control Agency regulates water quality under Section 401 of the Clean Water Act (33 USC Section 1344). The Applicant will apply for this Certification (which is applied for jointly with a Section 404 Clean Water Act Permit from USACE).

→ National Pollutant Discharge Elimination System (NPDES) Permit – A NPDES permit from the Minnesota Pollution Control Agency (MPCA) is required for stormwater discharges associated with construction activities disturbing an area of 1 acre or more (Minnesota Rule 7090.0030). A requirement of the permit is to develop and implement a Stormwater Pollution Prevention Plan (SWPPP), which includes best management practices (BMPs) to minimize discharge of pollutants from the site. The Applicant will apply for this permit once the design is complete, prior to initiation of construction.

→ Agricultural Mitigation Plan – The Minnesota Department of Agriculture is the lead agency for development of an agricultural mitigation plan, if necessary (Minnesota Statute Section 216B.243, Subdivision 7). The objective of an Agriculture Mitigation Plan is to identify measures that can be taken to avoid, mitigate, repair, and/or provide compensation for impacts caused by the transmission line construction on agricultural lands.

→ Noxious Weed Management Plan – Under Minnesota Statute Section 18G.04, the Minnesota Department of Agriculture has the responsibility for eradication, control, and abatement of nuisance plant species. The local County Agricultural Inspector administers the program. The Applicant will develop a vegetation maintenance and management plan for the Project.

3.4.3 Local Actions

In accordance with Minnesota Statue Section 216E.10, the Project is exempt from regional, county, local, and special purposed government route approvals. However, the Applicant has provided notice to local units of government in compliance with Minnesota Statutes Section 216E.03, subdivision 3a and anticipates coordination with local government units (LGUs) regarding the following issues:

→ Road crossing/ROW – Coordination might be required to cross or occupy county, township, and city road ROWs.

- → Public lands – Coordination would be required to occupy county, township, and city lands such as forest lands, parklands, watershed districts, and other properties owned by these entities.
- → Over-width load – Coordination might be required to move over-width or heavy loads on county, township, or city roads.
- → Driveway access – Coordination might be required to construct access roads or driveways from county, township, or city roads.

4.0 Development and Screening of Alternatives

4.1 Route Development Process Summary

Minnesota Power (Applicant) identified the proposed Route Alternatives through an iterative process that used carefully selected routing factors to narrow the initial Study Area first into Study Corridors, then into Preliminary Route Alternatives, and finally into Refined Route Alternatives. Throughout this process, the Applicant received feedback from both the stakeholders and the public. Taking into account all of this information, as well as the applicable regulatory framework and the purpose and need for the Project, the Applicant has now identified the proposed Route Alternatives and Segment Options for consideration in this Presidential Permit application (Application). The entire route development process leading to the identification of the Route Alternatives and Segment Options is discussed in detail below.

4.2 Development and Application of Routing Factors

The Applicant developed routing factors for the Project based on transmission line siting experience, knowledge of applicable federal and state regulations (including Minnesota Rule 7850.4100 and 4300), and stakeholder feedback. The routing factors guided the route development process.

The routing factors included the following components:

→ Constraints – Constraints are resources or conditions that could limit or prevent transmission line development. Avoiding those resources or conditions is a goal, but not necessarily a requirement, of the route development process. Constraints might include areas restricted by regulations, or areas where impacts on resources will be difficult to mitigate. Constraints include, for example: existing land uses such as homes, agriculture, religious facilities, and schools; federal, state, and locally designated environmental protection areas; sensitive habitats or areas identified by private conservation organizations; areas with special legal status such as Indian lands; cultural resources such as national landmarks and archaeological sites; and public infrastructure such as airports and aeronautical and commercial telecom structures. It is important for the route development process to account for the fact that Project development affects the various Constraints differently.

→ Opportunities – Opportunities are resources or conditions that will facilitate Project development. They include pre-existing linear infrastructure or other features (for example, roads, transmission lines, and public land survey divisions of land) along which Project development will be particularly compatible. Opportunities will also facilitate Project development by reducing impacts on Constraints. Furthermore, Minnesota Rule 7850.4100 indicates that the Minnesota Public Utilities Commission (PUC) will consider the use or paralleling of existing rights-of-way (ROWs) (for example, transportation corridors, pipelines, and electrical transmission lines), survey lines, natural division lines, and agricultural field boundaries.

→ Technical Guidelines – Technical Guidelines are the specific engineering requirements and objectives associated with the construction of the Project. For example, one engineering requirement included as part of the Technical Guidelines is the maintenance of at least 200 feet of separation between centerlines when paralleling other electric transmission lines of 230 kilovolts (kV) or above. Another engineering objective, included as part of the Technical Guidelines, is to minimize the overall length of the line. These Technical Guidelines are specific to the Project and provide the technical limitations related to the design, ROW requirements, and reliability concerns. Some Technical Guidelines apply to the entire Project, and others are specific to a particular segment of the Project.

The Applicant developed a list of potential Constraints, Opportunities, and Technical Guidelines that together comprise the routing factors for the Project. That list appears in Tables 4-1 and 4-2. It is important to note that not all of the items in Tables 4-1 and 4-2 are present in the Study Area, and that the list of routing factors did not remain static during the route development process. As additional Constraints and Opportunities were identified by stakeholders, the Applicant added them to the list of routing factors.

Opportunities were reviewed for the Project and considered in conjunction with potential Constraints. In some areas, existing linear infrastructure offered ROW corridors along which a transmission line might be located with less disruption to the natural and human environment. In other areas, there were no Opportunities to parallel existing ROW in the direction desired; exiting ROWs were too narrow or irregular in width and direction; or they were surrounded by relatively high concentrations of other Constraints, such as are typically found in more urban areas.

The Project Technical Guidelines listed in Tables 4-1 and 4-2 were identified through:

1. Regulatory requirements and guidelines
2. Technical expertise of engineers and other industry professionals responsible for the reliable and economic construction, operation, and maintenance of the Project, and other electric system facilities
3. Applicable codes and standards including the National Electrical Safety Code
4. North American Electric Reliability Corporation (NERC) reliability standards
5. Industry best practices

Table 4-1. Opportunities

Opportunities
Existing transmission lines[1]
Roadways and trails
Railroads[1]
Public land survey system (for example, section lines and half section lines)

Opportunities
Property lines (that is, legal divisions of land)
Natural division lines and agricultural field boundaries
Pipelines[1]
Formerly mined areas (non-active) [1]

Note:
[1]While some features may offer a routing opportunity; the nature of the feature may also constitute a constraint.

Table 4-2. Constraints and Prohibited Areas

Constraints	
Federal, State, and County Resources/Jurisdictions	
National wildlife (and fisheries) refuges	State wildlife management areas
State natural resource areas	State wildlife refuges and birding areas
Nature preserves	State scientific natural areas
Prairie restoration areas	Military lands and operations
National and state forests	Resource easement lands
Wild and scenic rivers	Indian reservations/Indian-owned lands
Non-Government Organization (NGO) Lands	
Conservation areas (for example, The Nature Conservancy and Sierra Club)	NGO resource easement lands
Important bird areas (for example, The Audubon Society)	
Special Status Species and Habitat	
Bald eagle and migratory bird regulations (for example, Bald and Golden Eagle Protection Act [BGEPA] and Migratory Bird Treaty Act [MBTA])	Bald eagle wintering and breeding habitat
Designated critical habitat	Threatened, endangered and protected species (known occurrence areas and habitat)
Cultural Resources	
Historic and cultural resources	Burial areas (prehistoric or historic)
National Register of Historic Places (that is, listed or eligible sites)	Cemeteries
Historic landscapes, trails, and markers	Cultural values (traditional communities)
National natural landmarks	Century and sesquicentennial farms

Constraints	
Visual Resources	
Scenic highways or corridors	Geological markers
Scenic overlooks	
Public Infrastructure	
Airports	Telecom (for example, communication towers and antenna structures)
Very high frequency omnidirectional range (VOR) (that is, aeronautic navigation equipment– clear zone)	Housing and homes (consider Environmental Justice)
Doppler radar systems	
Land Use	
Taconite mining operations (for example, tailings, pits, and mining structures)	Agriculture land
Planned development (that is, city and county plans)	Orchards
Commercial and industrial development	Forest land
Daycares, schools, and hospitals	Aggregate mine and quarries
Other structures (for example, billboards, barns, and sheds)	Trails (for example, local, snowmobile, bicycle, and horse)
Religious facilities	Recreation areas (for example, parks, golf courses, and off-highway vehicle [OHV] trails)
Safety regulations (for example, fireworks manufacturers, gas stations, and electrically sensitive areas)	Contaminated areas (for example, superfund and brownfield sites)
Center pivot and lateral move irrigation	
Natural Resources and Geomorphology	
Old growth forest areas – special management zones	Wetlands, peatlands, and calcareous fens
Flood control areas (that is, floodplain)	Native prairie
Lakes, ponds, reservoirs	Significant geomorphology or geologically unstable areas
Engineering Considerations	
Terrain and soil conditions	Size and type of foundation

Constraints	
Roadway access to for construction and maintenance	Inductive currents and interference
Number of special structures needed to avoid or minimize impacts on environmental features	Tree-trimming and vegetation management
Number of angle structures	Reliability and restorability
Prohibited Areas	
State or national wilderness areas	State scientific and natural areas
State and national parks	

4.3 Data Collection

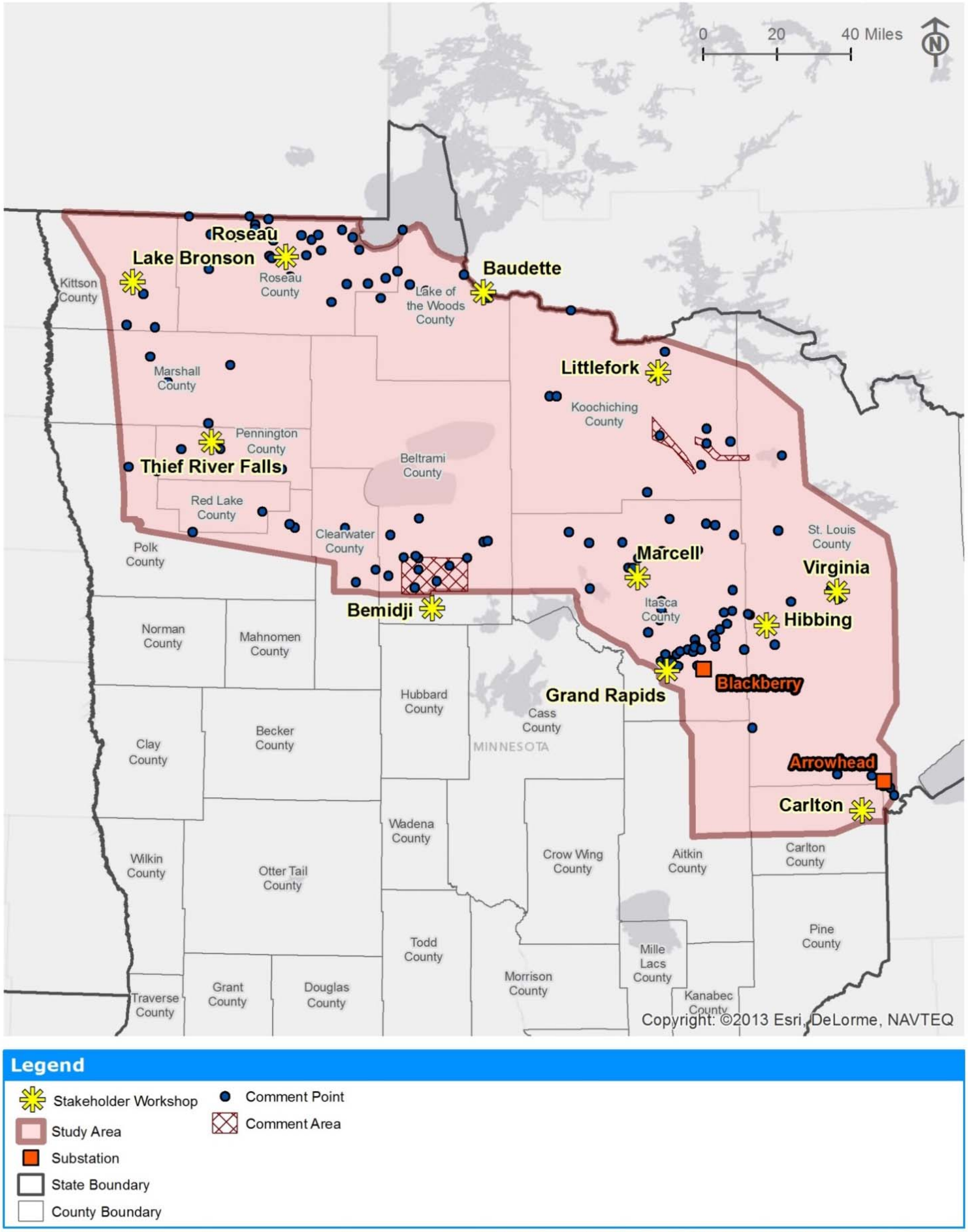
To identify Constraints and Opportunities within the Study Area, the Applicant started collecting data in April 2012, an effort that continued throughout the route development process. Sources included online data repositories; federal, state, and local agencies; aerial photo interpretation; field reconnaissance; and stakeholder comments. Field reconnaissance was conducted during the route development process from public roads and helicopter. Section 10.0, References includes a list of data sources/references for the Project.

4.4 Study Area Identification

The Study Area generally was delineated to include the Project endpoints (Minnesota-Manitoba Border Crossing Area and the delivery location at the proposed Blackberry 500 kV Substation) and major Opportunity features found between the endpoints (see Figure 4-1). The following sections describe the routing factors that influenced the boundaries of the Study Area. Feedback from agencies was solicited during the identification of the Study Area. See Appendix C for agency correspondence and public open house summaries.

minnesota power
AN ALLETE COMPANY
GREAT NORTHERN TRANSMISSION LINE

Study Area **Figure 4-1**



Sources: ESRI \\mspe-gis-file\gisprojlarge\MinnPower\182035\map_docs\CLIENT\Route_Permit\04-01_StudyArea.mxd

4.4.1 Northern Boundary

The northern boundary includes a majority of the Minnesota-Manitoba Border Crossing Area. In the extreme northwestern corner of the Study Area, the northern boundary was developed to include an existing pipeline as a border crossing and route-paralleling Opportunity. In the northeastern edge of the Study Area, the northern boundary diverts from the Minnesota-Manitoba border near International Falls and continues southeast. Voyageurs National Park, Boundary Waters Canoe and Wilderness Area, Canada lynx Federal critical habitat, and the large lakes located near the Minnesota-Manitoba Border Crossing Area were avoided due to regulatory restrictions and engineering Constraints.

4.4.2 Eastern Boundary

The eastern boundary of the Study Area was selected to include State Highway 73 as an Opportunity and avoid Voyageurs National Park, Boundary Waters Canoe and Wilderness Area, and Canada lynx critical habitat. Development of the eastern boundary considered the Bois Forte Indian Reservation, State Highway 73, and large lakes in the area that cannot be spanned. Further southeast, the Study Area boundary included Opportunities through the Iron Range (for example, County Highway 135 near Biwabik, as the eastern-most Opportunity) while avoiding the large Lake Vermillion complex. The Iron Range presents a challenging routing situation in that it is a productive mining area with mining expansion occurring frequently. The Study Area was adjusted in this location to allow for additional Opportunities to the east while minimizing impacts on the adjacent Superior National Forest.

4.4.3 Southern Boundary

The southern boundary was developed to avoid numerous large lakes between Bemidji and Grand Rapids, while incorporating a number of east to west Opportunities. The southwestern portion of the Study Area boundary avoided the City of Crookston, but included a number of east to west oriented county highways (that is, County Highway 92, 222, and 223). Further east, the boundary included an existing 115 kV transmission line. Continuing eastward the boundary avoided the heavily populated area near Bemidji as well as large, un-spanable lakes (including Leech Lake). The boundary curved southeast to include County Highway 46. The heavily populated area of Grand Rapids initially was included in the Study Area because there are existing transmission lines that provide paralleling Opportunities across the actively mined Iron Range. Southeast of Grand Rapids, the boundary turned south to provide routing flexibility around the west side of the cluster of lakes in Aitkin County.

The Study Area did not include U.S. Highway 169, as there were other potential Opportunities to the east that were accessible from the proposed Blackberry 500 kV Substation. Locating the transmission line along U.S. Highway 169 could have greater impact on landowners, businesses, and industries than other eastern Opportunities.

Extending the Study Area further south, to include the U.S. Highway 2 corridor or more southern locations, was not considered feasible. The U.S. Highway 2 corridor already is crowded with numerous pipelines and an existing transmission line. The general public has expressed weariness at the potential of adding more utilities to this existing corridor.

Additionally, the known Constraints made the U.S. Highway 2 corridor undesirable. Areas to the south of U.S. Highway 2 include more lakes and residential properties. Potential conflicts with landowners will increase as compared to the northern areas (that is, areas south of Red Lake) that are available for siting the transmission line.

4.4.4 Western Boundary

The western boundary primarily followed a line where the soil types transition from fine textured, lacustrine silt and clay soil associations of the Red River Valley to the west (that is, outside of the Study Area) to medium textured, lacustrine loam and sandy soils associations of beach ridges to the east (that is, inside the Study Area). Previous Project experience and engineering information indicates that foundation construction and design costs are likely to increase where transmission structures are located in the shrink-swell soils of the Red River Valley. The Applicant used Natural Resources Conservation Service (NRCS) State Soil Geographic Database (STATSGO) and Ecological Classification Series profiles to determine the transition between the soil associations. The extreme northwestern portion of the Study Area boundary deviates from the soil type justification and extends into fine textured soils to include an existing pipeline Opportunity. Minnesota Highway 75 was excluded from the Study Area, because a large portion of that road traverses fine textured soils.

4.5 Study Corridor Identification

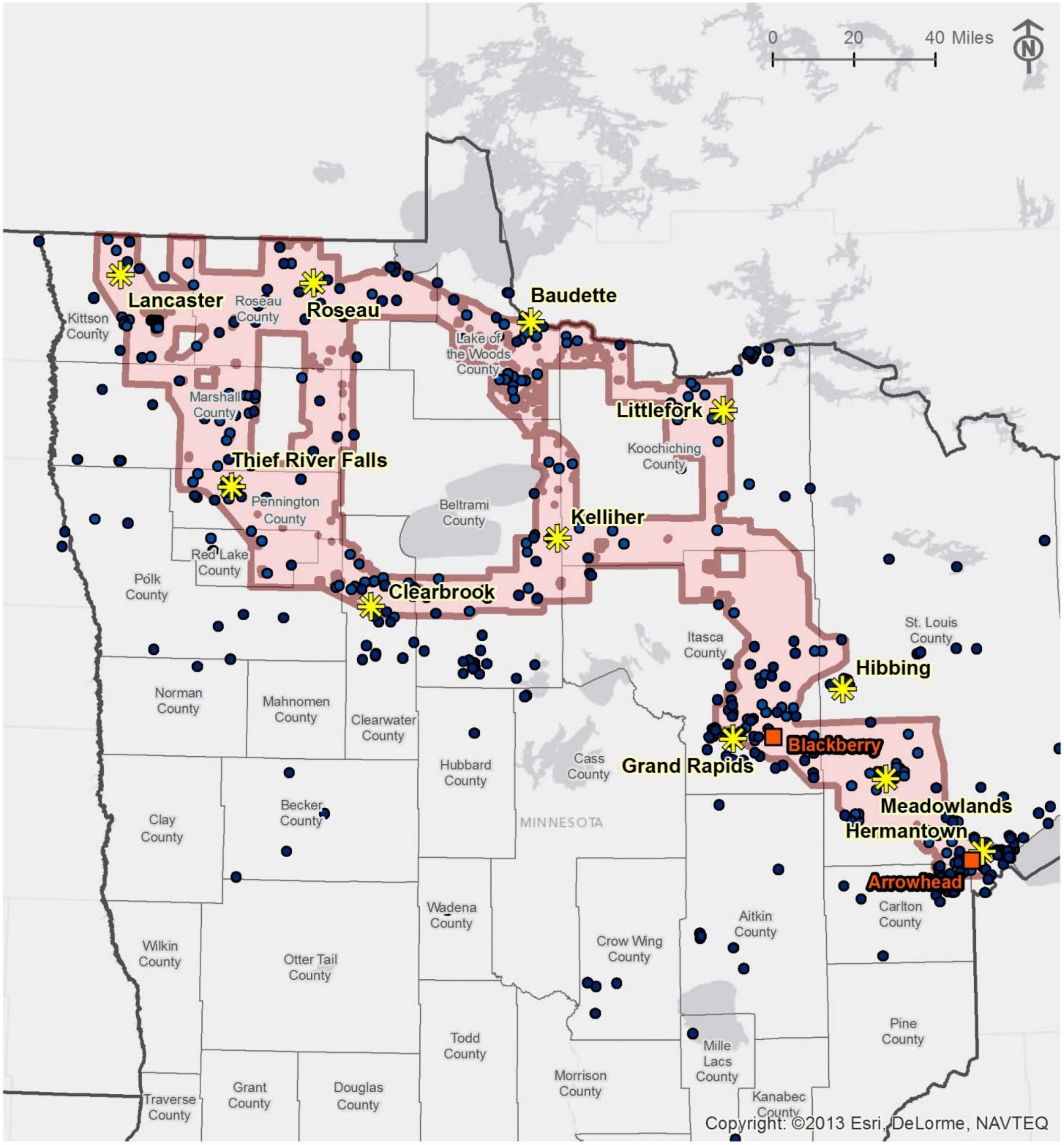
The Applicant developed the Study Corridors by reviewing collected data, meeting with stakeholders, and performing broad environmental and engineering analyses on the Study Area. The Study Corridors were generally 5 to 20 miles wide to allow for flexibility in determining Opportunities while avoiding concentrations of Constraints.

Applying this strategy, the Applicant selected Study Corridors that avoided Constraints such as densely populated areas, U.S. Fish and Wildlife National Wildlife Refuges, Tribal Lands and Reservations, Minnesota Scientific and Natural Areas, large lakes and areas with a high-density of lakes and large wetland complexes, and contiguous areas of relatively undisturbed natural resources.

The Study Corridors were presented to the public at the first round of open house meetings and to individual agencies during the fall 2012. These meetings provided information about the Project to the public and agencies, and allowed comments from them to be recorded for use during the next step of the route development process.

See Figures 4-2 and 4-3, and Appendix C for a summary of public and agency comments.

Study Corridor Figure 4-2

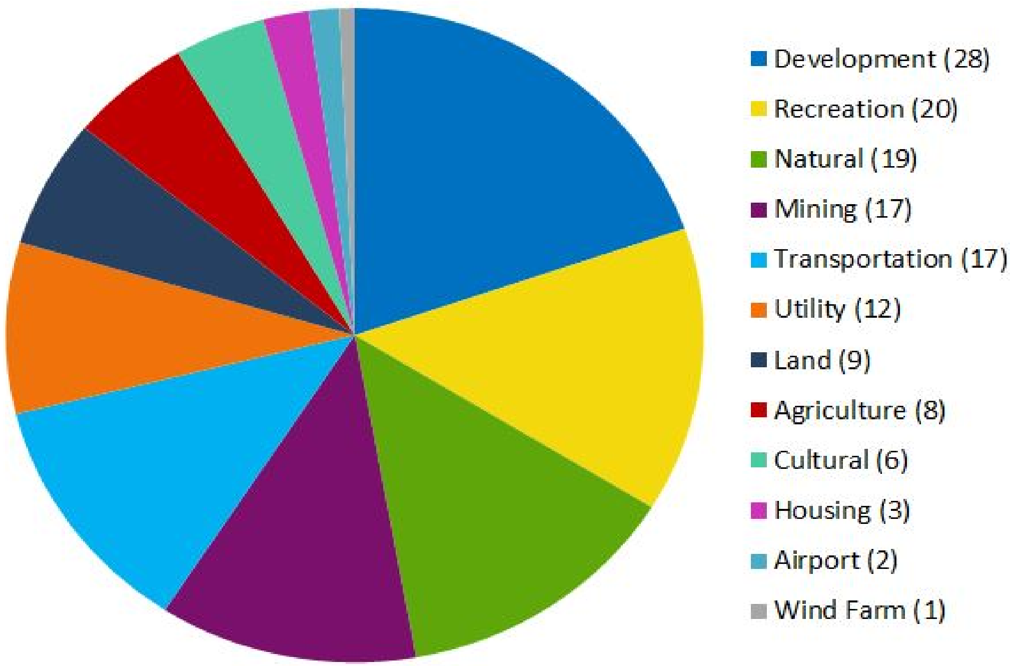


Legend

- Open House Location
- Comment Point
- Substation
- Study Corridor
- State Boundary
- County Boundary

Sources: ESRI \\mspe-gis-file\GISProjLarge\MinnPower\182035\map_docs\CLIENT\Route_Permit\04-02_StudyCorridor.mxd

Figure 4-3. Fall 2012 Open House Meetings Comment Type and Number



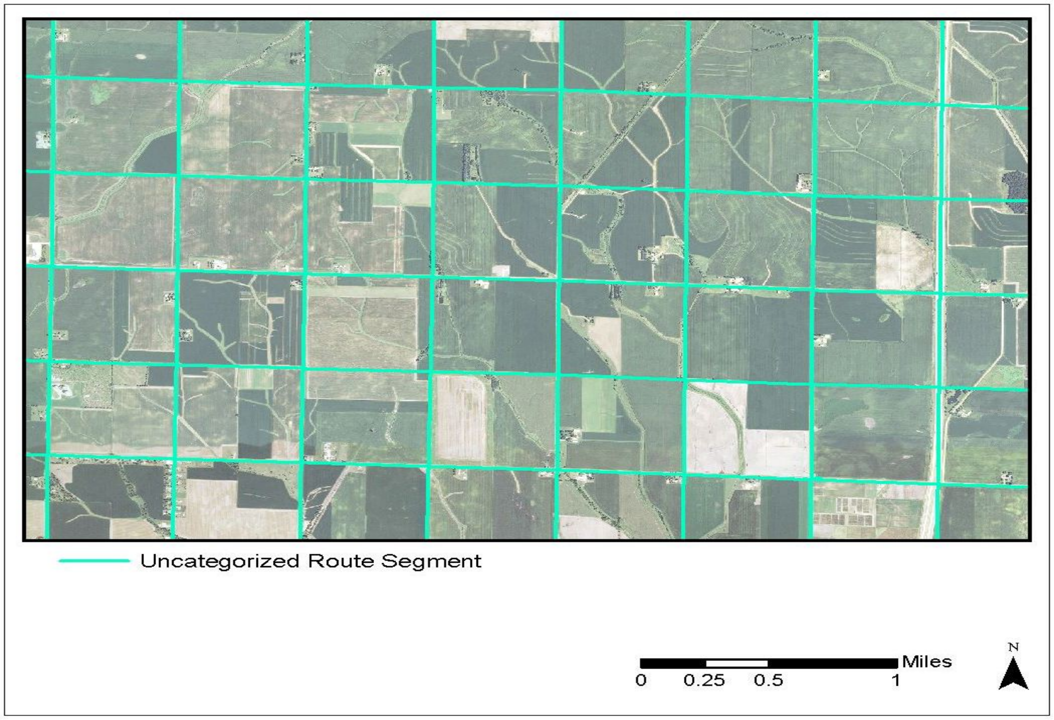
4.6 Route Segment Development

4.6.1 Network Development

The Applicant began Preliminary Route Alternative development by creating an extensive network by which potential route segments could be compared and evaluated. This process involved careful consideration of PUC's routing factors through the identification of roads, transmission lines, railroads, section lines, quarter-section lines, and general property boundaries within the Study Corridors. Opportunities that were oriented in a direction (that is, southwest to northeast) that conflicted with the Project direction, or that were located in a municipality, generally were excluded from the network. To the extent they were not excluded during the Study Corridor development, areas with a high concentration of Constraints, such as municipalities, were avoided during the network development. Where route segments intersected, a node was established.

Figure 4-4 illustrates route segment development in an agricultural setting, similar to what might be found in the western portion of the Study Corridors.

Figure 4-4. Route Segment Network Illustration



Because the Applicant identified minimization of impacts on people and their residences as a priority, the next step in the route segment development process was to identify all homes and structures (for example, barns, garages, sheds, and grain bins) within the Study Corridors. These two Constraints are widely distributed and common throughout most of the Study Area, and thus were difficult to avoid on a corridor scale.

Homes and structures initially were identified through field reviews, aerial image interpretation, and public comments. After the identification process was completed, the Applicant calculated the distance to the closest home and structure for each route segment and categorized the route segments by that distance. Figure 4-5 illustrates a route network with the segments categorized by home and structure distance intervals.

Using these measurements, the Applicant identified contiguous route segments that will maximize the distance from homes and other structures, while seeking to minimize the length and number of turns requiring angle structures.

Figure 4-5. Categorized Route Segment Network Illustration

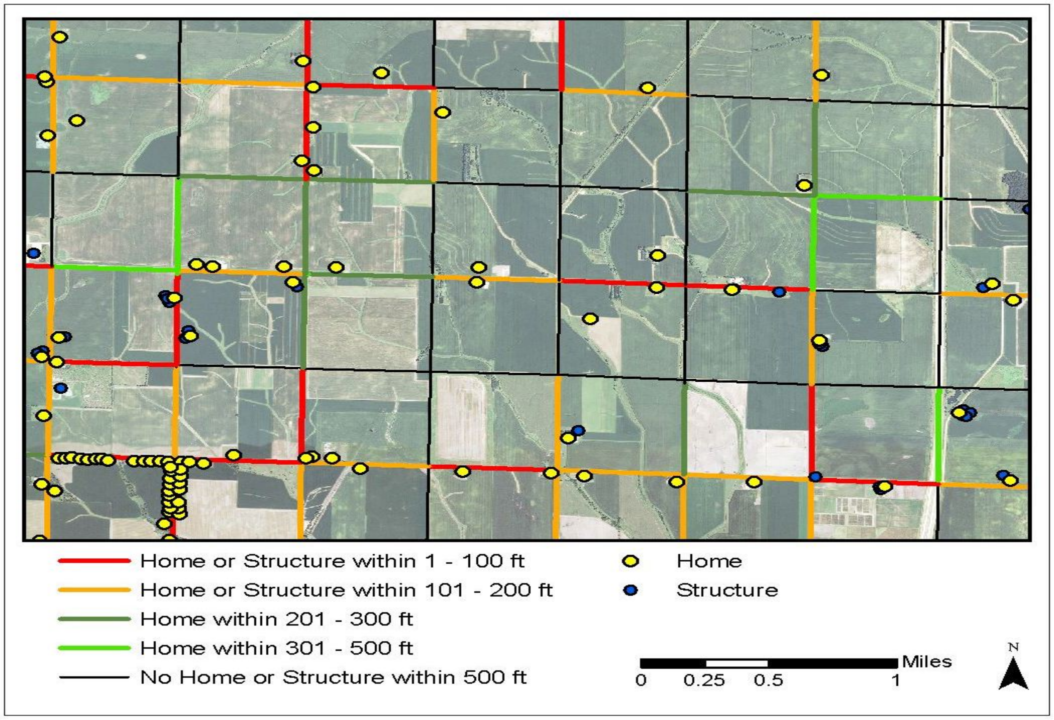
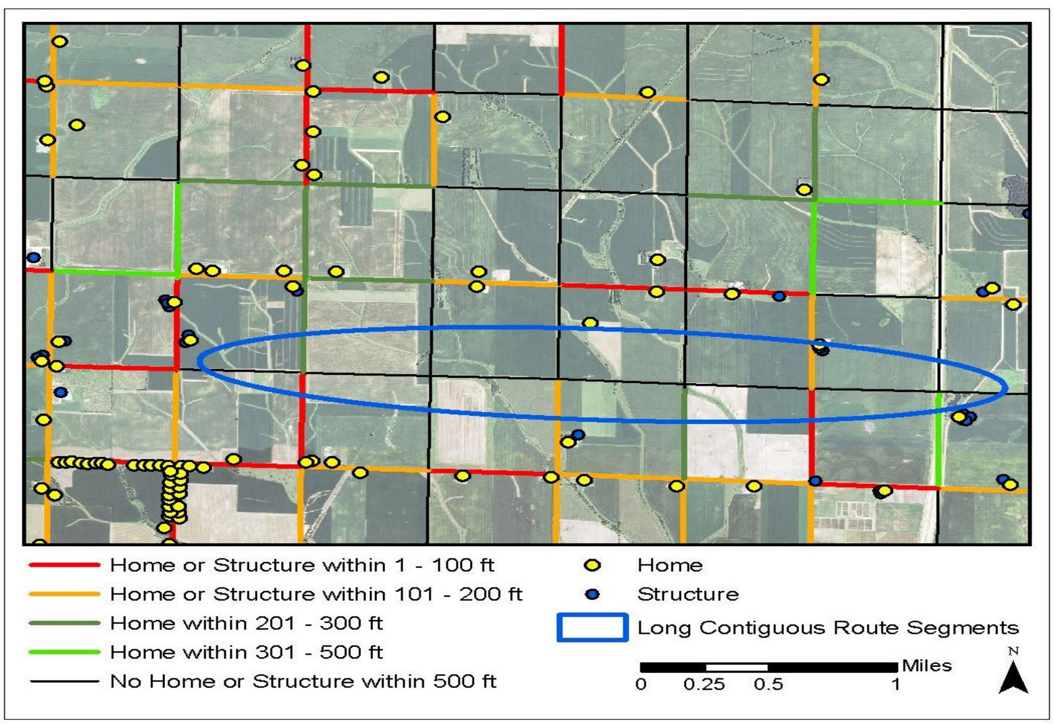


Figure 4-6 illustrates an example of contiguous route segments where a straight-line distance could be maximized.

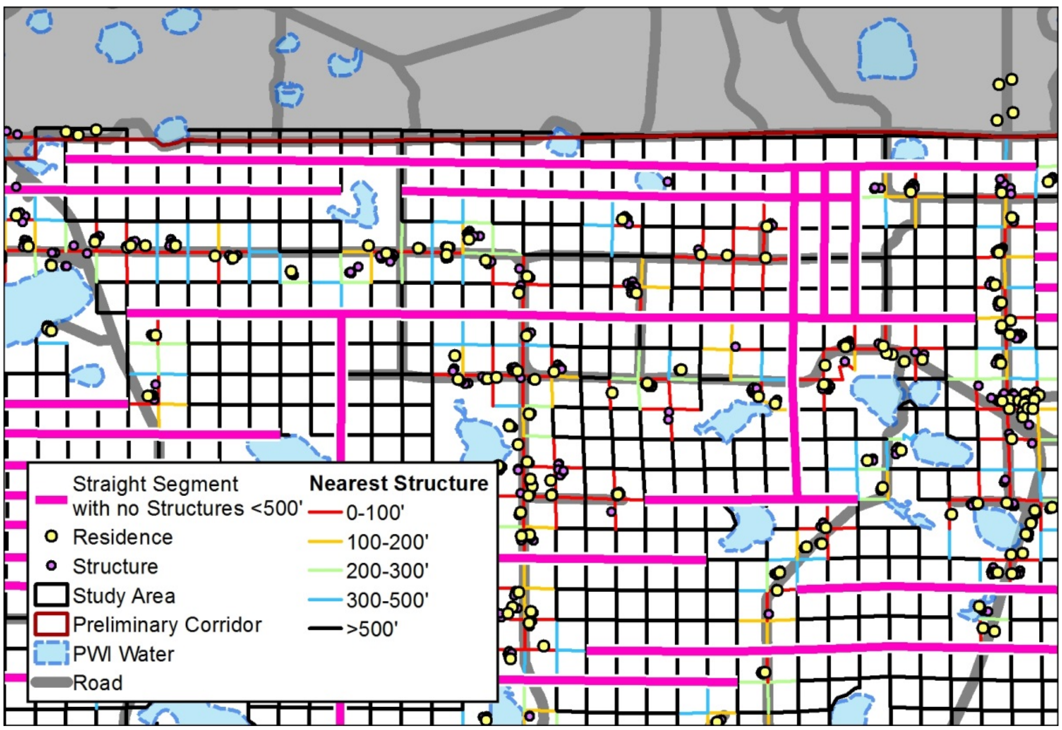
Figure 4-6. Long Contiguous Route Segment Illustration



The Applicant also prioritized quarter-section lines over quarter-quarter section lines because they more frequently coincide with property lines and field lines. Siting the Project along property lines or field lines helps minimize impacts on existing land uses.

The Applicant continued this process of identifying contiguous route segments until a network was identified that provided routing possibilities across the Study Corridors. Figure 4-7 illustrates an example of the network that was identified using the process described above. The network, which contained more than 600 route segments, was carried forward for further detailed analysis using all of the routing factors.

Figure 4-7. Network for Detailed Analysis Illustration

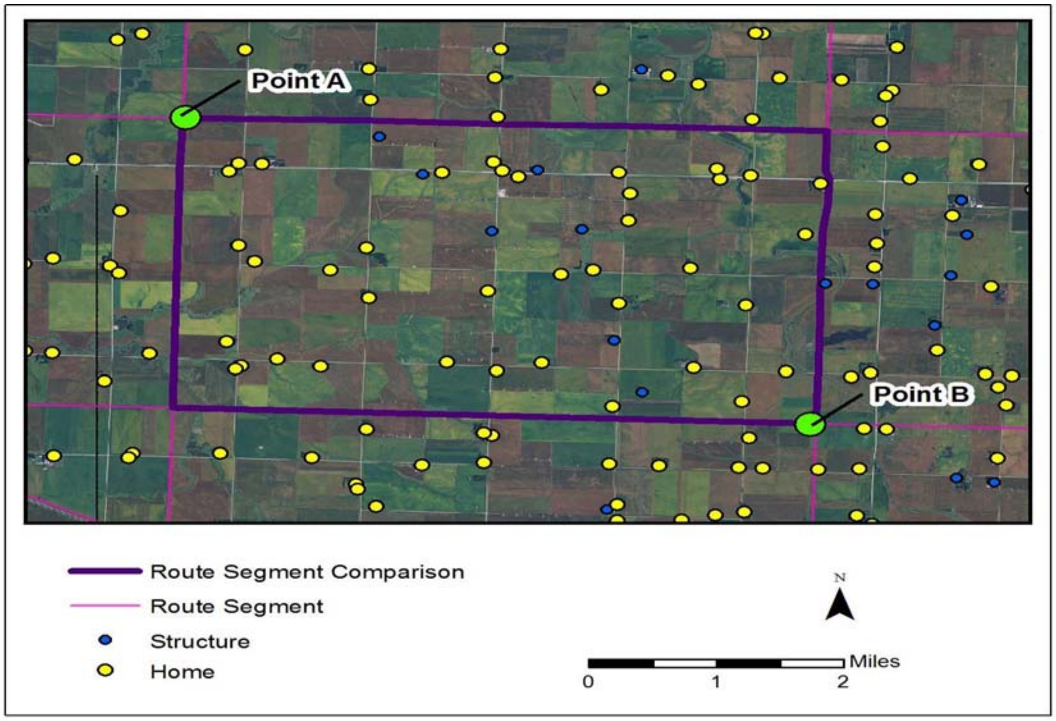


4.6.2 Route Segment Comparison

Once the network was developed, the Applicant analyzed the potential impacts associated with the route segments. The first step at this stage was to compare groups of smaller routes (contiguous route segments typically 3 to 10 miles long) that had common start and end points. Figure 4-8 provides an illustration of two route segments traversing from point A to point B that were comparatively analyzed with respect to potential impacts.

The route segments that best satisfied the routing factors in these comparisons were carried forward for further consideration. When all other factors were relatively equal, the Applicant generally gave preference to the route that had fewer homes in its proximity, lesser impact on wetlands, and was the shortest.

Figure 4-8. Route Segment Comparison Illustration

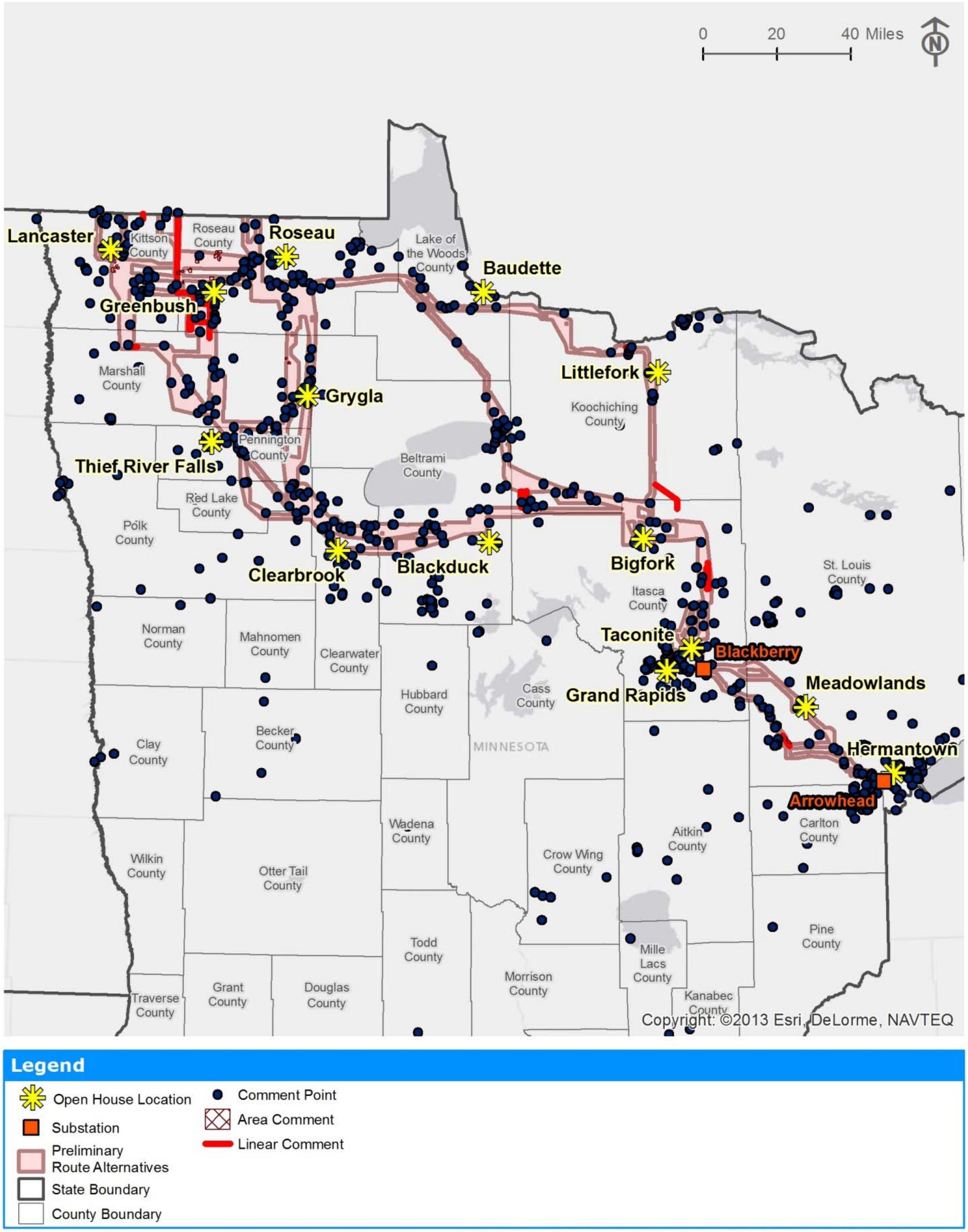


4.7 Preliminary Route Alternatives

The Applicant used the route segments it had developed to create Preliminary Route Alternatives from the Minnesota-Manitoba Border Crossing Area to the proposed Blackberry 500 kV Substation. These Preliminary Route Alternatives were approximately 1 to 3 miles wide and centered on identified route segments, as illustrated in Figure 4-9. Preliminary Route Alternatives wider than 1 mile were created to allow for additional flexibility when more than one route segment was feasible, or where the Applicant recognized potential conflict with planned development or land use Constraints.

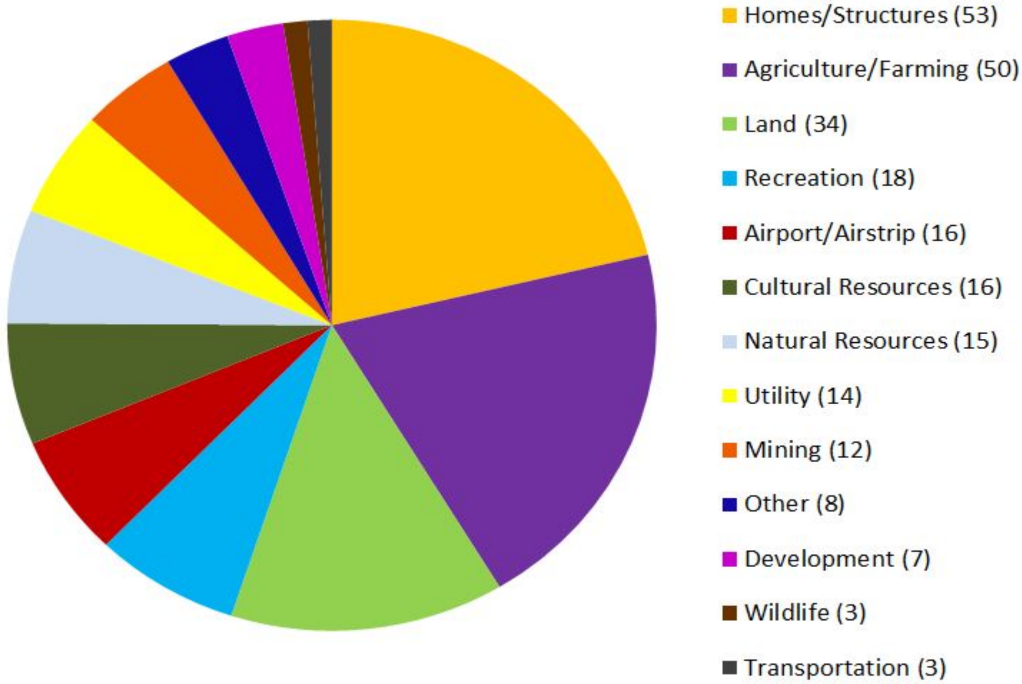
Preliminary Route Alternatives were presented to the public at a second round of open house meetings and to individual agencies during the spring 2013. These meetings provided the public and agencies with updated information and facilitated the collection of comments for use in the next step of the route development process. See Figure 4-10 and Appendix C for a summary of public and agency comments.

Preliminary Route Alternatives Figure 4-9



Sources: ESRI \\mspe-gis-file\GISProjLarge\MinnPower\182035\map_docs\CLIENT\Route_Permit\04-09_PrelimRouteAlts.mxd

Figure 4-10. Spring 2013 Open House Meetings Comment Type and Number.



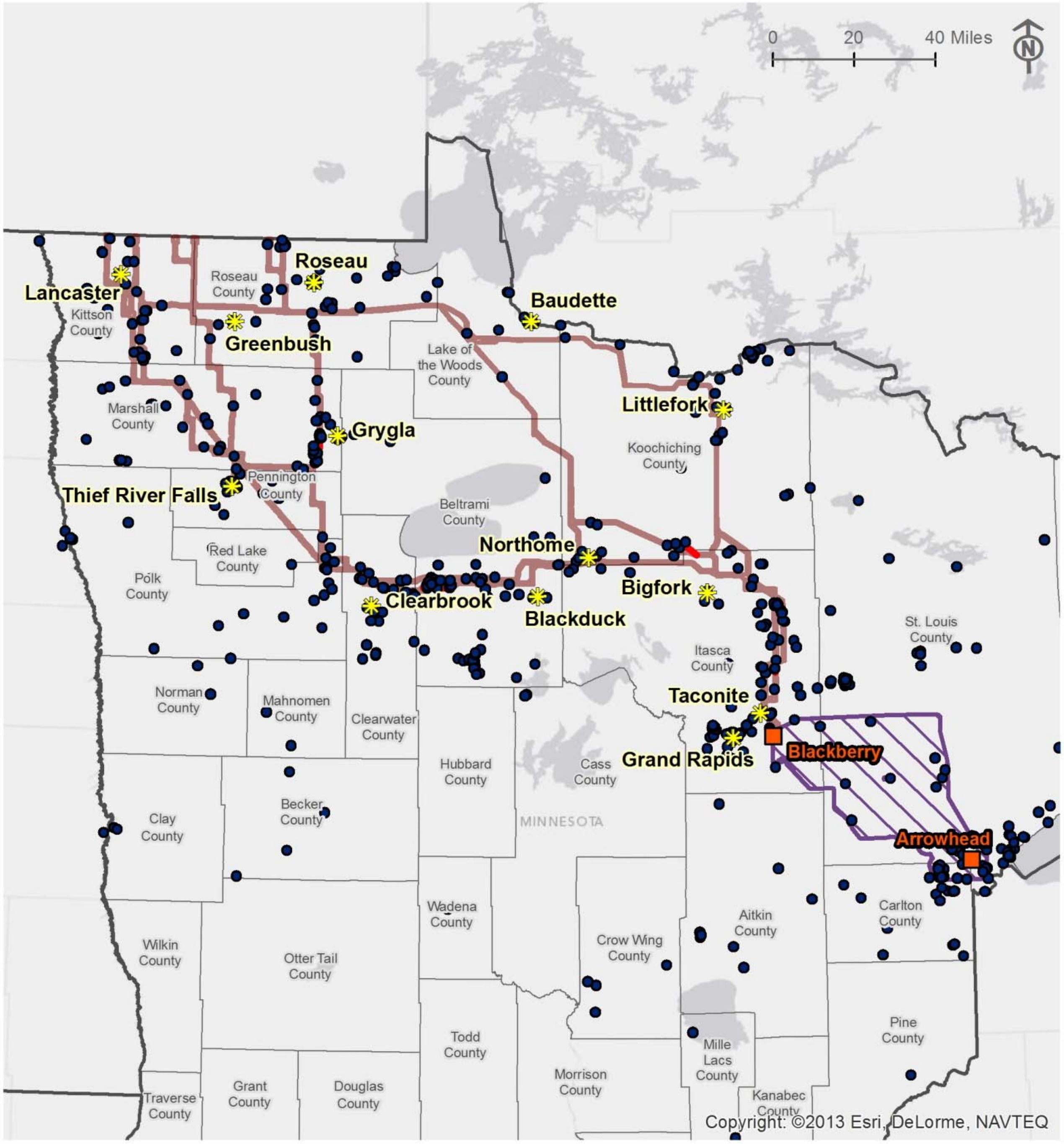
4.8 Refined Route Alternatives

Based on feedback from stakeholders and the public, as well as further analysis of the routing factors, the Applicant narrowed the Preliminary Route Alternatives to Refined Route Alternatives, each of which was 1,000 to 3,000 feet wide. Because these Refined Route Alternatives were closer in width to the actual ROW, the Applicant had to make additional decisions about minimizing impacts. At the same time, the Refined Route Alternatives maintained some flexibility with respect to the location of the centerline. The Refined Route Alternatives are shown in Figure 4-11.

The Refined Route Alternatives were presented to the public at a third round of open house meetings and to individual agencies in the fall 2013. Again, the Applicant used these meetings as an opportunity to both inform stakeholders about the Project and to gather information from the public and agencies for use in the route development process. See Figure 4-12 and Appendix C for a summary of public and agency comments.

At the beginning of project planning, Minnesota Power anticipated development of two transmission lines and associated facilities – the Project and a separate 345 kilovolt ("kV") transmission line between the terminus substation of the Project and the Arrowhead Substation near Hermantown, Minnesota. Subsequently, the Applicant determined that there are not sufficient transmission service requests to support this 345 kV transmission line. Therefore, the Applicant is not pursuing the 345 kV transmission line at this time.

Refined Route Alternatives Figure 4-11



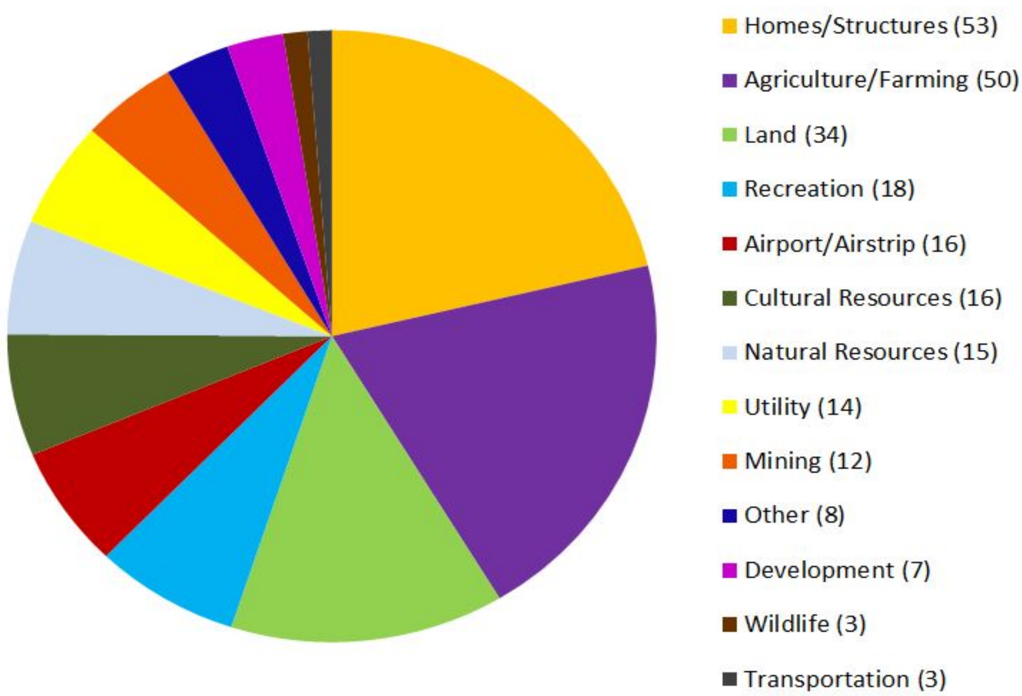
Legend

- Open House Location
- Substation
- Refined Route Alternative
- Area Removed from Further Consideration
- Comment Point
- Linear Comment
- State Boundary
- County Boundary

Sources: ESRI

\\mspe-gis-file\gisprojlarge\MinnPower\182035\map_docs\CLIENT\Route_Permit\04-11_RefinedRouteAlts.mxd

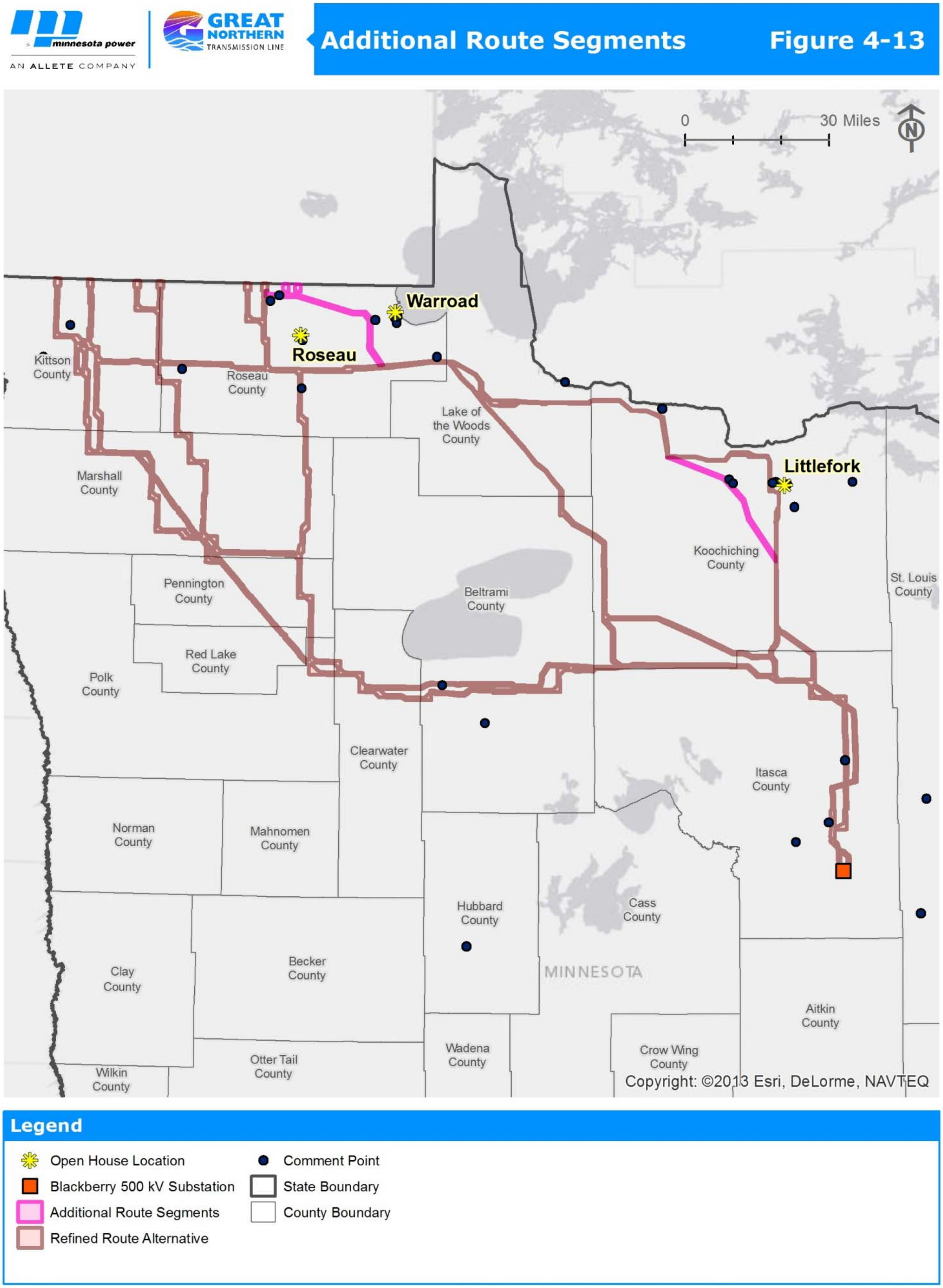
Figure 4-12. Fall 2013 Open House Meetings Comment Type and Number



4.9 Additional Route Segments

After further consideration of the comments received from the public and agencies during the third round of open house meetings, as well as further discussion about the application of the routing factors, the Applicant identified two additional route segments as potential routing options. The additional route segments, shown in Figure 4-13, were presented to the public during three open house meetings in November 2013. See Appendix C for a summary of public and agency comments.

Additional Route Segments — Figure 4-13



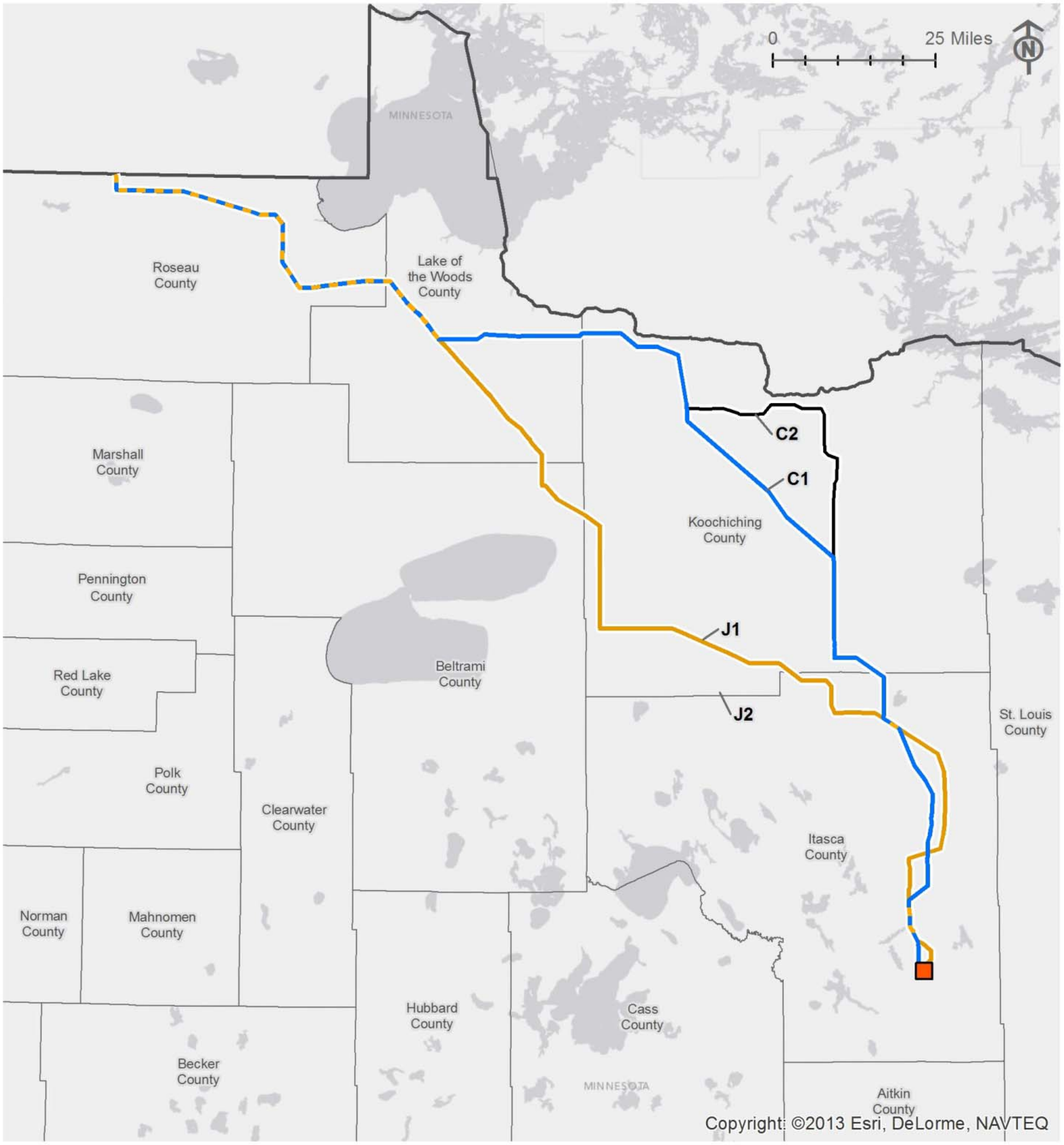
4.10 Proposed Route Alternatives and Segment Options

Under Minnesota Rules 7850.1900, the Applicant is required to propose at least two Route Alternatives for inclusion in the Route Permit application. These proposed Route Alternatives are shown in Figure 4-14. One Route Alternative, shown in orange in Figure 4-14, largely parallels an existing 500 kV transmission line. Another route alternative, shown in blue in Figure 4-14, largely parallels an existing 230 kV transmission line.

In addition to the Route Alternatives, the Project includes certain Segment Options that the Applicant proposes to carry forward into the permitting process. These Segment Options, which were identified as part of the route development process, would have different Project benefits and environmental effects.

- Segment Option C1 is shorter, and goes through undeveloped forest, whereas Segment Option C2 is longer, and is closer to residences.
- Segment Option J1 goes through undeveloped forest, whereas J2 is closer to residences. Segment Option J1 was suggested by the public during the open house meetings.

Proposed Route Alternatives Figure 4-14



Legend

- Blue Route
- Orange Route
- Segment Option
- Blackberry 500 kV Substation
- State Boundary
- County Boundary

Sources: ESRI

\\mspe-gis-file\gisprojlarge\MinnPower\182035\map_docs\CLIENT\Route_Permit\04-14_ProposedRouteAlts.mxd

4.11 Alternatives Considered but Rejected

No Route Alternatives in the western portion of the Study Area (the Alternatives Considered but Rejected, shown in Figure 4-15) were included in the proposed Route Alternatives. As discussed in detail below, the Applicant considered numerous factors when selecting the two proposed Route Alternatives and eliminating the remaining Western Route Alternatives from further analysis.

4.11.1 Border Crossing Options

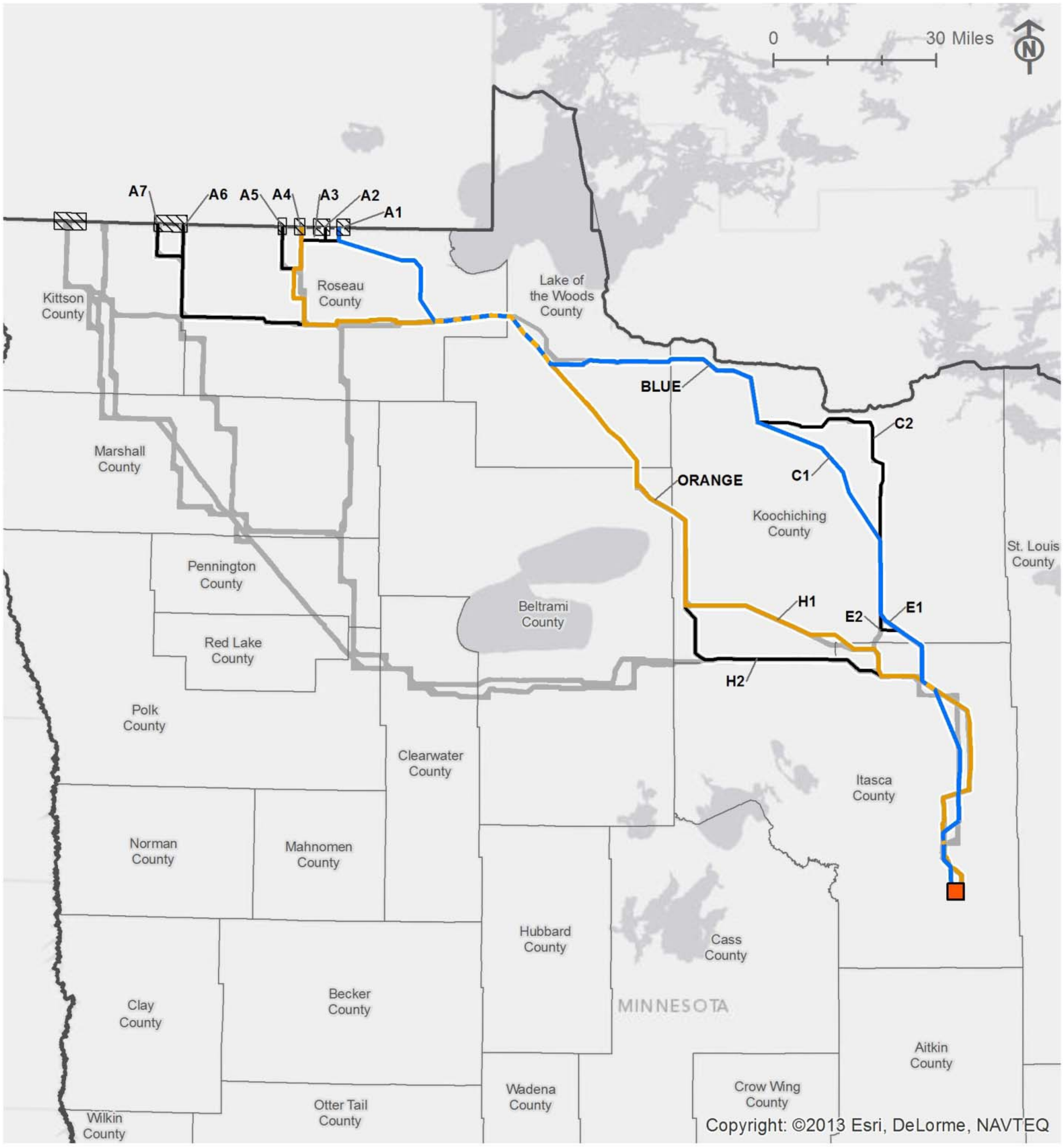
The Applicant included a number of potential locations for the Minnesota-Manitoba Border Crossing options in its Refined Route Alternatives. The Applicant recognizes that the location chosen must match the border crossing selected by Manitoba Hydro, which is conducting its own route development process (Minnesota Statutes Section 216E.02, subdivision 3). As Manitoba Hydro's process moved forward, the Applicant and Manitoba Hydro jointly agreed to eliminate the westernmost Border Crossing Area because it was less desirable in a number of respects, including effects on human settlement and the environment, than other Border Crossing Options. Because the westernmost Border Crossing option was eliminated by agreement with Manitoba Hydro, the Applicant also eliminated the most westerly route alternative that was exclusively associated with that Border Crossing Area from further consideration.

4.11.2 Existing Transmission Lines

When PUC issues route permits for high-voltage transmission lines like the Project, it favors routes that parallel existing transmission line ROWs. The Western Route Alternatives did not offer an opportunity to parallel existing high-voltage transmission lines. This factor favored selection of the Orange Route and Blue Route, which do parallel existing transmission lines, over the other Refined Route Alternatives.

Atlernatives Considered but Rejected

Figure 4-15



Legend

- Blue Route
- Orange Route
- Segment Option
- Blackberry 500 kV Substation
- Border Crossing Area
- Alternatives Considered but Rejected
- State Boundary
- County Boundary

Sources: ESRI

\\mspe-gis-file\gisprojlarge\MinnPower\182035\map_docs\CLIENT\Route_Permit\04-15_Rejected.mxd

4.11.3 Energy Demand and Power Purchase Agreements

The statement of purpose and need for the Project establishes that the regional demand for electricity is expected to grow significantly in the coming years. PUC has concluded that the Applicant faces an energy and capacity deficit from 2020–2035. To meet this need, the Applicant and Manitoba Hydro have signed a 250 megawatt (MW) Power Purchase Agreement (PPA) and a 133 MW Energy Sale Agreement. To fulfill these agreements, the Project must be in service by June 1, 2020.

The Applicant evaluated the likelihood of successfully achieving the June 1, 2020 in service date with each of the Refined Route Alternatives. This involved careful analysis of feedback received during public open house meetings; calculation of the estimated time it will take to acquire the necessary property rights and construct the transmission line; and consideration of the potential need for condemnation proceedings, including the unique aspects of Minnesota condemnation law. Because the Western Route Alternatives would involve a substantially larger number of privately owned parcels, many of which are used for agricultural purposes, and because public meeting attendees at the Western Route Alternative sites voiced more numerous and strenuous objections, the Applicant concluded that achieving the contractually determined June 1, 2020 in-service date will be highly unlikely for the Western Route Alternatives. For this reason, the Western Route Alternatives do not satisfy the purpose and need for the Project.

4.11.4 Community Impacts

The comments received at the public meetings for the Western Route Alternatives indicated to the Applicant that there is a substantial level of public opposition to siting the Project in the western portion of the Study Area. (See previous discussion in this chapter, Section 9.0, Public Participation and Agency Coordination, and Appendix C.) This opposition is attributable to the higher concentration of residences in the area and the concentration of agricultural land users, who object to the potential for diminished production capacity of their land. The fact that the Western Route Alternatives were much further removed from the Applicant's service area than the Orange Route and the Blue Route was also a source of objections. The Applicant's purpose and need for the Project includes the company's goal of having a positive impact on communities. The Applicant concluded, on the basis of comments it received during public open house meetings that adopting the Western Route Alternatives will threaten this goal. For this additional reason, the Western Route Alternatives do not satisfy the purpose and need for the Project.

4.12 Border Crossing Options

At the outset of the Project, the Applicant and Manitoba Hydro agreed to describe border crossing considerations related to length, impact on people, the environment and agency and community feedback, as well as schedule, and had exchanged information on their respective regulatory and routing processes. The Applicant and Manitoba Hydro then completed separate routing and public engagement processes to determine their unique preferences related to border crossing locations. On March 3, 2014 the Applicant met with Manitoba Hydro to discuss their respective border crossing preferences, with the objective of determining a mutually acceptable border crossing location that would serve the needs of the overall project. Figure 4-15 illustrates the crossing locations considered (A1 – A7).

Applicant Considerations and Preference

Key border crossing considerations for the Applicant are consistent with those described elsewhere in this Application, including minimizing length; avoiding potential impacts on residences, and productive agricultural land; and accounting for environmental concerns. Based on these considerations, the Applicant identified Option A1 as its preferred option because it results in routes that are shorter, impact fewer homes and less agricultural land, and allows more collocation with existing transmission lines. The Applicant considered Options A7 and A6 infeasible because they would affect many more homes and productive farmland, while at the same time creating many miles of new corridor. The area that would be affected by Options A7 and A6 has also been recognized as having outstanding biological diversity, a concern echoed in communications received from the Nature Conservancy.

Manitoba Hydro Considerations and Preference

Key border crossing considerations for Manitoba Hydro included determining route options that balance natural, engineering and built considerations while taking into consideration feedback from the public, stakeholders and aboriginal communities. Manitoba Hydro identified Option A7 as the best option based on all criteria considered. Options A1 and A2 were not feasible as they traverse areas of high biological diversity in Manitoba that have been noted by agencies and environmental non-governmental organizations and are primarily located through Crown lands, which have been criticized as a routing approach by the Clean Environment Commission. Additionally, Options A1 and A2 could raise significant concerns from First Nation communities in terms of traditional uses of the area.

Decision Process

Discussion during the March 3 meeting recognized that both parties had similar concerns regarding avoiding and/or reducing potential impacts on people and natural areas. Both utilities also understood the importance of considering risk, schedule and potential delays.

Since Options A6 and A7 were infeasible in Minnesota Power's perspective and Options A1 and A2 were infeasible in Manitoba Hydro's perspective, these crossings were removed from further consideration. Additionally, Manitoba Hydro preferred the most western crossing (Option A5) over the east crossing (Option A3/A4), since access to the east crossing (Option A3/A4) would require the selection of a route that was more environmentally impactful. Therefore, Manitoba Hydro and Minnesota Power agreed that Option A5 was the best and only feasible Border Crossing Option taking into account acceptability to parties, environmental impacts, community impacts and overall Project schedule (Minnesota Statutes Section 216E.02, subdivision 3).

As a result of the border crossing decision, the Applicant revised the Orange Route and Blue Route so that they both ended at the selected crossing location (see Figure 1-1 in Section 1.0, Introduction).

4.13 Segment Options E1 and E2

Segment Options E1 and E2 were originally identified as potential segments based on opportunities to follow existing infrastructure. Segment Option E1 follows 230 kV and 500 kV transmission lines. Segment Option E2 follows a portion of Deer River Line Road. Upon further analysis, Segment Option E1 was rejected because it parallels two high voltage transmission lines and would result in multiple stream crossings. While paralleling an existing transmission line generally presents a routing opportunity, there is also some risk that a single incident could affect service on both lines. The Applicant took that reliability risk into account when identifying transmission line paralleling opportunities. Paralleling two different high-voltage transmission lines, however, increases the reliability risk to the point that it outweighs the potential routing opportunity. Segment Option E1 accordingly was eliminated from further consideration, and Segment Option E2 was carried forward as part of the Blue Route.

4.14 Applicant's Preferred Route

Per Minnesota Rule 7850.1900 Subpart 2 C, the Applicant is required to identify their preferred route. In identification of the preferred route, the Applicant considered all of the information collected to date, including public and agency comments and the environmental data analyzed in this Application. Based on this review, the Applicant prefers the Blue Route.

5.0 Project Description

The Applicant's Great Northern Transmission Line includes a 500 kilovolt (kV) alternating current (AC) transmission line between the Minnesota-Manitoba border crossing northwest of Roseau, Minnesota and the existing Blackberry Substation near Grand Rapids, Minnesota, as well as associated substation facilities and transmission system modifications at the existing Blackberry Substation site, and a 500 kV series compensation station (Project) (see Section 1.0, Introduction, Figure 1-1). The new substation facilities required for the Project (Blackberry 500 kV Substation) will be constructed adjacent to and east of the existing Blackberry 230/115 kV Substation. The transmission line is expected to carry at least 750 MW to facilitate agreements and transmission service requests between Minnesota Power and Manitoba Hydro plus exports and transmission service requests by Manitoba Hydro to other utilities. Minnesota Power's agreements are for 383 megawatts (MW) by June 1, 2020 to meet the requirements of the Applicant's 250 MW Power Purchase Agreement (PPA) and 133 MW Renewable Optimization Agreement with Manitoba Hydro. In addition to meeting the Applicant's needs and Manitoba Hydro's exports to other utilities, the Project will support the regional electric grid.

In addition to its energy benefits, the Project will bring economic and fiscal benefits to the State of Minnesota during construction and ongoing benefits once the Project is operational. Based on preliminary estimates, hundreds of direct construction jobs in Minnesota, as well as professional and technical services jobs, will be supported during the Project's 3+ year construction phase. Through the multiplier effects from the direct and indirect expenditures, additional economic activity in retail, services, and other sectors also is expected, adding millions of dollars to household earnings each year during the construction phase. Once the Project is operational, it will add to the tax base for both the state of Minnesota and the local governments in the jurisdictions where the Project will be built.

5.1 Route and Segment Descriptions

The following provides a detailed description of the proposed locations for the Route Alternatives and Segment Options. Appendix A includes detailed figures that illustrate the routes. See Figure 5-1 for Border Crossing location and ownership.

5.1.1 Orange Route

The Orange Route crosses the Minnesota-Manitoba border in Section 25, Township 164N, Range 42W in Roseau County and continues south for approximately 2.5 miles. The Orange Route then heads east for 11 miles to Minnesota TH 310. From Section 2, Township 163N, Range 40W, the Orange Route proceeds southeast for 12 miles to Section 26, Township 163N, Range 38W. From there, the Orange Route continues east for 2.5 miles to the existing Minnkota Power 230 kV transmission line. The Orange Route follows the 230 kV transmission line southeast for 1.75 miles to the existing Xcel Energy 500 kV transmission line. From this point, the Orange Route follows the existing Xcel Energy 500 kilovolt (kV) transmission line to Section 25, Township 157N, Range 31W. The Orange Route then heads south for 4.75 miles to Section 24, Township 156N, Range 31W. The Orange Route then heads east for 0.5 mile, crossing TH 72, then southeast for 10.5 miles to Section 21, Township 155N, Range 29W. The Orange Route continues south for 16.0 miles to Section 9, Township 152N, Range 29W. From there, the Orange Route continues east for 12.0 miles to Section 8, Township 152N, Range 27W. The Orange Route then heads southeast for 13.0 miles to Section 5, Township 151N, Range 25W. The Orange Route then continues east for 5.0 miles, southeast for 4.25 miles, and then east for 4.0 miles to Section 11, Township 162N, Range 62W. The Orange Route then heads southeast for 5.5 miles, crossing TH 1, to Section 1, Township 161N, Range 26W. The Orange Route then heads east for 6.0 miles to Section 6, Township 161N, Range 24W. The Orange Route then proceeds southeast for 11.5 miles to Section 3, Township 60N, Range 23W. The Orange Route then heads south for 15.0 miles, staying east of Bear Lake and Wolf Lake, to Section 15, Township 58N, Range 23W. From there, the Orange Route continues southwest, utilizing an old Minnesota Power right-of-way (ROW) to Section 26, Township 58N, Range 24W. The Orange Route then heads south, between Bass Lake and Lawrence Lake, to Section 11, Township 56N, Range 24W. From there, it follows an existing 115 kV transmission line south to Section 23, Township 56N, Range 24W. The Orange Route continues southeast, between Holman Lake and South Twin Lake, for 4.0 miles to Section 5, Township 55N, Range 23W. From there, the Orange Route heads south for 1.0 mile to the existing Minnesota Power 115 kV transmission line. The Orange Route follows the existing 115kV transmission line southwest and then south to the new substation location (see Appendix A, sheets 1-15, 55-77, and41-54).

5.1.2 Blue Route

The Blue Route crosses the Minnesota-Manitoba border in Section 25, Township 164N, Range 42W in Roseau County and continues south for approximately 2.5 miles. The Blue Route then heads east for 11 miles to Minnesota TH 310. From Section 2, Township 163N, Range 40W, the Blue Route proceeds southeast for 12 miles to Section 26, Township 163N, Range 38W. From there, the Blue Route continues east for 2.5 miles to the existing Minnkota Power 230 kV transmission line. The Blue Route follows the Minnkota Power 230 kV transmission line southeast for 1.75 miles to the existing Xcel Energy 500 kV transmission line. The Blue Route follows the Xcel Energy 500 kV transmission line to the south and east for 36.0 miles to Section 29, Township 160N, Range 33W. The Blue Route stops following the Xcel Energy 500 kV transmission line and continues east for 6.0 miles, then northeast for 1.0 mile to Section 28, Township 160N, Range 32W. From there, the Blue Route follows the existing Minnkota Power 230 kV transmission line east for 31.0 miles to Section 9, Township 159N, Range 27W. At this point, the Blue Route stops following the Minnkota Power 230 kV transmission line and heads southeast for 8.0 miles to Section 22, Township 158N, Range 27W. The Blue Route continues to the southeast, cross-country, for 32 miles to the Minnesota Power 230 kV transmission line in Section 6, Township 65N, Range 25W. From this point, the Blue Route follows the Minnkota Power 230 kV transmission line south for 12.5 miles to Section 7, Township 63N, Range 25W. The Blue Route continues south for 2.5 miles to Section 19, Township 63N, Range 25W. The Blue Route then heads east for 3.5 miles to Section 22, Township 63N, Range 25W; southeast for 5.0 miles to Section 5, Township 62N, Range 24W; and then south for 7.0 miles to Section 8, Township 61N, Range 24W. The route then goes southeast for 14.0 miles, between Bass Lake and Larson Lake, to Section 4, Township 59N, Range 23W. From there, the Blue Route heads south for 14.0 miles, between Bray Lake and Thirty Lake, to Section 17, Township 58N, Range 23W. The Blue Route then heads southwest for 3.5 miles to Section 26, Township 57N, Range 24W and then south to Section 2, Township 56N, Range 24W. From there, the Blue Route follows the existing 115 kV transmission line south to U.S. Highway 169. The Blue Route crosses U.S. Highway 169 and then heads southeast to Section 26, Township 56N, Range 24W. The Blue Route then heads south for 4.0 miles to the existing Minnesota Power 230 kV transmission line. The Blue Route follows the Minnesota Power 230 kV transmission line east for 1.0 mile to the new substation location (see Appendix A, sheets 1-54).

5.1.3 Segment Options

Segment Option C1

Segment Option C1 begins in Section 22, Township 158N, Range 27W. This segment continues to the southeast, cross-country, for 32 miles to the Minnesota Power 230 kV transmission line in Section 6, Township 65N, Range 25W (see Appendix A, sheets 24-32).

Segment Option C2

Segment Option C2 begins in Section 22, Township 158N, Range 27W and follows the Minnkota and Minnesota Power 230 kV transmission line east and then south for 47.0 miles to Section 6, Township 65N, Range 25W (see Appendix A, sheets 78-87).

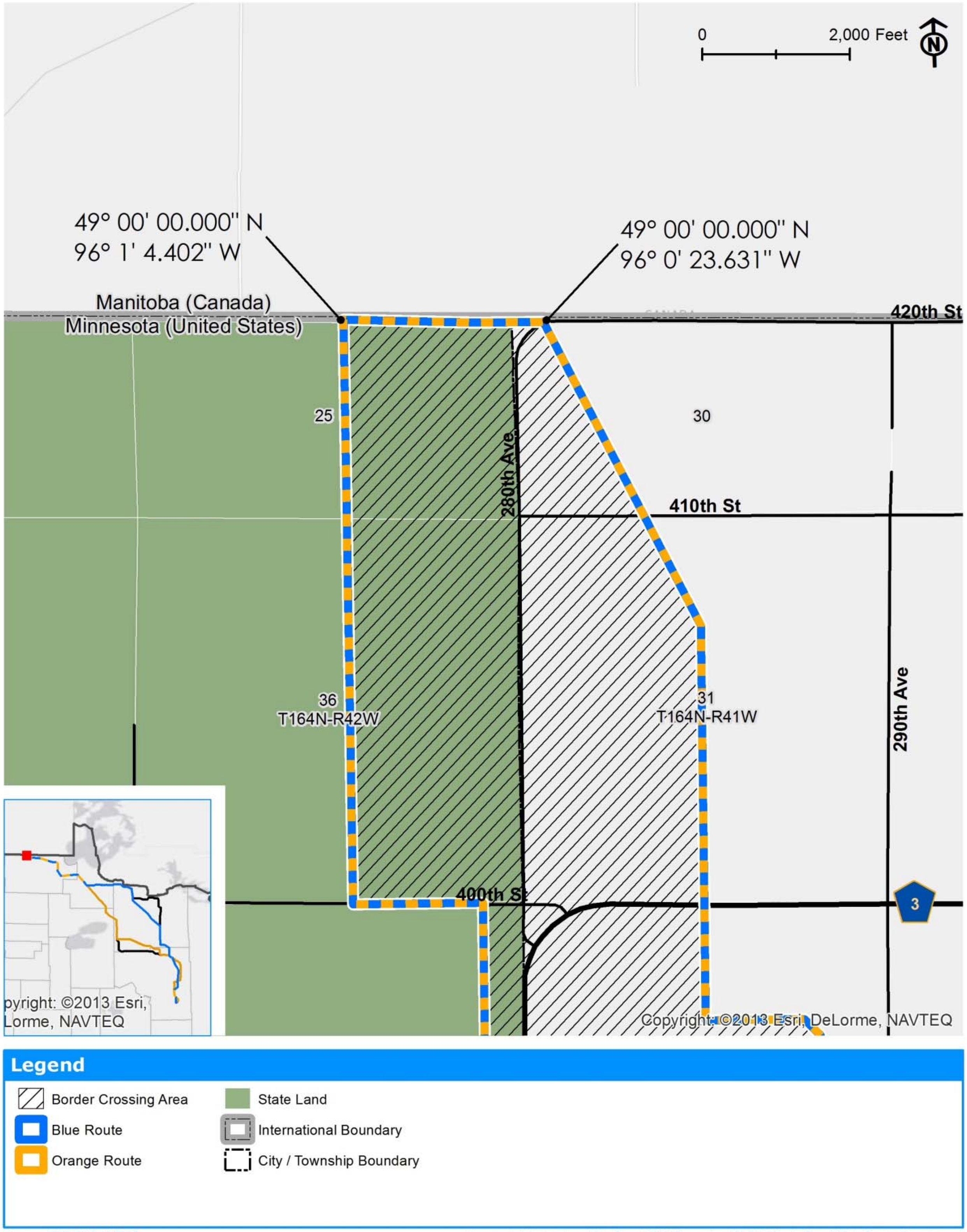
Segment Option J1

Segment Option H1 begins in Section 9, Township 152N, Range 29W. From there, Segment Option H1 heads east for 12.0 miles to Section 8, Township 152N, Range 27W. It then heads southeast for 13.0 miles to Section 5, Township 151N, Range 25W. Segment Option H1 continues east for 5.0 miles; southeast for 4.25 miles; and east for 4.0 miles to Section 11, Township 162N, Range 62W. Segment Option H1 then heads southeast for 5.5 miles, crossing TH 1, to Section 1, Township 161N, Range 26W. Segment Option H1 then heads east for 6.0 miles to Section 6, Township 161N, Range 24W. Segment Option H1 proceeds southeast for 5.0 miles to Section 8, Township 61N, Range 24W (see Appendix A, sheets 69-77).

Segment Option J2

Segment Option H2 begins in Section 9, Township 152N, Range 29W. It heads southeast for 2.5 miles; south for 6.0 miles; and then southeast for 2.0 miles to Section 36, Township 151N, Range 29W. Segment Option H2 then heads east for 26.0 miles to Section 24, Township 62N, Range 27W. It then heads southeast for 3.0 miles, crossing TH 1. Segment Option H2 then heads east for 2.0 miles, crossing TH 38, then southeast for 2.0 miles to Section 1, Township 61N, Range 26W. Segment Option H2 heads east for 6.0 miles to Section 6, Township 161N, Range 24W. It then heads southeast for 5.0 miles to Section 8, Township 61N, Range 24W (see Appendix A, sheets 87-94).

Border Crossing Figure 5-1



Sources: ESRI,DNR, MnDOT \\mspe-gis-file\gisprojlarge\MinnPower\182035\map_docs\CLIENT\Route_Permit\05-1_Border_Crossing.mxd

5.2 Technical Description

5.2.1 Number Circuits

The Applicant proposes to construct a single-circuit 500 kV AC overhead transmission line.

5.2.2 Operating Voltage and Frequency

The nominal three phase operating voltage for the Project will be 500 kV AC. The Project will be operated at a frequency of 60 Hertz (Hz).

5.2.3 Conductor Specifications

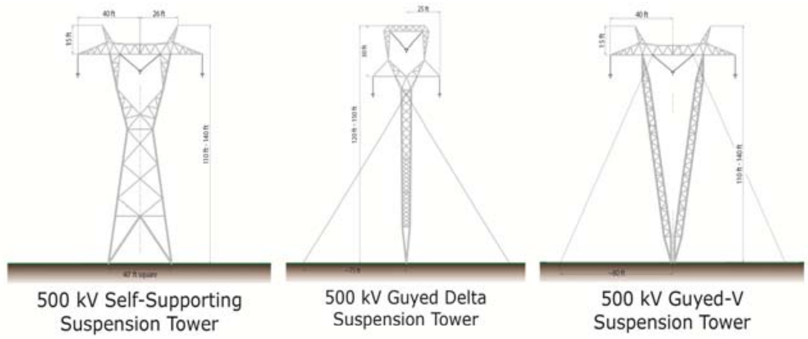
The Applicant anticipates using 3-conductor bundle 1192.5 kcmil Aluminum Conductor Steel Reinforced (ACSR) "Bunting" with 18 inch sub-spacing as the phase conductor for the Project. This conductor bundle is the same as that used on the United States portion of the existing Dorsey–Chisago 500 kV transmission line. The Applicant will perform a conductor optimization study before a final determination is made on conductor selection and bundle configuration.

5.2.4 Typical Supporting Structure

The Applicant is evaluating several structure types and configurations for the Project to accommodate variations in terrain and land use. The structure details provided are typical of these structure types (see Figure 5-1 and Appendix D).

The Applicant continues to evaluate several structure types and configurations that will be used for the Project, including: a self-supporting lattice structure, a lattice guyed-V structure, and a lattice guyed delta structure. The Applicant currently estimates approximately 4 to 5 structures per mile of transmission line. The type of structure in any given section of transmission line will be dependent on land type and land use. The Project structures will typically range in heights from approximately 100 feet above ground to approximately 150 feet above ground, depending on the structure type and the terrain. In some instances, such as where the Project crosses an existing transmission line, taller structures may be required. In cultivated lands or in areas of intensive land use, the Applicant anticipates utilizing self supporting lattice structures for the Project. In other areas where guy wires will not significantly interfere with land use, the Project may be installed on one of the guyed structure types.

Figure 5-2. Structure Schematics



Typical Spans:
1,000 ft - 1,450 ft
Right-of-way:
200 ft

Typical Spans:
1,000 ft - 1,450 ft
Right-of-way:
200 ft

The self-supporting lattice structures will be anchored to foundations at each leg of the structure. The guyed-V structure and the guyed-delta structure will utilize a single foundation system at the center of the structure and a set of at least four guys and anchors. The anchors used will vary depending on terrain.

The Applicant anticipates using either a single I-string or a V-string insulator assembly. The structures will support two overhead static ground wires to protect from lightning. In each case, one of the overhead static ground wires will have a fiber optic core to enable communications and system protection functions between the two endpoints.

5.2.5 Structure Spacing

The Applicant anticipates that the Project typically will be located on all new ROW that is approximately 200 feet wide. A wider ROW may be required for longer spans of the Project, at angle and corner structures, for guyed structures, or where special design requirements are dictated by topography. Generally, structures will be spaced approximately 1,000 to 1,450 feet apart, with shorter or longer spans as necessary.

5.2.6 Conductor Spacing

Lateral spacing of phase conductor bundles will vary with the various types of structures and will range from approximately 25 to 40 feet.

5.2.7 Line to Ground and Conductor Side Clearances

The required clearances at the structure, horizontal distance between each energized phase, and the minimum required ground clearance will be determined based on electrical studies in the design phase of the Project. All clearances will meet or exceed the recommended clearances in the National Electrical Safety Code (NESC). Based on preliminary design criteria for the Project, minimum ground clearance for the conductors is estimated to be 40 feet

5.2.8 Wind and Ice Loading

Wind and ice loading for the proposed Project will incorporate three National Electrical Safety Code (NESC) loading cases required for this area of the U.S. These cases are Rule 250B, Rule 250C, and Rule 250D. Rule 250B is the NESC heavy district loading case. It specifies a wind velocity of 40 miles per hour (mph), 0.5 inch of ice, and a wire temperature of 0 degrees Fahrenheit (°F). This loading case requires an additional NESC constant of 0.3 pounds per foot for the sag and tension calculations. Rule 250C considers extreme wind loading. A wind velocity of 90 mph at 60 degrees F is the weather condition that satisfies the NESC Rule 250C loading. Rule 250D is a loading case that considers an extreme ice load with a concurrent wind load. For the study area, an ice thickness of one-half inch , a wind gust speed of 50 mph and a wire temperature of 15 °F satisfies the conditions of NESC Rule 250D. NESC Rules 250C and 250D, as well as American Society of Civil Engineers (ASCE) Manual No. 74: "Guidelines for Electrical Transmission Line Structural Loading," provide default 50-year values for extreme ice and wind. A weather study will be performed to identify additional reliability-based wind and ice load cases to be considered in the final design of the Project.

5.3 Interconnection and Substation Description

5.3.1 Blackberry 500 kV Substation

The Project will terminate at a new substation (Blackberry 500 kV Substation) located on the same site as the Applicant's existing Blackberry 230/115 kV Substation (see Appendix A, sheet 54). The Blackberry 500 kV Substation will be located adjacent to and east of the existing substation, and will be designed to accommodate the new 500 kV line, 500/230 kV transformation, existing 230 kV lines, and all associated 500 kV and 230 kV equipment. Existing 230 kV and 115 kV transmission lines currently located on the property will need to be rerouted to accommodate the placement and electrical interconnection of the Blackberry 500 kV Substation.

5.3.2 500 kV Series Compensation Station

The Project will also require a 500 kV Series Compensation Station, which will be located within or adjacent to the final approved route. The 500 kV Series Compensation Station will include the 500 kV series capacitor banks necessary for the reliable operation and optimal performance of the Project, and all associated 500 kV equipment. The location of this facility will be determined by several factors that impact the design of the transmission line and the series capacitor equipment, including the voltage profile along the transmission line and the available fault current at the series capacitors. Since both of these factors are directly impacted by the overall length of the line between the Dorsey Substation in Manitoba and the Blackberry 500 kV Substation in Minnesota, the final location of the 500 kV Series Compensation Station is dependent on the final route determinations in both Canada and the United States. The Applicant has initiated electrical design optimization studies to identify generally what is the preferred location of the 500 kV Series Compensation Station. Based on these studies, candidate sites in Minnesota include the overall midpoint of the line and at one-third of the overall transmission line distance from Blackberry to Dorsey. The Applicant will provide more information on these studies and preferred location of the series capacitor equipment when available.

5.4 Bulk Power System Information

5.4.1 Expected Power Transfer Capability

The Project is designed to increase the total transfer capability between Manitoba and the United States by at least 750 MW. 10 C.F.R. Section 205.322(b)(3)(i). The Applicant will supplement this information after completion of additional MISO system impact studies.

5.4.2 System Power Flow

DOE regulations for a Presidential Permits require system power flow plots for the Applicant's proposed service areas for heavy summer and light spring load periods, with and without the proposed international interconnection, for the year the Project is scheduled to be placed in service and for the fifth year thereafter. 10 C.F.R. Section 205.322(b)(3)(ii). Initial power flow plots for the years 2020 and 2025, before and after development of the Project are included in Appendix K of this Presidential Permit application (Application). Additional information required under the applicable DOE regulations is found in other sections of this Application or will be developed later in accordance with DOE guidance. The Applicant will provide DOE any additional required information as set forth under 10 C.F.R. Section 205.322(b)(3)(v).

5.4.3 Interference Reduction Data

Direct and indirect impacts of the Project on Radio, Television, and Cellular Telephone signals are addressed in detail in Section 6.14, Radio, Television, and Cellular Telephone. This information is required under applicable DOE regulations. 10 C.F.R. Section 205.322(b)(3)(iii).

Electrical interference associated with the Project will be considered in the final determination of the conductor configuration. Radio and television interference is generated by corona occurring on the conductors. The conductor size and bundle configuration for the Project will be selected to minimize corona levels, which in turn will minimize radio and television interference. The design of this high voltage transmission line (HVTL) will use extra high voltage (EHV) hardware, appropriate construction techniques, and a line configuration that yields a low level of corona that will minimize the onset of gap discharges, which in turn avoids any unacceptable level of television interference. The substation design standards will also be formulated to minimize corona, to the extent feasible.

5.4.4 Relay Protection

The Project's protective relaying systems will use microprocessor based devices that conform to the requirements of the Applicant, the Institute for Electrical and Electronics Engineers, the North American Electric Reliability Corporation (NERC), and the Midwest Reliability Organization. 10 C.F.R. Section 205.322(b)(3)(iv). Specific protection schemes, equipment, and functional devices will be determined during the Project's detailed design phase.

5.5 Land Acquisition

5.5.1 Transmission Line Right-of-Way

This project will generally require a new 200-foot-wide right-of-way (ROW) to accommodate the transmission line. For high-voltage transmission lines (HVTL), utilities acquire easement rights across certain parcels to accommodate the facilities. The evaluation and acquisition process includes title examination, initial owner contacts, survey work, document preparation, and purchase. Each of these activities, particularly as it applies to easements for HVTL facilities, is described in more detail below.

The first step in the right-of-way process is to identify all persons and entities that may have a legal interest in the real estate upon which the facilities will be built. To compile this list, a ROW agent or other persons engaged by the utility will complete a public records search of all land involved in the Project to determine the legal description of the property and the owner(s) of record, and to gather information regarding easements, liens, restriction, encumbrances, and other conditions of record as needed.

After owners are identified, a ROW representative will contact each property owner or the property owner's representative. The ROW agent will explain the need for the transmission facilities and how the Project may affect each parcel. The ROW agent will also obtain from the landowner information about any specific construction concerns.

The next step in the acquisition process is evaluation of the specific parcel. For this work, the ROW agent may request permission from the owner for survey crews to enter the property to conduct preliminary survey work. Permission may also be requested to take soil borings to assess the soil conditions and determine appropriate foundation design. Surveys are conducted to locate the ROW, natural features, man-made features, and associated elevations for use during the detailed engineering of the line. The soil analysis is performed by an experienced geotechnical testing laboratory.

During the evaluation process, the location of the proposed transmission line may be staked with permission of the property owner. This means that the survey crew will locate each structure on the ground and place a surveyor's stake to mark the structures' anticipated location. By doing this, the ROW agent can show the landowner where the structure(s) will be located on the property. The ROW agent may also delineate the boundaries of the easement area required for safe operation of the line.

Prior to the acquisition of easements of property, land value data will be collected. Based on the impact of the easement or purchase to the market value of each parcel, a fair market value offer will be developed. The ROW agent will contact the property owner to present the offer for the easement and discuss the amount of just compensation for the rights to build, operate, and maintain the transmission facilities within the easement area and reasonable access to the easement area. The agent will also provide maps of the transmission line easement or site and maps showing the landowner's parcel. The landowner is allowed a reasonable amount of time to consider the offer and to present any material that the owner believes is relevant to determining the property's value and the value of the easement.

In nearly all cases, utilities are able to work with the landowners to address their concerns and an agreement is reached for the utility's purchase of land rights in the form of an easement. The ROW agent will prepare the easements required to complete each transaction. In those instances where a negotiated settlement cannot be reached, the landowner may choose to have an independent third party determine the value of the rights taken. Such valuation is made through the utility's exercise of the right of eminent domain pursuant to Minnesota Statutes, Chapter 117. The process of exercising the right of eminent domain is called condemnation.

Before commencing a condemnation proceeding, the ROW agent must obtain at least one appraisal for the property on which the proposed easement is to be acquired and a copy of that appraisal must be provided to the property owner in accordance with Minnesota Statutes Section 117.036, subdivision 2(a). The property owner may also obtain another property appraisal and the company must reimburse the property owner for the cost of the appraisal according to the limits set forth in Minnesota Statutes Section 117.036, subdivision 2(b). The property owner may be reimbursed for reasonable appraisal costs up to $1,500 for single-family and two-family residential properties, $1,500 for property with a value of $10,000 or less, and $5,000 for other types of properties.

To start the formal condemnation process, a utility will file a petition in the district court where the property is located and serves that Petition on all owners of the property. If the court grants the petition, the court will appoint a three-person condemnation commission that will determine the compensation for the easement. The three people must be knowledgeable of applicable real estate issues. Once appointed, the commissioners will schedule a viewing of the property over and across which the transmission line easement is to be located. Next, the condemnation commission will schedule a valuation hearing where the utility and landowners can testify as to the fair market value of the easement or fee. The condemnation commission will then make an award as to the value of the easement acquired and file it with the court. Each party has 40 days from the filing of the award to appeal to the district court for a jury trial. In the event of an appeal, the jury will hear land value evidence and render a verdict. At any point in this process, the case can be dismissed if the parties reach a settlement.

As part of the ROW acquisition process, the ROW agent will discuss the construction schedule and construction requirements with the owner of each parcel. To ensure safe construction of the transmission line, special consideration may be needed for fences, crops, or livestock. For instance, fences may need to be moved, temporary or permanent gates may need to be installed; crops may need to be harvested early; and livestock may need to be moved. In each case the ROW agent and construction personnel coordinate these processes with the landowner.

5.5.2 Substation Property

New land has been secured adjacent to and east of the Applicant's existing Blackberry 230/115 kV Substation to accommodate the Blackberry 500 kV Substation (see Appendix A, sheet 54). Property for the Blackberry 500 kV Substation will be purchased outright, rather than as an easement. The Applicant has entered a purchase option agreement with the owner of the property adjacent to and east of the existing Blackberry 230/115 kV Substation. Execution of a land purchase at this location will provide a definite end point for the Project.

Additional property will also be required for the Project's 500 kV Series Compensation Station. Based on electrical design optimization studies and route selection, the Applicant will identify candidate sites within or adjacent to the proposed Route Alternatives. At that time, the Applicant may seek to obtain a purchase option agreement with the owners of the identified properties. Upon final route determination, a land purchase will be executed for the appropriate site for the 500 kV Series Compensation Station.

5.6 Preconstruction Activities

Preconstruction activities include preparation and approval of the Certificate of Need and the Route Permit applications, completing the required environmental review and surveys, coordinating and obtaining all other necessary permits and approvals, performing the studies, surveys, and engineering necessary for the design of all transmission line and substation facilities, and acquiring ROW easements.

5.7 Construction Procedures

5.7.1 Transmission Line

Once access to the land is granted, preparation of the ROW for construction begins in coordination with landowners. Underground utilities would be identified and located in cooperation with local utility companies to minimize conflicts with the existing utilities along the route. Preparation for construction begins with development of access points from existing roads. Clearing of all woody vegetation and brush within the 200-foot-wide ROW will be required to facilitate the safe and efficient construction, operation, and maintenance of the Project. A reasonably level access path is required to provide for safe passage of construction equipment. At structure locations, a stable working surface free of tripping hazards is required for installation of foundations and guy anchors, as well as assembling and erecting structures.

Vegetation will be cut at or slightly above the ground surface. Rootstock will be left in place to stabilize existing soils and to regenerate vegetation after construction. With the approval of the landowner or land manager, stumps of tall-growing species will be treated with an approved herbicide to discourage re-growth. Merchantable timber typically is cut to standard log lengths and stacked along the ROW. Vegetation clearing debris (that is, unmerchantable trees, brush, and slash) may be cut and scattered, placed in windrow piles, chipped, or burned, depending on location.

To minimize the potential for tire and chassis damage to construction equipment, and to maintain a safe, level access path and structure installation area, incidental stump removal will occur. Stumps that interfere with the placement of mats or movement of construction equipment will be ground down to a point at or slightly below ground level. Stump grinding equipment will mix woody material with soils. This mixture will be evenly spread in the vicinity of the stump to a depth that will allow existing low-growing vegetation to re-establish.

If temporary removal or relocation of fences is necessary, the installation of temporary or permanent gates will be coordinated with the landowner. The ROW agent will work with landowners for early harvest of crops, where possible. During the construction process, the

Applicant may ask the property owner to remove or relocate equipment and livestock from the ROW.

Transmission line structures generally are designed for installation at existing grades. However, if vehicles or installation equipment cannot safely access or operate near the structure, minor grading of the immediate terrain will be performed to provide a reasonable level working surface for construction and maintenance of the structure.

Environmentally sensitive areas or areas susceptible to soil erosion will require special construction techniques. These techniques may include the use of low ground pressure equipment, matting, terracing, water bars, bale checks, rock checks, or temporary mulching and seeding of disturbed areas exposed during long periods of construction inactivity. Permanent soil erosion control measures may include permanent seeding, mulching, erosion control mats, or other measures depending on site conditions. Temporary silt fence, sedimentation ponds, and other measures may be utilized to prevent sediment from running off into wetlands or other surface waters.

Construction equipment will be inspected frequently to ensure hydraulic systems and oil pans are in good condition and free of significant leaks. Portable spill containment kits will be required for each piece of construction equipment with the potential to discharge a significant amount of oil to the environment. Operators will be present at the nozzle at all times when refueling is in progress. In the event of a spill, the source of the spill will be identified and contained immediately upon discovery. The spill and contaminated soils will be collected, treated, and disposed of in accordance with all applicable federal, state, and local requirements. If a significant spill were to occur to surface waters, methods to contain and recover released material such as floating booms and skimmer pumps would be used. Noticeably contaminated soils will be excavated, placed on, and covered by plastic sheeting in bermed areas. An emergency response contractor will be secured, if necessary, to further contain and clean up a severe spill. Refueling of equipment in wetlands will not be permitted.

In the event that protected species or cultural and historical artifacts are encountered during construction activities, project management personnel will consult with regulatory authorities regarding appropriate construction procedures and mitigation measures, which will be determined through applicable regulatory procedures.

Construction materials will be hauled either directly from the local highway or railroad network to structure sites, or brought first to material staging areas and then to the structure sites. The transmission line components, including the structures, conductor, and hardware, normally are brought to the temporary staging areas on flatbed trucks. These materials are stored until needed and then loaded on flatbed trailers or special structure trailers for delivery to the structure site where they are unloaded for installation.

A stable working surface is required at structure locations. Matting is commonly are used to provide a working surface in unstable soils. Structures may be site-assembled and erected or flown into position from a remote staging area.

Where reinforced concrete foundations are required, large rubber-tired or track-mounted auger equipment is used to excavate a circular hole of the appropriate diameter and depth. In upland areas, excavated material will be spread evenly around the structure base to promote site drainage. Reinforcing steel and anchor bolts are set in position. Ready-mixed concrete is then placed in the excavation. In wetland areas, a telescoping temporary steel caisson will be placed in the foundation hole to stabilize the soil walls. Concrete is placed in the excavation using the tremie method. Water pumped from the excavation will be appropriately filtered prior to discharge at the site or placed into tanker trucks or empty concrete trucks and hauled away to a specially designated upland disposal area, or brought back to the concrete batch plant for discharge. Concrete truck washwater will be discharged only in specially designated upland disposal areas or at the concrete batch plant.

After the concrete is poured, the steel caisson is removed. In some situations, a permanent caisson may be required to stabilize the excavation. During drilling, a minimal amount of granular material (from an outside source) will be placed in the area between the caissons and the matting (if required at that location) to provide safe footing for construction personnel. During final restoration, the granular material is leveled or removed to restore the original ground contours for re-vegetation of native species. After the foundation concrete is placed, excess excavated materials will be transported to a suitable upland site by truck for disposal. After allowing adequate curing time, the baseplate structures are bolted to the concrete foundations.

Where augured or driven piling foundations are required, as well as temporary and permanent guy anchors, large rubber-tired or track-mounted pile driving equipment is used to install the foundation. Additional fixtures or a concrete pile cap may also be attached to the piling foundation as necessary for structure setting. Piling foundations generally result in little or no generation of spoils or dewatering requirements.

The wire stringing process starts in a set-up area prepared to accommodate the stringing equipment and materials, normally located near mid-span on the centerline of the ROW. The rope machine, new conductor wire trailers, and tensioner are located at the wire stringing set-up area. This phase of construction occurs after the structures have been erected, and fitted with stringing blocks (also called dollies or sheaves) and with single-leader p-line ropes that reach the ground. Stringing blocks are a type of pulley that attaches to the insulator assembly and temporarily support a pulling rope or p-line and a wire rope or hard line, which in turn supports the conductor before it is permanently clipped in.

The process starts as the crew pulls the p-lines toward the first structure beyond the setup area. The p-lines may be pulled down the ROW with a small wide-track bombardier or other small equipment, or strung by helicopter. After the p-line has been strung through all the structures for all phases within the stringing interval, the pulling ropes are attached to a hard line and pulled, one at a time, back through the dollies to the beginning of the interval. A hard line set-up is located at the opposite end of the interval from the wire stringing setup area. Each hard line is then attached to the conductor wire with an anti-rotation device and an attachment called a sock, which is pulled back through the dollies to the end of the interval. Crewmembers monitor the progress of stringing to ensure the sock does not get hung up in the dollies. One phase at a time, the conductor wire bundles are then pulled to the appropriate tension. Once all three phases have been tensioned, they are clipped into place utilizing permanent suspension hardware. If stringing and hard line set-up areas in wetlands are required when surface conditions are not stable, extensive use of timber matting may be required.

The most effective means to minimize impacts on water areas during construction is to span streams and rivers by placing structures above the normal high water level. Where waterways must be crossed by construction equipment, the Applicant would seek the appropriate permits and use temporary clear span bridges to minimize the impact on the waterway. For those waterways that cannot be crossed with construction equipment, workers might walk across or use boats during wire stringing operations to pull in the new conductors and shield wires or in the winter drive equipment across the ice. In areas where construction occurs close to waterways, appropriate measures will be employed to minimize soil erosion and prevent sedimentation of the waterways. The Applicant will ensure that equipment fueling and lubricating occurs at a reasonable distance from the waterways.

5.7.2 Substation

The site of the existing Blackberry 230/115 kV Substation near Grand Rapids will be expanded to incorporate the Project's substation facilities (Blackberry 500 kV Substation), located adjacent to and east of the existing substation (see Appendix A, sheet 54). The Project will also require a 500 kV Series Compensation Station, which will be located within or adjacent to the final route. Similar construction work will occur at the Blackberry 500 kV Substation site and at the site of the 500 kV Series Compensation Station.

The substation and series compensation facilities will be constructed in compliance with the applicable requirements of the NESC, Occupational Safety and Health Act, and state and local regulations. Designs will be completed by Minnesota-licensed professional engineers with relevant experience. Contractors will be committed to safe working practices. The final design of the substation facilities will take the local conditions of the substation site(s) into consideration, and where warranted, will include safety provisions beyond the minimum requirements established in the various applicable safety codes. The substation facilities will be designed to allow future maintenance to be done with the minimum impact on transmission system operation and the necessary clearance from energized equipment to ensure safety.

Standard construction and mitigation practices developed from experience with past projects as well as industry-specific best management practices (BMPs) will be employed. BMPs for the Project will be based on the specific construction design, prohibitions, maintenance guidelines, inspection procedures, and other activities involved in constructing the substation facilities. In some cases these activities, such as schedules, are modified to incorporate a BMP for construction that will assist in minimizing impacts on sensitive environments. For instance, in areas where construction occurs close to waterways, BMPs are employed to help prevent soil erosion and ensure that equipment fuel and lubricants do not enter the waterway.

Upon the completion of construction activities, the Applicant will restore the remainder of the site. Post-construction reclamation activities will include removing and disposing of debris, removing all temporary structures (including staging areas), and employing appropriate erosion control measures. If areas outside the substation site are disturbed by construction activities, they will be reseeded with vegetation similar to that which was removed, within certain height restrictions to prevent interference with the substation and the transmission lines entering the substation.

5.8 Maintenance and Operation

5.8.1 Transmission Line

Access to the ROW of a completed transmission line is required periodically to perform inspections, conduct maintenance, and repair damage. Regular maintenance and inspections will be performed during the life of the facility to ensure its continued integrity. Generally, 500 kV transmission lines are inspected annually for problems by foot, all terrain vehicle (ATV), truck, snowmobile, or by air. Inspections are limited to the ROW and to those areas where obstruction or terrain may require off-ROW access. If problems are found during inspection, the Applicant will make an effort to notify the landowner before repairs are performed. If damages are incurred during maintenance or repairs, the landowner will be compensated appropriately. The structures for the Project will be new, so very little maintenance is expected for many years.

The ROW is managed to remove vegetation that interferes with the operation of the Project. Vegetation maintenance for 500 kV transmission lines is typically on a 2- to 5-year cycle. ROW clearing practices include a combination of mechanical and hand clearing, along with herbicide application where allowed and approved by the landowner, to remove or control vegetation growth. Prior to performing vegetation maintenance in a particular area, the Applicant will make an effort to notify affected landowners.

5.8.2 Substation

Over the life of the substation facilities, inspections will be performed regularly to maintain equipment and make necessary repairs. Routine maintenance will be conducted as required to remove undesired vegetation that may interfere with the safe and reliable operation of the facilities.

5.9 Environmental Protection Measures

Limited ground disturbance may occur at the structure sites during construction. For example, the construction contractor generally establishes a main staging area for temporary storage of materials and equipment. Such an area includes sufficient space to lay down material and pre-assemble some structural components or hardware. Other staging areas located along the ROW are limited to a structure site for lay down and framing prior to structure installation. Stringing setup areas are used to store conductors and the equipment necessary for stringing operations. Disturbed areas are restored to their original condition to the maximum extent practicable, or as negotiated with the landowner.

Post-construction reclamation activities involve restoring disturbed areas to their original condition to the extent practical, including removing and disposing of debris; removing all temporary facilities, including staging and laydown areas; employing appropriate erosion control measures; and reseeding areas disturbed by construction activities with appropriate seed mixture certified as free of noxious or invasive weeds. In cases where soil compaction has occurred in cultivated areas, the construction crew or a restoration contractor uses various methods to alleviate the compaction, or as negotiated with landowners.

5.10 Estimated Costs

At the time that the Certificate of Need application for the Project was filed in October 2013, the final Route Alternatives and Segment Options for inclusion in the Route Permit and Presidential Permit applications had not been determined. Therefore, the Applicant developed a proxy route that enabled its engineers to provide a meaningful cost estimate based on the best available information at that stage of the Project. Once the Route Alternatives and Segment Options were identified, the Applicant determined that it would be appropriate to refine the previously-provided cost estimates to reflect the more accurate route data that is currently available. In addition, the Applicant has refined its estimate related to expected construction costs, including the use of matting in wetlands to mitigate wetland impacts. The Applicant will continue to refine its estimates in both the Certificate of Need and Route Permit dockets as appropriate.

The cost estimates below are based on preliminary engineering considerations of the Route Alternatives and Segment Options. The Applicant estimates that the construction of the Project on the Route Alternatives and/or any combination of proposed Segment Options, including substation facilities, will cost between $495.5 million and $647.7 million (2013 dollars). If other routes are selected by the Commission, these current Project cost estimates may also change. The major components of these preliminary estimates are shown in Table 5-1, below.

Table 5-1. Current Project Cost Estimates

Project Components	Low End (in millions)	High End (in millions)
500 kV Transmission Line	$425.6	$570.8
Blackberry 500 kV Substation	$41.0	$45.1
500 kV Series Compensation Station	$24.7	$27.2
Existing 230 kV Transmission System Modifications	$4.2	$4.6
Project totals	$495.5	$647.7

5.11 Project Schedule

The Applicant requires an in-service date of June 1, 2020. The Applicant expects to complete the Route Permit approval process (including state and federal environmental review) by fall 2015. Depending on when other permits are received, it is estimated that Project construction will begin in fall 2016, as shown in Table 5-2, below.

Table 5-2. Project Schedule

Year	Month	Activity
2013	December	Certificate of Need Completeness Hearing
2014	February	Certificate of Need Environmental Report Scoping Meetings
	April	File Route Permit Application
	April	File Presidential Permit Application
	June	Route Permit/Presidential Permit Scoping Meetings
	June	Certificate of Need Environmental Report Released
	October	Certificate of Need Public Hearings
2015	February	Draft EIS Published
	March	Draft EIS Comment Meetings
	April	Certificate of Need Decision
	August	Final EIS Published
	August	State Final EIS Hearing
	October	Presidential Permit Decision
	October	Design, Right-of-way and Construction Permits Begin
	December	Route Permit Decision
2016	October	Construction Begins
2020	June	Project In Service

This page intentionally left blank

6.0 Affected Environment and Environmental Consequences

This chapter includes the detailed review of potential impacts for the Project.

- → Sections 6.1 through 6.5 provide a summary of the natural environment and human environment setting, and include evaluation of geology and physiography, soils, climate, vegetation, and human settlement.
- → Sections 6.6 through 6.15 provide a summary of the potential impacts on the human environment and related resources, and include land use, environmental justice, socioeconomics, cultural values, aesthetics, noise, air quality, public services, radio and television, and electric and magnetic fields.
- → Section 6.16 provides an evaluation of archaeological and historic resources.
- → Sections 6.17 through 6.21 provide a summary of potential impacts on natural resources, including water resources and floodplains, wetlands, wildlife, rare and unique species, and noxious weeds.
- → Sections 6.22 through 6.26 provide a summary of local economic impacts, including recreation and tourism, agricultural production, transportation, forestry, and mining.

The Project has not yet started final design or engineering. Therefore, detailed design data is not available. As with all projects at this stage of development, it is necessary to employ appropriate assumptions as a basis for estimating impacts.

The assumptions described below were used for the impact analysis in Section 6.0. These assumptions are based on the information available at the time of analysis and the best professional judgment of engineering and environmental professionals developing the project. In general, the Applicant has adopted conservative assumptions that are designed to err on the side of overestimating the magnitude of environmental effects.

The Applicant employed the following assumptions throughout Section 6.0 to estimate impacts:

- → The Route Alternatives (Route Area) and Segment Options are 1,000 feet to 3,000 feet wide, depending on proximity to existing transmission lines. See Appendix A for detailed figures.
- → The Study Area, for the existing conditions discussion, includes all Route Alternatives and Segment Options. As appropriate, the Study Area for existing conditions extends beyond 3,000 feet.
- → The anticipated right-of-way (ROW) for the Route Alternatives and Segment Options is assumed to be 200 feet wide, as depicted in Appendix A. The calculation of environmental impacts is described for the anticipated ROW for each Route Alternative and Segment Option.
- → Average structure spacing distance is assumed to be 1,000 feet for purposes of calculating environmental impacts. When constructed, structure spacing is anticipated to be between 1,000 feet and 1,400 feet.

- → Permanent land cover impacts are assumed to be 1,936 square feet per structure for self-supporting suspension towers, which includes the area covered by the base of each structure plus a 2-foot buffer, as depicted in Appendix D.
- → Permanent foundation impacts are assumed to be 60 square feet per structure for self-supporting towers and 33 square feet per structure for guyed-V and guyed-Delta towers; this is the area of fill required for the foundations, as depicted in Appendix D. Foundation impacts in floodplains may differ depending structure footing design requirements.
- → It is assumed that guyed-V or guyed-Delta towers will be used in wetlands; permanent wetland fill impacts are assumed to be 33 square feet per structure. This estimate is based on the assumption that the tower foundation will include a circular concrete cap with a diameter of 6 feet, and four guy wires will each require a 1-foot-diameter circular anchor.
- → ROW impacts were calculated for an anticipated centerline, which generally was assumed to be in the center of the Route Alternative or adjacent to existing infrastructure located within the Route Alternative. The anticipated centerline was developed using digital GIS data. The actual centerline will be identified during final design, and may be moved based on design requirements or to avoid or minimize affecting resources within or near the ROW.
- → Temporary impacts are assumed to be 22,650 square feet (0.52 acres) per structure (self supporting, guyed-V and guyed-Delta); this assumes an area of approximately 150 feet by 150 feet and will provide adequate space for lay-down and construction of each structure.
- → Temporary impacts are assumed to include an access path within the ROW that is 16 feet wide for construction.
- → Permanent clearing – the entire anticipated 200-foot-wide ROW is assumed to be cleared of forested vegetation.
- → Permanent clearing – a 70-foot-wide corridor centered on the anticipated centerline is assumed to be cleared of shrubby wetland vegetation. In some areas, shrubs may be allowed to grow within the ROW if they would not pose a safety or operations hazard; thus, the entire ROW may not need to be cleared.
- → Permanent impacts for the combined Blackberry 500 kV Substation and 500 kV Series Compensation Station would be 25.0 acres. Since the final location of the 500 kV Series Compensation Station will not be known until final route selection, the facility was assumed to be collocated with the Blackberry 500 kV Substation for the purpose of developing meaningful impact calculations.
- → It is assumed that there will be no grading or filling for permanent access; the Project may have a '2-track' access path running the length of the transmission line.

The final ROW for the Project will be developed during final design, which will be completed for the route selected through the permitting process. Table 6-1 provides the lengths and areas for the proposed Route Alternatives and Segment Options.

Table 6-1. Characteristics of the Routes and Anticipated ROW for Each Route Alternative and Segment Option[1]

Route Alternative or Segment Option	Length (Miles)	Number of Transmission Structures	Route Area (Acres)	Anticipated ROW Area (Acres)
Orange	219.9	1,162	75,879	5,332
Blue	219.5	1,159	65,805	5,321
C1	32.8	174	11,971	797
C2	46.0	243	8,672	1,116
J1	50.0	264	15,489	1,212
J2	52.9	280	16,532	1,284
Blackberry 500 kV Substation	-	-	25.0	-

Note:
[1] Potential impacts related to construction activities, such as off-ROW construction access and relocation of existing transmission lines near the Blackberry 500 kV Substation, are not included in this analysis.

As noted above, the analysis for each subject reviewed in Section 6.0 was based on the above assumptions. Additional information on data sources and calculation descriptions and assumptions can be found in Section 10.0, References and Appendix E. Detailed figures illustrating the location of the route and anticipated ROW for each Route Alternative and Segment Option are included in Appendix A. Calculated impacts for individual route segments, which were used to develop the Route Alternatives and Segment Options, are provided in Appendix B.

This page intentionally left blank

6.1 Geomorphic and Physiographic Environment

This section describes the topographic and geologic resources that are crossed by the Route Alternatives and Segment Options and the potential impacts of the Route Alternatives and Segment Options on those resources.

The ecological land classification system, developed by the Minnesota Department of Natural Resources (DNR) and the U.S. Forest Service (USFS), which is available on Minnesota DNR's website, was used to describe the Study Area. The ecological land classification system is used to identify, describe, and map progressively smaller areas of land with increasingly uniform ecological features.

6.1.1 Existing Conditions

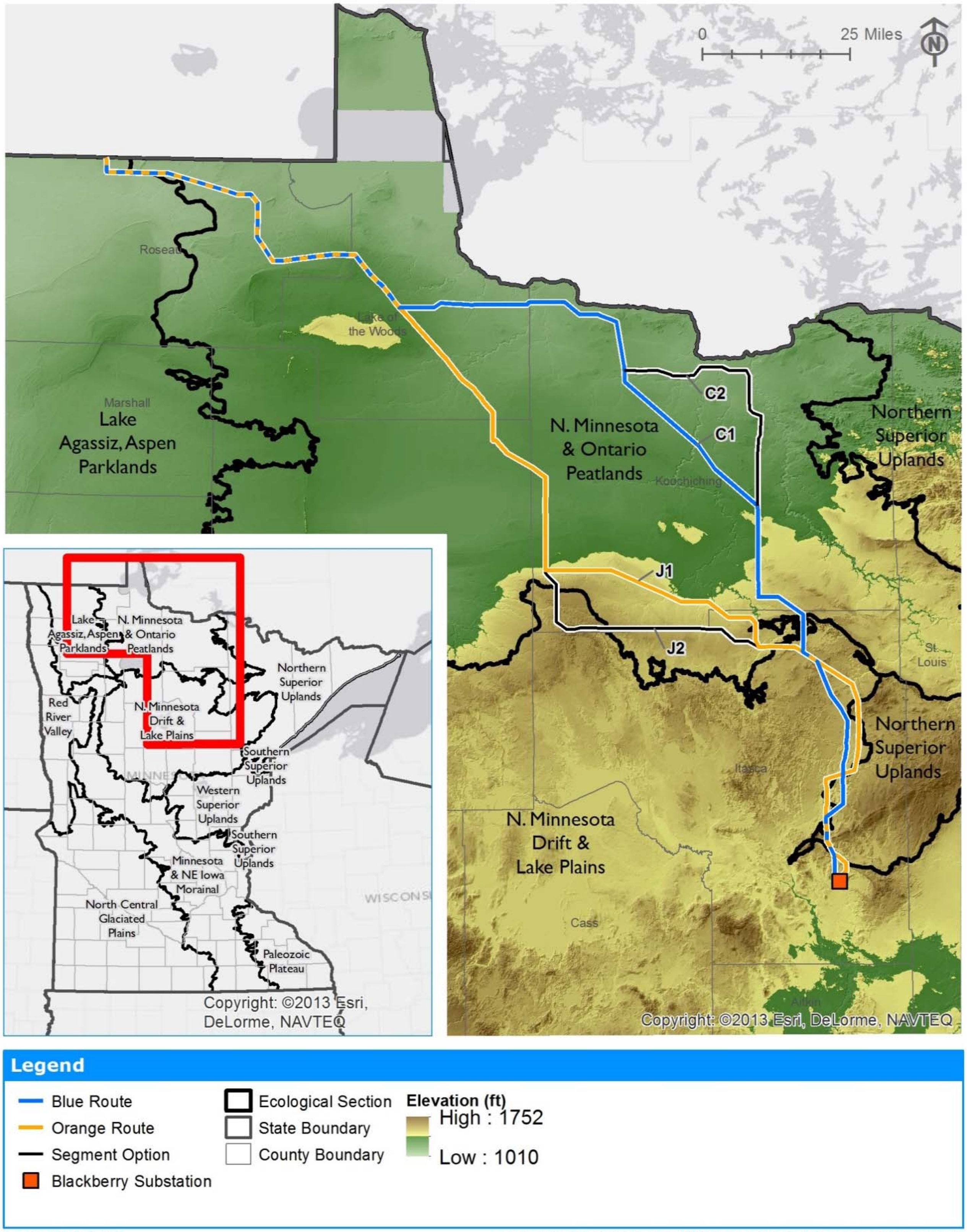
Topography

The entire Study Area has been shaped by the advance and retreat of glaciers. The northwestern two-thirds of the Study Area (see Figure 6.1-1) is a flat to gently rolling lake plain remnant of Glacial Lake Agassiz, with local topographic relief less than 50 feet in most areas (Minnesota DNR 2013a; Minnesota DNR 2013b). Bogs and swamps are common. The relatively flat lake plain transitions to steeper topography to the southeast in southern Koochiching County, Minnesota. The southeastern one-third of the Study Area is gently rolling to steeply sloping, characteristic of glacial end moraines and a pitted outwash plain (Minnesota DNR 2013c). This portion of the Study Area also intersects the Giants Range, which is a narrow bedrock ridge trending from southwest to northeast and rising 200 to 400 feet above the surrounding land (Minnesota DNR 2013d). The greatest elevation changes in the Study Area are at the Giants Range, near the cities of Taconite and Calumet, Minnesota.

The northwestern two-thirds of the Study Area is located primarily within the Northern Minnesota and Ontario Peatlands ecological section. Land cover in this area consists primarily of black spruce bogs and tamarack swamps (Minnesota DNR 2013a). Upland areas are covered by aspen and pine (Minnesota DNR 2013b). The southeastern one-third of the Study Area falls mostly within the St. Louis Moraines subsection of the Northern Minnesota Drift and Lake Plains ecological section. This area is heavily forested with aspen and mixtures of hardwoods and pine (Minnesota DNR 2013c). The Study Area includes many lakes, rivers, streams, creeks, marshes, and wetlands, which are typical of terrain subjected to geologically recent glacial occupation. Large streams in the vicinity of the Study Area include (from northwest to southeast): Roseau River, Rapid River, Black River, Big Fork River, and Prairie River. Lakes are common in the southeastern one-third of the Study Area and mostly absent elsewhere. Large lakes in the vicinity of the Study Area include Deer Lake (see Appendix A, sheets 39-40), and numerous lakes smaller than 1 mile across.

Topographic Relief

Figure 6.1-1



Sources: ESRI,DNR, NED

\\mspe-gis-file\GISProjLarge\MinnPower\182035\map_docs\CLIENT\Route_Permit\0601-1_Relief.mxd

Geology

Approximately 50 to 300 feet of glacially derived sediments and peat overlie the bedrock within most of the Study Area, although there are areas where bedrock is at or near the surface. Depth to bedrock data were provided by the Minnesota Geological Survey for geospatial processing using geographic information system (GIS) software, and verified with other map sources. Areas where bedrock is within 0 to 50 feet of the surface include: the Giants Range near the City of Taconite (Jirsa et al. 2002); eastern and northern Itasca County, Minnesota; and central and northwestern Koochiching County. Olson and Mossler (1982) indicate multiple isolated or grouped bedrock outcrops in these areas.

Due to the wide variation in the depth to bedrock, it is appropriate to describe the geology of the Study Area based upon both unconsolidated sediments and bedrock geology. Transmission line structures and underlying foundations will be installed to depths of 10 feet or more below ground surface and could encounter unconsolidated sediments and bedrock during construction. Due to the large geographic extent of the Project, this discussion is limited to an overview analysis of geological conditions in the region.

The northwestern two-thirds of the Study Area is covered with organic peat deposits, lake-modified glacial till primarily consisting of clay, silt, and limestone clasts, and glacial lake sediments comprised of sand and gravel (Hobbs and Goebel 1982). Peat depths can exceed 15 feet (Minnesota DNR 2013a). The southeastern one-third of the Study Area is covered with ground moraines, end moraines, and glacial outwash (Hobbs and Goebel 1982). Moraines are topographically diverse deposits of mixed glacial till, left behind by retreating glaciers. The till in the Study Area contains mostly clay, silt, and limestone clasts; clay and silt content is typically greater than 50 percent. Glacial outwash consists of sand and gravel that was produced from flowing water during glacial melting.

Bedrock in the Study Area is primarily composed of Late Archean-aged igneous and metamorphic rocks that formed 2.5 billion to 2.8 billion years ago. The dominant bedrock type is of granitic composition, including gneissic tonalite, granodiorite, and granite-rich migmatite (Jirsa et al. 2011), which underlie approximately two-thirds of the Study Area. Bedrock in the remainder of the Study Area is composed of biotite schist, metavolcanic rocks including the Ely Greenstone, and sedimentary units including the Biwabik Iron Formation and Coleraine Formation. The sedimentary units only exist in the extreme southeastern portion of the Study Area. The Biwabik Iron Formation is comprised of iron-rich chert and slate and is heavily mined in a narrow exposure south of the Giants Range. Details regarding the location of iron mining activities are provided in Section 6.26. Portions of the Biwabik Iron Formation are heavily fractured and weathered, leaving the rock structurally weak and easy to mine, particularly where the formation is near the ground surface. Typically bedrock formations near the ground surface in this part of Minnesota will exhibit a high degree of weakness due to intense physical and chemical weathering.

The Vermilion Fault and several smaller faults run east to west within the Study Area. However, there is only a minor seismic hazard in Minnesota as a whole (U.S. Geological Survey [USGS] 2013).

6.1.2 Direct and Indirect Effects

The direct and indirect effects of the Project, including Route Alternatives and Segment Options, are described in this section.

Topography

The Project will require minimal excavation or surface grading because transmission lines are constructed to conform to the local topography. Local soil disturbance will be required and is discussed in Section 6.2. Small areas will be excavated to install structures. Temporary or permanent impacts on regional topography are not expected from the Project.

Geology

The Project will require minimal excavation or surface grading because transmission lines are constructed to conform to the local topography. Surficial deposits are generally greater than 50 feet thick and in some areas bedrock might be encountered at construction depths. The Project is not expected to have temporary or permanent impacts on the geology of the Study Area.

6.1.3 Mitigation

Impacts on topography or geology are not expected. No mitigation is proposed.

6.2 Soils

This section describes the soil conditions that are crossed by the Route Alternatives and Segment Options and the potential impacts of the Route Alternatives and Segment Options on those resources.

The ecological land classification system, developed by the Minnesota Department of Natural Resources (DNR) and the U.S. Forest Service (USFS), which is available on Minnesota DNR's website, was used to describe the Study Area. Specific soil data was obtained from Minnesota DNR's website and the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) State Soil Geographic Database (STATSGO) (USDA NRCS 2013).

6.2.1 Existing Conditions

Soil Orders

Soil characteristics are the result of physical, chemical, and biological interactions that take place over time. Natural soils are influenced by the weathering of parent material, which is the biological activity that takes place in the oxygen rich environment of the earth's surface. The characteristics of soils, by extension, are a reflection of the interaction between climate, plant and animal community life, surface and subsurface hydrology, and the base parent materials of the underlying geologic formations and glacial activity (Anderson et al. 2001).

The soils of the Study Area are largely a reflection of surficial geology developed under the influence of glacial activity (Figure 6.2-1). The soils of the Study Area reflect plant community relationships with the physical world since the retreat of the glacial period ending approximately 10,000 years ago. Since glacial retreat, soils have developed in conjunction with advancing and retreating vegetation communities and changing climatic patterns. The establishment, disruption, reestablishment, and shifting of vegetation communities in concert with the physical landscape provide the underlying basis for soils of the Study Area.

The Study Area lies at the interface between major continental biomes, each with a different set of ecological and climatic characteristics and soil building qualities. The formative soils of the Study Area fall into four major orders, each with typical and distinct vegetation patterns that formed at the surface. The four major orders of the Study Area are described briefly here (Anderson et al. 2001):

- → ***Mollisols*** – This order of soils covers a large area of western Minnesota and includes the deep rich soils of the agricultural regions of the state. Mollisols have a nutrient rich surface layer of dark-colored thick material occurring throughout the grassland presettlement prairie regions of the state. These soils typically have a surface layer that is low density and loose.
- → ***Alfisols*** – This order of soils is typically forest soils. Alfisols are generally found in the eastern part of the Study Area and have high accumulations of aluminum (Al) and Iron (Fe). These fertile soils formed in loam or clay. The surface layer typically has less clay than the subsurface. These soils usually contain a leached zone of eluviation, or E horizon. This layer is typical of forest soils where this E horizon has been washed of

some mineral content through the percolation of water down the horizon. These soils often remain moist throughout the year.

→ ***Histosols*** – This order of soils is formed of organic materials from the remains of plants found in marshes and bogs. Histosols are comprised of the dead and decaying matter of leaf and root tissue of plants growing in wet environments. The soils range from Saprists (most material is decomposed and original constituents are unrecognizable) to Hemists (moderately decomposed soils where some recognizable plant material is distinguishable) to Fibrists (plant materials remain distinguishable).

→ ***Entisols*** – This order of soils is of recent origin often developing in river bottom alluvium and sand. Entisols are defined by the combination of being comprised of parent material not easily weathered (such as quartz) and being in a relatively early stage of development.

Tables 6.2-1 and 6.2-2 provide a summary of the soil orders crossed by the Route Alternatives and Segment Options. The types of soils identified within each Route Alternative are similar, with the Orange Route Alternative having more Mollisols, which is a soil that tends to have more agricultural use.

Table 6.2-1. Soil Orders for the Route Alternatives

Soil Orders	Orange Route		Blue Route	
	Acres	Percent	Acres	Percent
Mollisols	-	-	-	-
Alfisols	32,244	42.5	35,192	45.6
Entisols	18,385	24.2	16,621	21.5
Histosols	25,207	33.2	25,443	32.9
TOTAL	**75,836**	**100.0**	**77,256**	**100.0**

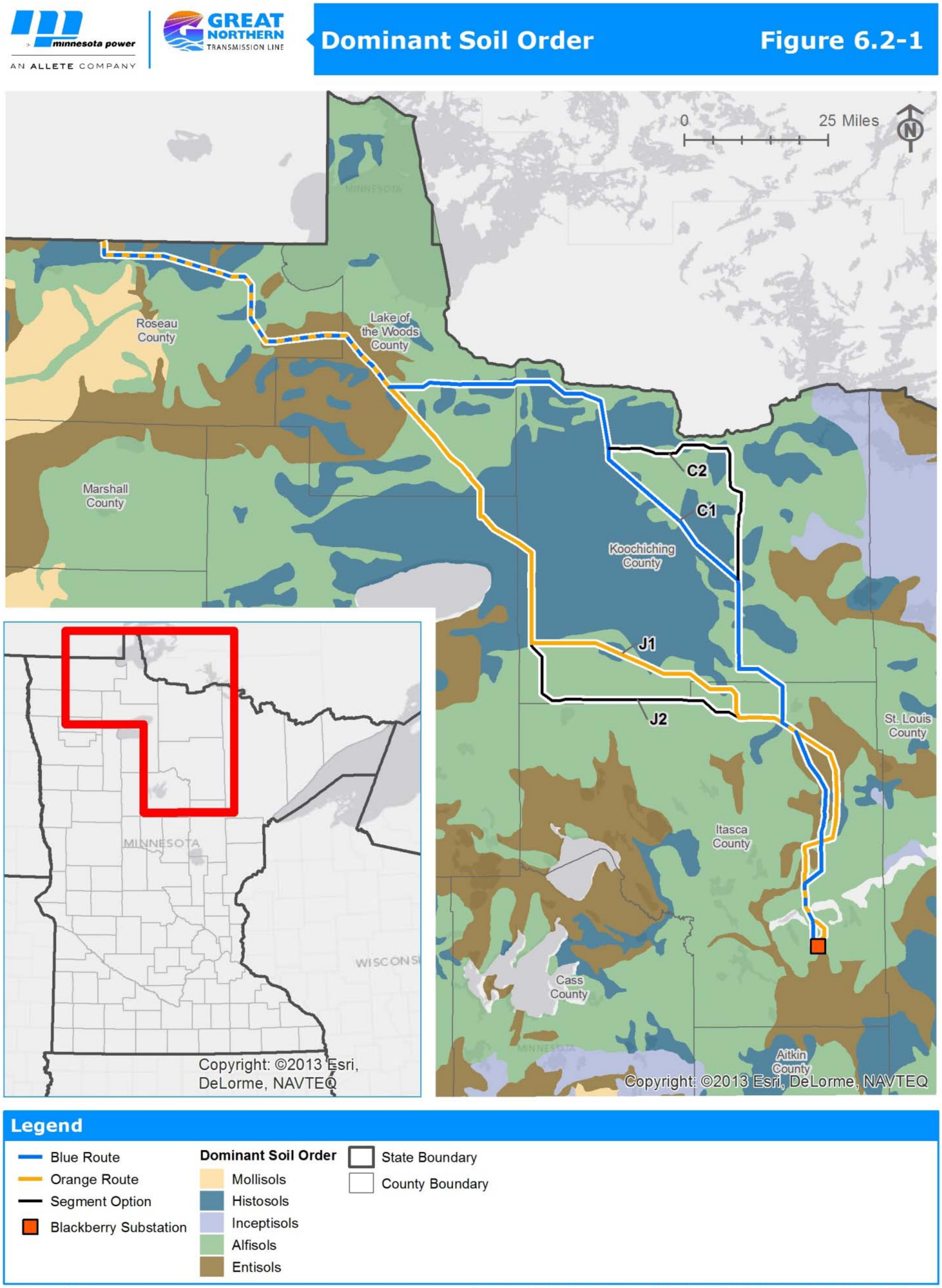
Source: Minnesota DNR Data Deli

Table 6.2-2. Soil Orders for the Segment Options (acres)

Soil Orders	C1	C2	J1	J2
Mollisols	-	-	-	-
Alfisols	3,190	6,418	11,742	16,288
Entisols	-	-	-	-
Histosols	8,781	2,254	3,747	244
TOTAL	**11,971**	**8,672**	**15,489**	**16,532**

Source: Minnesota DNR Data Deli

Dominant Soil Order — Figure 6.2-1



Sources: ESRI,DNR

\\mspe-gis-file\GISProjLarge\MinnPower\182035\map_docs\CLIENT\Route_Permit\0602-1_SoilOrder.mxd

The Study Area crosses five ecological subsections as classified by Minnesota DNR following the National Hierarchical Framework of Ecological Units (Cleland et al. 1997) as discussed in Section 6.4, Vegetation. Ecological subsections take into account soils information in combination with climate, geology, vegetation, and other landscape factors. Soil orders coincide closely with the ecological subsections, with Mollisols in the northwestern portion of the Orange Route Alternative within the Aspen Parklands subsection. Within the Agassiz Lowlands, soil orders are a mix of partially developed Entisols, organic Histosols, and forest Alfisols. Soil orders tend toward a mix of all three types within any given area, with Histosols dominating the large glacial lake bed and sandy beach ridges exposed throughout the region (Minnesota DNR 2013). The eastern portion of all Route Alternatives passes through the Littlefork-Vermillion Uplands through mostly Alfisols, which are comprised of clayey lake laid sediments or loamy and clayey glacial till. Organic peat soils (that is, Histosols) are common but not dominant in this area. The south easterly portion of the Project is dominated by Entisols and Alfisols; loamy to sandy soils derived from moraine and outwash sands of the Nashwauk Uplands and the St. Louis Moraine subsections (Minnesota DNR 2013).

Prime Agricultural Land

Prime Agricultural Land is identified by NRCS largely based on soil fertility and arability. Prime Agricultural Land is discussed in Section 6.23, Agricultural Production.

Peatlands

Peatlands are a unique resource where soils are dominated by organic soils comprised almost entirely of decomposed plant material. Peat develops in permanently or nearly permanently wet conditions, and unless drained, is likely to be considered a wetland resource. Though based on soil types, peatlands are discussed in Section 6.18, Wetlands.

6.2.2 Direct and Indirect Effects

Impacts on soils are dependent, to some extent, on the conditions of the soil surface at the time of construction. Most impacts will be temporary. Construction activities that occur on wet soils tend to have longer lasting impacts, regardless of the soil type. Identifying specific staging areas and associated impacts will be completed during final design; impacts will be mitigated as required by state and federal permits.

Surface soils will be disturbed by site clearing, grading, and excavation activities at structure locations, pulling and tensioning sites, setup areas, and during the transport of crews, machinery, materials, and equipment over access routes (primarily along rights-of-way [ROWs]). During dry conditions, this disturbance will be temporary, minimal, and generally will be less invasive than typical agricultural practices such as plowing and tilling. Soil compaction may occur on access paths, and at other locations as are result of heavy equipment activity. Soil erosion may occur if surface vegetation is removed, especially on fine textured soils that occur on sloping topography.

Tables 6.2-3 and 6.2-4 summarize soil types (that is, soil orders) within the anticipated ROW.

Table 6.2-3. Soil Orders within the Anticipated ROW

Soil Orders	Orange Route		Blue Route	
	Acres	Percent	Acres	Percent
Mollisols	-	-	-	-
Alfisols	2,266	42.5	2,064	39.0
Entisols	1,385	26.0	1,209	22.7
Histosols	1,678	31.5	2,045	38.4
TOTAL	5,329	100.0	5,317	100.0

Source: Minnesota DNR Data Deli

Table 6.2-4. Soil Orders within the Segment Options Anticipated ROW (acres)

Soil Orders	C1	C2	J1	J2
Mollisols	-	-	-	-
Alfisols	195	840	944	1,251
Entisols	-	-	-	-
Histosols	602	276	268	33
TOTAL	797	1,116	1,212	1,284

Source: Minnesota DNR Data Deli

Wet organic soils (that is, Histosols) pose a challenge for construction. Both Route Alternatives cross extensive areas of organic soils, which comprise 21 to 28 percent of the anticipated ROW. While there are widespread areas of organic soils as shown in Figure 6.2-1, they can also be found in scattered pockets throughout the Route Alternatives. The location and depth of organic soils will be identified for the approved Route Alternatives using mapping and, if necessary, on-site investigations and borings.

6.2.3 Mitigation

The Applicant proposes the following mitigation measures:

- → The Applicant will retain an environmental inspector (EI) during Project construction. Working on behalf of the Applicant, the EI will be responsible for understanding all of the conditions of the Project's environmental permits and to ensure that the contractors abide by these conditions.
- → To the extent practical, soil disturbance and excavation activities in steep slope areas will be avoided.
- → Where disturbance and excavation cannot be avoided entirely, it will be minimized using best management practices (BMPs) such as matting, ice roads, and low ground pressure equipment to the extent practical to minimize impacts during construction.
- → Sediment and erosion control plans will be developed that specify the types of BMPs necessary. Depending on the site, BMPs may include installation of silt fence, straw bales, or ditch blocks, and/or covering bare soils with mulch, plastic sheeting, or fiber rolls to protect drainage ways and streams from sediment runoff.

- → Erosion control practices will be inspected during construction, especially during significant precipitation events.
- → Soil compaction in cultivated areas will be treated and restored through tillage operations, for example using a subsoiler.
- → Where rutting occurs, the Applicant will repair the surface and restore ground vegetation upon completion of work in a given area.
- → All disturbed areas will be revegetated once construction is complete. Seed mixes will be specified based on site characteristics and in accordance with regulatory permits.
- → The introduction and establishment of noxious weeds will be minimized by prompt re-vegetation of disturbed areas using regional genotype native species where appropriate or by seed based on landowner agreements.

6.3 Climate

This section describes climate features within the Study Area and the potential impacts of the Route Alternatives and Segment Options on those resources.

Existing regional climate conditions and known science relating to local and global climate change was reviewed to qualitatively evaluate the impact of the proposed Project on climate change. This information was obtained form the National Climatic Data Center (NCDC), Council on Environmental Quality (CEQ), and the Midwest Regional Climate Center (MRCC).

6.3.1 Existing Conditions

Northern Minnesota has a continental-type climate and is subject to frequent outbreaks of continental polar air throughout the year, with occasional Arctic outbreaks during the winter. Prolonged periods of heat occur during the summer, though with less frequency and duration than in the southern part of the state (NCDC 2013). NCDC maintains a climatic monitoring network across the country. The MRCC, a joint program of the Illinois State Water Survey and NCDC, serves the nine-state Midwest region that includes Minnesota. For purposes of describing the climate of the region, temperature and precipitation normals for 1981 to 2010 were reviewed for each of the county seats for the five counties in the Study Area: Roseau (Roseau County, COOP ID 217087), Baudette (Lake of the Woods County, COOP ID 210515), Bemidji (Beltrami County, COOP ID 210643), International Falls (Koochiching County, COOP ID 214026), and Grand Rapids (Itasca County, COOP ID 213303). Climate normals are the most recent 30-year averages of climatological variables. Each climate station has complete monthly and yearly datasets for temperature and precipitation dating back between 98 years (Grand Rapids) and 119 years (Roseau).

Climate normals are defined as the 30-year average of a particular weather variable and are used for placing recent climate conditions into an historical context. The average annual temperature for 1981 to 2010 for these locations in the Study Area ranged from 37.5 degrees Fahrenheit (°F) (International Falls) to 40.6°F (Grand Rapids Forest Lab) (NCDC n.d.a), and the average annual precipitation ranged from 23.44 inches (Baudette) to 28.93 inches (Grand Rapids Forest Lab), with no data available for Roseau County (NCDC n.d.b). The average snowfall for the same years ranged from 55.5 inches (Grand Rapids Forest Lab) to 71 inches (International Falls), with no data available for Roseau, Baudette, or Bemidji counties (NCDC n.d.c). The historical 1-day maximum temperatures ranged from 103°F (Baudette, in 1936 and International Falls, in 1923) to 107°F (Roseau and Bemidji, in 1936). The historical 1-day minimum temperatures range from -55°F (International Falls, in 1909) to -49°F (Baudette, in 1909 and 1996). The historical highest 1-day precipitation ranged from 3.90 inches (Bemidji, in 1957) to 5.71 inches (Baudette, in 2002), and the historical highest 1-day snowfall ranged from 14.0 inches (Bemidji, in 1897, 1914, and 1927) to 20.0 inches (Baudette, in 1966). Historical 1-day values were taken from the MRCC cli-MATE (MRCC's Application Tools Environment) database, which can be accessed free with a user account (MRCC 2013).

The long-term normal temperature and precipitation totals (rainfall and snowfall) at any point within the Study Area can be expected to fall within or near the ranges listed above. Historical maximum and minimum temperatures at any point within the Study Area can be expected to fall within or near the ranges listed above, and will be frequently associated with extended heat waves or cold outbreaks, respectively. Individual precipitation 1-day extremes are the result of single events, and extrapolations between locations cannot be made, because the events that cause the maximums (or minimums) can vary greatly by location.

Global Climate Change

Global climate change is a term used to describe the gradual increase or decrease in worldwide average surface temperatures, or changes in precipitation, wind, or other climate variables. The level of human versus natural contribution to global climate change is the subject of much debate.

The CEQ has provided draft guidance on the ways in which federal agencies can improve their consideration of the effects of greenhouse gas (GHG) emissions and climate change (CEQ 2010). The guidance explicitly states that with regard to the effects of climate change on a project, agencies should, "focus on aspects of climate change that may lead to changes in the impacts, sustainability, vulnerability, and design" of the project. CEQ guidance goes on to further state that, "agencies should recognize the scientific limits of their ability to accurately predict climate change effects," and "not devote effort to analyzing wholly speculative effects." Further, CEQ guidance states that, "agencies should consider the uncertainties associated with long-term projections from global and regional climate change models." CEQ guidance also recommends that environmental documents should consider both how a project could impact climate change and how climate change could impact a project (CEQ 2010).

The main human contributions to global climate change are attributed to the emissions of what are commonly referred to as GHGs, such as carbon dioxide (CO_2), and to changes in land cover and land use that can affect the amount of CO_2 taken up or released by the land surface.

In 2007, the Minnesota legislature passed and the governor signed the Next Generation Energy Act (Act), which initiated efforts to increase renewable energy use in the state, increase energy conservation, and decrease GHG emissions, particularly CO_2. The Act also set specific state GHG emissions reductions percentage goals from a 2005 baseline date for the years 2015, 2025, and 2050. The Project will help in achieving the GHGH goals set forth in the Act as well as state preference for renewable resources (Minnesota Statutes Section 216B.243, subdivision 3a). In addition, hydropower generated by Manitoba Hydro from facilities under 100 MW qualify as an eligible energy resource under current state law (Minnesota Statutes Section 216B.1691, subdivision 1(a)(3) and future legislation could change the criteria for renewables such that all hydropower could qualify in the future. There are currently no additional GHG rules that will potentially affect the proposed Project.

6.3.2 Direct and Indirect Effects

Project Impacts on Climate Change

Global climate can be affected by many factors, including changes in atmospheric composition due to GHG emissions. Other factors include solar variation, volcanic activity, ocean current cycles, variations in earth orbit, and orientation of the earth on its rotational axis. Concerns expressed in recent years are that mankind's emissions of GHGs may warm the climate, possibly affecting precipitation patterns as well.

Potential direct and indirect effects on climate are primarily related to concerns about emissions of GHG. The Project does not include activities that have the potential to substantively increase GHG emissions, either temporarily or permanently. Minor activities, such as the operation of construction and maintenance equipment, are expected to emit small amounts of GHG under either Route Alternative.

Changes in land cover and land use can affect the amount of CO_2 taken up or released by the land surface. Either Route Alternative will require the removal of trees within the 200-foot right-of–way (ROW). Estimates of potential to remove forested acreage for the Project are included in Section 8.6, Land Use. The area cleared of forest will be restored with suitable vegetation, which partially will offset the loss of trees that will otherwise take up CO_2. There will be no change in climate inside or outside of the Study Area because of these changes in land cover.

Currently about 75 percent of the Applicant's energy fuel supply is produced by coal generation. The Project will deliver hydropower and help diversify the energy fuel supply; it is a key component in the Applicant's long-term strategy to generate or purchase low-carbon energy resources and reduce GHG emissions. Through the Project and other planned projects, the Applicant plans to reduce coal-generation in its portfolio to about 42 percent by 2026. The Project therefore is not expected to have any long-term direct or indirect effects on climate, but is part of the Applicant's long-term strategy to reduce GHG emissions.

Climate Change Impacts on the Project

The nature of the Project and its geographic location dictate that the Project will not be temporarily or permanently impacted by moderate increases or decreases in temperature or precipitation, should they occur in the long term. Under either Route Alternative, the Project's sustainability, vulnerability, and design will not be substantially different under future scenarios of climate change within the expected lifetime of the Project infrastructure.

6.3.3 Mitigation

No direct or indirect effects on climate from the proposed Project are expected. No mitigation measures are proposed.

This page intentionally left blank

6.4 Vegetation

This section describes vegetation resources that are crossed by the Route Alternatives and Segment Options and the potential impacts of the Route Alternatives and Segment Options on those resources.

The ecological land classification system, developed by the Minnesota Department of Natural Resources (DNR) and the U.S. Forest Service (USFS), which is available on Minnesota DNR's website, was used to describe the Study Area. The ecological land classification system is used to identify, describe, and map progressively smaller areas of land with increasingly uniform ecological features.

6.4.1 Existing Conditions

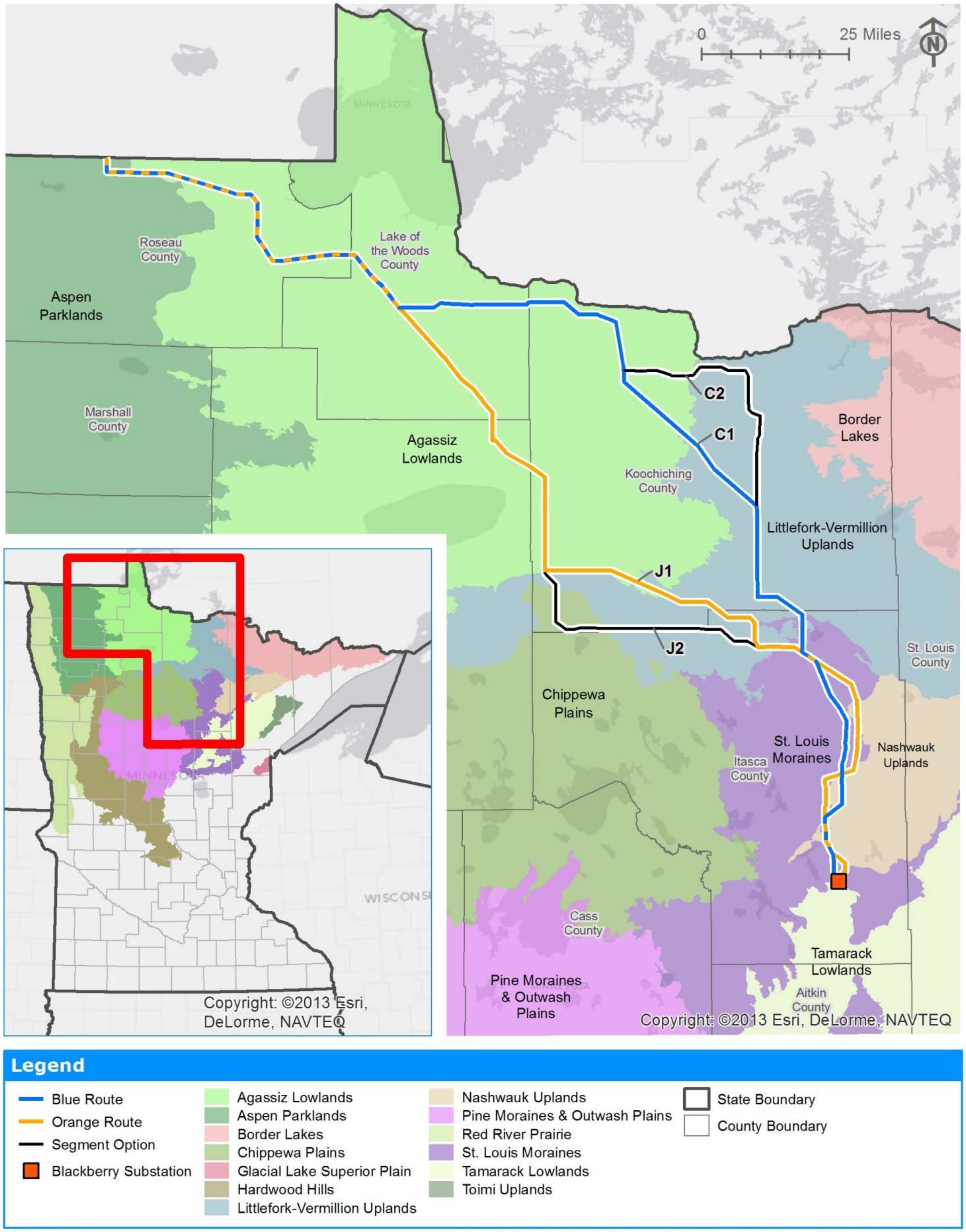
The Study Area is located within three Ecological Provinces and five Ecological Subsections, as classified by the Minnesota Department of Natural Resources (DNR) (2013a) following the National Hierarchical Framework of Ecological Units (Cleland et al. 1997). Figure 6.4-1 shows the ecological subsections within the Study Area. Rare and unique species and communities are discussed in Section 6.20.

The Study Area includes a range of landscape types and vegetation communities that change drastically from west to east, with generally open, limited forest communities to the west and increasingly forested vegetation types toward the east. Upland and wetland communities share this transition from herbaceous to forested, with coniferous and hardwood lowlands becoming more common than open wetlands on a gradient from the Tallgrass Parklands through the Laurentian Mixed Forest Province. Additionally, the Blackberry 500 kV Substation sits at the edge of the Tamarack Lowlands, but the Project does not cross the subsection, so it is not discussed in detail below. All vegetation community descriptions below are derived from Minnesota DNR's Ecological Classification System (ECS) descriptions (2013a). Discussion of pre-settlement conditions provides context for understanding plant community succession and change, both past and present. Ecological subsections within the Study Area and their characteristics are discussed from west to east below.

Aspen Parklands Ecological Subsection within the Tallgrass Aspen Parklands Eco-region lies at the southern end of a province extending north and west into Canada. The subsection is considered a transitional landscape between prairies to the west and vast forest provinces to the east. Characteristic landscape setting is typically low-lying with minimal topography. Regional water table is near the surface in much of the subsection, creating a mosaic of vegetation types including prairie, brushland, woodland, and forest. Fires were an important factor maintaining vegetation communities where conditions were dry enough to allow for natural or human-set burns. Peatlands are a common component in the subsection where the water table is near the ground surface.

minnesota power
AN ALLETE COMPANY
GREAT NORTHERN TRANSMISSION LINE

Ecological Subsections Figure 6.4-1



Sources: ESRI,DNR \\mspe-gis-file\gisprojlarge\MinnPower\182035\map_docs\CLIENT\Route_Permit\0604-1_EcoSubsections.mxd

The Agassiz Lowlands Ecological Subsection within the Laurentian Mixed Forest Province is predominantly comprised of vast peatlands and upland sand ridges resulting from the retreat of Glacial Lake Agassiz to the west. The subsection is generally very flat and poorly drained. Sand ridges commonly are dominated by aspen and birch, or jack pine forests and woodlands. Peatlands are a mosaic of forests dominated by black spruce or tamarack, or herbaceous sedge meadow, fresh meadow, and poor or rich fens. Past attempts at ditching and farming the peatlands largely have been unsuccessful and most of the subsection is uninhabited.

The Littlefork-Vermillion Uplands Subsection is a transition zone between the vast peatlands to the west and the shallow to bedrock controlled, clayey soils to the east. The gently rolling to flat, lake-plain setting is dominated by clay and loam soils formed from lake-laid sediment and glacial till. This subsection contains a rich variety of vegetation types, much of it occupied by aspen-birch forest trending toward white pine, white spruce, and balsam fir. The eastern portion of the subsection is dominated by white pine, red pine, and jack pine dominated forest. Poor and rich fens, black spruce bog, and cedar-black ash swamp are typical in lowlands. Low moraines and beach ridges are dominated by jack pine, paper birch, and aspen. Historically, insect infestations followed by fire in the dead standing trees were a common disturbance combination; so much of the subsection was covered by early successional, aspen dominated forest.

The St. Louis Moraines Subsection of the Laurentian Mixed Forest Province is dominated by steep slopes on end moraine settings. Soils predominantly are loamy calcareous (75 percent) and well drained outwash sands (10 percent) in uplands. Only 3 percent of the soils are classified as poorly drained. White and red pine forests historically dominated the northern portions of the subsection, whereas northern hardwood and aspen forest dominated moraines to the south. Mixed deciduous and coniferous forests were common on moraines.

The Nashwauk Uplands Ecological Subsection within the Laurentian Mixed Forest Province is dominated by Giant's Ridge, a narrow 200- to 400-foot-high bedrock feature extending northeast to southwest through the subsection Glacial outwash plains, rolling till plains and moraines of the Rainy Lobe glacier are the predominant landforms. Soils are most commonly loamy over dense basal till.

The Orange and Blue Routes cross a short section of the Aspen Parklands before entering the Agassiz Lowlands toward the south and east. Within the Aspen Parklands, the Route Alternatives cross a combination of lake plain and beach ridge features. Relict Beach Ridges are known to harbor unique vegetation communities (including calcareous fens) as they are in a transition zone between forest and prairie, lakeplain, and moraine. Within these Route Alternatives, native prairie with scattered aspen and oak patches are present, and harbor numerous rare and endangered species and community types (see Section 6.20, Rare and Unique Communities and Species, and Section 6.19, Wildlife). The Orange Route crosses through the center of the Agassiz Lowlands, which is dominated by vast peatlands that generally are open wetland communities with some scattered lowland conifer stands. The Blue Route skirts the northern edge of the Agassiz Lowland peatlands, then travels south through the Littlefork-Vermillion Uplands generally crossing a mix of upland and lowland conifers in this area. Both Route Alternatives generally traverse the Littlefork-Vermillion Uplands, St. Louis Moraine, and Nashwauk Uplands south and east to the project terminus. Table 6.4-1 lists the acreage of each Route Alternative within ecological subsections. Table 6.4-2 lists the acreage for each Segment Option within ecological subsections.

Table 6.4-1. Ecological Subsection Types within Each Route Alternative

ECS Types	Orange Route (Acres)	Blue Route (Acres)
Aspen Parklands	3,333	3,333
Agassiz Lowlands	41,125	36,080
Littlefork-Vermillion Uplands	10,249	13,219
St. Louis Moraines	15,806	13,931
Nashwauk Uplands	5,197	4,813
Tamarack Lowlands	140	140

Source: Minnesota DNR Data Deli

Table 6.4-2. Ecological Subsection Types within Each Segment Option

ECS Types	Segment Option (acres)			
	C1	C2	J1	J2
Agassiz Lowlands	5,922	1,876	6,056	208
Chippewa Plains	-	-	-	5,182
Littlefork-Vermillion Uplands	6,042	6,790	9,244	11,135
St. Louis Moraines	-	-	181	-

Source: Minnesota DNR Data Deli

The National Gap Analysis Program (GAP) Land Cover level 2 data indicate that each of the Route Alternatives traverse a range of landscapes and vegetation types. Figure 6.4-2 displays GAP level 2 vegetation and landcover types found throughout the Study Area. Table 6.4-3 lists landcover type acres and percent cover for each Route Alternative.

Table 6.4-3. GAP Level 2 Landcover within Each Route Alternative

GAP Level 2 Landcover	Orange Route		Blue Route	
	Landcover Area (acres)	Landcover (percent)	Landcover Area (acres)	Landcover (percent)
Aquatic environments	6,168	8.1	5,257	7.3
Crop and grass	10,005	13.2	9,840	13.8
Non-vegetated	80	0.1	194	0.3
Subtotal: Herbaceous and Open Cover Types	***15,020***	***21.4***	***15,290***	***21.4***
Shrubland	17,918	23.6	16,616	23.2
Subtotal: Woody Shrub Cover Types	***17,918***	***23.6***	***16,616***	***23.2***
Lowland coniferous forest	14,513	19.1	18,268	25.5
Lowland deciduous forest	1,584	2.1	1,064	1.5
Upland coniferous forest	3,475	4.6	2,997	4.2
Upland deciduous forest	22,135	29.2	17,312	24.2
Subtotal: Forest Cover Types	***35,742***	***55.0***	***39,641***	***55.4***
Total Landcover Area	**65,805**	**100.0**	**71,547**	**100.0**

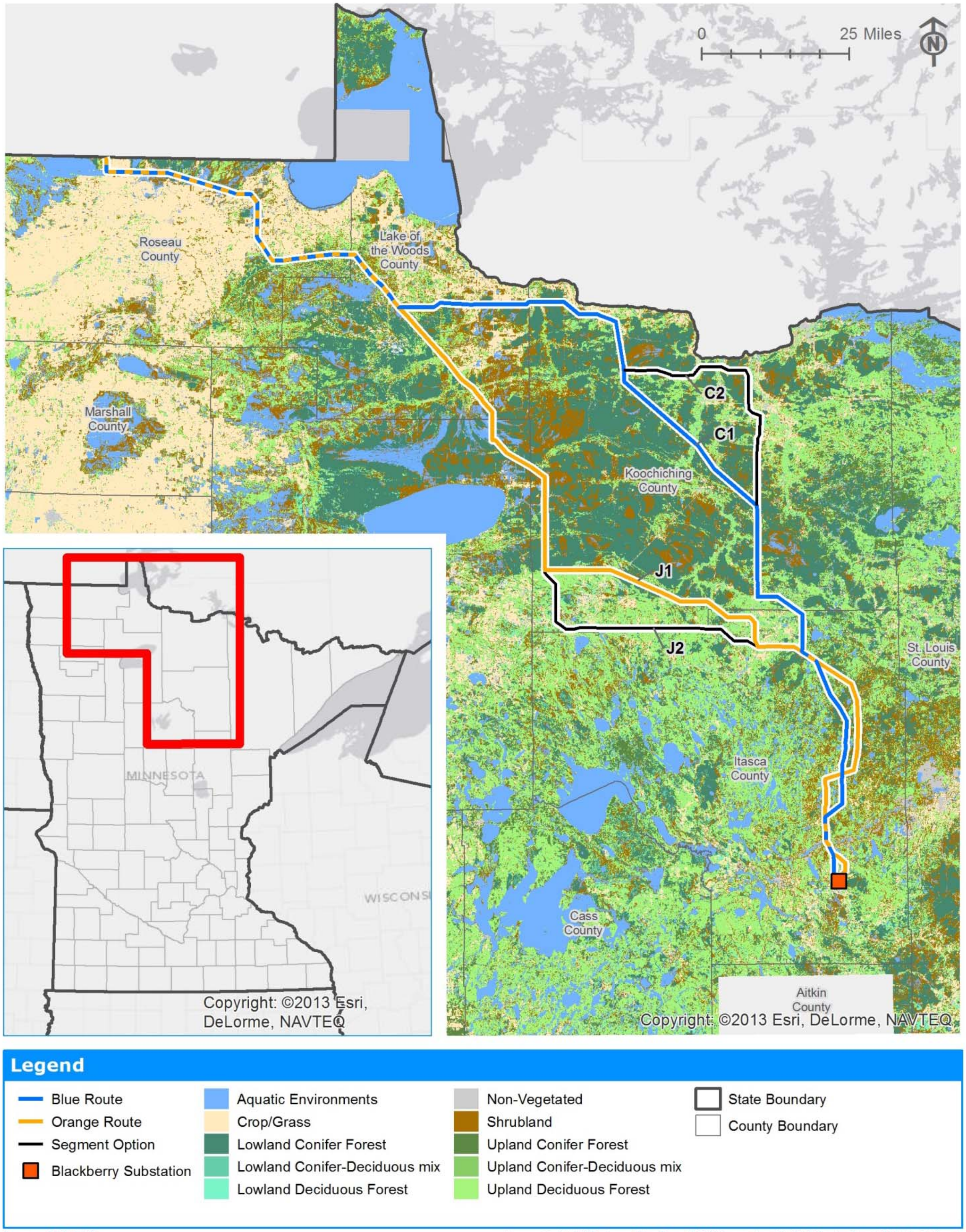
Source: Minnesota DNR Data Deli

The predominant landcover type traversed by the Orange Route is upland deciduous forest followed closely by shrubland. Lowland coniferous forest is the predominant landcover type crossed by the Blue Route, followed closely by upland deciduous forest and shrubland (see Table 6.4-3). Total forest type coverage is 35,742 acres (55.0 percent) for the Orange Route and 39,641 acres (55.4 percent) for the Blue Route.

minnesota power
AN ALLETE COMPANY
GREAT NORTHERN TRANSMISSION LINE

GAP Level 2 Vegetation & Landcover

Figure 6.4-2



Sources: ESRI,DNR

\\mspe-gis-file\GISProjLarge\MinnPower\182035\map_docs\CLIENT\Route_Permit\0604-2_GAP.mxd

Table 6.4-4. GAP Level 2 Landcover (acres) for Each Segment Option

GAP Level 2 Landcover	Segment Option (acres)			
	C1	C2	J1	J2
Aquatic environments	315	370	369	531
Crop and grass	50	773	508	767
Non-vegetated	40	166	59	111
Shrubland	1,543	2,114	1,802	1,877
Lowland coniferous and deciduous mix	-	-	-	87
Lowland coniferous forest	7,300	2,897	3,554	1,423
Lowland deciduous forest	291	263	677	1,048
Upland coniferous and deciduous mix	-	-	-	2
Upland conifer forest	370	86	873	203
Upland deciduous forest	2,062	2,003	7,646	10,483
Total Acres per Segment Option	11,971	8,672	15,489	16,532

Source: Minnesota DNR Data Deli

Table 6.4-4 lists landcover type acres for each Segment Option. Segment Options C1 and C2 both cross a mix of forested uplands and numerous peatland wetlands comprised of both woody and shrubland communities. Segment Options J1 and J2 generally cross managed aspen and birch forests; however, Segment Option J1 includes substantial portions of peatland dominated by intact lowland deciduous shrubs, cedar swamp, tamarack, and black spruce forests. Upland deciduous forest types generally are more prevalent in Segment Option J2, mostly represented by managed or early successional birch and aspen dominated forests.

Fragmentation

Fragmentation of vegetation communities occurs when linear corridors comprised of new community types bisects existing contiguous blocks of vegetation. The result is the creation of smaller fragmented areas of these communities. Low shrubby or grassland communities are less susceptible to structure alterations associated with transmission lines, as they typically are maintained similar to pre-construction conditions. Habitat fragmentation from corridor clearing affects forests and shrublands by increasing edges of these habitats, and allowing additional light into forest and shrublands. These changes have the potential to increase:

- → Soil desiccation, favoring species adapted to drier settings
- → Density of vegetation along new forest edges, thus reducing the overall forest core
- → The likelihood of introduction of invasive species adapted to edge, opening, and disturbed and maintained environments

→ Effects on variety of wildlife species adapted to interior habitats of woody vegetation communities (see Section 6.19, Wildlife)

Minnesota DNR Lands

Minnesota DNR lands crossed by the Route Alternatives and Segment Options include a combination of state forests, Scientific and Natural Areas (SNAs), and Wildlife Management Areas (WMAs), as well as natural resources issues on private lands. A summary of these managed areas is provided here.

Wildlife Management Areas

Minnesota DNR manages 1.29 million acres of land as WMAs intended to protect wildlife habitat; provide hunting opportunities; and recreational activities, including wildlife viewing (see Table 6.4-5 and Figure 6.19-1).

The Orange Route crosses 5,652 acres of WMA lands in four different WMAs. The WMAs are comprised of grasslands, prairie, fen, wet meadows, shrublands, open and forested peatlands. Cedar Bend WMA vegetation communities within the Blue Route are peatlands that mostly are comprised of low, ericaceous shrub dominated communities (see Appendix A, sheets 7-8). Roseau Lake and Roseau River WMAs are comprised of grasslands, prairie, fen, wet meadows, shrublands, open and forested peatlands (see Appendix A, sheets 1-3).

The Blue Route crosses 2,005 acres of WMA lands in five different WMAs. The portions of Carp Swamp and Silver Creek WMAs within the Blue Route are a mix of emergent, shrub, and forested wetlands (see Appendix A, sheets 17-18). Cedar Bend WMA vegetation communities within the Blue Route are peatlands that mostly are comprised of low, ericaceous shrub dominated communities (see Appendix A, sheets 7-8). Roseau Lake and Roseau River WMAs are comprised of grasslands, prairie, fen, wet meadows, shrublands, open and forested peatlands (see Appendix A, sheets 1-3).

Table 6.4-5. WMA Area (acres) within the Route Alternatives

Route Alternative	WMA Name	Route Area within WMA (acres)
Orange Route	Cedar Bend WMA (585 acres) Red Lake WMA (4,038 acres) Roseau Lake WMA (530 acres) Roseau River WMA (499 acres)	5,652
Blue Route	Carp Swamp WMA (365 acres) Cedar Bend WMA (585 acres) Roseau Lake WMA (530 acres) Roseau River WMA (499 acres) Silver Creek WMA (26 acres)	2,005

Source: Minnesota DNR Data Deli

Scientific and Natural Areas

SNAs were designated by the Minnesota Legislature in 1975 as a unit within the Outdoor Recreation System. There are currently 159 SNAs in the state encompassing 185,000 acres. The intent of the designation is to "protect and perpetuate in an undisturbed natural state those natural features which possess exceptional scientific or educational value" (Minnesota Statue 86A05, Subd. 5). Typically, SNAs contain native plant communities that harbor rare plants and animals or unique geological features

All project Route Alternatives and Segment Options avoid SNA boundaries. The Route Alternatives and Segment Option C2 also cross Watershed Protection Areas (WPAs), which are designed to provide greater protection for groundwater resources associated with groundwater dependent natural communities within SNAs. Table 6.4-6 lists SNAs adjacent to and WPAs crossed by the Route Alternatives or Segment Option.

Table 6.4-6. SNAs Adjacent to and WPAs Crossed by the Route Alternatives and Segment Option

SNA	Route Alternative or Segment Option Near SNA	SNA Distance from Route Alternative or Segment Option	SNA-WPA crossed by Route Alternative or Segment Option	Known Calcareous Fen Present in SNA
Pine Creek Peatland	Orange,	1.2 miles	Yes	Yes
	Blue	1.2 miles	Yes	Yes
Sprague Creek Peatland	Orange	0.7 mile	Yes	Yes
	Blue	0.7 mile	Yes	Yes
Red Lake Peatland	Orange	Adjacent	Yes	No
Lost River Peatland	Orange	0.7 mile	Yes	Yes
North Black River Peatland	C2	200 feet	Yes	No

Source: Minnesota DNR Data Deli

Calcareous Fens

Minnesota DNR has established Peatland WPAs around the Lost River Peatland, Pine Creek, and Sprague Creek SNAs to provide buffers for protection of core areas surrounding calcareous fen and peatland complexes. Portions of these WPAs are located within the Orange Route and the Blue Route (see Appendix A, sheets 64-65 and 3). Calcareous Fens are discussed in Section 6.18, Wetlands, and in greater detail in Section 6.20, Rare and Unique Species and Communities.

Public Forests

Minnesota DNR has identified Old Growth Forests (OGFs), High Conservation Value Forests (HCVFs), and Ecologically Important Lowland Conifers (EILCs) as sensitive resources.

Old Growth Forest

OGFs are defined by Minnesota DNR and others as forests older than 120 years developed in the absence of catastrophic disturbance. To protect OGFs and associated values, Minnesota DNR developed Old Growth Forests Guidelines in 1994, which set goals for OGF protection. Protections led to designations of OGFs that are protected from logging. If a designated old growth stand looses its old growth characteristics (due to human or natural causes), Minnesota DNR will place another stand of similar quality not previously protected into designated status (Minnesota DNR 2014). One designated area of lowland hardwood OGF is located within the southern half of the Orange Route and the Blue Route (Minnesota DNR 2010), south of the existing cleared corridor.

High Conservation Value Forests

HCVFs are defined by the Forest Stewardship Council (FSC) as "areas of outstanding biological or cultural significance." HCVFs (forest and non-forest) are defined by three categories (Minnesota DNR 2013b):

- → Category 1: Biodiversity Values are HCVFs containing globally, nationally, or regionally significant concentrations of biodiversity values, including globally imperiled and state or federally threatened or endangered species. May also include federal candidate or state proposed rare species, concentrations of rare species or outstanding key habitats for species in greatest need of conservation.
- → Category 2: Large landscape level forests containing important large landscape level forests with naturally occurring species existing in natural patterns of distribution and abundance.
- → Category 3: Areas containing rare, threatened, or endangered ecosystems

"Management activities in HCVFs shall maintain or enhance the attributes which define such forests. Decisions regarding HCVFs shall always be considered in the context of a precautionary approach. Minnesota Statutes 89 and 89A require that the state manage HCVFs for protection of rare species, communities, features and values across the landscape" (Minnesota DNR 2013c).

Minnesota DNR's process for selection of HCVFs has been ongoing. Minnesota DNR has determined that current management of many SNAs and DNR forests are sufficient to meet the FSC HCVF program requirements HCVF designation is unnecessary in many forested portions of the state. Candidate HCVFs have been identified and are pending final designation decision by Minnesota DNR Directors group.

- → Both the Orange and Blue Routes cross the southern edge of the Sprague Creek Peatland Candidate HCVF with combined forested, shrub, and open peatland community types.
- → Both the Orange and Blue Routes cross the southern edge of the Pine Creek Peatland HCVF, comprised of forest, shrub, and open peatland communities.
- → Both the Orange and the Blue Routes cross the northeast corner of the Bemis Swamp HCVF. This peatland-dominated site has a mix of forest, shrub, and open peatland communities. The Orange Route bisects the HCVF.

Ecologically Important Lowland Conifers

Minnesota DNR Division of Forestry manages vegetation on Wildlife and Forestry units through the Subsection Forest Resource Management Plan (SFRMP). ECS subsections define planning units. Within the SFRMPs, Minnesota DNR has identified EILCs as forest types specifically targeted for protection. "EILCs are defined as stands of black spruce, tamarack, and cedar, including stagnant lowland conifers that are examples of high quality native plant communities (NPCs) that are representative of lowland conifer NPCs found in the subsections" (Minnesota DNR 2009)

EILCs are reserved from treatment, for the period of time covered by the SFRMP (10 years), based on the ecologically important habitat or natural community type they represent. EILCs are determined by each subsection and are reviewed every 10 years during the recurring SFRMP process.

6.4.2 Direct and Indirect Effects

Direct and indirect effects of the Project on vegetation include:

- → Permanent conversion of forests
- → Permanent and temporary conversion of shrublands to more open, herbaceous settings within the anticipated ROW
- → Open, herbaceous landcover types will remain intact following construction except at structures
- → Temporary impacts on all vegetation types during construction due to clearing for equipment access along access paths and at structure locations
- → Temporary soil compaction due to the need for access to structures
- → Permanent loss of vegetation at structures
- → Potential for spread of invasive species and edge effects, particularly in adjacent forest communities
- → Overall permanent loss in forests, with associated reduction in intact blocks of forest habitat (fragmentation)
- → Favoring of plant species adapted to open areas over species of forested areas

General Vegetation

A small amount of vegetation permanently will be removed at each structure location. The total structures footprint is estimated to be 1.6 acres for each Route Alternative.

Trees and other woody vegetation will be removed from the ROW during construction and those areas will be maintained as short, herbaceous plant communities during operations to reduce hazards such as damage from falling limbs and electrical arcing. The anticipated ROW of the Orange Route contains 2,745 acres of forest that will be converted to non-forest plant communities. Within the anticipated ROW of the Blue Route, 2,680 acres of forest will be permanently converted to non-forest plant communities (see Table 6.4-7).

Table 6.4-7. GAP Level 4 Landcover Types within Route Alternatives for Anticipated ROW

Landcover Type[1]	Orange Route (acres)	Blue Route (acres)
Aspen and birch	**1,375**	**1,096**
Balsam fir mix	**80**	**64**
Barren	3	20
Black ash	**95**	**66**
Broadleaf sedge and cattail	178	137
Bur and white oak	**4**	**0**
Cropland	349	405
Floating aquatic	2	3
Grassland	299	294
Jack pine	**61**	**66**
Lowland black spruce	**301**	**575**
Lowland deciduous shrub	1,127	1,113
Lowland evergreen shrub	34	93
Lowland northern white-cedar	**290**	**256**
Maple and basswood	**51**	**30**
Red oak	**2**	**0**
Red pine	**30**	**31**
Red and white pine	**1**	**0**
Sedge meadow	311	315
Stagnant black spruce	**77**	**103**
Stagnant coniferous	**2**	**1**
Stagnant northern white-cedar	**7**	**11**
Stagnant tamarack	**39**	**50**
Tamarack	**294**	**308**
Upland deciduous	**11**	**0**
Upland northern white-cedar	**4**	**9**
Upland shrub	260	217
Water	23	43
White pine mix	**5**	**7**

Landcover Type[1]	Orange Route (acres)	Blue Route (acres)
White spruce	**19**	**5**
Total	5,332	5,319

Source: Minnesota DNR Data Deli

[1] Landcover types and acres in bold are forested lands.

The predominant landcover types within both the Orange Route and the Blue Route anticipated ROWs are aspen and birch, and lowland deciduous shrubs. In general, most vegetation cover types are similar in both Route Alternatives.

Table 6.4-8. GAP Level 4 Landcover Types within Segment Options for Anticipated ROW

Landcover Type[1]	Segment Option (acres)			
	C1	C2	J1	J2
Aspen and birch	**138**	**192**	**584**	**697**
Balsam fir mix	**1**	**1**	**12**	**3**
Barren	4	19	3	4
Black ash	**16**	**23**	**47**	**36**
Broadleaf sedge and cattail	0	0	1	10
Bur and white oak	**0**	**0**	**4**	**0**
Cropland	0	3	16	8
Floating aquatic	0	0	0	0
Grassland	6	113	43	60
Jack pine	**5**	**4**	**9**	**3**
Lowland black spruce	**212**	**200**	**82**	**40**
Lowland coniferous deciduous mix	**0**	**0**	**0**	**7**
Lowland deciduous	**0**	**0**	**0**	**31**
Lowland deciduous shrub	112	314	127	100
Lowland evergreen shrub	0	0	0	0
Lowland northern white-cedar	**135**	**50**	**111**	**42**
Lowland shrub	0	0	0	0
Maple and basswood	**0**	**0**	**11**	**26**
Red oak	**0**	**0**	**0**	**1**
Red pine	**4**	**1**	**15**	**2**

Landcover Type[1]	Segment Option (acres)			
	C1	C2	J1	J2
Red and white pine	**0**	**0**	**1**	**1**
Sedge meadow	11	64	4	5
Stagnant black spruce	**11**	**37**	**3**	**0**
Stagnant coniferous	**0**	**0**	**1**	**0**
Stagnant northern white-cedar	**0**	**7**	**1**	**0**
Stagnant tamarack	**16**	**10**	**1**	**0**
Tamarack	**103**	**44**	**82**	**34**
Upland deciduous	**0**	**0**	**11**	**122**
Upland northern white-cedar	**2**	**0**	**4**	**2**
Upland shrub	1	27	19	24
Water	16	8	12	18
White pine mix	**1**	**0**	**5**	**2**
White spruce	**3**	**0**	**6**	**4**
Total	797	1,116	1,212	1,282

Source: Minnesota DNR Data Deli
Note:
[1] Landcover types and acres in bold are forested lands.

Soil compaction limits plant growth by inhibiting the movement of moisture, air, and nutrients within the rooting zone of plants and limiting the ability of roots to thrive. Soil compaction will occur at construction locations and along access routes within the anticipated ROW. Soil compaction will be most pronounced near structure locations, at staging areas (typically near main roads access points) and along access paths within the ROW.

Fragmentation

In general, landscapes dominated by herbaceous vegetation will have minimal change in vegetation community composition. Woody vegetation will be cleared within the 200-foot ROW, resulting in widening of existing corridors or bisecting of forests and shrublands. The ROW will be maintained as low-stature vegetation to reduce interference with the maintenance and function of the Project.

Soil desiccation and alteration of vegetation community structure will occur at the edge of newly cleared forests or shrublands. In areas where the new transmission line will be located adjacent to existing utility ROW, these effects largely will be limited to one side of the ROW and will not create newly fragmented vegetation communities. Where the ROW will be located in a new corridor (that is, greenfield), the effects of desiccation and warming, creation of potential invasive species pathways, and increased edge effects will occur. Greenfields are those areas where the anticipated ROW is not parallel with an existing road, transmission line, railroad, or pipeline. Additionally, greenfield corridors will create fragmented habitat blocks, with the most pronounced effect occurring in forested areas. Effects on habitat for wildlife are discussed in Section 6.18, Wildlife.

Table 6.4-9 shows greenfield length of the centerline of each route.

Table 6.4-9. Greenfield Landcover for Each Route Alternative

GAP Cover Types	Orange Route Greenfield		Blue Route Greenfield	
	Length (miles)	Percent (%)	Length (miles)	Percent (%)
Conifer forest	41.0	28.1	47.2	37.3
Deciduous forest	48.6	33.3	35.6	28.2
Non-forest	56.3	38.6	43.6	34.5
Greenfield total	**145.9**		**126.4**	
Total ROW	219.9	66.3	219.5	57.6

Source: Minnesota DNR 2002

The Orange Route is 66.3 percent greenfield (145.9 miles); 89.6 miles would be through forested land cover. The Blue Route is 57.6 percent greenfield (126.4 miles); 82.8 miles would be through forested land cover. Forest communities are most susceptible to the effects of fragmentation, while open communities are less susceptible to the effects of fragmentation.

Table 6.4-10. Greenfield Landcover for Segment Options

GAP Cover Types	C1 Greenfield		C2 Greenfield		J1 Greenfield		J2 Greenfield	
	Length (miles)	Percent (%)	Length (miles)	Percent (%)	Length (miles)	Percent (%)	Length (miles)	Percent (%)
Conifer-deciduous mix	-	-	-	-	-	-	0.3	0.5
Conifer forest	20.2	61.6	1.5	29.3	13.5	27.0	5.5	10.5
Deciduous forest	6.5	19.9	2.5	49.3	27.2	54.5	37.7	71.1
Non-forest	6.1	18.5	1.1	21.4	9.2	18.5	9.5	17.9
Greenfield total	**32.8**		**5.1**		**49.9**		**52.9**	
Total ROW	33.1	99.1	44.9	11.4	50.0	99.8	52.9	100.0

Source: Minnesota DNR Data Deli

Segment Option C2 has the lowest greenfield amount, with 11.4 percent of the segment (5.1 miles). All of the other Segment Options are nearly 100 percent greenfield.

Wildlife Management Areas

Vegetation communities in WMAs crossed by the Project will be affected where forested plant communities are removed for construction of the Project. Trees will be removed and the ROW will be maintained as a grassland or shrubland community. Where grassland, prairie, or shrub communities are crossed the transmission line corridor will be maintained as open community types that are kept free of trees. WMAs are not included in the Prohibited Routes provisions of Minnesota Rules 7850.4300.

WMAs will be affected where construction of a transmission line alters forested habitat. GAP Level 2 landcover for WMAs within the anticipated ROW for the Orange and Blue Routes is shown in Table 6.4-11. Forest cover types are shown in bold.

Table 6.4-11. GAP Level 2 Landcover Types within WMAs in Route Alternatives Anticipated ROW

Route	WMA	GAP Level 2 Landcover[1]	Acres
Orange Route	Red Lake WMA	Aquatic environment	90.0
		Crop and grass	7.7
		Lowland coniferous forest	**121.9**
		Lowland deciduous forest	**2.7**
		Shrubland	34.8
		Upland deciduous forest	**19.6**
		Total	276.7
	Cedar Bend WMA	Aquatic environment	16.8
		Crop and grass	4.4
		Lowland coniferous forest	**2.4**
		Shrubland	11.2
		Upland deciduous forest	**5.2**
		Total	40.0
	Roseau Lake WMA	Aquatic environment	15.1
		Crop and grass	3.5
		Shrubland	5.9
		Total	24.6
	Roseau River WMA	**Upland deciduous forest**	**0.3**
		Total	0.3
Blue Route	Carp Swamp WMA	Aquatic environments	2.9
		Crop and grass	0.3

Route	WMA	GAP Level 2 Landcover[1]	Acres
		Lowland coniferous forest	**33.3**
		Shrubland	12.2
		Total	48.7
	Cedar Bend WMA	Aquatic environments	16.8
		Crop and grass	4.4
		Lowland conifer forest	**2.4**
		Shrubland	11.2
		Upland deciduous forest	**5.2**
		Total	40.0
	Roseau Lake WMA	Aquatic Environments	15.1
		Crop/Grass	3.5
		Shrubland	5.9
		Total	24.6
	Roseau River WMA	**Upland Deciduous Forest**	**0.3**
		Total	0.3

Source: Minnesota DNR Data Deli
Note:
[1] Landcover types and acres in bold are forested lands.

Landcover of WMAs within the Orange Route includes 152.0 of forested lands. The ROW of the Blue Route includes 41.2 acres of forested lands within WMAs.

Cedar Bends and Carp Swamp WMAs are managed using controlled burns (see Appendix A, sheets 17-18). Controlled burns may not be allowed under the transmission line. Maintenance of vegetation would be accomplished using mechanical methods, rather than controlled burns.

Scientific and Natural Areas and Watershed Protection Areas

Scientific and Natural Areas are avoided by all Route Alternatives and Segment Options. WPAs for SNAs are located within the boundaries of the Route Alternatives and Segment Options and the ROW, as currently defined, will encroach on these WPAs in the Route Alternatives and Segment Option C2 as identified in Table 6.4-6.

Public Forests

Old Growth Forest: One designated area of lowland hardwood OGF is located within the southern half of the Orange Route and the Blue Route (Minnesota DNR 2010), south of the existing cleared corridor. No designated OGF is located on the northern side of the Route at this location. During a stakeholder meeting in August 2012, Minnesota DNR foresters identified areas that they consider to have high concentrations of OGFs and have indicated that these areas have been avoided by all Route Alternatives and Segment Options, as exhibited at that time. The exact locations of these concentrations have not been made available to the Project.

High Conservation Value Forests: Candidate HCVFs and other natural areas will be crossed by the Route Alternatives. Effects to the HCVF community types are dependent upon the cover type and associated management and maintenance.

Ecologically Important Lowland Conifers: EILC forests are abundant in both the Orange Route and the Blue Route. Table 6.4-13 shows EILC designated forests within anticipated ROWs.

Table 6.4-13. Designated EILC Forests in Anticipated ROW of the Route Alternatives

Cover Types	Orange Route EILC (acres)	Blue Route EILC (acres)
Black spruce – lowland	12.7	-
Tamarack	3.6	24.5
White cedar	12.1	17.8
Total	28.4	42.3

Source: Minnesota DNR Data Deli

The anticipated ROW for both the Orange Route and the Blue Route cross designated EILCs. As shown in Table 6.4-14, the Orange Route would impact 28.4 acres while the Blue Route would impact 42.3 acres.

Table 6.4-14. Designated EILC Forests in Anticipated ROW of the Segment Options[1]

GAP Cover Types	Segment Option C1 EILC Area (acres)	Segment Option C2 EILC Area (acres)	Segment Option J1 EILC Area (acres)
Black spruce – lowland	12.7	24.2	-
Tamarack	-	-	24.5
Total	12.7	24.2	24.5

Source: Minnesota DNR Data Deli
Note:
[1]Designated EILC forests are only found in the anticipated ROW of Segment Options C1, C2 and J1.

Segment Options C1, C2 and J1 would each affect EILC areas, with impacts ranging from 12.7 acres to 24.5 acres. See Table 6.4-14. Coordination with the Minnesota DNR would be required to get approval for these impacts on DNR-owned lands.

6.4.3 Mitigation

All Minnesota DNR land and water crossings will require coordination and a permit, which will include identification of and implementation of appropriate mitigation measures. The Applicant also proposes the following mitigation measures:

- → The Applicant will retain an environmental inspector (EI) during Project construction. Working on behalf of the Applicant, the EI will be responsible for understanding all of the conditions of the Project's environmental permits and to ensure that the contractors abide by these conditions.
- → All areas of ground disturbance not permanently altered will be prepared for restoration (that is, soil preparation),and reseeded with an appropriate seed mix recommended by the appropriate agency's management or according to landowner requirements (subject to other regulations and permit conditions, such as, control of noxious weeds [see Section 8.21, Noxious Weeds and Exotic Organisms]), Section 401 and Section 404 of the Clean Water Act wetlands and waters permits, or National Pollutant Discharge Elimination System (NPDES) permit required prior to construction.
- → The Applicant will continue to coordinate with Minnesota DNR to minimize and avoid impacts on plant communities on state lands through adjustments to the anticipated ROW, permit conditions, and mitigation.
- → Where forested areas are cleared, appropriate herbaceous native seed mixes from sources as close as possible to the Study Area will be used to re-vegetate, as rapidly as possible, to prevent encroachment by non-native and noxious weed species. Where possible, reliance on natural revegetation will be encouraged (particularly in wetland areas).
- → Project construction will occur in wetlands and wet soils during frozen conditions to the extent practical to minimize soil compaction. Construction mats will be used to help protect wet soils where encountered during construction. Wetland protection and mitigation is discussed in Section 6.18, Wetlands.
- → Where only portions of the HCVFs are located within the Route Alternatives, it may be possible to avoid entirely the designated HCVF by shifting the ROW within the Route Alternatives.

This page intentionally left blank

6.5 Human Settlement

This section describes population density and human settlement resources that are crossed by the Route Alternatives and Segment Options and the potential impacts of the Route Alternatives and Segment Options on those resources.

Population information was obtained from the U.S Census Bureau data. Home and non-residential structure locations were identified through field reviews, aerial image interpretation, and public comments. Geographical Information System (GIS) was used to analyze the distances of the Route Alternatives and Segment Options to homes and non-residential structures. This analysis provided the framework for determining impacts to human settlement.

6.5.1 Existing Conditions

Population densities within the Study Area vary substantially across counties, as illustrated in Figure 6.5-1. The following list describes the populations within each county in the Study Area in accordance with the most recent U.S. Census Bureau, 2008-2012 American Community Survey (U.S. Census Bureau 2012a):

- Roseau County, Minnesota: 15,665
- Lake of the Woods County, Minnesota: 4,039
- Beltrami County, Minnesota: 44,651
- Koochiching County, Minnesota: 13,293
- Itasca County, Minnesota: 45,052

Itasca and Beltrami counties have the highest population; large cities such as Bemidji and Grand Rapids and Iron Range make up the majority of the overall population. Koochiching and Roseau counties each have one larger city: International Falls and Roseau, respectively, that contribute greatly to the overall population. Lastly, Lake of the Woods County is the least populated county within the Study Area. The Route Alternatives and Segment Options avoid population centers.

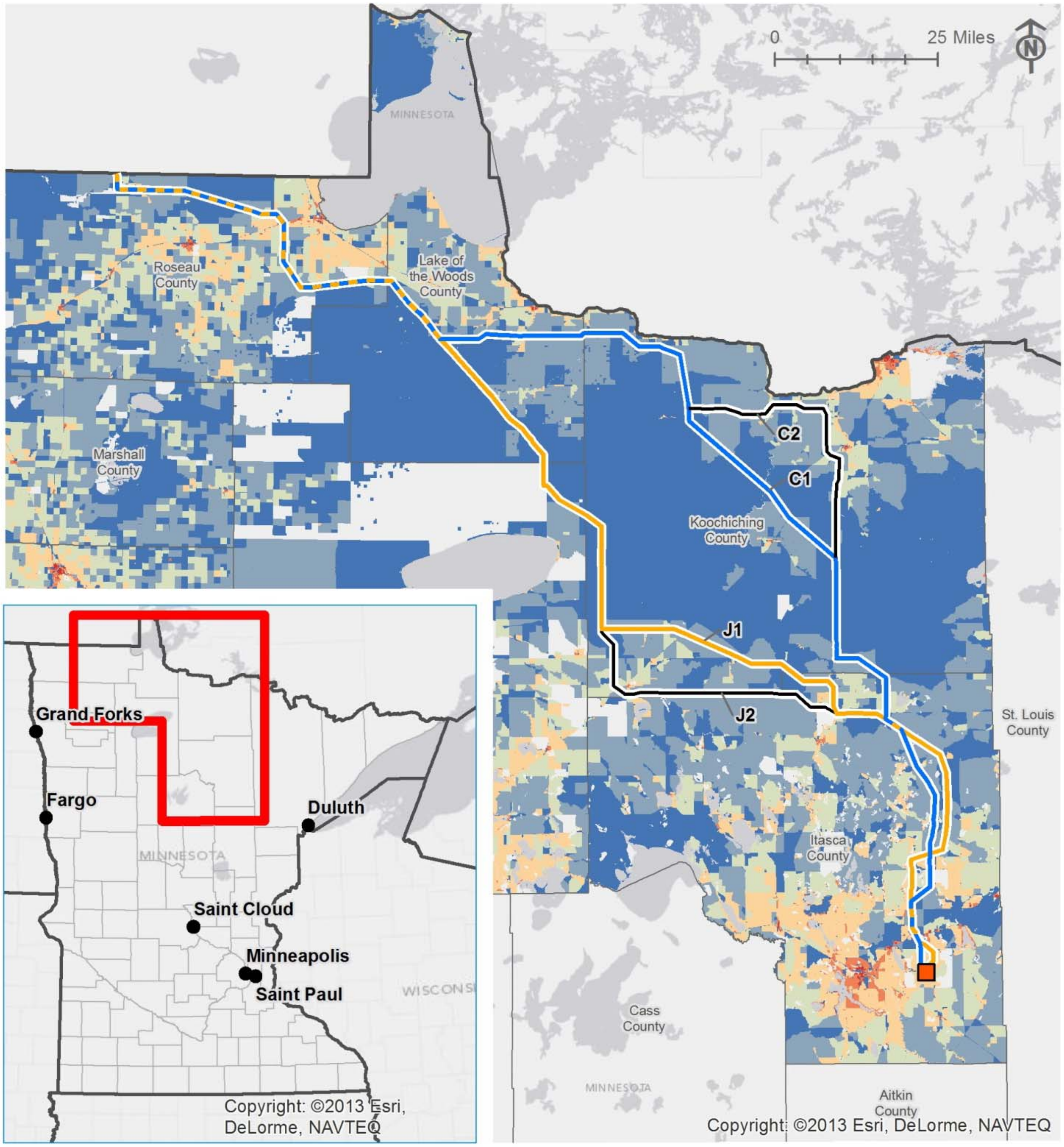
Route Alternatives

Residences in the Study Area are scattered primarily along county roadways, near lakeshore areas, and in municipal areas where residences tend to be concentrated. See Figure 6.5-2 for the locations of municipalities within the vicinity of the Project. Residences are generally located along or near Highway 11 in Roseau, Lake of the Woods, and Koochiching counties.

The Blue Route Alternative (Segment Option C1) avoids the town of Littlefork, Minnesota, and associated residences. Some residences in this area are seasonal cabins and hunting shacks. Permanent land owners in the region farm row crops, manage tree farms, or have large open lots. Route Alternatives through these three counties largely traverse wooded wetlands or forestland. The Orange Route Alternative (and Segment Option J1) through Koochiching County generally avoids municipalities (such as Kelliher and Northome, Minnesota) and also largely traverses wooded wetlands and forestland.

Population Density by Census Tract

Figure 6.5-1



Legend

- Blue Route
- Orange Route
- Segment Option
- Blackberry Substation

Persons per Square Mile

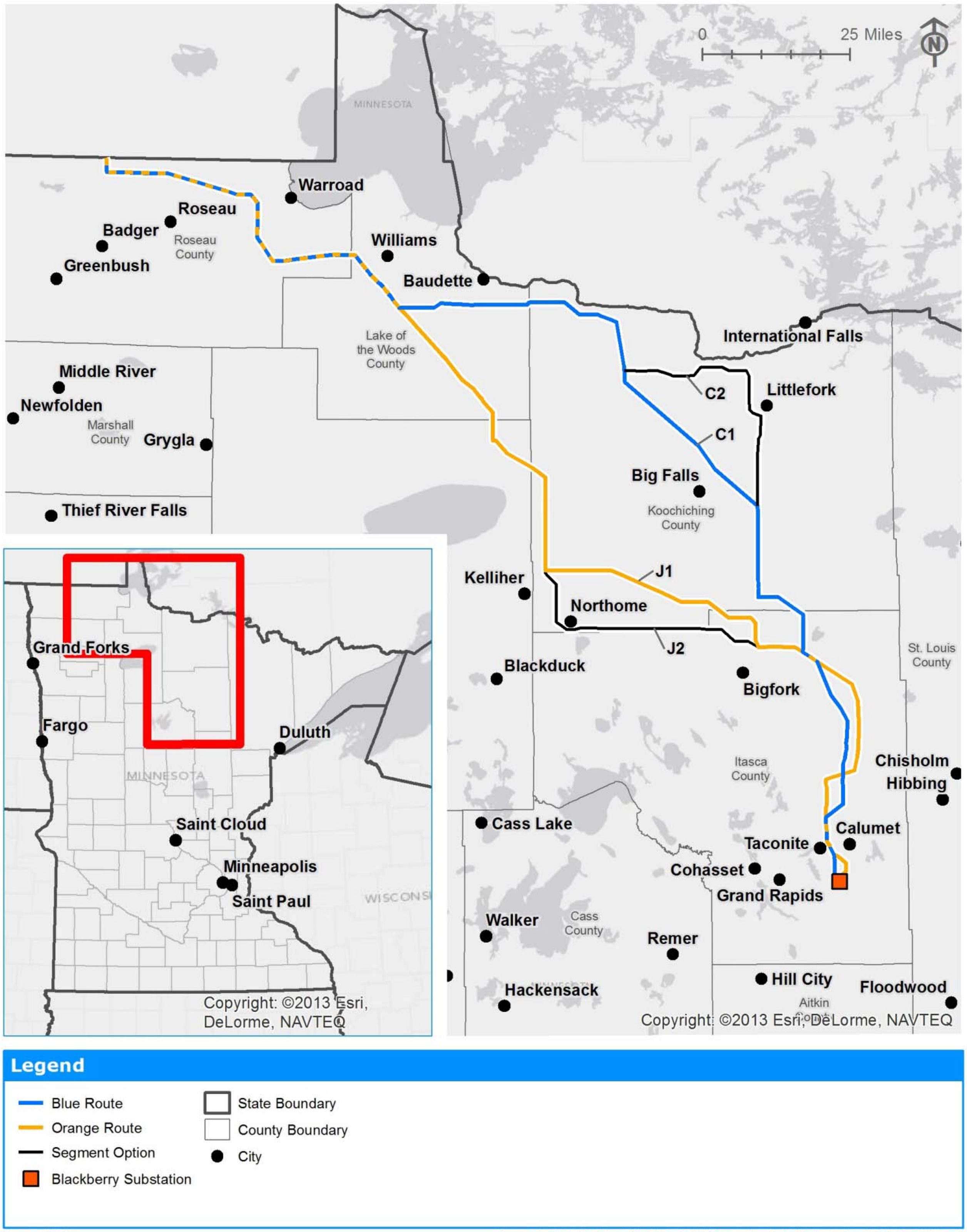
- 0
- 0.0001-4
- 4-12
- 12-127
- 127-1,862
- >1,862

- State Boundary
- County Boundary

Sources: ESRI,US CENSUS

\\mspe-gis-file\gisprojlarge\MinnPower\182035\map_docs\CLIENT\Route_Permit\0605-1_Density.mxd

Municipalities Figure 6.5-2



Sources: ESRI

\\mspe-gis-file\GISProjLarge\MinnPower\182035\map_docs\CLIENT\Route_Permit\0605-2_Munis.mxd

Residences are generally located around lakes and on county and state highways in Itasca County. Residences are dwellings or structures in which one can reside. Some of these residences are seasonal cabins. Routes through Itasca County largely traverse wooded wetlands and forestland. Small areas of pasture and hay are crossed near the Blackberry 500 kV Substation in southern Itasca County. Southern Itasca County is more densely populated, particularly near the Blackberry 500 kV Substation. Many residences are located on small lots.

Avoidance of residences was a priority when identifying viable Route Alternatives. Table 6.5-1 lists the number of residences located within the Route Alternatives. Neither of the Route Alternatives have any residences within their anticipated ROWs; the Blue Route Alternative contains one non-residential structure within the anticipated ROW. A non-residential structure is a structure in which one cannot reside (ex. barn, shed, out-building, etc).

Table 6.5-1. Existing Residences and Non-Residential Structures within the Route and Anticipated ROW

Route Alternative or Segment Option	Route		Anticipated ROW	
	Residences	Non-Residential Structures	Residences	Non-Residential Structures
Route Alternative				
Orange	64	149	0	0
Blue	49	114	0	1
Segment Options				
C1	0	0	0	0
C2	11	33	0	0
J1	0	3	0	0
J2	6	11	0	0

Source: HDR Engineering, Inc. 2013

Segment Options

None of the Segment Options contain any residences within the anticipated ROW. Segment Option C1 has fewer residences and non-residential structures within the route than Segment Option C2. Segment Option J1 has fewer residences and non-residential structures within the route than Segment Option J2.

6.5.2 Direct and Indirect Effects

The Applicant's anticipated ROW does not require any person to be permanently or temporarily displaced from their residence or business. Specifically, based on current data, no known residences are located within the anticipated ROW for either Route Alternative or for the Segment Options. Accordingly, no residences will have to be modified or otherwise directly impacted for construction of the Project.

Indirect effects on residential properties may occur and will include temporary construction related noise, potential interruptions of traffic during construction, temporary impacts on land use, and possible changes to home or property values. Construction-related effects would be temporary. By having the highest number of residences within the defined route boundaries, the Orange Route Alternative will have the greatest potential for indirect impacts.

A number of studies have been conducted to analyze the potential impact of overhead high-voltage transmission lines on residential properties. Based on these studies, the Applicant believes that transmission lines have little impact on property values and those impacts are likely to diminish over time following construction (Cowger et. al. 1996; PSC 2000; Chalmers and Voorvaart 2009; Solum 1985).

The Project will require the acquisitions of easements or property from private landowners. Minnesota Power will start acquiring easements for the ROW when a Route Alternative has been determined through state and federal regulatory processes. ROW agents will contact individual landowners along the Route Alternative to start discussing Project ROW needs. Land values will be researched and fair market value offers will be made to the landowners. The landowner will continue to own and use the land subject to the conditions of the easement.

There may be instances where property is purchased pursuant to Minnesota Statute Section 216E.12, Subdivision 4, sometimes referred to as the Buy the Farm option. Under certain circumstances defined by the statute, the property owner has the option of requiring a utility to purchase the contiguous property crossed by a ROW it acquires from the landowner at the fair market value of the land.

6.5.3 Mitigation

The Applicant proposes the following mitigation measures:

- → Property or easement acquisition will be conducted in accordance with applicable state and federal regulations.
- → During ROW acquisition, the placement of individual structures may be coordinated with property owners, to the extent practicable.
- → The construction crews will follow local, state, and federal regulations with regard to construction noise, dust, and timing.
- → The Project will be designed with local, state, and National Electrical Safety Code (NESC) standards regarding clearance to ground, clearance to crossing utilities, clearance to buildings, strength of materials, and ROW widths. Construction crews will comply with local, state, and NESC standards regarding installation of facilities and standard construction practices. Established Applicant and industry safety procedures will be followed during and after construction of the Project, including clear signage during all construction activities.
- → The transmission line will be equipped with protective devices to safeguard the public if an accident occurs, such as a structure or conductor falling to the ground. The protective devices are circuit breakers and relays located where the transmission line connects to the substation. The protective equipment is designed to de-energize the transmission line should such an event occur.

→ The substation facilities will have appropriate signage, will be fenced, and access will be limited to authorized personnel.

6.6 Land Use

This section describes the land use and land cover resources that are crossed by the Route Alternatives and Segment Options and the potential impacts of the Route Alternatives and Segment Options on those resources.

Datasets from the DNR, the U.S. Fish and Wildlife Service (USFWS), Non-governmental Organizations (NGOs), and County Tax Assessment data were used to characterize the land ownership types across the Study Area. The National Land Cover Dataset (NLCD) was used to classify the primary land cover types within the Route Alternatives and Segment Options. County Comprehensive Plans (when available) were used to describe the land use and zoning nature of each county within the Study Area.

6.6.1 Existing Conditions

Public and Private Lands

The Orange Route and the Blue Route extend through Roseau, Lake of the Woods, Beltrami (Orange Route only), Koochiching, and Itasca counties in northern Minnesota.

Both Route Alternatives cross through county, state, federal, and privately owned lands. No Route Alternatives (or Segment Options) cross the Red Lake Reservation, Boise Forte Reservation, or other tribal lands. Table 6.6-1 and Figure 6.6-1 summarize and display land ownership within each Route Alternative and Segment Option. Tables 6.6-2, 6.6-3, and 6.6-4 describe in more detail, what types of state, federal, and privately owned lands are crossed by the Route Alternatives and Segment Options. County lands are almost entirely county forest land and are not broken out into a separate table in this discussion.

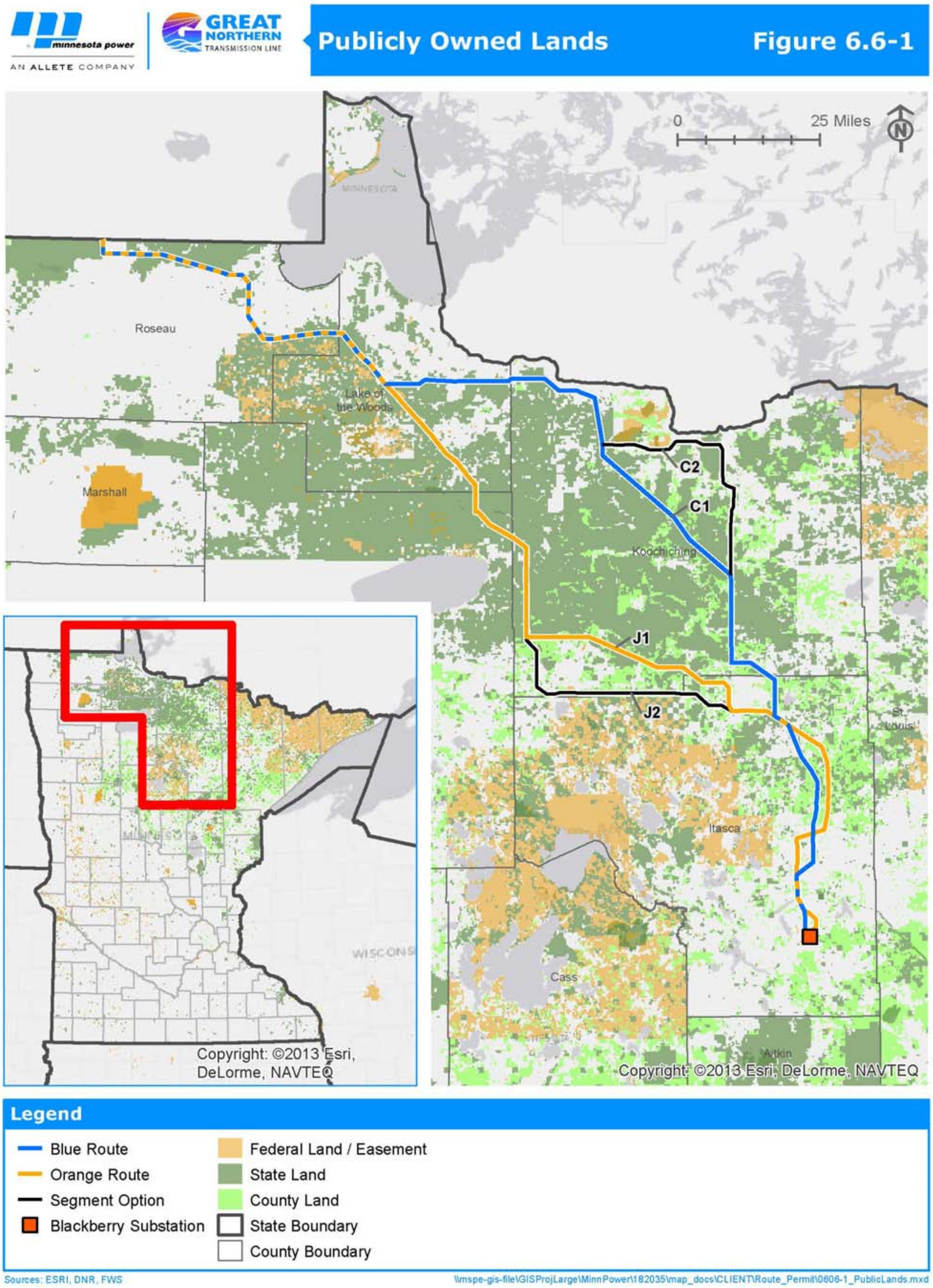
Table 6.6-1. Acreage of Privately and Publicly Owned Lands within Route Alternatives and Segment Options

Route Alternatives and Segment Options	Total Area in Route Acres	Private Land		County Land		State		Federal		Total Public Lands[1]	
		Acres	% of Total	Acres	% of Total	Acres	% of Total	Acres	% of Total	Acres	% of Total
Route Alternatives											
Orange	75,879	24,502	32	13,718	18	37,427	49	622	1	51,767	68
Blue	71,547	25,685	36	8,671	12	37,145	52	496	1	46,312	65
Segment Options											
C1	11,971	1,142	12	970	8	9,859	82	-	-	10,829	88
C2	8,672	3,453	40	1,598	18	3,623	42	1	-	5,221	60
J1	15,489	1,639	11	7,534	49	6,317	41	-	-	13,851	89
J2	16,532	3,750	23	7,898	48	4,746	29	207	<1	12,851	77

Source: Publicly available datasets from each agency/entity. Years vary.

Note:

[1] Some public lands fit into more than one category, thus causing the total public lands to be higher than actual. The Total Area in Route is correct.


minnesota power
AN ALLETE COMPANY
GREAT NORTHERN TRANSMISSION LINE
Publicly Owned Lands
Figure 6.6-1
0
25 Miles
N
MINNESOTA
Roseau
Lake of the Woods
Marshall
Koochiching
C2
C1
J1
J2
St. Louis
Itasca
Cass
Aitkin
WISCONS
Copyright: ©2013 Esri, DeLorme, NAVTEQ
Copyright: ©2013 Esri, DeLorme, NAVTEQ
Legend
Blue Route
Orange Route
Segment Option
Blackberry Substation
Federal Land / Easement
State Land
County Land
State Boundary
County Boundary
Sources: ESRI, DNR, FWS
\\mspe-gis-file\GISProjLarge\MinnPower\182035\map_docs\CLIENT\Route_Permit\0606-1_PublicLands.mxd

The Orange Route Alternative has fewer acres of privately owned lands within the route (32 percent) than the Blue Route Alternative (36 percent). Approximately 68 percent of the Orange Route Alternative and 65 percent of the Blue Route cross county, state, or federal lands. Some public lands overlap, causing a higher acreage and percentage of total public lands in Table 6.6-1.

Segment Options C1 and C2 cross county and state lands, but almost no federal land. Segment Option C1 crosses more acres of publicly owned land (88 percent) than does Segment Option C2 (60 percent).

Segment Options J1 and J2 are similar in the amount of publicly owned lands crossed; 89 percent and 77 percent, respectively.

Privately owned lands in the Study Area are classified into three different types: State Conservation Easement Land, The Nature Conservancy Land, and other privately owned land. The Minnesota Department of Natural Resources (DNR) manages privately owned land for conservation efforts; in the Project Study Area, these conservation easement lands typically are associated with forest preservation through purchase of development rights. The Nature Conservancy, a non-government organization (NGO), also manages privately owned lands for habitat restoration and conservation. Other privately owned lands are predominately farms, hunting and forest land, and homesteads. Table 6.6-2 summarizes the amount and types of privately owned land within the Route Alternatives and Segment Options.

Table 6.6-2. Breakdown of Private Lands within the Route Alternatives and Segment Options (acres)

Route Alternative or Segment Option	Total Acres of Private Land	State Conservation Easement Lands	The Nature Conservancy Lands	Other Private Lands
Route Alternative				
Orange	24,502	6,297	301	17,904
Blue	25,685	7,616	58	18,011
Segment Options				
C1	1,142	-	-	1,142
C2	3,453	-	-	3,453
J1	1,639	145	39	1,455
J2	3,750	683	91	2,976

Source: Publicly available datasets from each agency/entity. Years vary.

State forest lands are managed for general lumber production and habitat conservation by Minnesota DNR. Game refuges are managed and owned by Minnesota DNR and have certain restrictions on hunting or trapping of wildlife. Wildlife Management Areas (WMAs) are Minnesota DNR lands that are maintained and managed to provide habitat for waterfowl and other wildlife, as well as provide recreation and hunting opportunities for the public.

Table 6.6-3. Breakdown of State Lands within the Route Alternatives and Segment Options (acres)

Route Alternative or Segment Option	Total State Lands	State Forest	State Game Refuge	Wildlife Management Areas
Route Alternative				
Orange	37,427	31,698	77	5,652
Blue	37,145	35,063	77	2,005
Segment Options				
C1	9,859	9,859	-	-
C2	3,623	3,623	-	-
J1	6,317	6,317	-	-
J2	4,746	4,746	-	-

Source: DNR Data deli, 2012.

All Route Alternatives and Segment Options impact state forest lands, which are generally managed for timber production. The Blue Route Alternative crosses more acres of state forest land but fewer acres of WMA, than does the Orange Route Alternative. Total state lands crossed is similar for both Route Alternatives; both include crossing a State Game Refuge.

The Segment Options only cross state forest land. Segment Option C1 crosses almost three times as many acres of state forest land as C2. Segment Options J1 and J2 cross a similar amount of state forest lands.

Federal lands include lands owned and managed by the U.S. Fish and Wildlife Service (USFWS) for the protection and conservation of natural habitat and wetlands. Special Use Permits or other crossing permits will be required by USFWS to cross these parcels. Other federal lands include small parcels owned by the Bureau of Land Management (BLM) or the U.S. Forest Service (USFS).

Table 6.6-4. Breakdown of Federal Lands within the Route Alternatives and Segment Options (acres)

Route Alternative or Segment Option	Total Federal Lands	USFWS Lands	Other Federal Lands
Route Alternative			
Orange	622	556	66
Blue	496	471	25
Segment Options			
C1	-	-	-
C2	1	-	1
J1	-	-	-
J2	207	-	207

Source: Publicly available and requested datasets from USFWS, 2014 & DNR Data deli, 2012.

In total, few acres of federal land are crossed by the Route Alternatives and Segment Options. The Orange Route Alternative includes more acres of total federal lands (that is, 622 acres) than does the Blue Route Alternative (that is, 496 acres).

Segment Option C2 crosses less than 1 acre of federal lands.

Segment Option J1 does not cross any federal lands; whereas Segment Option J2 crosses 207 acres of federal lands.

Land Cover

The National Land Cover Dataset (NLCD) was used to classify the primary land cover types within the Route Alternatives and Segment Options (see Table 6.6-5, Table 6.6-6, and Figure 6.6-2). NLCD shows that the land cover types within the Orange Route Alternative and the Blue Route Alternative are primarily wooded wetlands (37,275 acres and 38,842 acres, respectively) and deciduous forest land (12,394 acres and 8,731 acres, respectively). Emergent herbaceous wetlands are the third most common land cover type for both Route Alternatives, with 6,114 acres and 6,250 acres.

Table 6.6-5. Land Cover Types within the Route Alternatives

Land Cover Types	Orange Route		Blue Route	
	Acres	Percentage	Acres	Percentage
Commercial, industrial, and transportation	149	0.1	211	0.3
Deciduous forest	12,394	16.3	8,731	12.2
Emergent herbaceous wetland	6,114	8.1	6,250	8.7
Evergreen forest	3,614	4.8	3,060	4.3
High intensity residential	-	-	-	-
Low intensity residential	1	-	1	-
Mixed forest	3,946	5.0	3,237	4.5
Open water	316	0.4	406	0.6
Pasture and hay	2,827	3.7	2,250	3.1
Quarries, strip mines, and gravel pits	6	-	6	-
Row crops	4,009	5.0	4,237	5.9
Shrubland	3,015	4.0	2,279	3.2
Small grains	1,054	1.4	1,075	1.5
Transitional	1,150	1.5	957	1.3
Urban and recreational grasses	9	-	5	-
Woody wetlands	37,275	49.1	38,842	54.3

Source: National Land Cover Dataset (NLCD) 2000

Table 6.6-6. Land Cover Types within the Segment Options

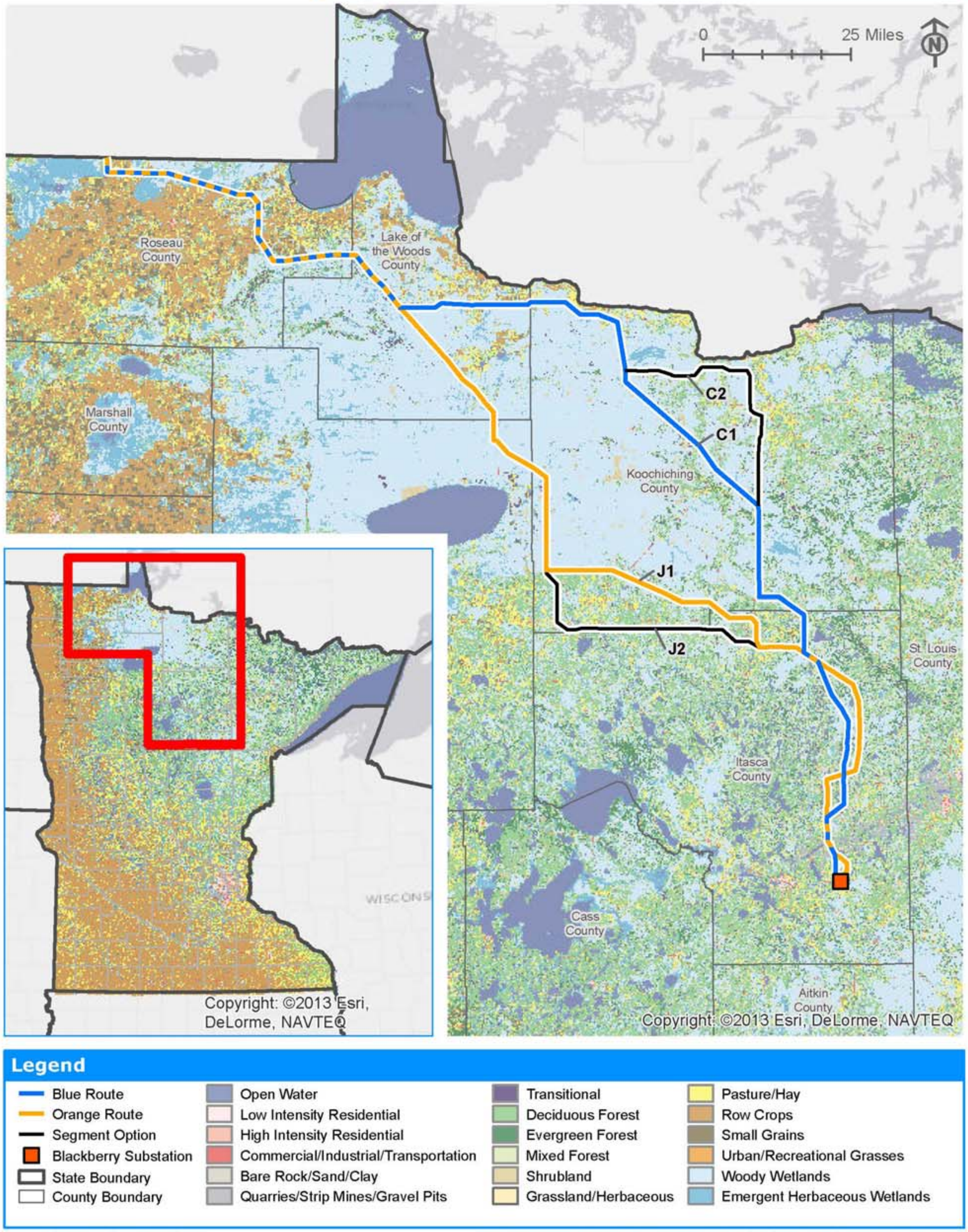
Land Cover Types	C1		C2		J1		J2	
	Acres	%	Acres	%	Acres	%	Acres	%
Commercial, industrial, and transportation	37	0.3	70	0.8	54	0.3	58	0.3
Deciduous forest	451	3.8	1,169	13.5	3,982	25.7	7,464	45.1
Emergent herbaceous wetland	144	1.2	410	4.7	490	3.2	714	4.3
Evergreen forest	348	2.9	163	1.9	1,107	7.1	353	2.1
Mixed forest	400	3.3	347	4.0	1,252	8.1	1,090	6.6
Open water	37	0.3	67	0.8	53	0.3	172	1.0
Pasture, and hay	5	0.1	363	4.2	472	3.0	739	4.5
Row crops	1	-	133	1.5	128	0.8	79	0.5
Shrubland	301	2.5	93	1.1	908	5.9	717	4.3
Small grains	-	-	-	-	1	-	-	-
Transitional	215	1.8	134	1.5	200	1.3	254	1.5
Urban and recreational grasses	-	-	-	-	3	-	1	-
Woody wetlands	10,032	83.8	5,724	66.0	6,840	44.1	4,893	29.6

Source: National Land Cover Dataset (NLCD) 2000

minnesota power
AN ALLETE COMPANY
GREAT NORTHERN TRANSMISSION LINE

Land Cover

Figure 6.6-2



Zoning and Use

Zoning is used on the local level to regulate permitted land uses in the State of Minnesota. This Project is considered a Large Energy Facility under Minnesota Statute 216B.2421 and requires a Certificate of Need and a Route Permit from the Minnesota Public Utilities Commission (PUC). Minnesota Statute 216E.10 indicates that a Route Permit issued for high-voltage transmission line purposes,

> "…shall be the sole site or route approval required to be obtained by the utility. Such permit shall supersede and preempt all zoning, building, or land use rules, regulations, ordinances promulgated by regional, county, local and special purpose government."

Roseau County does not have zoning regulations or a comprehensive land use plan.

The Lake of the Woods County 2000 Comprehensive Plan (Lake of the Woods County 2000) indicates that the county encompasses approximately 1,138,040 acres (that is, 1,778 square miles), which largely are covered with forest and wetlands. Nearly 76 percent of land in the county is classified as wetland (Lake of the Woods County 2000); more than 32 percent of land in the county is classified as forest cover. More than 75 percent of the county is under public or tribal ownership (Lake of the Woods County 2000). Timber sales and tourism are important economic factors. Conclusions of *The Lake of the Woods County 2000 Comprehensive Plan* include:

→ There likely will be a net decrease in farm land acreage.
→ Continued strong demand for wood as well as the revenues from Minnesota DNR from stumpage sales suggests that it is in Lake of the Woods County's best interest to maintain its present level of forested land.
→ There is ample land to accommodate permanent and seasonal home development and growth.

Beltrami County has small areas of residential and commercial development, largely centered around populated areas. A majority of the county is publicly owned and is more than 50 percent covered in wetlands (Beltrami County 2002). The Orange Route Alternative crosses through almost entirely open space (privately owned forested lands, wetlands, agricultural property, pasture, road right-of-way [ROW] and unutilized property) as designated in the *Beltrami County 2002 Comprehensive Plan* (Beltrami County 2002).

The land use goals outlined in the *Beltrami County 2002 Comprehensive Plan* include protecting the high-quality natural environment and maintaining the strong rural character of the county (Beltrami County 2002). Future land use maps included in the *Beltrami County 2002 Comprehensive Plan* indicate the area crossed by the Orange Route Alternative will be predominately (and currently is) for public use (Beltrami County 2002).

The *Koochiching County Comprehensive Plan* land use map indicates the Study Area crosses through areas currently zoned for forestry, agricultural land, and open space. Approximately 73 percent (that is, 1.5 millions acres) of the county's land is owned by county, state, federal, or tribal entities. Land classified as open space accounts for approximately 84 percent of the county of which, 74 percent is wetland. Future land uses are hindered by the lack of developable land within the county as much of it is wetland (Arrowhead Regional Development Commission 2001).

The *Itasca County Comprehensive Land Use Plan* outlines a framework to guide land use activities through 2020. The goals outlined in the *Itasca County Comprehensive Land Use Plan* center around stewardship for natural, cultural, and human resources (Itasca County 2013). Natural resource goals include maintaining high water quality and encouraging private land owners to conserve and protect environmentally sensitive areas. The *Itasca County Comprehensive Land Use Plan* specifically addresses minimizing visual impacts of transmission lines along scenic roadways (Itasca County 2013). Itasca County developed planning regions where the goals outlined in the *Itasca County Comprehensive Land Use Plan* are most relevant. The two major planning regions include the Iron Range area and a broad area that encompasses the dense lake region, centered around Scenic Highway 38. The Route Alternatives are located outside of the dense lake region planning area, but will cross through the Iron Range planning area. Existing utility corridors, where possible, will be followed to minimize visual impacts on the Iron Range area.

More information on land use can be found as follows: Agricultural Production is discussed in more detail in Section 6.23. Public lands are shown in Figure 6.6-1. Locations of residences and other human settlements are described in Section 6.25. Forestry is discussed in more detail in Section 6.25 and shown in Figure 6.6-2. Recreation is discussed in more detail in Section 6.22.

6.6.2 Direct and Indirect Effects

The Applicant has tried to minimize potential impacts by avoiding urban and residential areas and by paralleling the Route Alternatives along existing transmission lines and roadways where possible.

Public and Private Lands

Tables 6.6-7 and 6.6-8 describe the total acreage of each land ownership type within the anticipated ROW of the Route Alternatives and Segment Options. The total acreage describes how much of a certain land ownership type will be required for the anticipated ROW. Both tables (6.6-7 and 6.6-8) also include permanent and temporary impact estimates based on structure placements, temporary construction access road ROW requirements, and temporary construction areas required for the installation of each structure. The land converted for the placement of structures (that is, permanent impact) will still be owned by the corresponding entity.

Table 6.6-7. Impacts on Publicly and Privately Owned Lands within the Route Alternatives Anticipated ROW (acres)

Ownership[1]		Orange Route			Blue Route		
		Total Acres within ROW	Permanent	Temporary	Total Acres within ROW	Permanent	Temporary
Private	State Conservation Lands	397	4	77	531	5	101
	The Nature Conservancy Lands	15	< 1	3	8	< 1	1
	Other privately owned lands	1,101	11	210	1,241	12	240
County	All county lands	935	9	184	542	6	117
State	State forest	2,517	25	492	2,881	28	556
	Wildlife Management Areas	342	3	65	114	1	22
Federal	USFWS land	39	< 1	7	32	< 1	7
	Other federal land	3	< 1	< 1	-	< 1	< 1

Source: Publicly available datasets from each agency and entity. Years vary.
Note
[1] Game refuges are not included in this impacts table as no Route Alternative or Segment Option ROW crosses a game refuge; thus, no impacts are expected.

Table 6.6-8. Impacts on Publicly and Privately Owned Lands within the Segment Options Anticipated ROW (acres)

Ownership[1]		C1			C2			J1			J2		
		Total Acres in ROW	Perm	Temp	Total Acres in ROW	Perm	Temp	Total Acres in ROW	Perm	Temp	Total Acres in ROW	Perm	Temp
Private	State conservation lands	-	-	-	-	-	-	13	< 1	4	46	< 1	10
	The Nature Conservancy lands	-	-	-	-	-	-	12	< 1	2	16	< 1	4
	Other privately owned lands	66	< 1	13	481	5	93	137	1	23	263	3	51

Ownership[1]		C1			C2			J1			J2		
		Total Acres in ROW	Perm	Temp	Total Acres in ROW	Perm	Temp	Total Acres in ROW	Perm	Temp	Total Acres in ROW	Perm	Temp
County	All county lands	71	< 1	14	224	2	43	563	6	113	569	6	113
State	State forest	661	6	128	410	4	80	489	5	99	378	4	74
Federal	Other federal land	-	-	-	-	-	-	-	-	-	14	< 1	5

Source: Publicly available datasets from each agency and entity. Years vary.
[1] Game refuges, WMAs, and USFWS Lands are not included in this impacts table as no Route Alternative or Segment Option ROW crosses a game refuge; thus, no impacts are expected.

As shown in Table 6.6-7, the greatest permanent impacts for structures will occur on state forest land; additionally the 200-foot ROW of these forest-covered land types will be cleared of trees for the operation, construction, and maintenance of the Project. For the Orange Route, approximately 11 acres of permanent impact would occur on 'other privately owned lands;' 9 acres would occur in County Land; 4 acres would occur on State Conservation Lands; and 3 acres would occur in WMAs. The Blue Route will impact approximately 12 acres of 'other privately owned lands;' 6 acres of County Land; and 5 acres of State Conservation Lands. Approximately 1 acre would be permanently impacted in WMAs. Table 6.6-8 summarizes impacts for the Segment Options.

<u>Land Cover</u>

Table 6.6-9 provides a summary of the size of potential temporary and permanent land cover impacts for the anticipated ROW within each Route Alternative.

Less than 1 acre of all of the following land use categories will be affected based on the anticipated ROW, and therefore are not included in this table: Emergent herbaceous wetland; high and low intensity residential; open water; quarries, strip mines, and gravel pits; and urban and recreational grasses.

Table 6.6-9. Land Cover Impacts[1] within the Route Alternatives Anticipated ROW (acres)

Land Cover Types	Orange Route	Blue Route
	Permanent Impacts	Permanent Impacts
Commercial/industrial/transportation	-	1
Deciduous forest	777	565
Evergreen forest	220	202
Mixed forest	255	221
Pasture/Hay	1	1
Row Crops	2	3
Shrubland	2	2
Small Grains	1	1
Transitional	1	-
Woody wetlands	2,858	2,912
TOTAL[2]	4,118 acres	3,908 acres

Source: National Land Cover Database (NLCD) 2000
Note:
1 For this section ,permanent impacts to forested land cover types includes the entire ROW; permanent impacts to other land cover types is for structure locations. More detailed information on conversion of forestland can be found in Section 6.25.
[2]Total does not include the permanent impacts from land cover types with impacts of less than 1 acre.

Permanent and temporary impacts on land cover will vary depending on the type. In general, permanent impacts on commercial, industrial, and transportation; emergent herbaceous wetland; high and low intensity residential; pasture and hay; quarries, strip mines, and gravel pits; row crops; shrubland; small grains; transitional; and urban and recreational grasses would occur where a structure is installed. With the exception of row crops and shrubland, each of these land cover types would have a permanent impact of one acre or less. There would be no permanent impacts on transportation corridors or open water areas as these areas would be spanned by the transmission line.

Permanent impacts on forest lands and woody wetlands would total the entire ROW that crosses these land cover types. Typically, tall trees and most woody vegetation will be removed from the ROW for construction and operation of the Project. The Applicant will remove those trees that are required by North American Electric Reliability Corporation (NERC) standards and for the safe operation of the Project. Low growing vegetation will remain under the transmission line following construction and once the construction area is restored. The Orange Route Alternative and the Blue Route Alternative impact similar acres of forest lands and woody wetlands.

Total permanent impacts on non-forested land cover types within the anticipated ROW of the Route Alternatives will be approximately 7 acres, each.

Temporary impacts on commercial, industrial, and transportation; emergent herbaceous wetland; high and low intensity residential; pasture and hay; quarries, strip mines, and gravel pits; row crops; shrubland; small grains; transitional; and urban and recreational grasses are based on the temporary construction disturbance of approximately 0.52 acre per structure and the assumption of a 16-foot-wide temporary access road for the length of the ROW through those land types. A span distance of 1,000 feet conservatively was estimated for this calculation. Table 6.6-10 describes the temporary impacts on the aforementioned land use types.

Table 6.6-10. Temporary Land Cover Impacts within the Route Alternatives Anticipated ROW (acres)

Land Cover Type[1]	Orange Route	Blue Route
	Temporary Impacts	Temporary Impacts
Commercial, industrial, and transportation	1	10
Emergent herbaceous wetland	88	124
Pasture and hay	27	26
Row crops	40	52
Shrubland	38	32
Small grains	12	12
Transitional	22	9
TOTAL	229 acres	264 acres

Source: National Land Cover Database (NLCD) 2000

Note

[1]Land cover types with temporary impacts of less than 1 acre are not included in this table, with the exception of all forest land types and woody wetlands. Open Water was not included as no temporary impacts will occur as these areas will be spanned.

The largest temporary impact within the Orange and Blue Route Alternatives will be to emergent herbaceous wetlands, with 88 acres and 124 acres, respectively. Overall, the Orange Route Alternative will temporarily impact approximately 229 acres, whereas the Blue Route Alternative will impact approximately 264 acres. Forest lands and woody wetlands are not included in Table 6.6-10, because the entire ROW that cross these land cover types will be permanently impacted.

Segment Options

Table 6.6-11 provides a summary of the potential temporary and permanent land use impacts for the anticipated ROW within each Segment Option. Less than 1 acre of the following land use categories would be affected if the ROW analyzed here is selected, and therefore are not included in this table: high and low intensity residential; quarries, strip mines, and gravel pits; small grains; and urban and recreational grasses.

Table 6.6-11. Land Cover Impacts within Anticipated ROW for the Segment Option (acres)

Land Cover Types	C1		C2		J1		J2	
	Perma-nent	Temporary	Perma-nent	Temporary	Perma-nent	Temporary	Perma-nent	Temporary
Commercial/ industrial/ transportation	-	-	-	4	-	-	-	1
Deciduous forest	24	-	123	-	323	-	577	-
Emergent herbaceous wetland	-	2	-	14	-	7	-	9
Evergreen forest	20	-	19	-	70	-	31	-
Mixed forest	27	-	40	-	120	-	109	-
Pasture and hay	-	-	-	7	-	8	1	13
Row crops	-	-	-	3	-	1	-	1
Shrubland	<1	4	-	4	1	11	1	11
Transitional	<1	2	-	4	-	5	-	4
Woody wetlands	680	-	742	-	525	-	361	-
TOTAL	752	8	924	36	1,039	32	1,080	39

Source: National Land Cover Database (NLCD) 2000

Segment Options C1 and C2 have the highest permanent impacts on woody wetlands of any of the Segment Options, but have fewer permanent impacts on deciduous, evergreen, and mixed forest lands.

Substation

Temporary and permanent impacts at the Blackberry 500 kV Substation and 500 kV Series Compensation Station sites will vary depending on the final location the facilities. In order to develop a meaningful estimate of the direct and indirect effects of the Project's Substation and Series Compensation Facilities, the Applicants developed an anticipated substation arrangement and location on the property adjacent to and east of the existing Blackberry Substation. This anticipated arrangement included the Project's 500 kV and 230 kV equipment as well as the 500 kV Series Compensation Station required for the Project. The Blackberry 500kV Substation does not include the re-location of other existing transmission lines which may be necessary during construction.

Temporary impacts on the area would be associated with construction of the new facilities. Based on the anticipated arrangement and location, the Substation will permanently impact approximately 8 acres of deciduous forest; 6 acres of woody wetlands; 4 acres of transitional lands; 3 acres of shrubland; one acre each of mixed forest and pasture/hay; and less than one acre each for emergent herbaceous wetland, evergreen forest, and row crops.

Zoning and Use

This Project is not regulated by local zoning ordinances and land use policies (Minnesota Statutes Section 216E.10, subdivision 1).

As shown in the tables above, the greatest permanent impacts will occur in forest lands and woody wetlands (generally located on public lands). Minimal temporary impacts will occur in agricultural and development areas (generally located on privately owned lands).

Private landowners would experience temporary and permanent loss of land use within the anticipated ROW acquired for the Project. The landowner will still own the property, but certain activities and uses will be limited. Additional information on ROW acquisition can be found in Section 6.5, Human Settlement.

6.6.3 Mitigation

The Applicant proposes the following mitigation measures:

→ The Applicant will work with Minnesota DNR to minimize impacts on sensitive forested areas within the state forests. Areas disturbed in state forest land would be reseeded with a seed mix recommended by the appropriate agency's management.
→ The minimum area necessary will be used for access roads.
→ Spans will be adjusted such that structures, where practicable, will avoid open water and transportation corridors. Likewise, construction and maintenance access roads will be located to avoid or minimize impacts on these areas as well.
→ Construction activities will be limited to the ROW, unless access permission is obtained from landowners.
→ Fences, gates, and similar improvements that are removed or damaged would be repaired or replaced.
→ Mitigation of potential impacts at the Blackberry 500 kV Substation will focus on selecting the appropriate location for constructing the required facilities within the site.

6.7 Environmental Justice

An environmental justice analysis considers disproportionate adverse environmental and human health impacts on minority and low income populations. Environmental justice analysis is required by federal Executive Order, but is not relevant to the state routing process.

U.S. Census Bureau data was used to analyze Environmental Justice. The analysis involves comparing the impacts and environmental justice populations in the area actually affected by a project, to the regional area in which the affected area is located. The larger regional area, including the affected area, is called the region of comparison (ROC). For the purpose of this analysis, the ROC is the five-county area made up of Roseau, Lake of the Woods, Beltrami, Koochiching, and Itasca counties. The affected area, referred to in this analysis as the Study Area, contains 12 census tract groups within the ROC that will be impacted by the Route Alternatives.

The existing conditions section of this analysis describes the existing conditions in the ROC and Study Area. The direct and indirect effects discussion describes how and if minority and low income populations will be impacted by the Route Alternatives.

6.7.1 Existing Conditions

Minority Populations

Minority populations are made up of federally designated groups of persons including Black or African American, American Indian and Alaska Native, and other races; which, in this analysis, include Asian, Pacific Islander, and 'Some Other Race' as defined by the U.S. Census Bureau. Hispanic and Latino are also considered. Hispanic and Latino is an ethnic classification rather than a racial one in the U.S. Census and is treated as such in this document.

Region of Comparison

Table 6.7-1 shows minority population composition within the state and the ROC. The total population of the State of Minnesota is approximately 5,379,139 persons (U.S. Census Bureau 2102a). Overall, 15 percent of the state is made up of federally designated minorities. The total population of the ROC is 122,701 persons. At 2.3 percent of the total of the population of the state, the ROC makes up only a small percentage of the state's total population.

Within the ROC, Itasca County, with a population of approximately 45,052 persons (6.6 percent minority), and Beltrami County, with a population of approximately 44,652 persons (25.6 percent minority), are the two counties with the highest overall population. The remainder of the ROC is made up of Roseau County, population 15,665 (5.6 percent minority); Koochiching County, population 13,293 (5.6 percent minority); and Lake of the Woods County, population 4,039 (4.5 percent minority). In total, minorities make up approximately 13.2 percent of the ROC (U.S. Census Bureau 2102a).

At 25.6 percent, Beltrami County has the highest percentage of minorities within the ROC compared to 15 percent in the state overall. American Indians make up 22.1 percent of this population, compared to only 1.9 percent in the state. Beltrami County is the only county within the ROC that has a relatively high percentage of minorities (U.S. Census Bureau 2102a). The high American Indian population would be expected, due to the location of the Red Lake Reservation and other nearby tribal parcels.

Table 6.7-1. Minority Population Composition of ROC

Location	Criteria	Total	White	Black or African American	American Indian and Alaska Native	Asian/ Native Hawaiian & Pacific Islander/ Other	Total and Percent Minority	Hispanic or Latino
State of Minnesota	Number of People	5,379,139	4,721,186	346,566	101,612	356,088	804,266	264,025
	Percent	-	87.8%	6.4%	1.9%	6.6%	15%	4.9%
ROC	Number of People	122,701	109,707	1,265	12,988	1,967	16,220	1,403
	Percent	-	89.4%	1.0%	10.6%	1.6%	13.2%	1.1%
Roseau County	Number of People	15,665	15,017	84	297	495	876	120
	Percent	-	95.9%	0.5%	1.9%	3.2%	5.6%	0.8%
Lake of the Woods County	Number of People	4,039	3,919	62	64	57	183	0
	Percent	-	97.0%	1.5%	1.6%	1.4%	4.5%	0%
Beltrami County	Number of People	44,652	34,948	753	9,887	785	11,425	708
	Percent	-	78.3%	1.7%	22.1%	1.8%	25.6%	1.6%
Koochiching County	Number of People	13,293	12,735	72	550	134	756	144
	Percent	-	95.8%	0.5%	4.1%	1.0%	5.6%	1.1%
Itasca County	Number of People	45,052	43,088	294	2,190	496	2,980	431
	Percent	-	95.6%	0.7%	4.9%	1.1%	6.6%	1.0%

Source: U.S. Census Bureau, 2008-2012 American Community Survey

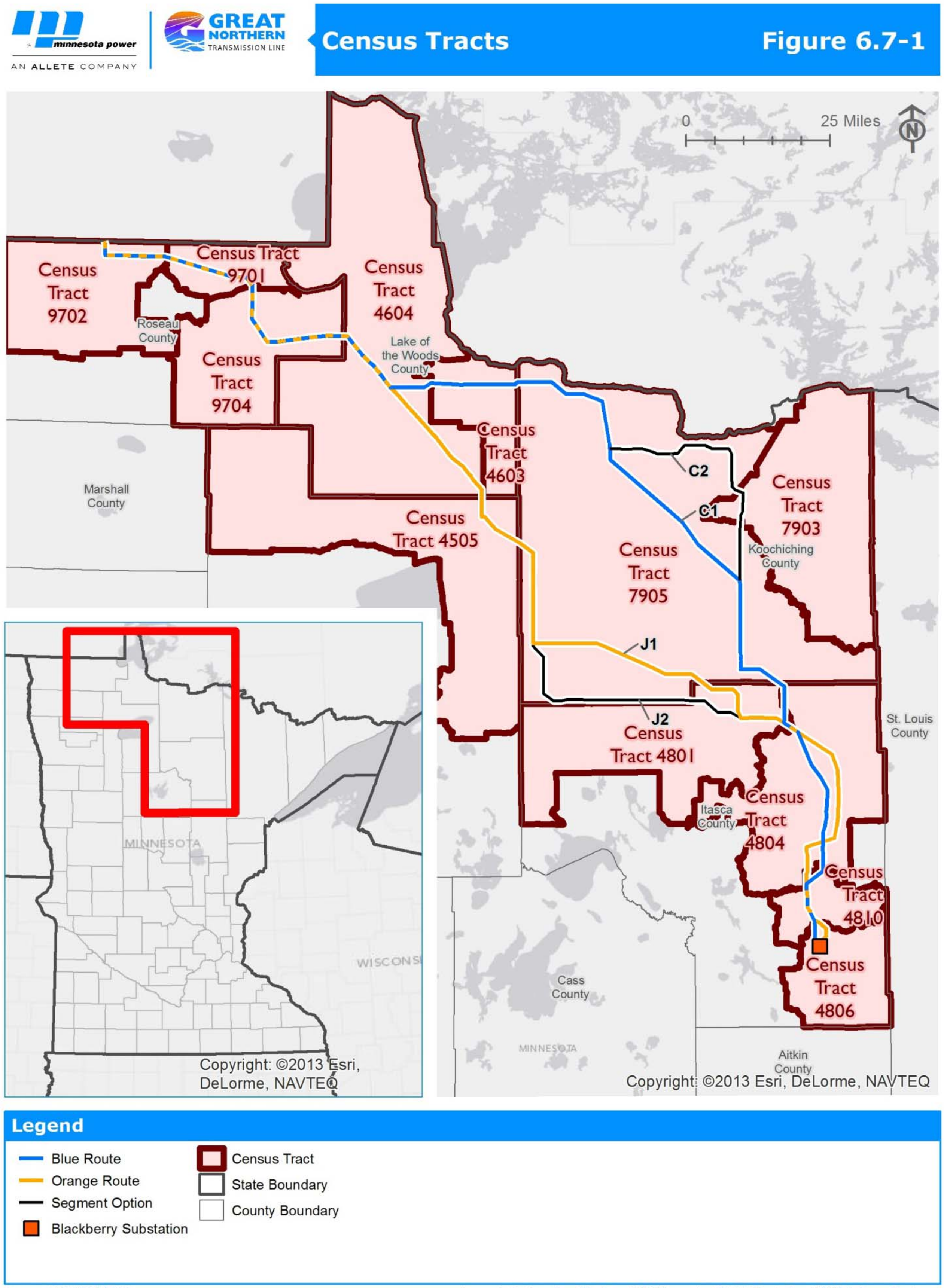
Study Area

For purposes of this analysis, the Study Area encompasses the 12 census tract groups that are intersected by the Route Alternatives for the Project. These areas are shown in Figure 6.7-1. Table 6.7-2 provides a summary of minority populations in the census tracts within the Study Area.

In total, the largest minority group in the Study Area is American Indian/Native Alaskan at 2.5 percent. Asian/Native Hawaiian & Pacific Islander/Other are the second largest minority group at 1.5 percent. Black or African American persons make up 0.5 percent of the Study Area and Hispanic and Latino persons make up 0.6 percent of the Study Area. The average number of minority persons in the Study Area is approximately 4.5 percent, which is lower than the ROC (13.2 percent) and the state (15 percent) (U.S. Census Bureau 2102a).

At 13.0 percent, census tract 9701 in northeast Roseau County has the highest number of minority persons in the Study Area. This census tract is located near the communities of Roseau and Warroad, Minnesota. At 1.6 percent, the census tract 4505 in Beltrami County has the fewest number of minority persons in the Study Area (28 persons or 1.6 percent of the census tract). All other census tracts have between approximately 2 and 8 percent total minority persons (U.S. Census Bureau 2102a).

Census Tracts Figure 6.7-1



Sources: ESRI,US CENSUS

\\mspe-gis-file\gisprojlarge\MinnPower\182035\map_docs\CLIENT\Route_Permit\0607-1_CensusTracts.mxd

Table 6.7-2. Minority Population Composition of Study Area

Area	Census Tract	Race											Ethnicity	
		Number of People	White	%	Black or African American	%	American Indian/ Native Alaskan	%	Asian/ Native Hawaiian & Pacific Island/ Other	%	Total Minority	%	Hispanic or Latino	%
State of Minnesota		5,379,139	4,721,186	87.8	346,566	6.4	101,612	1.9	356,088	6.6	804,266	15	264.025	4.9
ROC		122,647	109,707	89.4	1,265	1.0	12,988	10.6	1,967	1.6	16,220	13.2	1,403	1.1
Study Area														
Roseau	9701	4,249	3764	88.6	10	0.2	193	4.5	348	8.2	551	13.0	0	0
	9702	2,153	2,148	99.8	14	0.7	29	1.3	6	0.3	49	2.3	16	0.7
	9704	3,596	3,576	99.4	13	0.4	30	0.8	19	0.5	62	1.7	32	0.9
Lake of the Woods	4603	1,628	1,552	95.3	30	1.8	54	3.3	28	1.7	112	6.9	0	0
	4604	2,411	2,367	98.2	32	1.3	10	0.4	29	1.2	71	2.9	0	0
Beltrami	4505	1,714	1.694	98.8	2	0.1	20	1.2	6	0.4	28	1.6	0	0
Koochiching	7903	3,070	2,976	96.9	9	0.3	88	2.9	19	0.6	116	3.8	0	0
	7905	2,356	2,260	95.9	7	0.3	109	4.6	7	0.3	123	5.2	18	0.8
Itasca	4801	2,541	2,469	97.2	8	0.3	59	2.3	26	1	93	3.7	34	1.3
	4804	3,564	3,464	97.2	10	0.3	72	2	52	1.5	134	3.8	46	1.3
	4806	2,569	2,554	99.4	10	0.4	32	1.2	5	0.2	47	1.8	0	0
	4810	5,861	5,685	97	18	0.3	294	5	131	2.2	443	7.6	130	2.2
Study Area Average		**2,976**	**2,734.7**	**97.0**	**13.6**	**0.5**	**82.5**	**2.5**	**56.3**	**1.5**	**152.4**	**4.5**	**23**	**0.6**

Source: U.S. Census, American Community Survey 5 year Estimates 2008-2012.

Poverty Level

Table 6.7-3 shows the poverty levels based on the U.S. Census 2012 American Community Survey. On average, approximately 11.8 percent of the Study Area is comprised of individuals below the poverty level. This is lower than the 14.7 percent average poverty level in the five-county ROC and slightly higher than the 11.4 percent poverty level in the state (U.S. Census Bureau 2102b).

At 22.8 percent, Lake of the Woods County census tract 4604 has the highest number of individuals below the poverty level. Koochiching County census tract 7903 has the lowest number of individuals below the poverty level, at 4.6 percent. The remaining census tracts range between 7 and 18 percent below the poverty level (U.S. Census Bureau 2102b).

Table 6.7-3. Poverty Level of Study Area

Area	Percent Below Poverty Level	Census Tract	Percent Below Poverty Level
State of Minnesota	11.4	-	-
ROC Average	14.7	-	-
Study Area			
Roseau County	10.4	9701	9.9
		9702	7.1
		9704	10.5
Lake of the Woods County	17.7	4603	10.0
		4604	22.8
Beltrami	20.7	4505	18.2
Koochiching County	12.0	7903	4.6
		7905	13.9
Itasca County	12.5	4801	15.2
		4804	8.9
		4806	8.5
		4810	11.7
Study Area Average			**11.8**

Source: U.S. Census, 2012 American Community Survey 1-Year Estimates.

Income

Table 6.7-4 shows median income based on U.S. Census, 2008–2012 American Community Survey 5-Year Estimates. At $58,906, the median household income was higher for the state than the ROC, which has a median income of $44,597, and also higher than in the Study Area, which has a median income of $46,962. Koochiching County census tract 7905 and Beltrami County census tract 4505 have the lowest median household incomes at $39,417 and $37,628, respectively (U.S. Census Bureau 2102b).

Table 6.7-4. Median Income of Study Area

Area	Median Income	Census Tract	Median Income
State of Minnesota	$58,906	-	-
ROC Average[1]	$44,597	-	-
Study Area			
Roseau County	$50,620	9701	$50,444
		9702	$54,113
		9704	$50,948
Lake of the Woods County	$41,979	4603	$45,326
		4604	$41,387
Beltrami County	$44,038	4505	$39,628
Koochiching County	$40,167	7903	$61,512
		7905	$39,417
Itasca County	$46,180	4801	$40,114
		4804	$52,052
		4806	$46,172
		4810	$42,426
Study Area Average[2]			**$46,962**

Source: US Census, 2008-2012 American Community Survey 5-Year Estimates
Notes:
[1] Average median income five county ROC
[2] Average median income of 12 census tracts within ROC

Limited English Proficiency

For the population 5 years old and over, persons who do not speak English very well are considered to have a Limited English Proficiency (LEP). Table 6.7-5 shows the LEP characteristics of the Study Area, the ROC, and the state. In this comparison, the state has the highest percentage of LEP individuals at 4.2 percent, followed by the Study Area with 0.8 percent, and the ROC with 0.7 percent (U.S. Census Bureau 2102c).

Table 6.7-5. Limited English Proficiency

Characteristic	Study Area	ROC	State of Minnesota
Population (5 years and over)	33,814	114,997	5,031,558
Limited English Proficiency (individuals)	271	820	212,619
Limited English Proficiency (percent)	0.8	0.7	4.2

Source: U.S. Census, 2008-2012 American Community Survey 5-Year Estimates

6.7.2 Direct and Indirect Effects

The Direct and Indirect Effects discussion that follows describes how persons in the Study Area will be impacted by the Project Route Alternatives and Segment Options.

Minority Populations

The proposed Project is not expected to impact minority populations. As described in Section 5: Development of Alternatives, Route Alternatives examined in this document were identified based on federal and state regulations, transmission line siting experience, and stakeholder feedback. Efforts were made to route around tribal lands. Given the low proportion of minority populations in the Study Area, the Project will not have a disproportionately high and adverse affect on minority or low-income individuals or households, or have a high impact on any individual or population.

As Table 6.7-6 shows, in terms of the Route Alternatives examined, 10 census tracts intersect the Orange Route. Of the ten census tracts that make up the Orange Route, tract 9701 in Roseau County has the highest percent minority (that is 13 percent). The combined total of minorities in the census blocks crossed by the Orange Route is 1,601 people, which is approximately 5.2 percent of the total population within the ten census tracts. The percent of minorities within the Orange Route does not exceed the ROC (U.S. Census Bureau 2102a). Selection and construction of the Orange Route is not anticipated to have a disproportionately high or adverse affect on minority or low-income individuals or households, or have a high impact on any individual or population.

As Table 6.7-6 shows, ten census tracts intersect the Blue Route. Of the ten census tracts that make up the Blue Route, tract 9701 in Roseau County has the highest percent minority (that is 13 percent). The combined total of minorities in the census blocks crossed by the Blue Route is 1,685 people, which is approximately 5.4 percent of the total population within the ten census tracts. The percent of minorities within the Blue Route does not exceed the ROC (U.S. Census Bureau 2102a). Selection and construction of the Blue Route is not anticipated to have a disproportionately high or adverse affect on minority or low-income individuals or households, or have a high impact on any individual or population.

When comparing the Route Alternatives, on average, those census tracts along the Blue Route at 5.4 percent have a slightly higher percentage of minority groups than those along the Orange Route at 5.2 percent. However, neither Route Alternative is anticipated to have a disproportionately high or adverse affect on minority or low-income individuals or households, or have a high impact on any individual or population.

Table 6.7-6. Minority Population Composition of Route Alternatives

Region	Census Tract	Total Number of People in Census Tract	Number of Minority persons	Percent Minority	Higher than ROC? Yes/No
State of Minnesota	-	-	804,266	15	No
ROC	-	-	16,220	13.2	-
Orange Route					
Roseau County	9701	4,249	551	13.0	No
	9702	2,153	49	2.3	No
	9704	3,596	62	1.7	No
Lake of the Woods County	4604	2,411	71	2.9	No
Beltrami County	4505	1,714	28	1.6	No
Koochiching County	7905	2,356	123	5.2	No
Itasca County	4801	2,541	93	3.7	No
	4804	3,564	134	3.8	No
	4810	5,861	443	7.6	No
	4806	2,569	47	1.8	No
Orange Route Total		**31,014**	**1,601**	**5.2**	**No**
Blue Route					
Roseau County	9701	4,249	551	13.0	No
	9702	2,153	49	2.3	No
	9704	3,596	62	1.7	No
Lake of the Woods County	4604	2,411	71	2.9	No
	4603	1,628	112	6.9	No
Koochiching County	7905	2,356	123	5.2	No
Itasca County	4801	2,541	93	3.7	No
	4804	3,564	134	3.8	No
	4810	5,861	443	7.6	No
	4806	2,569	47	1.8	No
Blue Route Total		**30,928**	**1,685**	**5.4**	**No**

Source: U.S. Census, American Community Survey 3- and 5-year Estimates 2008–2012.

Poverty Levels and Income

When comparing the Route Alternatives, census tracts included along the Orange Route have a slightly lower median income level, at $45,670, that those along the Blue Route, at $46,240. As discussed in Section 6.5, Human Settlement, the Orange Route has a higher number of residences located within it than the Blue Route does. Areas affected by the Route Alternatives have a lower median income than the state median income of $58,906. However, both the Orange and the Blue Routes are above the average median income of the ROC at $44,597 (U.S. Census Bureau 2102b).

Three census tracts have higher poverty rates than the ROC: tract 4604, tract 4505 and 4801. At 22.8 percent, Lake of the Woods County census tract 4604 has the highest number of individuals below the poverty level. Both the Orange Route and Blue Route cross this census tract. Both Route Alternatives also cross census tract 4505, which has a poverty rate of 15.2 percent, which is just slightly higher than the ROC. In addition, the Orange Route crosses tract 4505 which has a poverty rate of 18.2.

Section 6.5, Human Settlement, has more information about potential right-of-way (ROW) effects and references a study that indicates that homeowners near power lines may experience negative impacts relative to property values. Other studies show that no negative effects occur, or that effects are temporary.

Table 6.7-7. Median Income for the Route Alternatives

Area	Census Tract	Median Income	Percent of Below Poverty Level
State of Minnesota	-	$58,906	11.4
ROC Average[1]	-	$44,597	14.7
Orange Route			
Roseau County	9701	$50,444	9.9
	9702	$54,113	7.1
	9704	$50,948	10.5
Lake of the Woods County	4604	$41,387	22.8
Beltrami County	4505	$39,628	18.2
Koochiching County	7905	$39,417	13.9
Itasca County	4801	$40,114	15.2
	4804	$52,052	8.9
	4810	$42,426	11.7
	4806	$46,172	8.5
Orange Route Average		**$45,670**	**12.7**
Blue Route			
Roseau County	9701	$50,444	9.9
	9702	$54,113	7.1
	9704	$50,948	10.5

Area	Census Tract	Median Income	Percent of Below Poverty Level
Lake of the Woods County	4603	$45,326	10.0
	4604	$41,387	22.8
Koochiching County	7905	$39,417	13.9
	4801	$40,114	15.2
Itasca County	4804	$52,052	8.9
	4810	$42,426	11.7
	4806	$46,172	8.5
Blue Route Average		**$46,240**	**11.9**

Source: U.S. Census, 2008–2012 American Community Survey 5-Year Estimates
Note:
[1] Average median income five county ROC

<u>Limited English Proficiency</u>

Table 6.7-8 shows the LEP characteristics of both the Orange Route and Blue Route in comparison to the Study Area, the ROC, and the state. In this comparison, the state has the highest percentage of LEP individuals over the age of 5 at 4.2 percent, followed by the Orange Route/Blue Route/Study Area with 0.8 percent, and the ROC with 0.7 percent (U.S. Census Bureau 2102c).

Table 6.7-8. Route Comparison Limited English Proficiency

Characteristic	Orange Route	Blue Route	Study Area	ROC	State of Minnesota
Population (5 years and over)	29,313	29,230	33,814	114,997	5,031,558
Limited English Proficiency (number of individuals)	238	243	271	820	212,619
Limited English Proficiency (percent)	0.8	0.8	0.8	0.7	4.2

Source: U.S. Census, 2008–2012 American Community Survey 5-Year Estimates

In summary, the Project will not have a disproportionately high and adverse affect on minority populations, or have a high impact on any individual or population. Minority and low-income individuals may experience construction related impacts in the same manner as other individuals. These may include temporary construction impacts and operation and maintenance impacts.

6.7.3 Segment Options

The Project does not anticipate that direct impacts on residents, as in the taking of a home or business, will occur. The Orange Route includes J1 and J2 Segment Options and the Blue Route includes C1 and C2 Segment Options. In terms Segment Options, impacts will be the same as those for the Routes, as described above.

6.7.4 Mitigation

Impacts on low income or minority populations are not expected. No mitigation is proposed.

6.8 Socioeconomic Factors

This section describes the socioeconomic factors that make up the Study Area and the potential impacts of the Route Alternatives and Segment Options on socioeconomics.

The U.S. Census Bureau 2008-2012 American Community Survey (ACS) 5-Year Estimates data was used to characterize population densities and leading industries by County (U.S. Census Bureau 2012b). An economics study performed by the University of Minnesota – Duluth Labovitz School of Business and Economics was used to describe potential economic impacts of the Project to the Study Area (University of Minnesota 2013).

6.8.1 Existing Conditions

The Route Alternatives are located in Roseau, Lake of the Woods, Beltrami, Koochiching, and Itasca counties, Minnesota. In 2012, county population was as follows: Roseau County 15,665; Lake of the Woods County 4,039; Beltrami County 44,652; Koochiching County 13,293; Itasca County 45,052 (U.S. Census Bureau 2012a). Demographic characteristics of the Route Alternatives are contained in Section 6.7, Environmental Justice. Table 6.7-2 within Section 6.7 lists the specific U.S. Census tracts that the Route Alternatives cross, and Figure 6.7-1 shows the location of the census tracks.

According to ACS estimates, the top-employing industries within the five counties include manufacturing; retail trade; arts, entertainment, and recreation, and accommodation and food services; and educational services and health care and social assistance (Table 6.8-1). Unemployment rates (percent) in the five counties are as follows: Roseau County 2.7; Lake of the Woods County 2.4; Beltrami County 6.9; Koochiching County 4.8; Itasca County 5.9 (U.S. Census Bureau 2012b).

The location of residences along and near the Project, and the potential effects of constructing and operating the Project on residential property values are discussed in Section 8.5, Human Settlement.

Table 6.8-1. Leading Industries by County

Geographic Area	Industry	Percent of Workforce
Beltrami County	Educational services and health care and social assistance	32.1
	Retail trade	13.1
	Arts, entertainment, and recreation, and accommodation & food services	11.1
	Manufacturing	7.4
Itasca County	Educational services and health care and social assistance	27.0
	Retail trade	11.6
	Manufacturing	11.2

Geographic Area	Industry	Percent of Workforce
	Arts, entertainment, and recreation, and accommodation & food services	10.0
Koochiching County	Educational services and health care and social assistance	21.2
	Manufacturing	19.3
	Retail trade	10.6
	Arts, entertainment, and recreation, and accommodation & food services	8.8
Lake of the Woods County	Arts, entertainment, and recreation, and accommodation & food services	22.4
	Manufacturing	18.3
	Retail trade	12.4
	Educational services and health care and social assistance	11.7
Roseau County	Manufacturing	41.1
	Educational services and health care and social assistance	17.3
	Retail trade	9.0
	Arts, entertainment, and recreation, and accommodation & food services	7.1

6.8.2 Direct and Indirect Effects

In general, increasing transmission outlet capability and reliability will benefit northern Minnesota on a regional basis, with direct benefits to Minnesota Power customers, particularly near the Iron Range.

In a study to determine the potential economic impacts of the Project conducted by the University of Minnesota–Duluth's Labovitz School of Business and Economics (2013), 213 jobs are estimated to be directly created from construction of the Project and 73 jobs are estimated to be added in industries such as food service, healthcare, and building and professional services. These economic benefits are temporary, lasting the duration of construction; it is not anticipated that the Project will create new, permanent jobs in the Project area (University of Minnesota 2013).

If local contractors are used for portions of the construction, total wages and salaries paid to contractors and workers in surrounding counties will contribute to the total personal income of the region. Additional personal income will be generated for residents in the region and the state by circulation and recirculation of dollars paid out by the Applicant as business expenditures and state and local taxes.

The University of Minnesota-Duluth (2013) study also estimates that the Project will generate approximately 28 million dollars in state and local taxes through compensation, business, household, and corporation taxes. In addition, the study estimated there will be approximately

875 million dollars of direct and indirect spending on goods and services needed to support construction activities for expenditures of equipment, energy, fuel, operating supplies, and other products.

Indirectly, the increased capability and reliability of the electric system to supply energy to commercial and industrial users might contribute to the economic growth of the region. Long-term positive economic impacts will result from the new utility infrastructure and will include improved, more reliable utility service.

In summary, the availability of reliable power in the area will have a positive effect on local businesses and the quality of services provided to the public and increase opportunity for expanding the local economic base. The Project is not expected to have negative economic impacts. The construction, operation, and maintenance of the Project will not negatively impact the socioeconomic resources in the Study Area.

6.8.3 Mitigation

It is expected that impacts on socioeconomic factors will be temporary and beneficial. No mitigation measures are proposed.

This page intentionally left blank

6.9 Cultural Values

This section provides information about the existing cultural values in the Study Area and describes identified values and possible effects from construction of the Project. For the purposes of this analysis, the Study Area is comprised of the two Route Alternatives and Segment Options. The potential impacts on cultural values could occur to residents, seasonal visitors, or American Indian inhabitants and Tribes with a current or historic interest in the Study Area.

For purposes of effects analysis, potential impacts were identified within the anticipated 200-foot right-of-way (ROW). The analysis includes a review of cultural values—that is, shared beliefs or attitudes in a given community that reinforce that community's unity and sense of identity—particularly as those values are reflected in specific aspects of the built or non-built environment.

6.9.1 Existing Conditions

The Orange Route and Blue Route cross parts of Roseau, Beltrami (Orange Route only), Lake of the Woods, Koochiching, and Itasca counties. The communities in these counties are not marked by significant cultural differences. Within the U.S., they are part of a larger area that Colin Woodard (2012) has termed "Yankeedom", and share general values with communities in the New England states. According to Woodard, these can be described as a middle-class ethos, a general belief that government should be used for improving the lives of its citizens, and the exertion of local political control (2012). In the book, *Our Patchwork Nation*, authors Dante Chinni and James Gimpel used U.S. Census data to analyze the entire United States county by county and provide a list of 12 distinct types of communities that comprise the nation (2010). In Chinni and Gimpel's analysis, three of the five counties crossed by the Route Alternatives (that is, Roseau, Lake of the Woods, and Koochiching counties) share traits characterized by the Empty Nest-type communities, and the remaining two are characterized by either Boom Town (that is, Beltrami County) or Service Worker Center (that is, Itasca County) communities. Although there are major differences between these sectors, common traits (with the exception of Boom Town) include that they predominantly are populated by older, primarily white, mostly conservative people with incomes generally lower than the national average. Presumably, these communities will have shared cultural values.

The Project is located in an area that was inhabited by numerous American Indian Tribes before Euro-American settlement. Presently, the Anishinabe Tribe, which is the most prominent of these Tribes, is still residing in the area. The Anishinabe reside in several reservations within northern Minnesota. One of these federally recognized bands, the Red Lake Band of Chippewa, hold more than 840,000 acres of land, most of which is within two large contiguous areas around Upper and Lower Red Lake, but whose holdings also include hundreds of small parcels spread throughout Beltrami, Clearwater, Lake of the Woods, Koochiching, Roseau, Pennington, Marshall, Red Lake, and Polk counties. Another Anishinabe band, the Bois Forte Band of Chippewa, have three reservation parcels within St. Louis, Koochiching, and Itasca counties. Because the Anishinabe, and the Dakota people before them, once controlled all of the area, their concerns and values are likely to be more consistent throughout both Route Alternatives. Although not all American Indian populations share the same values, American Indian communities, and the Red Lake Band of Chippewa in particular, generally value a respect for the natural environment and consideration of plants and animals that are embedded in traditional cultural and spiritual expressions and practices. In this area of the country, cultural values particularly are strong with respect to wild rice.

This Project will involve a Presidential Permit; the federal government has a responsibility to consult with American Indian Tribes on a government-to-government basis. This consultation has not yet taken place, and no specific attempts have been made to identify opinions of Tribes that no longer reside in the area, but that may continue to have an interest in the Route Alternatives. Therefore, it is not known what specific cultural values they ascribe to the area and its resources, nor what the possible effects will be due to Project construction; these considerations are expected to be addressed as the Section 106 consultation process proceeds.

Both the Orange Route and Blue Route pass through a small portion of the northwestern agricultural area of the state, represented by Roseau County, and areas that include more forested areas as one proceeds to the more southeasterly counties. Though not densely populated, northern Minnesota largely was settled by Protestant German and Scandinavian immigrants in the 19th century, and communities in the region may identify with those ethnic heritages. The communities in the more agricultural areas to the west appear to have cultural values that relate to the economic activities of agriculture, tourism, and manufacturing, while those to the east will relate to mining, tourism, and manufacturing. Common themes mentioned on the websites of regional cities and business communities stress hard work, optimism, and appreciation of the natural world. The major values within the region include pragmatism, appreciation and use of natural resources, individualism, political and social conservatism, community pride, and economic well-being. Perusal of individual comments gathered by the Applicant from the Project's website (that is, www.greatnortherntransmission.com), public meetings and email comments indicate that most comments were attempts to get clarification on Route Alternatives and additional information, but 13 percent of comments brought up concerns specifically relating to possible visual and environmental impacts, implying cultural values of visual aesthetics of the landscape and sustained environmental conditions. Another common concern of the public comments was with possible decreasing home or land values, something that would be an understandable concern for people living on fixed incomes. This would imply valuing a certain standard of living and quality of life.

6.9.2 Direct and Indirect Effects

The Applicant anticipates evaluating any effects on cultural values through continued engagement with the public as the Project moves forward through the environmental review process, and through careful compliance with the requirements of Section 106 of the National Historic Preservation Act, as discussed in Section 6.16. However, given that the communities within the Study Area are fairly homogenous, it would appear that neither Route Alternative will have a greater effect on cultural values. The following are some typical values and possible effects.

Pragmatism

As stated above, there are few major differences in cultural values between the Orange Route and the Blue Route. The people living along the Route Alternatives tend to value pragmatism as seen by their concern for maintaining a certain standard of living. The Project's public involvement survey data suggests that there is a general understanding of the need for the Project. However the local benefits of the Project, in the form of tax payments to county government, may not be perceived as a direct benefit. If there is no perceived direct benefit in better, more reliable energy to the communities, or if they sense it will inhibit their economic life in relation to tourism, agriculture, or decreasing land values, and inadequate compensation for use of their land, there could be adverse effects on the cultural values of pragmatism and quality of life.

Natural Resource Appreciation and Use

As indicated in other sections of this Application, the proposed Project will have direct effects on a number of natural resources to varying degrees, depending on the Route Alternative selected. Impacts on the visual aesthetics of the Study Area depend on the location of the Project in relation to observers and the immediate characteristics of the surrounding area. Visual impacts will be less pronounced in an area that has low visibility or in an area where there are many existing human-made intrusions, such as existing roads, buildings, and utility lines.

Traditional natural resource use activities such as hunting, fishing, wild rice harvesting, or berry picking, are indications of cultural values tied to self-reliance and respect for tradition. Many of these activities are carried out with others, indicating a value for social interaction. If a community is hindered in completing these activities, it could degrade their sense of self-reliance and result in loss of traditional knowledge, skills, and techniques. Direct effects on natural resource use activities will depend on the requirements of the resource, the degree to which that activity will be inhibited, and the Route Alternative that is selected. The Project may have a positive effect in some cases. For example, opportunities for berry picking likely will increase because of the conversion of forest lands to grasslands and shrub lands within the Project ROW. Impacts on existing wild rice and riverine resources are not anticipated, as the proposed Project will span rivers and deep-water wetlands.

Game animal populations are not expected to be affected by the Project. The Project is not expected to have any negative impacts on hunting opportunities within the Study Area.

No indirect effects on natural resource appreciation and use are anticipated.

Individualism and Community Pride

The values of individualism and community pride are tied to the overall quality of life experienced by the area's residents. The basic elements of the community that are sources of community pride include a shared sense of the natural beauty of the area, access to the natural environment, and tourism. The Project will allow local residents to continue their overall individual economic and social activities, and access to the natural environment and tourism is not expected to be permanently and negatively affected by the Project. An impact on the sense of beauty of the natural environment could occur in areas where the Route Alternative comes closest to occupied areas.

The construction of a new transmission line within a community setting has the potential to impact the aesthetics of the area, although most of the Segment Options are hidden from normal view as the areas crossed by the Route Alternatives are rural and remote. There may be temporary disturbances to wildlife and vegetation during construction, but these impacts will diminish and will not be a hindrance to residents and tourists in the long term. The Route Alternatives do not cross any established recreation areas (for example, campgrounds and similarly developed facilities), but do cross or come close to state forests and recreational trails. The presence of new transmission lines will not hinder use of trails or forest areas for recreational purposes, and therefore should not keep tourists away. Outdoor recreational and tourism opportunities should continue to exist, and not affect community pride or individual economic or social opportunities.

Overall, the Project is not expected to have lasting direct effects on the values of individualism and community pride. Likewise, no indirect effects on natural resource appreciation and use are anticipated.

Economic Well-being, Quality of Life, and Standard of Living

As discussed in Section 6.8, the proposed Project will have a positive temporary direct affect on the local economy during construction. There should be no lasting negative impacts on economic activities related to hunting, fishing, hiking, snowmobiling, and other recreational activities where local businesses provide services to tourists for income.

No indirect effects on economic well-being, quality of life, and standard of living are anticipated.

6.9.3 Mitigation

The proposed Project will include vegetative restoration using native species, to the extent practicable. Water quality impacts that may affect wild rice are not anticipated and will be minimized through the installation and maintenance of best management practices (BMPs). Construction activities and timing will be announced through the Project website in an effort to minimize conflicts with local recreational activities. The Applicant expects to address issues as they might arise, using agreed-upon methods as outlined in a Programmatic Agreement document as well as through the State and National Environmental Protection Act (NEPA) scoping process.

6.10 Aesthetics

This section describes the potential changes to visual aesthetics as related to the natural landscape, recreation areas, transportation corridors, and human settlement. Mitigation measures also are proposed.

The analysis in this chapter was developed based on data from the Minnesota Department of Natural Resources (DNR), Minnesota Department of Transportation (DOT), Minnesota State Historic Preservation Office (SHPO) and the National Register of Historic Places (NHRP), as well as comments received from the public during open house meetings. Data is not presently available to conduct a full analysis of the Project's visual and aesthetic effects. Additional data will be gathered, and additional analysis conducted, at the appropriate time.

6.10.1 Existing Conditions

Public Input

There are areas considered to be of high scenic integrity at points along both the Orange Route and the Blue Route and the Segment Options as identified by the public and agency officials during public open houses and agency meetings. Specifically, these areas include river and open water features, public recreation areas, and scenic vistas, as discussed below. See also Appendix C for meeting summaries.

Natural Landscape

The natural landscape crossed by the Route Alternatives and Segment Options in northern Minnesota from the Canadian border to the Blackberry 500 kilovolt (kV) Substation is a mixture of agriculture (primarily row crops), farmsteads, large open vistas, bogs, woody wetlands, forested wetlands, forests, and lakes. The Study Area stretches more than 200 miles across northern Minnesota, and includes potential observation points where the Route Alternatives and Segment Options might be viewed. It is beneficial to divide the Project into four regions for the purposes of characterizing the visual effects: northwest, central, east, and south. The natural landscapes, from a visual impact perspective, correlate with Minnesota DNR's Ecological Classification System (ECS) subsection units. Figure 6.4.-1 in Section 6.4, Vegetation, depicts ecological subsections.

- → Northwest Region – Aspen Parklands: Western Roseau County is included in this region. The Aspen Parklands region is a transitional subsection that consists of prairie, brush land, woodland, and forest. Farmland (that is, row crops and pasture and hay fields) also is very common in this region.
- → Central Region – Agassiz Lowlands: Eastern Roseau, Lake of the Woods, northeastern Beltrami, and western Koochiching counties. This subsection predominantly is comprised of vast, flat, poorly drained peatlands, and upland sand ridges commonly dominated by aspen and birch or jack pine forests and woodlands.
- → Eastern Region – Littlefork-Vermillion Uplands: Eastern Koochiching County. The Littlefork-Vermilion Uplands is another transitional subsection that mostly is flat, but

includes some peatlands and is dominated by forest lands with some fens, black spruce bogs, and forested swamps.

→ Southern Region – St. Louis Moraines and Nashwauk Uplands: Itasca County. The St. Louis Moraine and Nashwauk Uplands are steeper sloped forested landscapes with areas of bogs and swamps.

Human Settlement

Residences

As described in Section 6.5, Human Settlement, the Project primarily is located in sparsely populated rural areas of northern Minnesota. The settlements in much of the Study Area are rural residents and farm buildings scattered along country roads.

Zones of denser residential development are located generally within cities and towns near the Study Area (such as Roseau, Littlefork, Northome, and Taconite) and specifically along the Big Fork River in Koochiching County, lakeshores in north central Itasca County, and in the narrow central portion of the subsection from Turtle Lake and south to the mining areas of Coleraine-Bovey of Itasca County.

Generally, the Route Alternatives and Segment Options are not located in a built environment, though there are residences within and beyond the Route Alternatives and Segment Options that will have views of the transmission line. The landscape vegetative cover will affect how visible the Project is to residences.

Transportation

Motorists along any roadways crossed by the Route Alternatives or Segment Options will view the transmission line. Section 6.24, Transportation and Figure 6.24-1 describe and depict transportation corridors in the Study Area. Traffic volumes typically are highest on major roads such as U.S. highways and state highways (see Section 6.24, Transportation, Tables 6.24-1 and 6.24-2). Waters of the Dancing Sky Scenic Byway (that is, state highway 11 in Roseau, Lake of the Woods, and Koochiching counties) will be crossed by the Route Alternatives. Edge of the Wilderness National Scenic Byway (that is, state highway 38 in Itasca County) is crossed by Segment Option J2 one mile south of Effie (see Appendix A, sheet 94). A Utility Accommodation on Trunk Highway Right of Way (Form 2525) Permit is required by MnDOT to cross state highway ROW; MnDOT will consider scenic and visual qualities of the state highway crossing. The Orange and Blue Routes cross highway 11 adjacent to the existing 500 kV transmission line thereby, reducing additional visual intrusions along the Scenic Byway (highway 11) (see Appendix A, sheet 7).

Recreation Areas

Big Bog State Recreation Area is the closest state-designated public recreation area to the Route Alternatives or Segment Options. Big Bog State Recreation Area is located in Beltrami County adjacent to the Orange Route along state highway 72 (see Appendix A, sheet 61). As discussed in Section 6.22, there are numerous WMA's crossed by the Project. These may also be used for recreational purposes.

Trails located within the Study Area that could be considered scenic vantage points include the Taconite Trail (used primarily for snowmobiling, see Appendix A, sheet 45-46); the Mesabi Trail (see Appendix A, sheet 52); and numerous snowmobile trails sponsored and maintained by local clubs, or maintained within the state forests (that is, Beltrami Island, Pine Island, George Washington, Koochiching, and Big Fork/Big Fork River Canoe Trail). There is also an all-terrain vehicle (ATV) trail (that is, Bemis Hill) in Roseau County (see Appendix A, sheet 10). Roseau River WMA is one of 45 viewing stops along the Pine to Prairie Birding Trail; Roseau County also includes the Lost River Snowmobile Trail (see Appendix A, sheets 2-4). In Koochiching County, the Blue Ox/Caldwell/Lunstrom Trail follows U.S. Highway 71 (see Appendix A, sheets 29, 71, 82, and 89). The Big Fork Canoe and Red Lake Canoe Trails are located in Koochiching and Beltrami counties (see Appendix A, sheets 28, 79-80 and sheet 65, respectively). A complete list of trails crossed by Route Alternatives or Segment Options can be found in Section 6.22, Recreation and Tourism.

Historic Structures

Historic structures may be found in various locations throughout the Study Area. Data from Minnesota SHPO and NRHP were obtained to identify historic structures along and near the Route Alternatives and Segment Options. Section 6.16, Archaeological and Historic Resources, describes historic resources in more detail.

6.10.2 Direct and Indirect Effects

The structure type, configuration, spacing and height will influence the visual effects of the project. The Applicant is evaluating several structure types and configurations that will be used for the Project, including: a self-supporting lattice tower, a lattice guyed-V structure, and a lattice guyed delta structure. The Applicant currently estimates approximately four to five structures per mile of transmission line. Generally, structures will be spaced approximately 1,000 to 1,400 feet apart, with longer or shorter spans as necessary.

The type of structure in any given section of transmission line will be dependent on land type and land use. The Project structures will typically range in heights from approximately 100 feet above ground to approximately 150 feet above ground, depending on the structure type and the terrain. In some instances, such as where the Project crosses an existing transmission line, taller structures may be required. In cultivated lands or in areas of intensive land use, the Applicant anticipates utilizing self supporting lattice structures for the Project. In other areas where guy wires will not significantly interfere with land use, the Project may be installed on one of the guyed structure types.

More information on structure types can be found in Appendix D.

General Viewers Across the Natural Landscape

Visual impacts and overall changes in aesthetics will vary depending on the terrain, topography, and vegetative cover of the natural landscape. Views of the transmission line cannot be avoided completely due to its size and the open landscape in some portions of the Study Area. The visual profile of transmission structures and conductors may influence the perceived aesthetic quality of a view from a particular location.

The Northwest Region is dominated by agricultural lands, open prairie, shrubland, and some forested lands. In agricultural areas where the natural landscape generally is flat with few visual obstructions (for example, tree rows and wind breaks), the transmission line may be visible for at least 3 miles. A viewer's degree of discernible detail decreases as physical distance from an object increases (see Figure 6.10-1). Beyond 3 miles in physical distance, the outline of the structures may still be visible from unobstructed views of the horizon. View of the transmission line conductors will decrease rapidly as distance increases because of their small size. The public generally has stated that the view of the transmission line in agricultural areas will diminish the aesthetic value of the viewshed.

Figure 6.10-1. View of Existing 500kV Transmission Line in Agricultural Setting

The Central and Eastern Regions mostly are dominated by forest and wetlands of varying types. Trees and woody vegetation will be cleared from the ROW and may cause a localized reduction in scenic visual quality (see Figure 6.10-2). Trees surrounding the ROW will create a visual obstruction for viewers standing nearby; however, those crossing the ROW will have a clear view of the transmission line structures for several miles, as those structures extend above the forest canopy. Both Route Alternatives parallel existing transmission lines through portions of these areas; paralleling existing ROWs will reduce visual effects, since the public is accustomed to viewing the existing transmission lines. Based on public comments, in areas that do not have existing transmission lines, the Project may be viewed as an intrusion into the natural viewshed. However, the intrusion will be less noticeable where it will be buffered by forested vegetation.

The Southern Region of the Study Area has lakes, wetlands, and greater changes in elevation. The Route Alternatives that cross near lakes will impact the viewshed of cabin owners and residents located around those lakes. Lakes closest to the Route Alternatives and Segment Options in Itasca County include: Deer, Bass, Larson, Coon, Rat, Klingepiel, Eve, Wilson, Tuber, Raddison, Napoleon, Little Bear, Bear, Wasson, Scooty, Hartley, Wolf, South Fork, Harrison, Kennedy, Dollar, Shoal, Thirty, Thirtyone, Grass, Bray, Isaac, Snaptail, Crooked, Bass, Lawrence, Lower Lawrence, Moose, Fourth Sucker, Rice, Dunning, Big Diamond, Little Diamond, Holman, Twin, Bass (2nd), Loon, Foot, and Little Sand lakes (see Appendix A, sheets 40-53).

Transmission structures located on higher elevations than the surrounding natural landscape could create a greater visual impact for a potentially longer distance than those on flat terrain. The view of the transmission line structures will be buffered by forested vegetation in the Southern Region.

Figure 6.10-2. Aerial View of Existing 500kV Transmission Line in Forested Setting

Local Residents

Residences are located within the Route Alternatives, but no residences are located within the anticipated ROW for any of the Route Alternatives or Segment Options. Table 6.10-1 identifies the number of residents proximate to the Route Alternatives and Segment Options.

Table 6.10-1. Residents within the Route Alternatives and Segment Options

Route Alternative or Segment Option	Number of Homes
Orange Route	64
Blue Route	49
C1	0
C2	11
J1	0
J2	6

Source: HDR Engineering, Inc. 2013

Some residents have surrounded their homes with a mix of deciduous and coniferous trees that serve as natural windbreaks, create shade, and enhance privacy. The presence of natural windbreaks and tree rows may reduce the visual impact of the Project to the residence.

In the agricultural area of both Route Alternatives, there are existing transmission lines of similar character to the Project. The perceived visual impact on these residents may be minimal because the Project will be consistent with the existing viewshed. In other agricultural areas, the visual impact may be more intrusive because the Project will introduce a new element into the viewshed.

Visual impacts in forested areas are expected to be less pronounced; however, residents, particularly cabin owners and other residents near the Big Fork River (Blue Route and Segment Option C1), have expressed concern over the visual impact of the Project. Likewise, residents and cabin owners in the Southern Region have expressed similar concerns.

Research indicates that visibility of transmission lines does not consistently affect property value (Chalmers and Voorvaart, 2009). That said, visual effects to the property owner may increase depending on proximity and location of the transmission line ROW and structures with respect to a residence (Jackson and Pitts, 2010).

More information on human settlement as it pertains to residences and population density within the Study Area can be found in Section 6.5, Human Settlement, and in Figure 6.5-1.

Highway Users

Major road vantage points of the Orange Route are U.S. highways 71 and 169 and Minnesota highways 89, 11 (that is, Waters of the Dancing Sky Scenic Highway), 6, and 1. Major road vantage points for the Blue Route are U.S. highways 71 and 169, Minnesota highways 11, 72, and 1. The primary visual intrusion of the Project at these vantage points will occur at the location where the transmission line crosses each feature (see Figure 6.10-3). If a feature is parallel to the vantage point such that the transmission line will be viewed for a longer time, then the impact is considered higher than if the transmission line runs perpendicular to the vantage point. A perpendicular crossing of a vantage point minimizes the effects of the transmission line for the viewer. The Orange and Blue Routes parallel 390th Street/County Highway 118 for approximately 8 miles in northern Roseau County (see Appendix A, sheet 2).

Figure 6.10-3. View of Existing 500kV Transmission Line and Corner Structure at Highway Crossing

Recreation Area Users

Recreation Areas described in Section 6.22, Recreation and Tourism, may have visual impacts from the Project. Big Bog Recreation Area (see Figure 6.10-4 and Appendix A, sheet 62), Big Fork River Canoe Trail (see Appendix A, sheet 28), and other recreational trails crossed or paralleled by the Route Alternatives or Segment Options will be impacted by the Project. . Where the Orange Route is adjacent to the Big Bog State Recreation Area in Beltrami County (see Appendix A, sheet 62), visual impact because of structures and conductors could be long-term if they can be viewed from the boardwalk. Additional study is required to determine potential impacts at this location.

Figure 6.10-4. View of Big Bog State Recreation Area Boardwalk

Historic Structure Viewshed

Section 6.16, Archaeological and Historic Resources, describes the cultural resources within the Study Area. Specifically, Tables 6.16-2 through 6.16-6 summarize the location and types of cultural resources within the Route Alternatives and Segment Options. Visual impacts will vary, as the cultural resources listed include: farmsteads, agricultural buildings, schools, churches, cemeteries, bridges, mine and gravel pits, historic railroads, wells, and camps. The aspects of setting, design, feeling and association of these resources may be compromised by visual intrusions where such aspects contribute to the qualities that may make these various types of properties eligible for the NRHP.

Construction

It is possible that construction activities will have a temporary impact on visual aesthetics. Machinery and debris could be perceived as a visual nuisance.

6.10.3 Mitigation

The Route Alternatives and Segment Options have been developed to avoid cities, towns, and rural residents to the greatest extent practicable. The Applicant proposes the following mitigation measures:

- → The Applicant will seek to minimize the negative visible impacts of the Project at site specific locations, such as travel ways, recreation sites, and bodies of water with access and residents.
- → Minor shifts to the anticipated ROW will be evaluated once a Route Alternative is chosen to further minimize impacts.
- → Further evaluate potential visual impacts at the Big Bog State Recreation Area and work with Minnesota DNR to identify mitigation, as appropriate.

→ Residences have been avoided and distances to residences and structures were maximized during the development of the Route Alternatives and Segment Options to the extent practical.
→ The Project will parallel existing ROWs, to the extent practical, to minimize visual impacts on farmlands, open spaces, and recreational areas.
→ Crossing of Water of the Dancing Sky (that is, Minnesota Highway 11) will be perpendicular to that highway and will be parallel to the existing 500 kV transmission line.
→ To the greatest extent possible, waterways will be spanned in the same location as existing disturbances or ROWs; otherwise, the Applicant will seek to cross waterways perpendicularly to the extent practical to minimize visual effects of recreational users.
→ In most cases, the ROW will need to remain free of trees throughout construction and operation of the Project; however, bushy shrubs and low-growing vegetation could be allowed to regenerate in portions of the ROW to reduce, though not eliminate, the visual impacts. Planting of visual screening will be considered on a case-by-case basis.
→ The Applicant and its contractors will remove construction waste and scrap on a regular schedule or at the end of each construction phase to minimize short-term visual impacts.

6.11 Noise

This section describes the noise characteristics proximate to the Route Alternatives and Segment Options and the potential impacts of the Route Alternatives and Segment Options on noise conditions.

Noise is defined as unwanted sound. It may be comprised of a variety of sounds of different intensities across the entire frequency spectrum. Noise is measured in units of decibels (dB) on a logarithmic scale. Because human hearing is not equally sensitive to all frequencies of sound, certain frequencies are given more weight. The A-weighted decibel (dBA) scale corresponds to the sensitivity range for human hearing. A noise level change of 3 dBA is barely perceptible to average human hearing. A 5 dBA change in noise level is clearly noticeable. A 10 dBA change in noise level will be perceived as doubling (or halving) the loudness of the noise. For reference, Table 6.11-1 shows noise levels associated with common, everyday sources, providing context for the transmission line and substation noise levels discussed in the section.

Table 6.11-1. Common Noise Sources and 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 (MPCA) 2008

In Minnesota, statistical descriptors (L10, L50) are used to evaluate noise levels and identify noise impacts. The Minnesota Pollution Control Agency (MPCA) noise standards are expressed as a range of permissible dBA within a one hour period. L10 is defined as the noise level, in dBA, that may be exceeded 10 percent of the time, or for six minutes in an hour. L50 is the noise level, in dBA, that may be exceeded 50 percent of the time, or for 30 minutes in an hour.

Land areas, such as picnic areas, churches, or commercial spaces, are assigned an activity category based on the type of activities or use occurring in the area. Activity categories are then categorized based on their sensitivity to traffic noise. The Noise Area Classification (NAC) is listed in MPCA noise standards to distinguish the categories. Residential areas, churches, and similar type land use activities are included in NAC-1; commercial-type land use activities are included in NAC-2; and industrial-type land use activities are included in NAC-3.

Table 6.11-2 identifies the established daytime and nighttime noise standards by NAC.

Table 6.11-2. Noise Standards by Noise Area Classification (dBA)

NAC	Daytime		Nighttime	
	L50	L10	L50	L10
1	60	65	50	55
2	65	70	65	70
3	75	80	75	80

6.11.1 Existing Conditions

Existing noise levels in the Study Area were estimated using methods contained in American National Standards Institute (ANSI) acoustical standard ANSI S12.9 Part 3 2008.

Land use throughout the Study Area includes rural, forested, and undeveloped areas, with few scattered residences and other small areas of localized development. Noise from natural sources dominates the outdoor soundscape throughout most of the Study Area. This includes noise from wind and vegetation, animals, and insects. Anthropogenic noise also exists near roadways, homes, and other areas of human activity. Existing power lines are another minor source of anthropogenic noise in the Study Area. At the site of the proposed substation, existing transmission lines and substation equipment are notable noise sources.

Figure 6.11-1 presents estimates of typical daytime hourly average equivalent noise levels (Leq) in urban and rural settings. The Leq is an energy-based average noise level, expressed using A-weighted decibels (dBA). Information in this figure is based on an ANSI acoustical standard ANSI S12.9 Part 3 2008, and is representative of the Study Area.

The primary land uses in the Study Area are forest and agricultural lands, with rural residential populations. Typical noise sensitive receptors in the routes include residents and outdoor recreation users. Current average noise levels in these areas are typically in the 30 to 40 dBA range and are considered acceptable for residential land use activities. Ambient noise in rural areas is commonly made up of rustling vegetation and infrequent vehicle pass-bys. Higher ambient noise levels, typically 50 to 60 dBA, would be expected near roadways, urban areas, and commercial and industrial properties.

Figure 6.11-1. Representative Daytime Noise Levels (Leq) in dBA

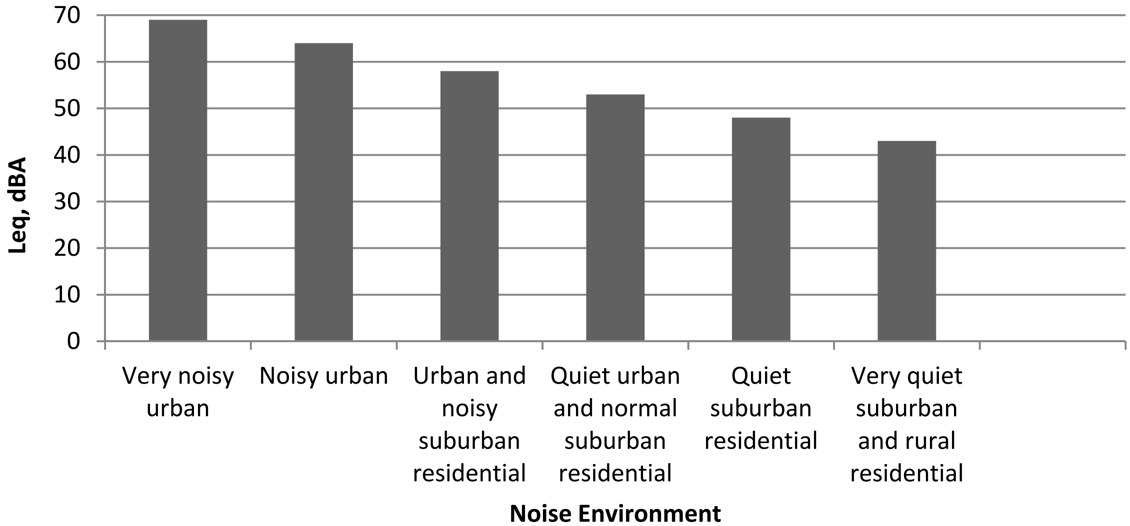
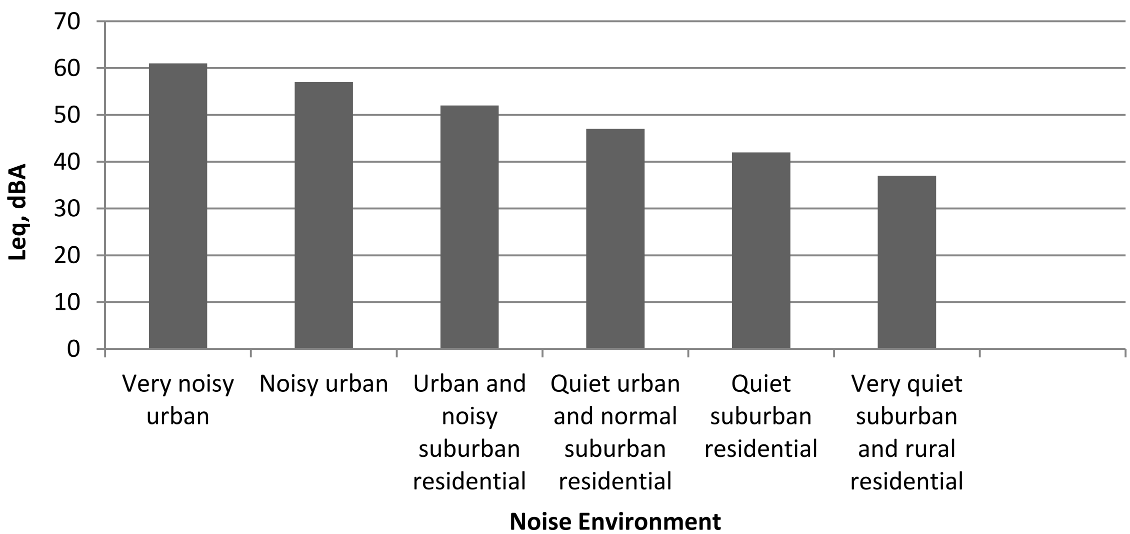


Figure 6.11-2 presents estimates of typical nighttime hourly average equivalent noise levels (Leq) for land uses such as those found in in the Study Area. Figure 6.11-2 is based on ANSI S12.9 Part 3 2008.

Figure 6.11-2. Representative Nighttime Noise Levels (Leq) in dBA



6.11.2 Direct and Indirect Effects

Direct audible noise impacts associated with the Project include increases in temporary noise during the construction phase of the Project as well as permanent noise during its operation. Impacts associated with the operation of the Project can further be defined to those associated with the Project's transmission line and substation components, respectively.

Construction

Construction equipment, including heavy trucks and cranes, supporting equipment like air compressors and concrete mixers, and potentially even helicopters, would generate temporary noise in the area surrounding the construction site. Table 6.11-3 provides noise levels experienced for typical construction equipment within 50 feet from the source of the noise.

Table 6.11-3. Typical Noise from Construction Equipment (dBA)

Typical Sources	Sound Pressure Level (dBA)
Pump	76
Backhoe	80
Air Compressor	81
Mobile Crane	83
Concrete Mixer	85
Jack Hammer	88
Paver	89
Rock Drill	98
Pile Driver	101

Source: Federal Transit Administration (FTA) 2006

Transmission Line

Transmission line conductors produce noise under certain conditions. The level of noise depends on conductor conditions, voltage level, and weather conditions. Generally, activity-related noise levels during the operation and maintenance of substations and transmission lines are minimal.

Noise emissions from transmission line conductors generally occur during heavy rain and wet conductor conditions. In foggy, damp or rainy weather, transmission lines can create a crackling sound due to corona discharges—the small amount of electricity ionizing the moist air near the conductors. During heavy rain the background noise level of the rain is usually greater than the noise from the transmission line. As a result, people do not normally hear noise from a transmission line during heavy rain. During light rain, dense fog, snow and other times when there is moisture in the air, transmission lines will produce audible noise equal to approximately household background levels. During dry weather, audible noise from transmission lines is barely perceptible.

The predicted L50 audible noise levels associated with the various structure configurations of the Project are given in Table 6.11-4 for the edge of the ROW (100 feet from centerline). Where the Project parallels existing transmission lines, the presence of another energized line nearby will impact the audible noise profile around the parallel lines. Therefore, the predicted audible noise levels associated with the various scenarios where the Project parallels existing transmission lines are given in Table 6.11-5.

As indicated in Table 6.11-2 above, the most stringent MPCA noise standard is the nighttime L50 limit for the land use category that includes residential areas (NAC-1), which is 50 dBA. The calculated L50 values at the edge of ROW for the Project presented in Table 6.11-4 and Table

6.11-5 below demonstrate that the audible noise associated with the Project will be within the most stringent MPCA limitations in nearly all scenarios. Where the Project parallels the existing 500 kV line, the analysis results indicate that audible noise has the potential to reach 50.5 dBA on an L50 basis at the edge of the common ROW for the two lines. Based on a review of aerial photography using GIS technology, the nearest residence is approximately 2,000 feet away from the ROW. At that distance, the projected audible noise levels attributable to the Project are expected to attenuate to approximately 42 dBA or less on an L50 basis. Therefore, audible noise is not anticipated to cause or contribute to an exceedence of the MPCA noise standards, even where the Project parallels the existing 500 kV line.

Table 6.11-4. Predicted L50 Audible Noise Levels at Maximum Operating Voltage Where Not Paralleling Existing Transmission Lines

Structure Type	L50 Noise (dBA) Edge of ROW
500 kV Guyed-Delta	47.9
500 kV Guyed-V	47.2
500 kV Self-Supporting	47.2

Table 6.11-5. Predicted L50 Audible Noise Level at Maximum Operating Voltage Where the Project Parallels Existing Transmission Lines

Structure Type	L50 Noise (dBA) Edge of ROW
Project: 500 kV Guyed-Delta Existing: 500 kV Self-Supporting	50.5
Project: 500 kV Guyed-V Existing: 500 kV Self-Supporting	50.4
Project: 500 kV Self-Supporting Existing: 500 kV Self-Supporting	50.4
Project: 500 kV Guyed-Delta Existing: 500 kV Guyed-Delta	50.2
Project: 500 kV Guyed-V Existing: 500 kV Guyed-Delta	50.1
Project: 500 kV Self-Supporting Existing: 500 kV Guyed-Delta	50.1
Project: 500 kV Guyed-Delta Existing: 230 kV H-Frame	48.5
Project: 500 kV Guyed-V Existing: 230 kV H-Frame	47.9
Project: 500 kV Self-Supporting Existing: 230 kV H-Frame	47.9
Project: 500 kV Guyed-Delta Existing: 115 kV H-Frame	47.9
Project: 500 kV Guyed-V Existing: 115 kV H-Frame	47.2

Structure Type	L50 Noise (dBA) Edge of ROW
Project: 500 kV Self-Supporting Existing: 115 kV H-Frame	47.2
Project: 500 kV Guyed-Delta Existing: 115 kV H-Frame Existing: 115 kV H-Frame	47.9
Project: 500 kV Guyed-V Existing: 115 kV H-Frame Existing: 115 kV H-Frame	47.2
Project: 500 kV Self-Supporting Existing: 115 kV H-Frame Existing: 115 kV H-Frame	47.2
Project: 500 kV Guyed-Delta Existing: 115 kV H-Frame Existing: 230 kV H-Frame	48.2
Project: 500 kV Guyed-V Existing: 115 kV H-Frame Existing: 230 kV H-Frame	47.4
Project: 500 kV Self-Supporting Existing: 115 kV H-Frame Existing: 230 kV H-Frame	47.4

Values were calculated using Bonneville Power Administration's Corona and Field Effects Program, Version 3.0. Because audible noise is particularly dependent on the voltage of the transmission line, the values in the tables were calculated at the lines' maximum continuous operating voltage. Maximum continuous operating voltage is defined for the Project as the nominal voltage plus 10 percent, in this case 550 kV. The maximum continuous operating voltage associated with the existing 500 kV, 230 kV, and 115 kV transmission lines that the Project may parallel is similarly defined as nominal voltage plus 10 percent. This results in maximum continuous operating voltage levels of 550 kV, 253 kV, and 127 kV, respectively. In accordance with Institute of Electrical and Electronics Engineers (IEEE) Standard 656-1992, *IEEE Standard for the Measurement of Audible Noise from Overhead Transmission Lines* (1992), values were calculated at a height of five feet above the ground.

More detailed results from the Applicant's audible noise calculations, including audible noise levels at various distances from ROW centerline and plots of the lateral profile of audible noise level for each structure configuration, can be found in Appendix F.

<u>Substation</u>

At substations, audible noise is generated primarily by transformers. Noise from a transformer is present whenever the transformer is energized and is nearly constant with only a slight variation associated with the operation of cooling fans or pumps. Noise levels associated with power transformers are highly dependent upon the size and voltage level of the transformers.

The Project includes new 500/230 kV transformation located at the Blackberry 500 kV Substation. The exact size, number, and location of Project transformers depends on the results of electrical design optimization studies and final substation engineering, therefore calculations similar to those provided for the Project's transmission line are not appropriate at this time. New substations and substation upgrades will be designed and constructed to comply with state noise standards established by MPCA. Maximum and typical levels of audible noise attributable to Project facilities will be calculated and field monitored as needed. The closest receptor to the Blackberry 500 kV Substation is 995 feet away (see Appendix A, sheet 54).

Mitigation

Audible noise from transmission lines is not an intense noise source, and is therefore highly localized. Analysis results indicate that audible noise associated with the Project will be in compliance with the relevant MPCA noise standards at the edge of the Project ROW. Therefore exceedances of the MPCA noise standards are not anticipated to occur outside of the Project ROW, and mitigation measures are unnecessary.

The dominant noise sources at the proposed Blackberry 500 kV Substation are the 500/230 kV transformers. Since these transformers have not been selected or sited yet, their audible noise impact is hard to quantify. Best management practices (BMP) can effectively mitigate noise from transformers at the substation. Sample BMP's include:

- Purchasing low-noise transformers
- Siting the substation so it is not close to noise-sensitive land uses (residences)
- Path treatments such as a wooden noise wall around the transformers to reduce air-borne noise
- Making sure the transformers are not installed on pilings that are directly coupled to bedrock (to reduce ground-borne noise). This is particularly important if homes in the vicinity of the substation have foundations that are coupled to the bedrock.

This page intentionally left blank

6.12 Air Quality

This section describes air quality conditions within the Study Area and the potential impacts of the Route Alternatives and Segment Options on those resources.

Air Quality Standards and other information was collected from the U.S. Environmental Protection Agency (EPA) and Minnesota Rules to characterize Air Quality.

6.12.1 Existing Conditions

Air quality generally is determined by comparing monitored pollutant concentrations with prescribed standards. The maximum level of a pollutant considered to be acceptable is specified by EPA. The Clean Air Act established two types of National Ambient Air Quality Standards (NAAQS). The primary standards set limits to protect public health, and the secondary standards set limits to protect public welfare (United States Code [USC] 7409). EPA Office of Air Quality Planning and Standards has set NAAQS for the following six criteria pollutants: ozone (O_3), nitrogen dioxide (NO_2), carbon monoxide (CO), sulfur dioxide (SO_2), respirable particulate matter (PM_{10} and $PM_{2.5}$), and lead (Pb). In addition, the state of Minnesota has set Ambient Air Quality Standards (MAAQS) for hydrogen sulfide (H_2S) and particulate matter (PM).

Tables 6.12-1 and 6.12-2 show the NAAQS and MAAQS for these pollutants, respectively, expressed in parts per million (ppm), parts per billion (ppb), milligrams per cubic meter of air (mg/m^3), or micrograms per cubic meter of air ($\mu g/m^3$), as applicable. To determine compliance with NAAQS, concentrations of pollutants are measured and averaged over a specified duration (ranging from 1 hour to 1 year, depending on the pollutant and standard) for comparison with the applicable standard. As shown in Table 6.12-1, the NAAQS for O_3 is 0.075 ppm on an 8-hour averaging period (40 Code of Federal Regulations [CFR] Part 50). This standard is based on the fourth highest 8-hour value in a year at a monitor, averaged over 3 years. The MAAQS for O_3 is 0.08 ppm (see Table 6.12-2), based upon the fourth highest 8-hour daily maximum average in 1 year (Minnesota Rule 7009.0080).

Table 6.12-1. National Ambient Air Quality Standards

Pollutant	Primary and/or Secondary	Averaging Time	Level	Form
Carbon monoxide (CO)	primary	8-hour	9 parts per million (ppm)	not to be exceeded more than once per year
		1-hour	35 ppm	
Lead (Pb)	primary and secondary	Rolling 3-month average	0.15 micrograms per cubic meter of air ($\mu g/m^3$)[1]	not to be exceeded
Nitrogen dioxide (NO_2)	primary	1-hour	100 parts per billion (ppb)	98th percentile of 1-hour daily maximum concentrations, averaged over 3 years
	primary and secondary	Annual	53 ppb[2]	annual mean

Pollutant	Primary and/or Secondary	Averaging Time	Level	Form
Ozone (O_3)	primary and secondary	8-hour	0.075 ppm[3]	annual fourth-highest daily maximum 8-hr concentration, averaged over 3 years
Particulate matter ($PM_{2.5}$)	primary	Annual	12 µg /m³	annual mean, averaged over 3 years
	secondary	Annual	15 µg /m³	annual mean, averaged over 3 years
	primary and secondary	24-hour	35 µg /m³	98th percentile, averaged over 3 years
Particulate matter (PM_{10})	primary and secondary	24-hour	150 µg /m³	not to be exceeded more than once per year on average over 3 years
Sulfur dioxide (SO_2)	primary	1-hour	75 ppb[4]	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
	secondary	3-hour	0.5 ppm	not to be exceeded more than once per year

Source: U.S. Environmental Protection Agency (EPA) 2013

Notes:

[1] Final rule signed October 15, 2008. The 1978 lead standard (1.5 µg/m³ as a quarterly average) remains in effect until 1 year after an area is designated for the 2008 standard, except that in areas designated for the 1978 standard, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.

[2] The official level of the annual NO_2 standard is 0.053 ppm, equal to 53 ppb, which is shown here for the purpose of clearer comparison to the 1-hour standard.

[3] Final rule signed March 12, 2008. The 1997 ozone standard (0.08 ppm, annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years) and related implementation rules remain in place. In 1997, EPA revoked the 1-hour ozone standard (0.12 ppm, not to be exceeded more than once per year) in all areas, although some areas have continued obligations under that standard ("anti-backsliding"). The 1-hour ozone standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is less than or equal to 1.

[4] Final rule signed June 2, 2010. The 1971 annual and 24-hour SO_2 standards were revoked in that same rulemaking. However, these standards remain in effect until 1 year after an area is designated for the 2010 standard, except in areas designated nonattainment for the 1971 standards, where the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standard are approved.

Table 6.12-2. Minnesota Ambient Air Quality Standards

Pollutant	Primary and or Secondary	Averaging Time	Level	Form
Carbon monoxide (CO)	primary and secondary	8-hour	9 parts per million (ppm)	not to be exceeded more than once per year
		1-hour	30 ppm	
Lead (Pb)	primary and secondary	calendar quarter	1.5 micrograms per cubic meter of air ($\mu g/m^3$)	arithmetic mean averaged over a calendar quarter
Nitrogen dioxide (NO_2)	primary and secondary	Annual	.05 ppm	arithmetic mean
Ozone (O_3)	primary and secondary	8-hour	0.08 ppm	daily maximum 8-hour average; the standard is attained when the average of the annual fourth-highest concentration is less than or equal to the standard
Particulate matter ($PM_{2.5}$)	Primary and secondary	Annual	15.0 $\mu g/m^3$	arithmetic mean; the standard is attained when the annual mean concentration is less than or equal to the standard
	primary and secondary	24-hour	65 $\mu g/m^3$	the standard is attained when the 98th percentile 24-hour concentration is less than or equal to the standard
Particulate matter (PM_{10})	primary and secondary	Annual	50 $\mu g/m^3$	arithmetic mean; the standard is attained when the expected number of days per calendar year exceeding the standard is less than or equal to one
	primary and secondary	24-hour	150 $\mu g/m^3$	the standard is attained when the annual mean concentration is less than or equal to the standard
Sulfur dioxide (SO_2)	primary	Annual	80 $\mu g/m^3$	arithmetic mean
	secondary	Annual	60 $\mu g/m^3$	arithmetic mean
	primary and secondary	24-hour	365 $\mu g/m^3$	not to be exceeded more than once per year
	secondary(1)	3-hour	915 $\mu g/m^3$	not to be exceeded more than once per year
	primary	3-hour	1300 $\mu g/m^3$	not to be exceeded more than once per year
	primary	1-hour	1300 $\mu g/m^3$	not to be exceeded more than once per year

Pollutant	Primary and or Secondary	Averaging Time	Level	Form
Hydrogen sulfide (H_2S)	primary	½-hour	0.05 ppm	not to be exceeded more than twice per year
	primary	½-hour	0.03 ppm	not to be exceeded more than twice in any 5 consecutive days
Particulate matter	primary	Annual	75 µg /m^3	geometric mean
	secondary	Annual	60 µg /m^3	geometric mean
	primary	24-hour	260 µg /m^3	not to be exceeded more than once per year
	secondary	24-hour	150 µg /m^3	not to be exceeded more than once per year

Source: U.S. Environmental Protection Agency (EPA) 2013; Minnesota Rules 7009.0080
Notes:
[1] This standard only applies in Air Quality Control Regions 127 (includes the counties of Benton, Chisago, Isanti, Kanabec, Mille Lacs, Pine, Sherburne, Stearns, and Wright), 129 (includes the counties of Aitkin, Carlton, Cook, Itasca, Koochiching, Lake, and St. Louis), 130 (includes Clay County) and 132 (includes the counties of Becker, Beltrami, Cass, Clearwater, Crow Wing, Douglas, Grant, Hubbard, Kittson, Lake of the Woods, Mahnomen, Marshall, Morrison, Norman, Otter Tail, Pennington, Polk, Pope, Red Lake, Roseau, Stevens, Todd, Traverse, Wadena, and Wilkin). Air Quality Control Regions are defined in Minnesota Rules 7009.0080.

The Study Area for this analysis of Air Quality consists of the counties where the emissions will occur, which includes the counties impacted by the Route Alternatives: Roseau, Lake of the Woods, Beltrami [Orange Route Alternative], Koochiching, and Itasca counties in northern Minnesota.

Areas of special concern related to air quality are regions designated by the Clean Air Act as federal Class I areas. Class I areas have been designated as requiring special attention in regard to protecting and even improving the visibility in these areas. A Class I area is defined as national parks greater than 6,000 acres, national wilderness or memorial parks greater than 5,000 acres, and inter-nation parks in existence since August 1977. The state of Minnesota contains two Class I areas, Voyageurs National Park (in Koochiching and St. Louis counties) and Boundary Waters Canoe Area (in St. Louis, Lake, and Cook counties). Neither of the Route Alternatives passes through a Class I area.

The Minnesota Pollution Control Agency (MPCA) operates a network of approximately 53 air quality monitoring sites throughout the state. This includes monitoring at three tribal sites, four Interagency Monitoring of Protected Visual Environments sites, three Chemical Speciation Network sites, and ten National Acid Deposition Program sites. The data collected through this monitoring network are analyzed to determine compliance (and therefore, attainment status) with the NAAQS. There are no air quality monitors within the Study Area. The air quality monitors nearest to the Study Area are in Virginia, Minnesota (St. Louis County; $PM_{2.5}$, PM_{10}, and Total Suspended Particulate ([TSP]/Metals), International Falls, Minnesota (St. Louis County; $PM_{2.5}$, O_3, and Acid Deposition), and Detroit Lakes, Minnesota (Becker County; $PM_{2.5}$ and O_3).

As of December 4, 2013, all counties within the Study Area are in attainment (or are unclassifiable, to be treated as attainment) with NAAQS and MAAQS for all criteria pollutants. Attainment areas are defined based on federal pollutant standards set by EPA. An attainment area is a geographic area in which the level of a criteria air pollutant meets the NAAQS for that pollutant.

6.12.2 Direct and Indirect Effects

The primary long-term air quality concerns related to transmission lines are ozone and nitrogen oxide emissions surrounding the conductor due to corona discharges. Corona discharge consists of the breakdown or ionization of air within a few centimeters or less of the conductors. It occurs when the electric field intensity, or surface gradient, on the conductor exceeds breakdown strength of air. Usually a water droplet or some imperfection, such as a scratch on the conductor, is necessary to cause corona discharge. In general, monitored concentrations of ozone due to corona discharge from transmission lines show no significant incremental ozone concentrations at ground level, and minimal (0 to 8 ppb) concentrations at an elevation nearer to the transmission line (Jeffers 1999). Typically, these concentrations are detected only during heavy corona discharge in foul weather. Additional testing has shown that production of nitrogen oxide due to corona discharges is approximately one-fourth of the production of ozone due to corona discharges (Jeffers 1999).

Ozone is a very reactive form of oxygen and combines readily with other elements and compounds in the atmosphere. Ozone forms naturally in the lower atmosphere from lightning discharges and from reactions between solar ultraviolet radiation and air pollutants, such as hydrocarbons from auto emissions. The natural production rate of ozone is directly proportional to temperature and sunlight and inversely proportional to humidity. Humidity (or moisture), the same factor that increases corona discharges from transmission lines, inhibits the production of ozone. For these reasons, and the fact that the Study Area is in attainment for both NAAQS and MAAQS, long-term emissions due to operation of either Route Alternatives are not expected to have any direct or indirect effects on air quality, and are not expected to cause or contribute to a violation of NAAQS and MAAQS. Long-term emissions are not expected to be substantially different for one Route Alternative versus the other.

During construction of the Project, limited, temporary, and localized impacts on air quality might occur during construction of either Route Alternative due to the disturbance of topsoil, which raises fugitive dust particles. These short-term emissions will be influenced heavily by weather conditions and the specific construction activity occurring. Temporary impacts from fugitive dust will be minimized or avoided by using best management practices (BMPs). Oil and other petroleum derivatives will not be used for dust control. Exhaust emissions, primarily from diesel equipment, will vary according to the phase of construction and the specific equipment used. Construction equipment will be operated properly and maintained in good working order.

Due to the temporary and intermittent nature of these emissions and the fact that the Study Area is in attainment for both NAAQS and MAAQS, short-term emissions due to construction of either Route Alternative are not expected to have any short-term direct or indirect effects on air quality, and are not expected to cause or contribute to a violation of NAAQS and MAAQS. Short-term emissions are not expected to be substantially different between Route Alternatives.

6.12.3 Mitigation

No direct or indirect effects on air quality from the proposed Project are expected, other than the temporary, intermittent, and localized effects during construction, which will be minimized or avoided by using BMPs. The Applicant proposed the following mitigation measures:

- → The Applicant will retain an environmental inspector (EI) during Project construction. Working on behalf of the Applicant, the EI will be responsible for understanding all of the conditions of the Project's environmental permits and to ensure that the contractors abide by these conditions.
- → Regular, frequent cleaning of construction equipment and vehicles on the right-of-way (ROW) will occur.
- → Restoration of cleared ROWs, storage areas, and access roads will minimize the extent of disturbed areas and limit the potential for dust generation.
- → All disturbed areas will be revegetated once construction is complete.

6.13 Public Services and Utility Systems

This section describes the public services and existing utility systems within the Study Area and the potential impacts of the Route Alternatives and Segment Options on this infrastructure.

Data from the Minnesota Geospatial Information Office (MNGeo) was used to identify existing transmission lines and pipelines within the Study Area.

6.13.1 Existing Conditions

Public Services

Public Services is a term that generally denotes services provided by government entities to its citizens. Public services are often those services that are used to benefit public health and safety, such as education, emergency services (fire, ambulance, and police), potable water, waste management (sanitary sewer), and utilities. Most public services are located near the urban areas within and near the Study Area. Outside of urban areas, landowners are typically serviced with privately-owned septic systems, drinking water wells, and aboveground propane and natural gas tanks. Emergency fire services exist in some cities and towns near the Study Area. County sheriffs and Minnesota Highway Patrol monitor county and state highways.

Existing Gas Pipelines

There are two gas pipelines within the Study Area. One is owned by Central Pipeline Minnesota, Inc., and located near Warroad, Minnesota; the other, owned by Northern Natural Gas Company, is located near the Blackberry 500 kV Substation site. No oil pipelines are located within the Study Area. None of the Route Alternatives or Segment Options parallel an existing pipeline (Figure 6.13-1).

The Orange and Blue Route Alternatives cross two gas pipelines; one owned by Northern Natural Gas Company and the other owned by Central Pipeline Minnesota, Inc. (see Appendix A, sheets 6 and 53/54).

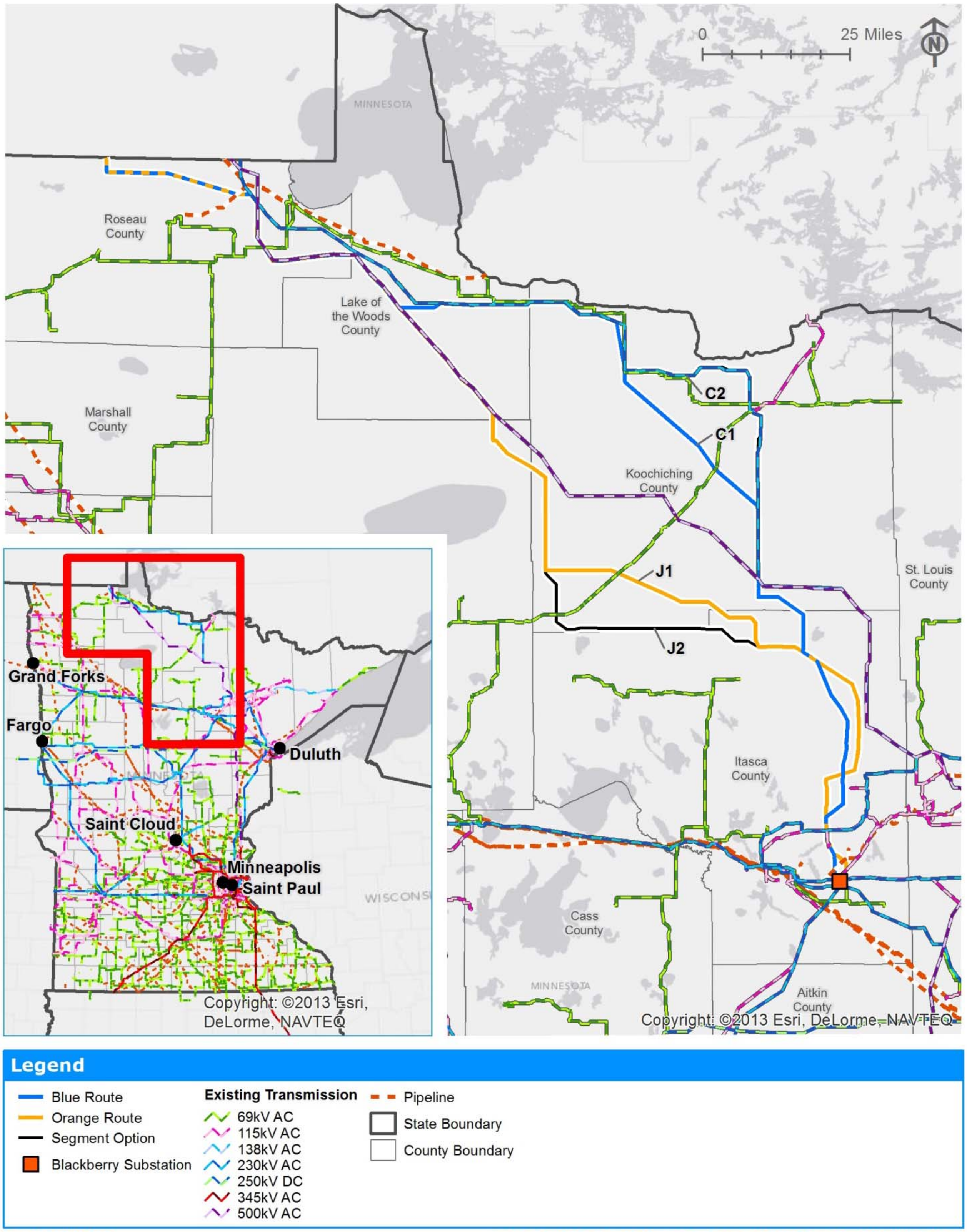
Existing Electric Transmission Lines

Electric transmission lines in the Study Area generally include 115 kV, 230 kV, and 500 kV lines. The two main transmission lines in the Study Area are a 230 kV line owned by Minnkota Power Cooperative and the Applicant, and a 500 kV line owned by Xcel Energy. Both of these existing lines are tie lines between Manitoba and the United States that run from the Minnesota-Manitoba border to the Iron Range in Minnesota. Both Route Alternatives cross existing 115 kV and 230 kV transmission lines; the Blue Route Alternative crosses the existing 500 kV transmission line owned by Xcel Energy twice (Figure 6.13-1) (see Appendix A, sheets 15 and 36).

minnesota power
AN ALLETE COMPANY
GREAT NORTHERN TRANSMISSION LINE

Existing Gas Pipelines and Electric Utility System

Figure 6.13-1



Sources: ESRI, MnGEO \\mspe-gis-file\GISProjLarge\MinnPower\182035\map_docs\CLIENT\Route_Permit\0613-1_Utilities.mxd

The Orange Route Alternative parallels existing electric transmission line ROW for approximately 66.4 miles, or 30 percent of its length. Of this 66.4 miles, approximately 1.9 miles parallels the existing 230 kV tie line owned by Minnkota Power Cooperative; approximately 59.9 miles parallels the existing 500 kV tie line owned by Xcel Energy; and approximately 4.6 miles parallels existing 115 kV transmission lines owned by Minnesota Power. The Blue Route Alternative parallels existing electric transmission line ROW for approximately 84.2 miles, or 38 percent of its length. Of this 84.2 miles, approximately 44.5 miles parallels the existing 230 kV tie line owned by Minnkota Power Cooperative and the Applicant; 36.2 miles parallels the existing 500 kV tie line owned by Xcel Energy; and approximately 3.5 miles parallels existing 115 kV transmission lines owned by Minnesota Power.

Only one Segment Option parallels existing transmission line ROW: C2 (36.2 miles).

6.13.2 Direct and Indirect Effects

Public Services

Potential temporary impacts on public services, mainly emergency services, could occur if construction activities block or otherwise disrupt roadways and access. Once construction is complete, the Project, including all Route Alternatives, will span all roads and therefore will not impede emergency services or otherwise result in any permanent negative direct or indirect effects on public services.

Existing Gas Pipelines

Depending on the Route Alternative selected, the transmission line will cross gas pipelines twice.

Damage to underground pipelines could occur as a result of excavation and grading activity during construction. The Applicant will utilize the Gopher State One-Call utility locating service to identify and avoid temporary impacts on existing pipelines. Gas pipelines are not common in the Study Area and therefore, impacts on gas and oil pipelines are not expected.

Existing Electric Transmission Lines

The Orange and Blue Route Alternatives parallel existing electrical transmission lines for approximately 66.4 miles and 84.2 miles, respectively. The anticipated ROW will be adjacent to, but not within, existing transmission line ROW. Construction and operation of the Project will not interfere with the operation of existing transmission lines as the appropriate separation distance will be maintained for clearance and safety issues.

One of the existing transmission lines located within the Study Area is a 500 kV line owned by Xcel Energy. After completion of the Riel Station Reliability Project in October 2014, this line will originate at the Riel Substation near Winnipeg, Manitoba. From the Winnipeg area, the line crosses the Minnesota-Manitoba border near Roseau, Minnesota, and connects to the Forbes Substation on Minnesota's Iron Range, where a second 500 kV line continues from Forbes to the Chisago Substation near the Twin Cities. The Riel – Forbes 500 kV line is the largest of the four existing transmission lines that connect Manitoba and the United States. As noted above, the

Orange Route Alternative parallels this existing 500 kV line for 59.9 miles, while the Blue Route Alternative parallels this existing 500 kV line for 36.2 miles. Because of the significance of the Riel – Forbes 500 kV line and the fact that the Project is similar in size and purpose to the existing 500 kV line, the Applicant considered the specific impact of these parallel route segments.

The main impact of locating the Project adjacent to the existing 500 kV line is the perception the physical proximity of the two 500 kV lines would increase the likelihood of an unexpected simultaneous outage of both lines. In practice, unexpected transmission line outages are rare, and simultaneous unexpected outages of parallel lines not sharing a common tower are even rarer. Unexpected transmission line outages occur for a number of reasons. In this case the primary concerns are with extreme weather events and equipment failures. Extreme weather events including lightning, high winds, extreme icing, or tornadoes could result in a simultaneous outage of both 500 kV lines if the localized effect at the parallel corridor was extreme enough to cause significant damage to both lines. Similarly, the failure of transmission line equipment such as conductors, shield wires, insulators, or structures could result in a simultaneous or near-simultaneous outage if appropriate separation distance between the two lines did not exist, allowing the failed equipment of one line to damage the other line. In both cases – weather and equipment failures – the likelihood of an actual event severely impacting both 500 kV lines can be greatly reduced by incorporating the appropriate transmission line design considerations into the engineering of the Project.

Previously, an unexpected outage of the Riel – Forbes 500 kV line was the largest single contingency in the Midcontinent Independent System Operator (MISO) footprint. With the recent integration of the MISO South region utilities on December 19, 2013, this outage officially became the second-largest single contingency in MISO. Without the Project, the incremental transfers required by Minnesota Power's agreements with Manitoba Hydro would cause more power to flow on the Riel – Forbes 500 kV line, increasing the severity of an unexpected outage of the line and potentially causing it to once again become the largest single contingency in MISO. The Project, therefore, is designed to maintain or improve the performance of the Riel – Forbes 500 kV line while facilitating the incremental transfers necessary to serve Minnesota Power's customers.

The reliability impact of the Riel – Forbes 500 kV line outage is currently addressed with a special protection system (SPS). The existing SPS acts nearly instantaneously to reduce the power transfer from Manitoba to the United States in the event of an unexpected outage of any of the four existing tie lines between Manitoba and the United States, or combinations thereof. As an additional Manitoba to United States tie line, the Project would also come under the existing SPS. Therefore, the reliability impacts in the United States of an unexpected simultaneous outage of both 500 kV tie lines would largely be addressed by the SPS and corresponding power transfer reductions.

6.13.3 Mitigation

The Applicant proposed the following mitigation measures:

→ As construction progresses, information will be provided to local emergency services to inform personnel of upcoming activity and impacts of the work as well as to plan for emergency situations on the construction site, should they occur.

→ The Applicant will coordinate and provide the necessary requirements for any short term road or lane closure with the appropriate authority, including emergency services.

→ Prior to construction, the Gopher State One-Call utility locating service will be utilized to identify buried utilities that must be avoided during construction, including pipelines and any associated distribution lines.

→ The Applicant will also coordinate the appropriate construction measures to protect buried pipelines or electric lines where they must be crossed by heavy equipment.

→ If any disruptions to the electrical system are required during construction, the Applicant or the contractor will contact the appropriate utility or electric cooperative to schedule planned disruptions.

→ The Applicant will address potential simultaneous outages of the Project and the existing 500 kV line due to weather events by developing a weather study of the Project's Study Area to define and incorporate the appropriate design considerations based on actual weather data. Based on the weather study, the design criteria for the Project may be adjusted to increase the robustness of the design for those lengths where the Project parallels the existing 500 kV transmission line.

→ Where design criteria cannot fully address potential simultaneous outages due to weather events, as is the case with tornadoes, the Applicant will consider further mitigation as appropriate to enhance restorability. This could include more frequent use of anti-cascade towers, maintaining an increased supply of emergency spare towers, or even locating a permanent storage facility for emergency spares on or near the location where the Project parallels the existing 500 kV transmission line.

→ The Applicant will address potential simultaneous outages of the Project and the existing 500 kV line due to lightning events by installing shield wires and single pole tripping, a protective relay scheme that allows power to continue being transferred over the line even if one of the three phases is struck by lightning. Since the majority of lightning events only affect one phase of a transmission line, single pole tripping should alleviate any concerns with simultaneous outages due to lightning.

→ The Applicant will address potential simultaneous outages of the Project and the existing 500 kV line due to equipment failures by maintaining appropriate separation distances between the Project and the existing 500 kV transmission line.

→ The Applicant will evaluate the steady state and dynamic performance of the regional transmission system after a simultaneous outage of the two 500 kV transmission lines for both north and south flow conditions in the electrical design optimization studies for the

Project. These studies should identify any potential electrical problems with this event and if there are any reasonable electrical design considerations that will improve the performance of the system during this event.

→ Once the Project is in service, the reliability impacts in the United States of a simultaneous outage of the Project and the existing 500 kV line will be addressed by modifying the existing SPS associated with the four current Manitoba to United States tie lines to include the Project and associated facilities. In the event of an unexpected simultaneous outage of the Project and the existing 500 kV line, the modified SPS will be set up to preserve the integrity of the system based on the operating studies for the Project.

6.14 Radio, Television, and Cellular Telephone

This section describes the radio, television, and cellular telephone infrastructure within the Study Area and the potential impacts of the Route Alternatives and Segment Options on that infrastructure.

Communication tower data was obtained from the Federal Communications Commission (FCC) and spatially analyzed in Geographic Information System (GIS) to determine direct and indirect impacts.

6.14.1 Existing Conditions

Communications technologies identified within the Orange and Blue Route Alternatives and Segment Options can be divided into two broad categories: omnidirectional and unidirectional signals. Omnidirectional refers to those antennae that are able to transmit or receive signals in any direction, whereas unidirectional refers to those antennae that are able to transmit or receive signals in one direction. Microwave signals are unidirectional and all others (that is, radio, television, communications, and cellular phone) are omnidirectional.

Omnidirectional Signals

Generally, transmission lines do not cause interference with omnidirectional radio, television, or other communication antenna reception. While it is rare in everyday operations, four potential interference sources do exist: gap discharges, corona discharges, shadowing effects, and reflection effects.

Gap discharge interference is the most commonly noticed form of transmission line interference with omnidirectional signals. Gap discharges may occur on transmission lines and distribution lines where small gaps (that is, spaces) develop between mechanically connected metal parts. As sparks discharge across a gap, they create the potential for electrical noise, which can occur at any electrical line voltage. The degree of interference depends on the quality and strength of the transmitted communication signal, the quality of the antenna system, and the distance between the receiver and the electrical line. Gap discharges typically are not a design issue, but tend to be associated with equipment maintenance, occurring at areas where gaps have formed due to broken or ill fitted hardware (for example, clamps, insulators, and brackets). Because gap discharges are a hardware issue, they can be repaired when they occur. While gap discharges and their effects can happen on any electrical line, they typically occur on lower voltage distribution lines. The gap discharge potential of larger transmission lines (like the Project) tends to be minimized because there are fewer structures and a higher mechanical load on hardware.

Corona discharges can generate radio frequency electrical interference. Corona discharges are a potential issue with all transmission lines. They are caused when localized electric fields near an energized conductor produce small electric discharges ionizing nearby air. Most often, the reasons for corona discharge are related to irregularities on conductors, including scratches or nicks, dust buildup, or water drops. The air ionization caused by corona discharges results in energy loss and generates audible noise, radio noise, light, heat, and small amounts of ozone.

The energy loss from corona discharges is minimized through the design process by selecting conductors properly sized for the operating voltage of the line. In the case of the Project, a three-conductor bundle in a delta arrangement was selected largely for this purpose. The potential for radio and television signal interference due to corona discharges relates to the magnitude of the transmission line-induced radio frequency noise compared to the strength of the broadcast signals. Because radio frequency noise, like electric and magnetic fields, becomes significantly weaker with distance from the transmission line conductors, very few practical interference problems occur with existing transmission lines. In most cases, the strength of the radio or television broadcast signal within a broadcaster's primary coverage area is great enough to prevent interference.

Shadowing and reflection effects typically are associated with large structures, such as high buildings, that may cause reception problems by disturbing broadcast links and leading to poor radio and television reception. Although the occurrence is rare, a transmission structure or the conductor can create a shadow on adjoining properties that obstructs or reduces the transmitted signal. Structure may cause a reflection or scattering of the signal. Reflected signals from a structure result in the original signal breaking into two or more signals. Multipath reflection or scattering interference can be caused by the combination of a signal that travels directly to the receiver, and a signal reflected from the structure that travels a slightly longer distance, and thus may be received slightly later by the receiver. If one signal arrives with significant delay relative to the other, the picture quality of both analog and digital television broadcast signals may be impacted. With analog broadcasts, a second image may appear on the receiver's screen and displace the other. This type of reception interference is known as ghosting or delayed image. With digital broadcasts, the picture can become pixelated or freeze and become unstable. The most significant factors affecting the potential for signal shadow and multipath reflection are structure height above the surrounding landscape and the presence of large flat metallic facades. Potential shadow and reflection effects from the Project tend to be minimized because there are spaces between the members of the steel lattice structures and because the structures will be placed up to 1,400 feet apart. Due to the spaces between the lattice elements and the large spaces between individual structures, the Project's structures do not create one large obstacle, and broadcast signals should travel through the structures, minimizing the likelihood of shadowing and reflection effects.

Microwave (Unidirectional) Signals

Microwave antennas are operated as high-frequency, unidirectional, point-to-point systems and depend on line-of-sight between antenna receivers. These systems are unlikely to be affected negatively by electrical noise, but could be affected by infrastructure located directly between two microwave signal points.

Existing Tower Locations

Communication tower locations were identified by accessing the FCC database (FCC 2012). Based on the data available, both Route Alternatives include seven communication towers; there are no communication towers within the anticipated ROW of any Route Alternative or Segment Option (see Table 6.14-1). See Figure 6.14-1 for the locations of communication towers.

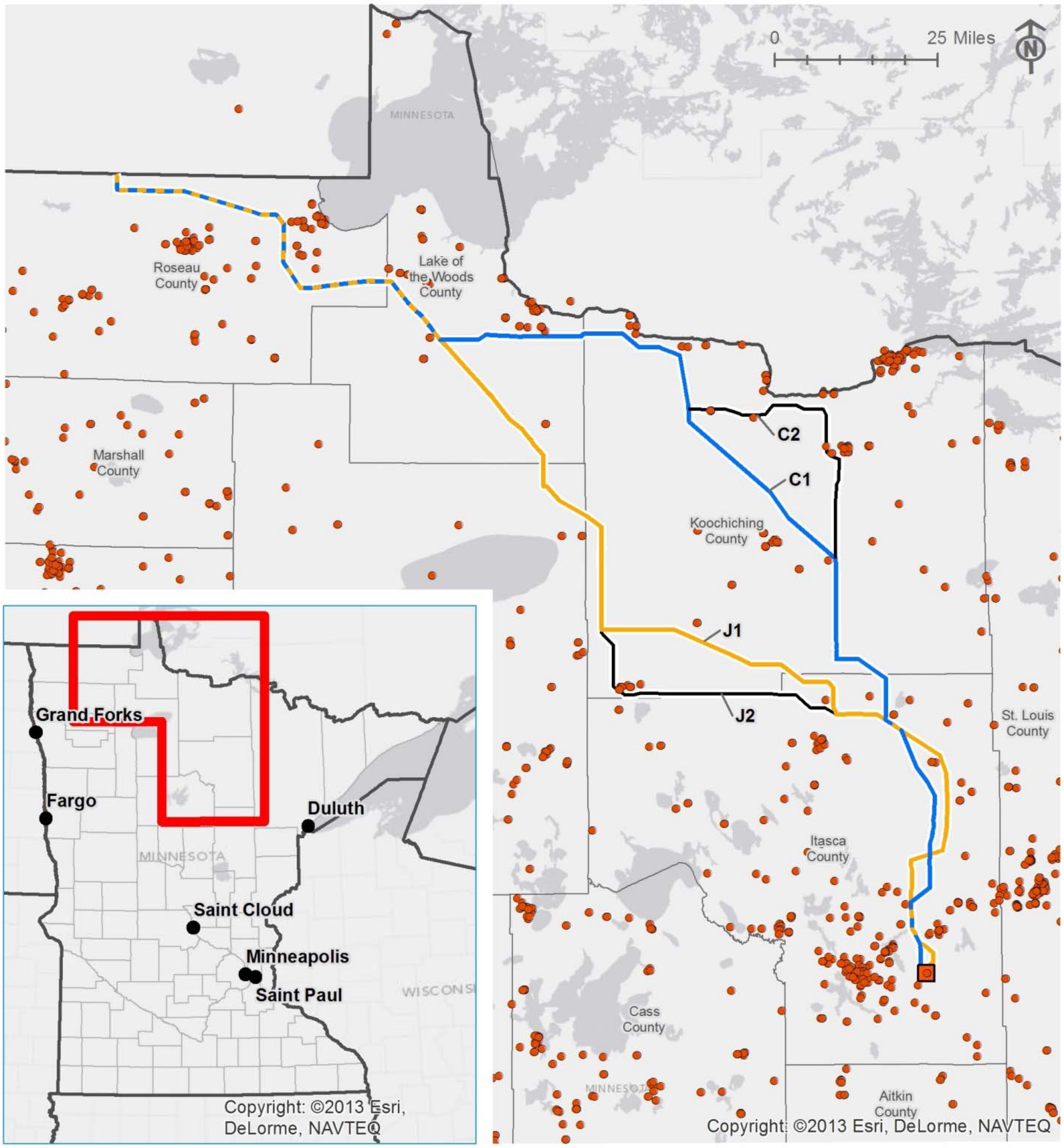
Table 6.14-1. Number of Towers within Each Segment Option

Route Alternative or Segment Option	Number of Towers
Orange Route	7
Blue Route	7
C1	0
C2	11
J1	0
J2	15

Source: FCC database (FCC 2012)

Omnidirectional and Uniderictional Communication Towers

Figure 6.14-1



Legend

- Blue Route
- Orange Route
- Segment Option
- Blackberry Substation
- FCC Registered Communications Tower
- State Boundary
- County Boundary

Sources: ESRI,FCC \\mspe-gis-file\GISProjLarge\MinnPower\182035\map_docs\CLIENT\Route_Permit\0614-1_FCC.mxd

6.14.2 Direct and Indirect Effects

The Applicant is not aware of any complaints related to radio or television interference resulting from the operation of existing transmission lines located near the Route Alternatives or Segment Options, and does not expect that such interference will be an issue. In addition, there are no communication towers located in the anticipated ROW for the Route Alternatives or Segment Alternatives; thus, construction of the Project will not directly affect any communication towers.

No indirect impacts on omnidirectional communications are anticipated as the transmission line hardware will be designed to reduce gap discharges and corona discharges. The transmission line will be properly maintained to minimize gap discharges and corona discharges.

Interference from transmission line corona discharges associated with the Project could occur for an amplitude modulation (AM) radio station within a station's primary coverage area where good reception existed before the Project was built. The situation is unlikely, however, because AM radio frequency interference typically occurs immediately under a transmission line and dissipates rapidly with increasing distance from the line.

Frequency modulation (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 Megahertz)
- → The interference rejection properties inherent in FM radio systems make them virtually immune to amplitude type disturbances.

Television reception could be impacted by the structures or the transmission line conductors. The large size of these transmission line components might cause a shadowing effect that could cause reception interferences.

In addition, corona-generated radio frequency noise and transmission line structure placement could cause interference with television broadcast signals. Because digital reception is in most cases considerably more tolerant of noise and somewhat less resistant to multipath reflections (that is, reflections from structures) than analog broadcasts, interference is not anticipated. However, if the noise level or reflections are great enough, they will impact digital television reception.

Due to the higher frequencies of television broadcast signals (that is, 54 Megahertz and above), a transmission line seldom causes reception problems within a station's primary coverage area. In the rare situation where the construction of the Project causes interference within a television station's primary coverage area, the Applicant will work with the affected viewers to correct the problem. Usually any reception problem can be corrected with the addition of an outside antenna.

6.14.3 Mitigation

The Applicant proposes the following mitigation measures.

- → If television or radio interference is caused by the operation of the proposed facilities in those areas where good reception was available prior to construction of the Project, the Applicant will inspect and repair loose or damaged hardware in the transmission line, or take other necessary action to restore reception to the present level, including the appropriate modification of receiving antenna systems if necessary.
- → If interference from corona discharges does occur for an AM radio station within a station's primary coverage area with good reception before the Project was built, satisfactory reception can be obtained by appropriate modification of the receiving antenna system.
- → A two-way mobile radio located immediately adjacent to and behind a large metallic structure (such as a steel transmission line structure) may experience interference because of the signal blocking effects of the structure. Moving either mobile unit by less than 50 feet so that the metallic structure is no longer immediately between the two units should restore communications.
- → If television interference is caused by the operation of the Project, the Applicant will inspect and repair any loose or damaged hardware in the transmission line or take other necessary action to restore reception to the present level.
- → If necessary, the Applicant will work with tower operators to resolve any issues directly related to the Project.

Radio frequency noise is not an issue for cellular phones because it is almost non-existent in the frequency range for cellular-type phones, and the technology used by cellular phones is superior to that used in two-way mobile radio units.

6.15 Electric and Magnetic Fields

This section describes electric and magnetic fields and stray voltage, which are phenomenon associated with electrical energy sources. It also describes how these phenomena are related to human health.

Many sources relating to each specific phenomenon are cited in the text below and provide a context for the impacts and mitigation discussions.

6.15.1 Existing Conditions

Electric and magnetic fields (EMF) are invisible lines of force that are present anywhere electricity is produced or used, including around electric appliances and any wire that is conducting electricity. The term EMF is typically used to refer to electric and magnetic fields that are coupled together. For the lower frequencies associated with power lines (referred to as extremely low frequency or ELF), electric and magnetic fields are relatively decoupled and should be described separately in terms of kilovolts per meter (kV/m) and milliGauss (mG), respectively.

Electric Fields

Voltage on any wire (that is, conductor) produces an electric field in the area surrounding the wire. The electric field associated with a high-voltage transmission line extends from the energized conductors to other nearby objects, such as the ground, structures, vegetation, buildings, and vehicles. The intensity of electric field associated with a high voltage transmission line is proportional to the voltage of the line, and becomes weaker with increasing distance from the line conductors. Nearby trees and building material also greatly reduce the strength of transmission line electric fields.

When an electric field reaches a nearby conductive object, such as a vehicle or a metal fence, it induces a voltage on the object. The magnitude of the induced voltage is dependent on many factors, including the object's capacitance, shape, size, orientation, location, resistance to ground, and the weather conditions. If the object is insulated or semi-insulated from the ground and a person touches it, a small current will pass through the person's body to the ground. This might be accompanied by a spark discharge and mild shock, similar to what can occur when a person walks across a carpet and touches a grounded object, like a door knob, or another person.

The main concern with induced voltage on an object is not the level of induced voltage, but the current that flows through a person to the ground when the person touches the object. To ensure that any discharge does not reach unsafe levels, the National Electrical Safety Code (NESC) requires that any discharge be less than 5 milliAmperes (mA). While there is not an official state or federal standard for transmission line electric fields, the Minnesota Environmental Quality Board (EQB) has historically enforced a maximum electric field limit of 8 kV/m measured at one meter above ground for new transmission line projects. This limit was designed, consistent with the NESC spark discharge limit, to prevent serious hazard from shocks when touching large conductive objects under AC transmission lines of 500 kV or greater.

Electric field strength is measured in units of voltage density, expressed as volts per meter (V/m) or kilovolts per meter (kV/m). Transmission line electric fields are typically measured at 1 meter above the ground.

Magnetic Fields

Current passing through any conductive material, including a wire, produces a magnetic field in the area around that material. The current flowing through the conductors of a high-voltage transmission line generates a magnetic field that, in similar fashion to the electric field, extends from the energized conductors to nearby objects. The intensity of the magnetic field associated with a high-voltage transmission line is proportional to the amount of current flowing through the line conductors, and rapidly weakens with increasing distance from the line conductors. Unlike electric fields, magnetic fields are not substantially affected by the presence of trees, buildings, or other solid structures nearby. The magnetic field is expressed in units of magnetic flux density, expressed as Gauss (G) or mG.

Electric and Magnetic Fields Health Effects Research

The question of whether exposure to power-frequency (60 Hertz [Hz]) magnetic fields can cause biological responses or adverse health effects has been the subject of considerable research for the past three decades. The most recent and exhaustive reviews of the health effects from power-frequency fields conclude that the evidence of health risk is minimal. The National Institute of Environmental Health Sciences (NIEHS) issued its final report, NIEHS Report on *Health Effects from Exposure to Power-Line Frequency Electric and Magnetic Fields*, on June 15, 1999, following 6 years of intensive research (NIEHS 1999). In the report, NIEHS concluded that the scientific evidence linking EMF exposures with health risks is weak and that this finding does not warrant aggressive regulatory concern. However, in light of the weak scientific evidence supporting some association between EMF and health effects and the fact that exposure to electricity is common in the U.S., NIEHS stated that passive regulatory action, such as providing public education on reducing exposures, is warranted.

The U.S. Environmental Protection Agency (EPA) has come to a similar conclusion about the link between adverse health effects, specifically childhood leukemia, and power-frequency EMF exposure (EPA 2012). On its website, EPA states:

> Many people are concerned about potential adverse health effects. Much of the research about power lines and potential health effects is inconclusive. Despite more than two decades of research to determine whether elevated EMF exposure, principally to magnetic fields, is related to an increased risk of childhood leukemia, there is still no definitive answer. The general scientific consensus is that, thus far, the evidence available is weak and is not sufficient to establish a definitive cause-effect relationship.

Minnesota, California, and Wisconsin have each conducted their own literature reviews or research to examine this issue. In 2002, Minnesota formed an Interagency Working Group to evaluate the research and develop policy recommendations to protect the public health from any potential problems arising from EMF effects associated with high-voltage transmission lines. The Minnesota Department of Health published the Working Group's findings in *A White Paper on Electric and Magnetic Field (EMF) Policy and Mitigation Options* (Minnesota Department of Health 2002). The Working Group summarized its findings as follows:

> Research on the health effects of EMF has been carried out since the 1970's. Epidemiological studies have mixed results – some have shown no statistically significant association between exposure to EMF and health effects, some have shown a weak association. More recently, laboratory studies have failed to show such an association, or to establish a biological mechanism for how magnetic fields may cause cancer. A number of scientific panels convened by national and international health agencies and the United States Congress have reviewed the research carried out to date. Most researchers concluded that there is insufficient evidence to prove an association between EMF and health effects; however many of them also concluded that there is insufficient evidence to prove that EMF exposure is safe.

Most recently, results of a large epidemiological study were published presenting the findings of a case-control study that investigated risks of adult cancers in relation to distance and the ELF magnetic fields from high-voltage overhead transmission lines (Elliott et al. 2013). The study examined National Cancer Registry Data in England and Wales from 1974 to 2008. The data examined included 7,823 leukemia, 6,781 brain and central nervous system, 9,153 malignant melanoma, and 29,202 female breast cancer cases. Case cancers were individuals 17 to 74 years old diagnosed between 1974 and 2008, and lived within 1,000 meters (that is, 3,280 feet) of a high-voltage overhead transmission line. The transmission lines included in the study were 400 kV, 275 kV, and 132 kV transmission lines across England and Wales. The study also included 79,507 controls frequency-matched on year and region. The controls were individuals selected from a range of cancers not considered to be associated with electric and magnetic fields. They found that the results do not support an epidemiological association of adult cancers with proximity to residential magnetic fields from high-voltage overhead transmission lines.

There are currently no federal guidelines pertaining to magnetic field exposure beneath a high-voltage transmission line. The Minnesota Public Utilities Commission (PUC) has addressed the matter with respect to new transmission lines in a number of separate dockets over the past few years. In its September 12, 2012, Order in PUC Docket Number E-002/TL-11-800 for the North Rochester to Chester 161 kV transmission line, PUC approved and adopted the following findings with regard to magnetic field exposure:

> 107. There are no State of Minnesota or federal standards for exposure to magnetic fields from transmission lines. Florida, Massachusetts, and New York have established standards for magnetic field exposure at the edge of

transmission line rights-of-way. These standards are 150 mG, 85 mG, and 200 mG respectively.

108. The International Commission on Non-Ionizing Radiation Protection (ICNIRP) has developed standards for magnetic field exposure. The ICNIRP standard for magnetic field exposure for the general public is 2,000 mG.

109. Epidemiological studies have shown an association between magnetic field exposure and health risks for children. Epidemiological studies, clinical studies, and cellular studies have shown no association between magnetic field exposure and health risks for adults. No studies have established a causal relationship between magnetic field exposure and adverse health impacts.

110. The estimated magnetic fields for the project are below all standards adopted by other states and below international standards. No adverse health impacts from magnetic fields are anticipated for persons living or working near the project.

Stray Voltage

Stray voltage is a condition that can occur on the electric service entrances to structures from distribution lines—not transmission lines. More precisely, stray voltage is a voltage that exists between the neutral wire of the service entrance and grounded objects in buildings such as barns and milking parlors.

Transmission lines do not, by themselves, create stray voltage because they do not connect to businesses or residences. However, transmission lines can induce stray voltage on a distribution circuit that is parallel and immediately under the transmission line. Appropriate measures will be taken to prevent stray voltage problems when the proposed Project parallels or crosses distribution lines.

6.15.2 Direct and Indirect Effects

Electric Fields

The predicted intensity of electric fields associated with the various structure configurations of the Project are given in Table 6.15-1 for the edge of the ROW (100 feet from centerline) and at the location where the maximum electric field will be experienced. Where the Project parallels existing transmission lines, the presence of another energized line nearby will impact the electric field profile around the parallel lines. Therefore, the predicted intensity of electric fields associated with the various scenarios where the Project parallels existing transmission lines are given in Table 6.15-2.

Values were calculated using Bonneville Power Administration's Corona and Field Effects Program, Version 3.0. Because electric fields are particularly dependent on the voltage of the transmission line, the values in the tables were calculated at the lines' maximum continuous operating voltage. Maximum continuous operating voltage is defined for the Project as the nominal voltage plus 10 percent, in this case 550 kV. The maximum continuous operating voltage associated with the existing 500 kV, 230 kV, and 115 kV transmission lines that the Project may parallel is similarly defined as nominal voltage plus 10 percent. As indicated in Table 6.15-2 below, this results in maximum continuous operating voltage levels of 550 kV, 253 kV, and 127 kV, respectively. In accordance with Institute of Electrical and Electronics Engineers (IEEE) Standard 644-1994 (R2008), *IEEE Standard Procedures for Measurement of Power Frequency Electric and Magnetic Fields From AC Power Lines*, values were calculated at minimum conductor-to-ground clearance (that is, mid-span) at a height of 1 meter above ground.

Table 6.15-1. Predicted Intensity of Electric Fields at Maximum Operating Voltage Where Not Paralleling Existing Transmission Lines

Structure Type	Line Voltage	Edge of ROW	Maximum Overall	
		Intensity (mG)	Intensity (mG)	Distance from ROW Centerline (feet)
500 kV Guyed-Delta	550 kV	1.330	6.613	31.2
500 kV Guyed-V	550 kV	2.325	7.122	43.8
500 kV Self-Supporting	550 kV	2.325	7.122	43.8

Table 6.15-2. Predicted Intensity of Electric Fields at Maximum Operating Voltage Where the Project Parallels Existing Transmission Lines

Structure Type	Line Voltage	Edge of ROW	Maximum Overall	
		Intensity (mG)	Intensity (mG)	Distance from ROW Centerline (feet)
Project: 500 kV Guyed-Delta Existing: 500 kV Self-Supporting	550 kV 550 kV	1.732	6.652	31.2
Project: 500 kV Guyed-V Existing: 500 kV Self-Supporting	550 kV 550 kV	2.358	7.156	43.8
Project: 500 kV Self-Supporting Existing: 500 kV Self-Supporting	550 kV 550 kV	2.358	7.156	43.8
Project: 500 kV Guyed-Delta Existing: 500 kV Guyed-Delta	550 kV 550 kV	1.347	6.627	31.2
Project: 500 kV Guyed-V Existing: 500 kV Guyed-Delta	550 kV 550 kV	2.335	7.139	43.8
Project: 500 kV Self-Supporting Existing: 500 kV Guyed-Delta	550 kV 550 kV	2.335	7.139	43.8
Project: 500 kV Guyed-Delta Existing: 230 kV H-Frame	550 kV 253 kV	1.337	6.624	31.2
Project: 500 kV Guyed-V Existing: 230 kV H-Frame	550 kV 253 kV	2.334	7.131	43.8
Project: 500 kV Self-Supporting Existing: 115 kV H-Frame	550 kV 253 kV	2.334	7.131	43.8
Project: 500 kV Guyed-Delta Existing: 115 kV H-Frame	550 kV 127 kV	1.329	6.622	31.2

Structure Type	Line Voltage	Edge of ROW	Maximum Overall	
		Intensity (mG)	Intensity (mG)	Distance from ROW Centerline (feet)
Project: 500 kV Guyed-V Existing: 115 kV H-Frame	550 kV 127 kV	2.321	7.130	43.8
Project: 500 kV Self-Supporting Existing: 115 kV H-Frame	550 kV 127 kV	2.321	7.130	43.8
Project: 500 kV Guyed-Delta Existing: 115 kV H-Frame Existing: 115 kV H-Frame	550 kV 127 kV 127 kV	1.330	6.637	31.2
Project: 500 kV Guyed-V Existing: 115 kV H-Frame Existing: 115 kV H-Frame	550 kV 127 kV 127 kV	2.322	7.141	43.8
Project: 500 kV Self-Supporting Existing: 115 kV H-Frame Existing: 115 kV H-Frame	550 kV 127 kV 127 kV	2.322	7.141	43.8
Project: 500 kV Guyed-Delta Existing: 115 kV H-Frame Existing: 230 kV H-Frame	550 kV 127 kV 253 kV	1.338	6.625	31.2
Project: 500 kV Guyed-V Existing: 115 kV H-Frame Existing: 230 kV H-Frame	550 kV 127 kV 253 kV	2.332	7.127	43.8
Project: 500 kV Self-Supporting Existing: 115 kV H-Frame Existing: 230 kV H-Frame	550 kV 127 kV 253 kV	2.332	7.127	43.8

More detailed results from the Applicant's electric field calculations, including predicted electric field levels at various distances from ROW centerline and plots of the lateral profile of electric field levels for each structure configuration, can be found in Appendix I.

Based on the maximum calculated intensity of electric field shown in Tables 6.15-1 and 6.15-2 below (7.156 kV/m), the Applicant has calculated the approximate spark discharge from a typical school bus (40 feet long by 8.5 feet wide by 10.75 feet high) stopped at mid-span under a 500 kV transmission line. The modeling shows that the spark discharge current will be approximately 3.83 mA, which is within the 5 mA limit deemed safe by the NESC. Where appropriate, the Applicant will work with affected landowners to ensure that fixed objects, such as a fence or other large permanent conductive object proximate to, or parallel to the transmission line, are appropriately grounded to further reduce the likelihood of shock hazard. As stated above, EQB has historically enforced a maximum electric field limit of 8 kV/m measured at 1 meter above the ground for transmission line projects. As demonstrated in Tables 6.15-1 and 6.15-2, the Project will also comply with the EQB standard.

Other potential impacts of electric fields include interference with the operation of pacemakers and implantable cardioverter-defibrillators (ICDs). Interference with implanted cardiac devices can occur if the electric field intensity is high enough to induce sufficient body currents to cause interaction. In general, the response depends on the make and model of the device as well as the individual's height, build, and physical orientation with respect to the electric field. Pacemaker manufactures such as, Medtronic and Guidant, have indicated that modern cardiac devices are much less susceptible to interactions with electric fields than older unipolar designs. A recent study (Scholten et al. 2005) concludes that the risk of interference inhibition of unipolar cardiac pacemakers from high-voltage transmission lines in everyday life is small. In 2007, Minnesota Power and Xcel Energy conducted studies with Medtronic to evaluate the impact of the electric fields associated with existing 115 kV, 230 kV, 345 kV, and 500 kV transmission lines on implantable medical devices. The analysis was based on real life public exposure levels under actual transmission lines in Minnesota; no adverse interaction with pacemakers or ICDs occurred (University of Minnesota Power Systems Conference Proceedings 2007). The analysis concluded that, although interaction may be possible in unique situations, device interaction due to typical public exposure would be rare.

In the unlikely event a pacemaker is impacted, the effect is typically a temporary asynchronous pacing. The pacemaker will return to its normal operation when the person moves away from the source of the interference.

Magnetic Fields

The predicted intensity of magnetic fields associated with the various structure configurations of the Project are given in Tables 6.15-3 and 6.15-5 for the edge of the ROW (100 feet from centerline) and at the location where the maximum magnetic field will be experienced. Where the Project parallels existing transmission lines, the presence of another energized line nearby will impact the magnetic field profile around the parallel lines. Therefore, the predicted intensity of magnetic fields associated with the various scenarios where the Project parallels existing transmission lines are given in Tables 6.15-4 and 6.15-6.

Values were calculated using Bonneville Power Administration's Corona and Field Effects Program, Version 3.0. Because magnetic fields are particularly dependent on the current flowing on the transmission line, magnetic field information is provided for two conditions: the maximum continuous rating of the Project (Tables 6.15-3 and 6.15-4) and the projected peak loading when the Project is in service (Tables 6.15-5 and 6.15-6).

Maximum continuous rating is defined for the Project as the expected capacity of the transmission line based on the most limiting piece of equipment connected to it. In this case, the Project's maximum continuous rating is 2,000 Amps based on the likely rating of the Project's series capacitor banks, which are necessary for the reliable operation of the transmission line. The projected peak loading of the Project—1,024 Amps—was derived from power system modeling of the Project under system normal conditions in a 2020 summer off-peak case with high Manitoba–United States transfers. The maximum continuous rating and projected peak loading associated with the existing 500 kV, 230 kV, and 115 kV transmission lines that the Project may parallel were derived in similar fashion and are given in the tables below. In accordance with IEEE Standard 644-1994 (R2008), *IEEE Standard Procedures for Measurement of Power Frequency Electric and Magnetic Fields From AC Power Lines*, values were calculated at minimum conductor-to-ground clearance (that is, mid-span) at a height of 1 meter above ground.

Table 6.15-3. Predicted Intensity of Magnetic Fields at Maximum Continuous Rating Where Not Paralleling Existing Transmission Lines

Structure Type	Line Current	Edge of ROW	Maximum Overall	
		Intensity (mG)	Intensity (mG)	Distance from ROW Centerline (feet)
500 kV Guyed-Delta	2,000 A	52.94	258.11	0
500 kV Guyed-V	2,000 A	88.54	293.67	18.8
500 kV Self-Supporting	2,000 A	88.54	293.67	18.8

Table 6.15-4. Predicted Intensity of Magnetic Fields at Maximum Continuous Rating Where the Project Parallels Existing Transmission Lines

Structure Type	Line Current	Edge of ROW	Maximum Overall	
		Intensity (mG)	Intensity (mG)	Distance from ROW Centerline (feet)
Project: 500 kV Guyed-Delta Existing: 500 kV Self-Supporting	2,000 A 2,000 A	72.94	268.51	212.5
Project: 500 kV Guyed-V Existing: 500 kV Self-Supporting	2,000 A 2,000 A	95.20	284.12	25.0
Project: 500 kV Self-Supporting Existing: 500 kV Self-Supporting	2,000 A 2,000 A	95.20	284.12	25.0
Project: 500 kV Guyed-Delta Existing: 500 kV Guyed-Delta	2,000 A 2,000 A	57.15	248.00	0.0
Project: 500 kV Guyed-V Existing: 500 kV Guyed-Delta	2,000 A 2,000 A	92.28	285.52	25.0
Project: 500 kV Self-Supporting Existing: 500 kV Guyed-Delta	2,000 A 2,000 A	92.28	285.52	25.0
Project: 500 kV Guyed-Delta Existing: 230 kV H-Frame	2,000 A 1,198 A	56.03	250.09	0.0
Project: 500 kV Guyed-V Existing: 230 kV H-Frame	2,000 A 1,198 A	91.29	288.35	18.8
Project: 500 kV Self-Supporting Existing: 115 kV H-Frame	2,000 A 1,198 A	91.29	288.35	18.8
Project: 500 kV Guyed-Delta Existing: 115 kV H-Frame	2,000 A 96 A	52.83	258.39	0
Project: 500 kV Guyed-V Existing: 115 kV H-Frame	2,000 A 96 A	88.45	294.02	18.8

Structure Type	Line Current	Edge of ROW	Maximum Overall	
		Intensity (mG)	Intensity (mG)	Distance from ROW Centerline (feet)
Project: 500 kV Self-Supporting Existing: 115 kV H-Frame	2,000 A 96 A	88.45	294.02	18.8
Project: 500 kV Guyed-Delta Existing: 115 kV H-Frame Existing: 115 kV H-Frame	2,000 A 929 A 929 A	50.39	265.47	0.0
Project: 500 kV Guyed-V Existing: 115 kV H-Frame Existing: 115 kV H-Frame	2,000 A 929 A 929 A	86.30	303.11	18.8
Project: 500 kV Self-Supporting Existing: 115 kV H-Frame Existing: 115 kV H-Frame	2,000 A 929 A 929 A	86.30	303.11	18.8
Project: 500 kV Guyed-Delta Existing: 115 kV H-Frame Existing: 230 kV H-Frame	2,000 A 804 A 1,753 A	82.36	246.59	6.2
Project: 500 kV Guyed-V Existing: 115 kV H-Frame Existing: 230 kV H-Frame	2,000 A 804 A 1,753 A	93.25	286.56	25.0
Project: 500 kV Self-Supporting Existing: 115 kV H-Frame Existing: 230 kV H-Frame	2,000 A 804 A 1,753 A	93.25	286.56	25.0

Table 6.15-5. Predicted Intensity of Magnetic Fields at Projected Peak Loading

Structure Type	Line Current	Edge of ROW	Maximum Overall	
		Intensity (mG)	Intensity (mG)	Distance from ROW Centerline (feet)
500 kV Guyed-Delta	1,024 A	26.81	126.18	0.0
500 kV Guyed-V	1,024 A	44.76	144.68	18.8
500 kV Self-Supporting	1,024 A	44.76	144.68	18.8

Table 6.15-6. Predicted Intensity of Magnetic Fields at Projected Peak Loading Where the Project Parallels Existing Transmission Lines

Structure Type	Line Current	Edge of ROW	Maximum Overall	
		Intensity (mG)	Intensity (mG)	Distance from ROW Centerline (feet)
Project: 500 kV Guyed-Delta Existing: 500 kV Self-Supporting	1,024 A 1,897 A	66.94	259.37	206.2

Structure Type	Line Current	Edge of ROW	Maximum Overall	
		Intensity (mG)	Intensity (mG)	Distance from ROW Centerline (feet)
Project: 500 kV Guyed-V Existing: 500 kV Self-Supporting	1,024 A 1,897 A	68.80	256.63	212.5
Project: 500 kV Self-Supporting Existing: 500 kV Self-Supporting	1,024 A 1,897 A	68.80	256.63	212.5
Project: 500 kV Guyed-Delta Existing: 500 kV Guyed-Delta	1,024 A 1,897 A	42.96	211.69	200.0
Project: 500 kV Guyed-V Existing: 500 kV Guyed-Delta	1,024 A 1,897 A	48.32	207.64	200.0
Project: 500 kV Self-Supporting Existing: 500 kV Guyed-Delta	1,024 A 1,897 A	48.32	207.64	200.0
Project: 500 kV Guyed-Delta Existing: 230 kV H-Frame	1,024 A 434 A	27.92	123.28	0.0
Project: 500 kV Guyed-V Existing: 230 kV H-Frame	1,024 A 434 A	45.74	142.75	18.8
Project: 500 kV Self-Supporting Existing: 115 kV H-Frame	1,024 A 434 A	45.74	142.75	18.8
Project: 500 kV Guyed-Delta Existing: 115 kV H-Frame	1,024 A 32 A	26.77	126.28	0.0
Project: 500 kV Guyed-V Existing: 115 kV H-Frame	1,024 A 32 A	44.73	144.79	18.8
Project: 500 kV Self-Supporting Existing: 115 kV H-Frame	1,024 A 32 A	44.73	144.79	18.8
Project: 500 kV Guyed-Delta Existing: 115 kV H-Frame Existing: 115 kV H-Frame	1,024 A 536 A 536 A	22.64	130.43	6.2
Project: 500 kV Guyed-V Existing: 115 kV H-Frame Existing: 115 kV H-Frame	1,024 A 536 A 536 A	38.76	150.14	25.0
Project: 500 kV Self-Supporting Existing: 115 kV H-Frame Existing: 115 kV H-Frame	1,024 A 536 A 536 A	38.76	150.14	25.0
Project: 500 kV Guyed-Delta Existing: 115 kV H-Frame Existing: 230 kV H-Frame	1,024 A 557 A 601 A	31.10	120.81	0.0
Project: 500 kV Guyed-V Existing: 115 kV H-Frame Existing: 230 kV H-Frame	1,024 A 557 A 601 A	42.04	141.15	12.5
Project: 500 kV Self-Supporting Existing: 115 kV H-Frame Existing: 230 kV H-Frame	1,024 A 557 A 601 A	42.04	141.15	12.5

More detailed results from the Applicant's magnetic field calculations, including predicted magnetic field levels at various distances from ROW centerline and plots of the lateral profile of magnetic field levels for each structure configuration, can be found in Appendix I.

As shown in Tables 6.15-5 and 6.15-6, the predicted peak magnetic field at the Project's projected peak loading is below the International Commission on Non-Ionizing Radiation Protection (ICNIRP) Standard (2,000 mG) at the edge of the Project's ROW. Because the magnetic field produced by the transmission line is dependent on the current flowing on its conductors, the actual magnetic field when the Project is placed in service will vary as the power flow on the line changes throughout the day. Since the actual power flow on the transmission line will be less than projected peak levels during most hours of the year, the actual magnetic field levels surrounding the line will also be less than those shown in Table 6.15-5 and 6.15-6 during most hours of the year.

Stray Voltage

Transmission lines do not, by themselves, create stray voltage because they do not connect to businesses or residences. However, transmission lines can induce stray voltage on a distribution circuit that is parallel and immediately under the transmission line. No stray voltage issues are expected with this Project.

6.15.3 Mitigation

No direct or indirect effects attributed to EMF from the Project are expected. Mitigation measures are not proposed.

This page intentionally left blank

6.16 Archaeological and Historic Resources

This chapter addresses compliance with various statutes and Executive Orders that protect historic and cultural resources, particularly Section 106 of the National Historic Preservation Act (NHPA), which is implemented through regulations published at 36 Code of Federal Regulations (CFR) 800.

Section 106 of the NHPA directs federal agencies, prior to the issuance of a license, permit, or funding, to take into account the effects of their undertakings on historic properties. Historic property is defined at 36 CFR 800.16(l)(1) as:

> "…any prehistoric or historic district, site, building, structure or object included in or eligible for inclusion in the National Register of Historic Places maintained by the Secretary of the Interior. This term includes artifacts, records, and remains that are related to and located within such properties. The term includes properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization and that meet the National Register criteria."

In addition to federal permitting requirements, Minnesota Rule 7850.1900 Subpart 3 (Environmental information) states that a route permit for a power line of greater than 100 kV must contain a description of the effects of the facility on archaeological and historic resources. These resources include historic and prehistoric properties as well as intangible sociocultural attributes such as social cohesion, social institutions, lifeways, folklore, and cultural practices that are considered historically or culturally important.

This section has been completed with the intent to describe both federal and state regulatory needs.

6.16.1 Existing Conditions

<u>Background</u>

For purposes of this Application, the cultural resource evaluation considers a Study Area encompassing 1 mile to each side of each Route Alternative centerline. The following discussion provides a description of the resources present in this Study Area. The discussion also provides analysis of effects based on the anticipated ROW, which is defined as a 200-foot-wide easement that would be used for Project construction and operation, consistent with other resource evaluations.

In general, there are few differences in the existing conditions within the Study Area of the Orange and Blue Route Alternatives (see Figures 6.16-1, 6.16-2 and 6.16-3). Both cross similar terrain and have similar potential to affect archaeological, architectural, and properties of traditional religious and cultural importance (otherwise referred to as Traditional Cultural Properties [TCPs]).

Data regarding previously recorded archaeological resources, architectural properties, and TCPs were obtained through archival review. During fall 2013 and winter 2013/2014, the archival data was gathered from several sources, including the Minnesota Historical Society

(MHS) State Historic Preservation Office (SHPO), from electronic database resources maintained by MHS that contain historical features (such as roads, structures, and fields), from the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Soils survey, and public reference material written about the region (such as, county histories and historic contexts from SHPO). A more detailed list of data used for the archival review can be found in the *Cultural Resource Literature Search for the Great Northern Transmission Line Project, Beltrami, Itasca, Kittson, Koochiching, Lake of the Woods, and Roseau Counties, Minnesota* (see Appendix G). This report summarizes the background information available for the Project. The archival review encompassed the Study Area, as defined above.

The following narrative describes and summarizes the archival information derived regarding archaeological, architectural, and TCP resources of the Route Alternatives; briefly discusses the chronological time periods the resource could be associated with; and lists the environmental landscapes the Route Alternatives pass through.

Many of the cultural properties recorded in the Study Area were identified through cultural resource investigations conducted for other transmission line projects, pipeline projects, transportation projects, and projects that impact state and/or federally owned management areas. Table 6.16-1 summarizes the density of cultural properties identified in the Study Area for both the Route Alternatives and the Segment Options, and indicates the number of resources that are determined eligible or listed on the National Register of Historic Places (NRHP).

Tables 6.16-2 through 6.16-5 list the known cultural resources within the Study Area for each Route Alternative. Details of the Segment Options can be found in Table 6.16-6. Most of the properties documented to date have not been evaluated as to their eligibility for listing on the NRHP and/or historic significance.

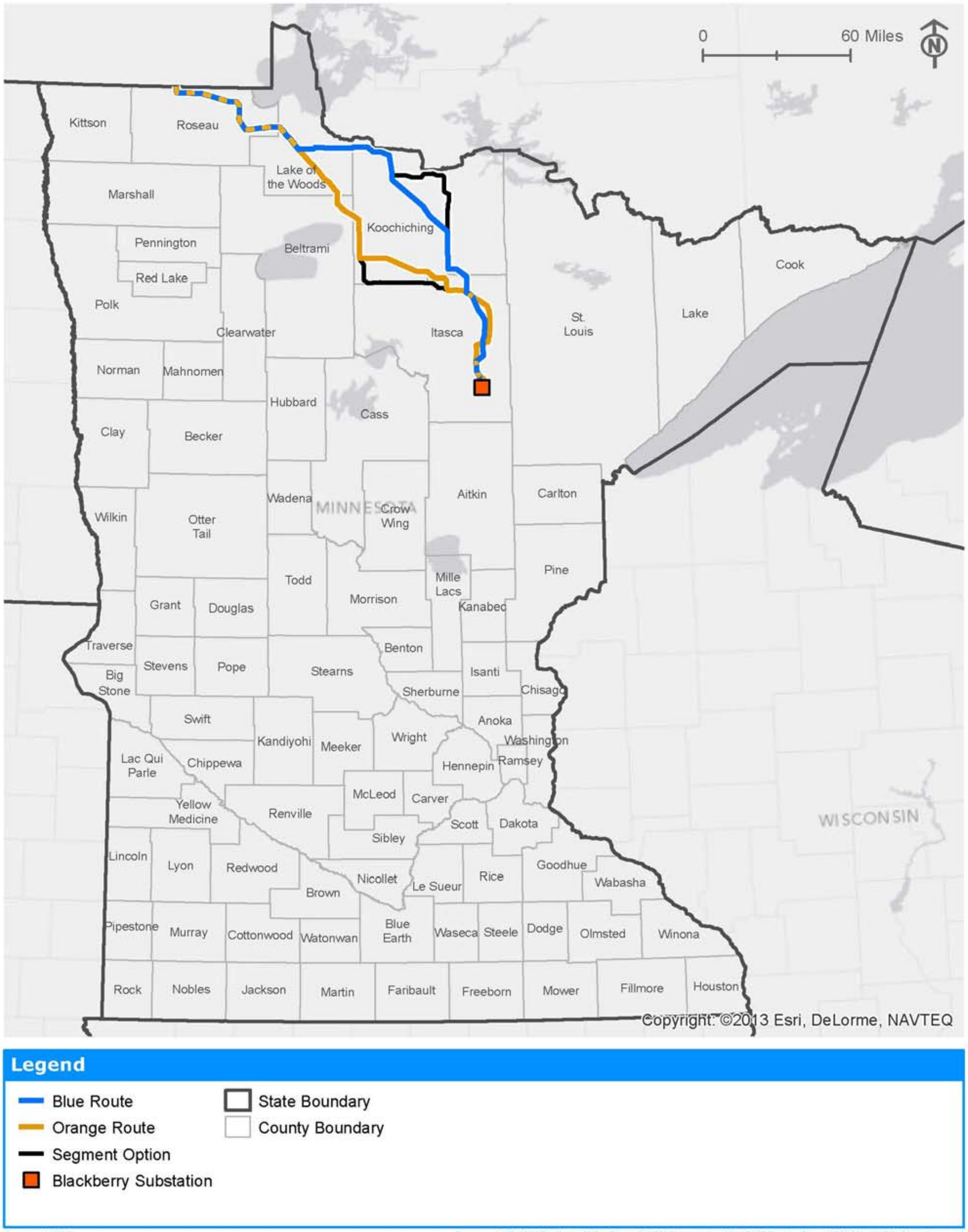
No TCPs have been recorded within the Study Area, based on the review that has been completed for this Project.

minnesota power
AN ALLETE COMPANY

GREAT NORTHERN TRANSMISSION LINE

Overview

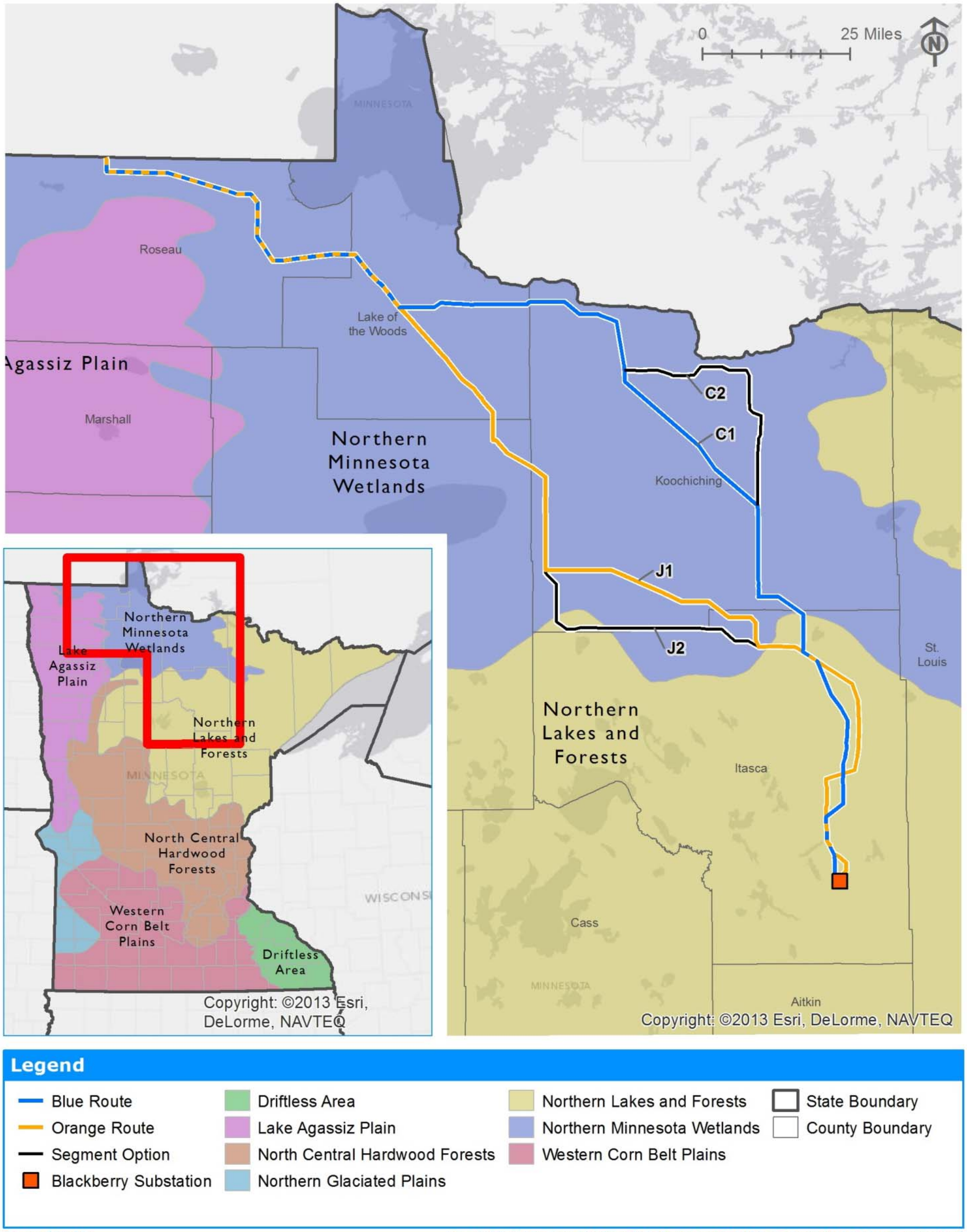
Figure 6.16-1



Sources: ESRI \\mspe-gis-file\GISProjLarge\MinnPower\182035\map_docs\CLIENT\Route_Permit\0616-1_CRM_Overview.mxd

Ecoregions

Figure 6.16-2



Sources: ESRI,EPA

\\mspe-gis-file\GISProjLarge\MinnPower\182035\map_docs\CLIENT\Route_Permit\0616-2_CRM_Ecoregions.mxd

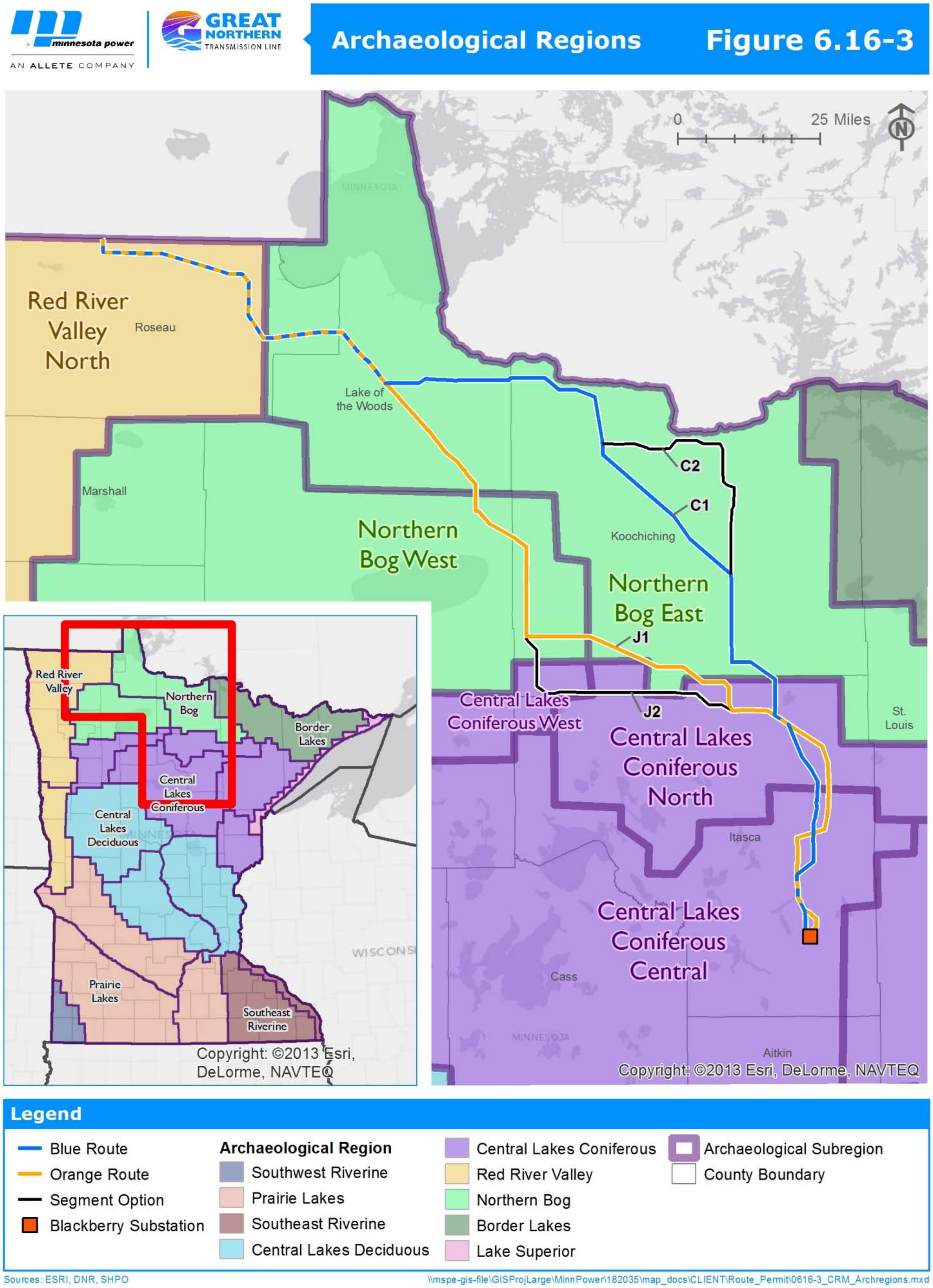

minnesota power
AN ALLETE COMPANY
GREAT NORTHERN TRANSMISSION LINE
Archaeological Regions
Figure 6.16-3
0
25 Miles
N
Red River Valley North
Roseau
Lake of the Woods
Marshall
Northern Bog West
Northern Bog East
Koochiching
C1
C2
J1
J2
Central Lakes Coniferous West
Central Lakes Coniferous North
Central Lakes Coniferous Central
Itasca
Cass
Aitkin
St. Louis
Red River Valley
Northern Bog
Border Lakes
Central Lakes Coniferous
Central Lakes Deciduous
Prairie Lakes
Southeast Riverine
WISCONSI
Copyright: ©2013 Esri, DeLorme, NAVTEQ
Legend
Blue Route
Orange Route
Segment Option
Blackberry Substation
Archaeological Region
Southwest Riverine
Prairie Lakes
Southeast Riverine
Central Lakes Deciduous
Central Lakes Coniferous
Red River Valley
Northern Bog
Border Lakes
Lake Superior
Archaeological Subregion
County Boundary
Sources: ESRI, DNR, SHPO
\\mspe-gis-file\GISProjLarge\MinnPower\182035\map_docs\CLIENT\Route_Permit\0616-3_CRM_Archregions.mxd

Table 6.16-1. Number of Archeological and Architectural Resources Known to Occur within Study Area for the Route Alternatives and Segment Options

Study Area	Archaeological		Historic Architecture	NRHP Eligible	Percentage of Study Area that Already has been Inventoried
	Prehistoric	Historic			
Orange Route	4	2	37	4	1.7%
Blue Route	4	2	28	4	2.0%
C1	0	0	0	0	0%
C2	1	0	0	0	4.4%
J1	1	0	4	0	0%
J2	0	1	11	2	0.2%

Available Data

No field reviews have been conducted for this Project; the information provided is based on an archival review of available material. Additional data collection will be necessary to fulfill the requirements of applicable state and federal laws. Previously recorded cultural properties within the Cultural Resource Study Area are presented in Figure 6.16-4.

For the Orange Route Alternative, the archival review identified 6 archaeological properties (both prehistoric and/or historic), 37 architectural properties, and 13 previous surveys within 1 mile of the Route Alternative (see Table 6.16-1). The 6 archaeological properties and 37 architectural properties are further described in Tables 6.16-2 and 6.16-3, respectively. Four of the previously recorded historic architecture resources within the Cultural Resource Study Area (Site numbers IC-IRT-009, IC-IRT-010, IC-IRT-012, IC-IRT-013) are either listed, or considered eligible for listing, on the NRHP.

The archaeological regions this Route Alternative passes through from west to east include the Red River Valley, Northern Bog, and Central Lakes Coniferous (see Figure 6.16-3). While the characteristics of these archaeological and ecological regions are discussed in detail in the *Cultural Resource Literature Search for the Great Northern Transmission Line Project, Beltrami, Itasca, Koochiching, Lake of the Woods, and Roseau Counties, Minnesota* (Appendix G), some generalizations about archaeological potential can be made about these regions. For example, archaeological sites in the Red River Archaeological Region tend to be located on higher elevations overlooking rivers, and along the Glacial Lake Agassiz beach ridges. This region tends to have a limited source of raw material for prehistoric tool manufacture, although cobbles, which can be associated with prehistoric tool making, can be found where the beach ridges have been cut through by rivers. Precontact archaeological sites located on these beach ridges are likely to be small-to-medium-sized lithic or artifact scatters associated with the procurement of lithic resources. Small lithic scatters or isolated finds associated with the exploitation of resources along the shore of Glacial Lake Agassiz during the Paleoindian Tradition may also be encountered on these beach ridges.

Archaeological sites in the Northern Bog Region tend to be located along glacial lake beaches, along major rivers, around the few lakes of the region, and at the confluences of rivers and lakes. Subsistence orientations differed from east to west, with the east having a forest-oriented economy and the west having a focus on harvesting bison. Many sites, specifically Middle Prehistoric period Archaic sites might be buried in the interior peatlands. Within the peatlands, temporary campsites and special activity sites should be present, but large habitation sites should be absent.

Early prehistoric period settlement patterns in the Central Lakes Deciduous Region are poorly understood, but a focus of activity seemed to occur near lakes. Generally, sites are located on major lakes and rivers, with very few sites occurring in the interior. Sites also are concentrated along abandoned channels of the Mississippi River. Sites include village sites, burial mounds, and earthworks. In addition, one bison kill site (that is, 21CE1) has been recorded within the region. Late Prehistoric period Blackduck and Sandy Lake Woodland sites are numerous, with a concentration in the Headwaters Region in the central portion of the Central Lakes Coniferous Region. With an increasing focus on wild rice harvesting, concentrations of villages are often located on major lakes near wild rice beds.

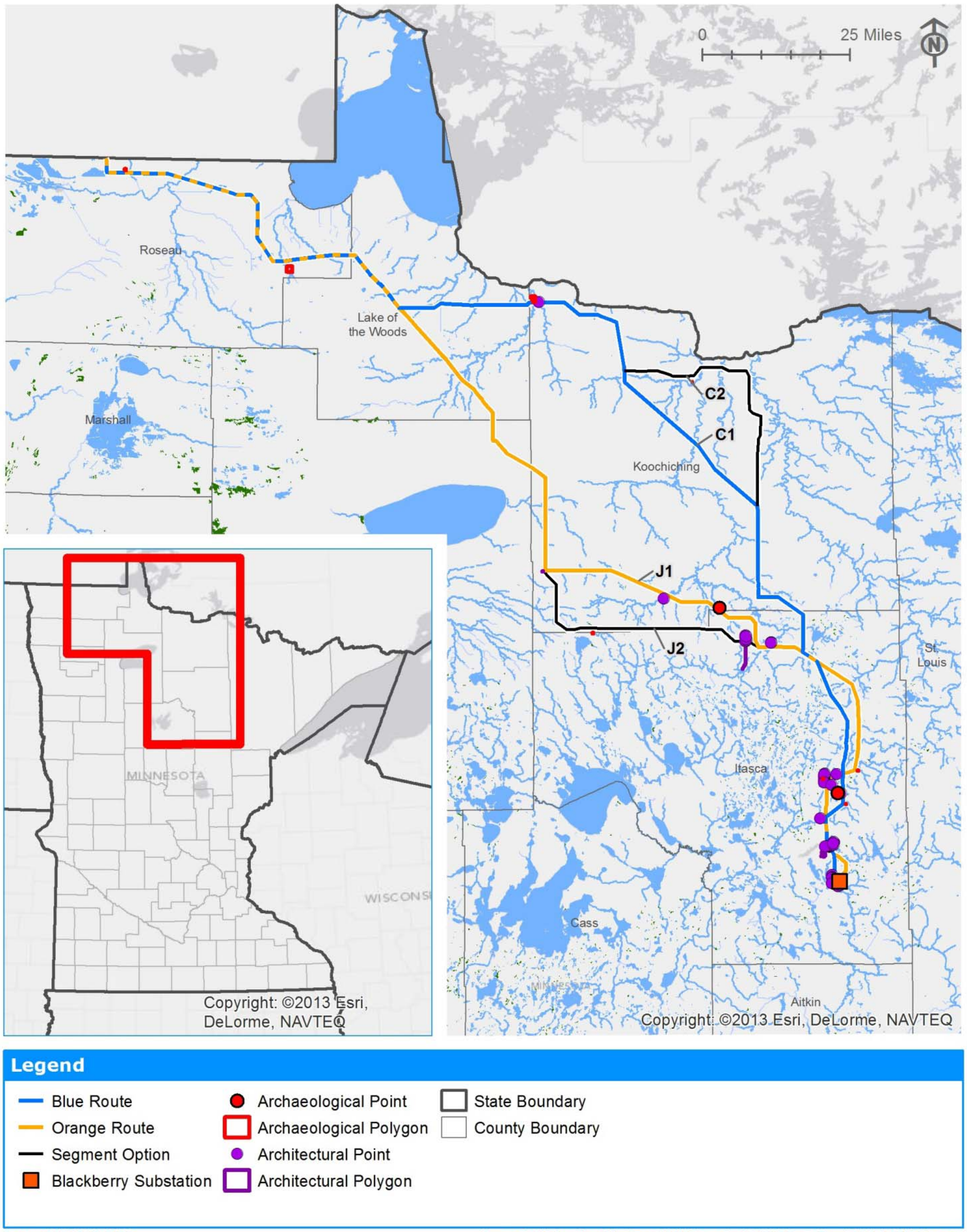
Table 6.16-2. Archaeological Sites Identified within the Study Area for the Orange Route Alternative

Site Number	County	Township	Range	Section	Site Type	NRHP Eligibility Determination
21IC0093	Itasca	58	23	15	Precontact Lithic Scatter	Undetermined
21IC0095	Itasca	58	24	27	Precontact Single Artifact	Undetermined
21KC0072	Koochiching	63	27	36	Precontact Single Artifact	Undetermined
21RO0033	Roseau	161	36	20	Historic Structural Ruin	Undetermined
21ROaf	Roseau	163	41	3	Precontact Artifact Scatter, Cemetery	Undetermined
21ROao	Roseau	161	36	29	Historic Ghost Town-Clear river	Undetermined

minnesota power
AN ALLETE COMPANY
GREAT NORTHERN TRANSMISSION LINE

Recorded Cultural Resources

Figure 6.16-4



Sources: ESRI, DNR, SHPO

\\mspe-gis-file\gisprojlarge\MinnPower\182035\map_docs\CLIENT\Route_Permit\0616-4_CRM_Sites.mxd

Table 6.16-3. Architectural Properties Identified within the Study Area for the Orange Route Alternative

Site Number	County	Township	Range	Section	Site Type	NRHP Eligibility Determination
IC-BAL-007	Itasca	58	24	23	Conservative Mennonite Church	Undetermined
IC-BAL-009	Itasca	58	24	26	Spur Station	Undetermined
IC-BAL-010	Itasca	58	24	26	T.J.'s Family Restaurant	Undetermined
IC-BAL-011	Itasca	58	24	27	Alvar and Norma Hupila House	Undetermined
IC-BAL-012	Itasca	58	24	26	Balsam School	Undetermined
IC-BAL-013	Itasca	58	24	26	Balsam Bible Chapel	Undetermined
IC-BAL-014	Itasca	58	24	27	Bersons "Markat"	Undetermined
IC-BAL-015	Itasca	58	24	23	Robert E. Bergstrom House	Undetermined
IC-BAL-016	Itasca	58	24	22	Kevin and Cynthia Malmquist House	Undetermined
IC-BAL-022	Itasca	58	24	23	Donna E. Wodahl House	Undetermined
IC-BAL-024	Itasca	58	23	19	Bridge Number 7419	Undetermined
IC-BAL-025	Itasca	58	24	36	Bridge Number 7000	Undetermined
IC-IRT-008	Itasca	56	24	22, 27, 28, 33	Holman Mine Line to the Trout Lake Washing Plant	Undetermined
IC-IRT-009	Itasca	56	24	22, 27, 28	Great Northern Railway Nashwauk-Gunn Line	Eligible

Site Number	County	Township	Range	Section	Site Type	NRHP Eligibility Determination
IC-IRT-010	Itasca	56	24	22,23, 27, 28	Duluth, Missabe and Northern Railway Alborn Branch Line	Eligible
IC-IRT-012	Itasca	56	24	22, 27, 34	Holman Mine Stripping and Lean Ore Dump	Eligible
IC-IRT-013	Itasca	56	24	22	Brown Number 2 Mine Stripping Dump	Eligible
IC-IRT-016	Itasca	56	24	23	Rhude Media Plant	Undetermined
IC-IRT-017	Itasca	56	24	23	House	Undetermined
IC-IRT-018	Itasca	56	24	23	House	Undetermined
IC-IRT-027[1]	Itasca	56	24	23, 24	DM&N/DM &IR Railroad Corridor to Arcturus Mine	Undetermined
IC-IRT-028	Itasca	56	24	18, 24	Arcturus Mine Open Pit	Undetermined
IC-IRT-029	Itasca	56	24	24	Arcturus Mine Stripping Dump	Undetermined
IC-IRT-030[1]	Itasca	56	24	23, 24	DM&N/DM &IR Corridor to Arcturus Concentrator	Undetermined
IC-IRT-031	Itasca	56	24	23, 24	Arcturus Mine Gravel Pit	Undetermined
IC-IRT-032	Itasca	56	24	24	Arcturus Mine Lean Ore Dump	Undetermined

Site Number	County	Township	Range	Section	Site Type	NRHP Eligibility Determination
IC-IRT-033	Itasca	56	24		Arcturus Mine Stripping Dump	Undetermined
IC-IRT-034	Itasca	56	24	23	House	Undetermined
IC-IRT-035	Itasca	56	24	23	House	Undetermined
IC-LAW-002	Itasca	57	24	27	Church	Undetermined
IC-TCC-005	Itasca	56	24	22	Bridge Number L3811	Undetermined
IC-UOG-013	Itasca	55	23	30	Log Barn	Undetermined
IC-UOG-014	Itasca	55	23	30	Log Barn	Undetermined
IC-UOG-044	Itasca	62	25	33	Gunderson Homestead Cabin	Undetermined
IC-UOG-086	Itasca	62	25	33	Bridge Number 7073	Undetermined
KC-UOG-031	Koochiching	152	29	8	Flowing Well	Undetermined
KC-UOG-035	Koochiching	151	26	2	Lumber Camp	Undetermined

Notes:
[1] Site is located within the anticipated ROW

For the Blue Route Alternative, the archival review identified six archaeological properties (both prehistoric and/or historic), 28 architectural properties, and 17 previous surveys within the Study Area (see Tables 6.16-4 and 6.16-5). Four of the previously recorded historic architecture resources within the Cultural Resource Study Area (Site numbers IC-IRT-009, IC-IRT-010, IC-IRT-012, IC-IRT-013) are on the NRHP or are eligible for listing on the NRHP. The Blue Route Alternative passes through the same archaeological regions as the Orange Route Alternative.

Table 6.16-4. Archaeological Sites Identified within the Study Area for the Blue Route Alternative

Site Number	County	Township	Range	Section	Site Type	NRHP Eligibility Determination
21IC0096	Itasca	57	23	17	Precontact Lithic Scatter	Undetermined
21IC0099	Itasca	57	23	6	Precontact Single Artifact	Undetermined
21KCc	Koochiching	160	29	19	Precontact Earthworks	Undetermined
21ROaf	Roseau	163	41	3	Precontact Artifact Scatter, Cemetery	Undetermined
21ROao	Roseau	161	36	29	Historic Ghost Town-Clear river	Undetermined
21RO0033	Roseau	161	36	20	Historic Structural Ruin	Undetermined

Table 6.16-5. Architectural Properties Identified within the Study Area for the Blue Route Alternative

Site Number	County	Township	Range	Section	Site Type	NRHP Eligibility Determination
IC-IRT-008	Itasca	56	24	22, 27, 28, 33	Holman Mine Line to the Trout Lake Washing Plant	Undetermined
IC-IRT-009	Itasca	56	24	22, 27, 28	Great Northern Railway Nashwauk-Gunn Line	Eligible
IC-IRT-010	Itasca	56	24	22, 23, 27, 28	Duluth, Missabe and Northern Railway Alborn Branch Line	Eligible
IC-IRT-012	Itasca	56	24	22, 27, 34	Holman Mine Stripping and Lean Ore Dump	Eligible

Site Number	County	Township	Range	Section	Site Type	NRHP Eligibility Determination
IC-IRT-013	Itasca	56	24	22	Brown Number 2 Mine Stripping Dump	Eligible
IC-IRT-016	Itasca	56	24	23	Rhude Media Plant	Undetermined
IC-IRT-017	Itasca	56	24	23	House	Undetermined
IC-IRT-018	Itasca	56	24	23	House	Undetermined
IC-IRT-027[1]	Itasca	56	24	23, 24	DM&N/DM &IR Railroad Corridor to Arcturus Mine	Undetermined
IC-IRT-028	Itasca	56	24	23, 24	Arcturus Mine Open Pit	Undetermined
IC-IRT-029	Itasca	56	24	24	Arcturus Mine Stripping Dump	Undetermined
IC-IRT-030[1]	Itasca	56	24	23, 24	DM&N/DM &IR Corridor to Arcturus Concentrator	Undetermined
IC-IRT-031	Itasca	56	24	23, 24	Arcturus Mine Gravel Pit	Undetermined
IC-IRT-032	Itasca	56	24	24	Arcturus Mine Lean Ore Dump	Undetermined
IC-IRT-033	Itasca	56	24	13, 24	Arcturus Mine Stripping Dump	Undetermined
IC-IRT-034	Itasca	56	24	23	House	Undetermined
IC-IRT-035	Itasca	56	24	23	House	Undetermined
IC-LAW-002	Itasca	57	24	27	Church	Undetermined
IC-NWT-003	Itasca	57	23	6	Bridge Number 88159	Undetermined
IC-TCC-005	Itasca	56	24	22	Bridge Number L3811	Undetermined

Site Number	County	Township	Range	Section	Site Type	NRHP Eligibility Determination
IC-TLT-004	Itasca	55	24	13	Abandoned Log House and Barn	Undetermined
IC-TLT-005	Itasca	55	24	13	Jacob Edward Johnson Farmstead	Undetermined
IC-TLT-009	Itasca	55	24	24	Finnish Log Barn and Building	Undetermined
IC-TLT-010	Itasca	55	24	24	Trout Lake Apostolic Lutheran Church	Undetermined
IC-TLT-011	Itasca	55	24	24	School and Teacherage	Undetermined
IC-UOG-013	Itasca	55	23	30	Log Barn	Undetermined
IC-UOG-014	Itasca	55	23	30	Log Barn	Undetermined
KC-UOG-070	Koochiching	160	29	29	Bridge Number 3570	Undetermined

Notes:
[1] Site is located within the anticipated ROW

Table 6.16-6. Archaeological Sites and Architectural Properties within the Study Area for Segment Options[1]

Segment Option	Site Number	County	Township	Range	Section	Site Type	NRHP Eligibility Determination
C2	21KC0062	Koochiching	158	25	34	Precontact Lithic Scatter	Undetermined
J1	21KC0072	Koochiching	63	27	36	Precontact Single Artifact	Undetermined
	IC-UOG-044	Itasca	62	25	33	Gunderson Homestead Cabin	Undetermined
	IC-UOG-086	Itasca	62	25	33	Bridge Number 7073	Undetermined
	KC-UOG-031	Koochiching	152	29	8	Flowing Well	Undetermined
	KC-UOG-035	Koochiching	151	26	2	Lumber Camp	Undetermined
J2	21ICaju	Itasca	150	28	2	Logging Camp	Undetermined

Segment Option	Site Number	County	Township	Range	Section	Site Type	NRHP Eligibility Determination
	IC-BFT-017	Itasca	61	26	3, 10, 15, 22, 27, 33, 34	Minnesota Highway 38	Eligible
	IC-EFC-006	Itasca	62	26	27	Storage Shed	Undetermined
	IC-EFC-007	Itasca	62	26	27	Minnesota DOT Service Building	Undetermined
	IC-EFC-015[2]	Itasca	62	26	27, 34	Minnesota Highway 38	Eligible
	IC-EFC-016	Itasca	62	26	27	William Anderson House	Undetermined
	IC-EFC-017	Itasca	62	26	27	House	Undetermined
	IC-UOG-044	Itasca	62	25	33	Gunderson Homestead Cabin	Undetermined
	IC-UOG-074	Itasca	62	26	34	Joyce Dahlberg Farmstead	Undetermined
	IC-UOG-075	Itasca	62	26	34	Donna Gillespie House	Undetermined
	IC-UOG-086	Itasca	62	25	33	Bridge Number 7073	Undetermined
	KC-UOG-031	Koochiching	152	29	8	Logging Camp Well	Undetermined

Notes:
[1] Segment Options were not included if they did not have identified resources present
[2]Site is located within the anticipated ROW

Prehistoric Archaeological Properties

For both Route Alternatives, the greatest density of prehistoric archaeological properties seems to occur along the margins of existing and ancient lakes and rivers (roughly within 0.25 mile of an identified ancient or existing water body) (see Figure 6.16-4). Prehistoric archaeological properties also seem to appear in prominent higher elevation locations across this landscape. The nature and significance of most of these properties remains unknown. Prehistoric archaeological properties mainly include earthworks, burial areas, surface and subsurface scatters of lithic tool or tool debitage material, and deposits of lithic artifacts. The time periods represented by these properties may run through the entire range of documented cultural time periods (that is, Paleo, Archaic, Woodland, and Fur Trade and Contact) in the state.

Historic Archaeological Properties

Historic archaeological properties tend not to follow any set pattern of distribution as environmental, engineering, and/or socio-cultural values that restrict other properties do not apply to these properties. As such, the abundance of archeological properties can only be broadly described. In general, these types of properties tend to be located along water, railroad, or road transportation routes. Their documented presence along existing railroad or transportation routes may be coincidental, as this is also where most of the surveys have been conducted. The nature and significance of most of these properties remains unknown. Historic archaeology properties mainly include abandoned farmsteads, abandoned homes, abandoned businesses, logging and mining facilities, facilities related to railroads, and hunter and fur trapper cabins. The time periods represented by these properties might run from the Fur Trade and Contact period through the Modern Industrial Development period of the 40s, 50s, and 60s.

Architectural Properties

Architectural properties, also known as historic standing buildings and structures, can be found wherever conditions are suitable (such as, houses and homesteads on higher elevation sites, or sites suitable for agriculture) or areas where structures were necessary (such as a bridge crossing a river or stream, or a road through a swamp). As such, the abundance of architectural properties can be only broadly described. In general, these types of properties tend to be located in areas that already have a built environment and/or are located adjacent to road, railroad, and water transportation routes. The nature and significance of most of these properties remains unknown. Architectural properties mainly include farmsteads, homes, businesses, civic works, religious works, and industry works. The time periods represented by these properties run from the early Euro-American settlement period through the Modern Industrial Development period. Architectural properties may represent post-contact contexts such as:

- Indian communities and reservations 1837–1934
- Early agriculture and river settlement 1840–1870
- Railroads and agricultural development 1870–1940
- Northern Minnesota lumbering 1870–1930s
- Minnesota's iron ore industry 1880s–1945
- Minnesota tourism and recreation in the lake regions 1870–1945
- Urban centers 1870–1940

Traditional Cultural Properties

TCPs are a special type of property that can be human modified locations on the landscape or naturally occurring phenomena that are ascribed spiritual or traditional cultural importance. Because they sometimes retain sacred and sensitive qualities to living communities they may not be discussed or detailed to individuals outside those communities or made available to the public. The nature and significance of many of these properties may need to be kept confidential. Consultation with Native American Tribes and other traditional communities will help to identify any TCPs within the Study Area.

6.16.2 Direct and Indirect Effects

The construction of new transmission line facilities could affect architectural and archaeological properties and TCPs.

Table 6.16-7. Number of Archaeological Sites and Architectural Properties within the Anticipated ROW for Route Alternatives and Segment Options.

Study Area	Number of Resources That are within the Anticipated ROW
Orange Route	2
Blue Route	2
C1	0
C2	0
J1	0
J2	1

Orange Route

The Study Area for the Orange Route has 6 archaeological properties (4 prehistoric and 2 historic) and 36 architectural properties. Of the identified properties, two architectural properties (IC-IRT-027 and IC-IRT-030) are within the anticipated ROW and could be directly or indirectly affected. The anticipated ROW does not include any properties previously listed or determined eligible for the NRHP.

Blue Route

The Study Area for the Blue Route has 6 previously recorded archaeological properties (4 prehistoric and 2 historic) and 28 previously recorded architectural properties. Of the identified properties, two architectural properties (IC-IRT-027 and IC-IRT-030) are within the anticipated ROW and could be directly or indirectly affected. The anticipated ROW does not include any properties previously listed or determined eligible for listing on the NRHP.

Segment Options

One previously identified architectural property (IC-EFC-015) falls within the anticipated ROW for Segment Option J2 and could be directly or indirectly affected. Architectural property IC-EFC-015 has been determined eligible for listing on the NRHP.

For the Project, possible impacts on archaeological and architectural properties, and TCPs properties could result from one or more of the following:

- Direct disturbance or alteration to the resource from preconstruction, construction, or maintenance activities
- Disturbance to surface soils from heavy construction vehicles, equipment, or materials
- Disturbance to surface soils through grubbing, stump removal, boulder removal, and grading
- Subsurface excavation necessary for construction

- Visual, atmospheric, or audible intrusions causing alterations to the setting, character, viewshed, or landscape of the property
- Unauthorized removal of or damage to the property by individuals made aware of the presence of such properties.

6.16.3 Mitigation

The Section 106 process is designed to identify historic properties, and to avoid, minimize or mitigate effects on those properties. The Applicant anticipates that appropriate mitigation measures will be developed through that process. Those measures may include:

- Working with DOE and any consulting parties to develop a Programmatic Agreement (36 CFR 800.14 (b)) for the Project.
- Completing cultural resource surveys and reports in accord with the Programmatic Agreement.
- Implementing avoidance and mitigation measures in accord with the Programmatic Agreement.

6.17 Water Resources and Floodplains

Hydrologic features, such as wetlands, lakes, rivers, and floodplains perform important functions within a landscape, including flood attenuation, ground water recharge, water quality protection, and wildlife habitat production.

The following sections provide a summary of surface water, including the Minnesota Department of Natural Resources (DNR) Public Water Inventory (PWI) watercourses and basins, water quality, floodplain, and groundwater resources present in the Study Area. PWI watercourses and basins are those features under the regulatory jurisdiction of Minnesota DNR.

6.17.1 Existing Conditions

Water resources within the Study Area are diverse and the types of waters found throughout the Study Area are associated closely with the ecological subsection crossed by the Project. See Section 6.4, Vegetation, for a more detailed description of ecological subsections. In Section 6.4, Vegetation, Figure 6.4-1 depicts the extent of ecological subsections in the Study Area. In particular, the transitions from the Agassiz Lowlands to the Littlefork-Vermillion Uplands and St. Louis Moraines separates the region of low-lying peatlands with few lakes in the northwestern portion of the Study Area, from undulating moraines and outwash plains with numerous lakes in the southeast. The following discussion of existing water resources generally is organized by ecological subsection.

Ecological Subsections and Watersheds

Agassiz Lowlands

Water resources within the Agassiz Lowlands, which generally occupies approximately the northwestern half of the Study Area (see Section 6.4, Figure 6.4-1), are dominated by vast complexes of peatlands that include intermixed bogs, fens, and coniferous wetlands with relatively few lakes despite the relatively high water table in the area (Minnesota DNR 2013a). Watersheds within the Agassiz Lowlands included in the Study Area are the Roseau River, Lake of the Woods, Rainy River–Baudette (see Appendix A, sheet 20), Rapid River (see Appendix A, sheets 18-19), Rainy River–Manitou, and Upper and Lower Red Lake watersheds. Figure 6.17-1 displays regional and major watersheds in the vicinity of the Study Area.

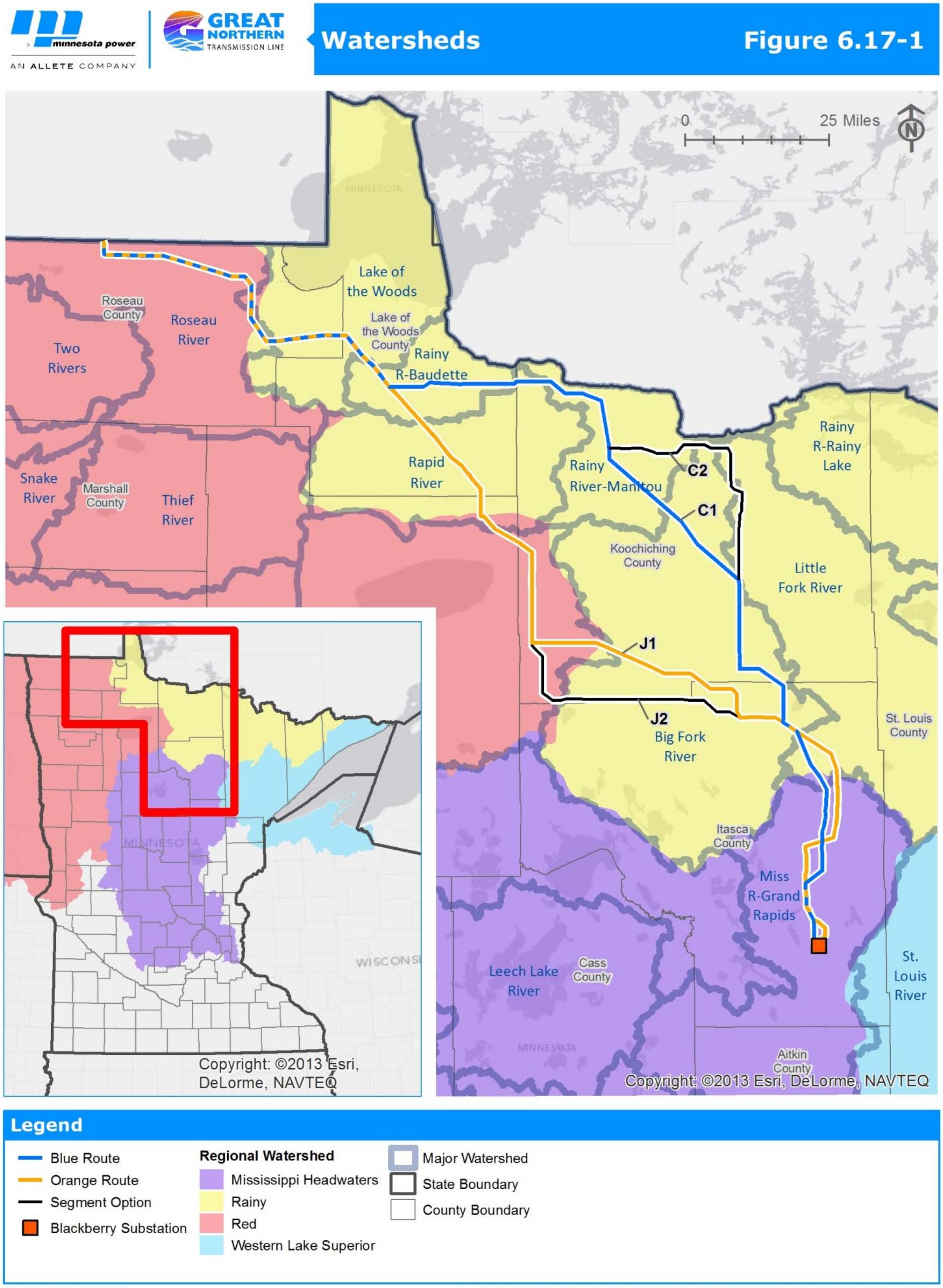
The peatlands in this ecological subsection are vast and regionally important. They have been separated into the Pine Island Peatlands, the Beltrami-Pine Island Peatlands, and Red Lake Peatlands land type associations by the Minnesota Ecological Classification System (Minnesota DNR 1999). The Pine Island Peatlands are dispersed across the northern portion of this ecological subsection, among remnant Lake Agassiz beach ridges and outwash plains, while the Beltrami-Pine Island Peatlands adjoin the Red Lake Peatlands in the central portion of the ecological subsection to form a vast, relatively intact complex of bogs, fens, emergent wetlands with dispersed beach ridges, and till plains associated with rivers. Figure 6.17-2 displays the location of these peatlands. Numerous Scientific Natural Areas (SNAs) have been established within these peatlands to protect their unique features, such as water tracks, ovoid bogs, raised bogs, teardrop islands, and ribbed fens, in addition to numerous sensitive plants and wildlife species that specially are adapted to these habitats. For example, the Red Lake Peatland SNA includes the most extensive and diverse patterned peatland in the U.S. and has examples of every type of fen pattern (Minnesota DNR 2013d; 2013f-i).

Most of the rivers in this subsection flow north into the Rainy River or Lake of the Woods, with the exception of the Roseau River, which is a part of the Red River Watershed. These rivers tend to be of small to moderate size and relatively short. Due to the flat terrain of this region, the natural courses of these rivers and their tributaries are highly sinuous. The headwaters of many rivers in this ecological subsection are associated with the large peatland complexes. For example, the Rapid River and many of its tributaries originate to the north of the Red Lake Peatlands, the Roseau River headwaters are in the vicinity of Mulligan Lake Peatlands and Norris Camp Peatlands, and the headwaters of the Warroad and Winter Road Rivers are associated with the Winter Road Peatlands (Minnesota DNR 1999). While not designated as PWI watercourses, drainage canals especially are abundant in the peatlands, and typically follow section lines, half section lines, or property lines. These drainage canals are the result of relatively unsuccessful attempts to drain these areas to support agricultural development. Figure 6.17-3 displays PWI watercourses and basins in the vicinity of the Study Area.

Two of the only lakes in the region, Upper and Lower Red Lake and Lake of the Woods, are remnants of Glacial Lake Agassiz and are very large compared to lakes in other ecological subsections of the Study Area. Other than these lakes, PWI basins in this subsection mostly are restricted to emergent wetland complexes, such as those located within the impoundments of the Roseau River Wildlife Management Area (WMA) (see Appendix A, sheets 1-2) or peatland lakes, such as Winter Road Lake.

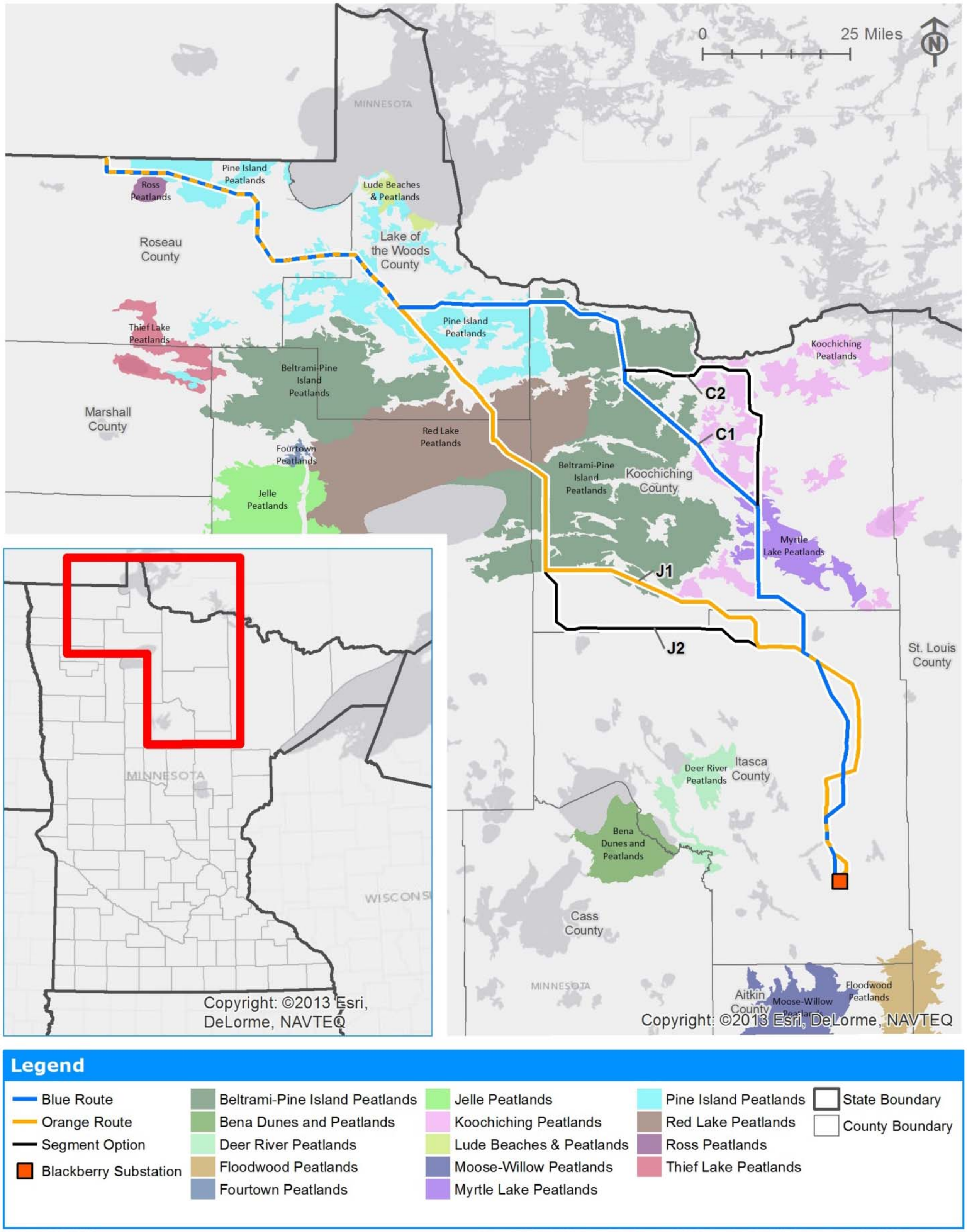
Both the Orange Route and the Blue Route cross a portion of these peatlands. The Orange Route follows a more direct path, which follows a northwest to southeast orientation across the heart of the Red Lake Peatlands (see Appendix A, sheet 61). The Blue Route follows a more northerly path that avoids the Red Lake Peatlands, but would cross a longer portion of the Beltrami-Island Peatlands (see Figure 6.17-2).

Watersheds — Figure 6.17-1



Peatland Land Type Associations

Figure 6.17-2

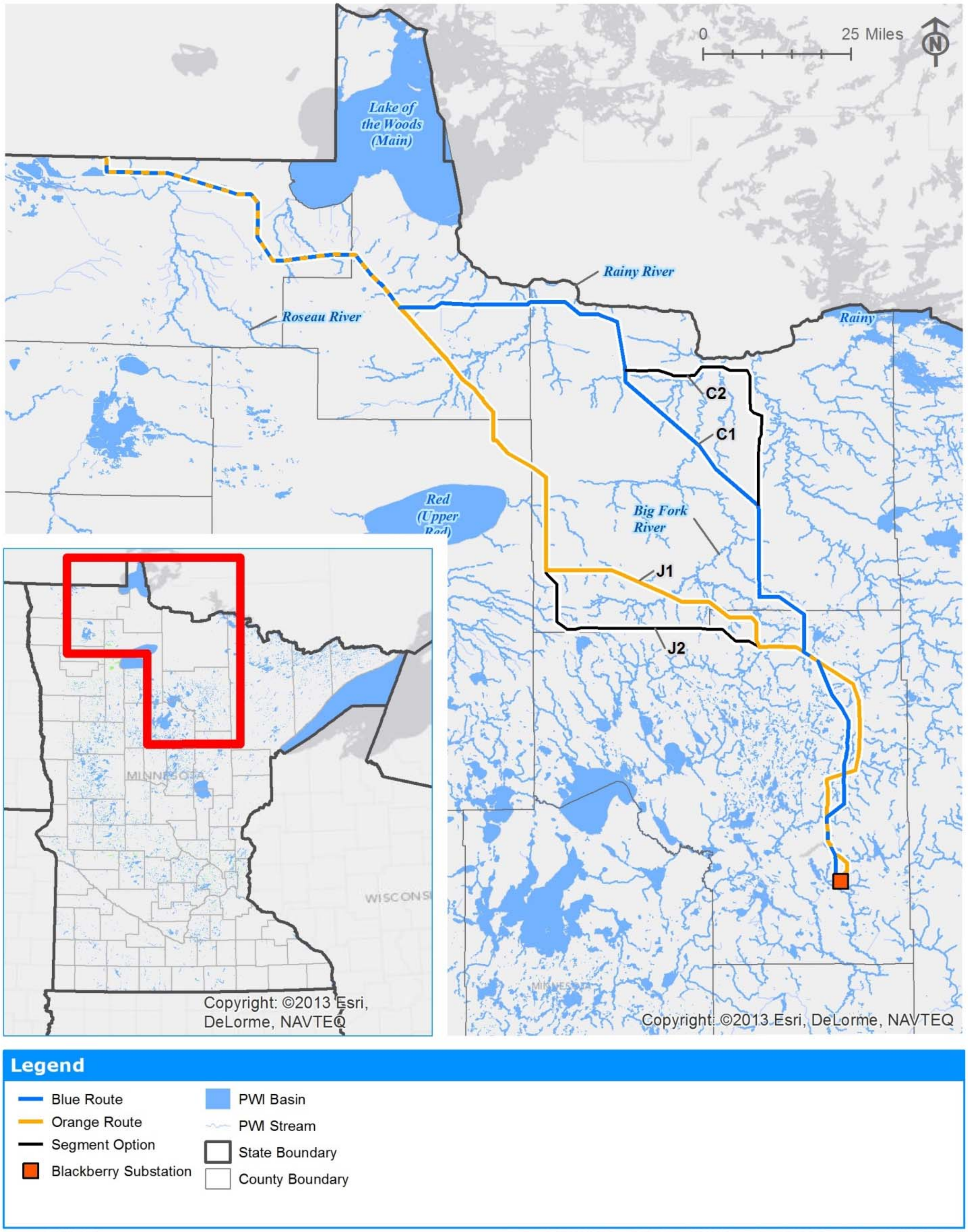


Sources: ESRI,DNR

\\mspe-gis-file\GISProjLarge\MinnPower\182035\map_docs\CLIENT\Route_Permit\0617-2_Peatlands.mxd

Public Water Inventory (PWI) Watercourses & Basins

Figure 6.17-3



Sources: ESRI,DNR

\\mspe-gis-file\GISProjLarge\MinnPower\182035\map_docs\CLIENT\Route_Permit\0617-3_PWI.mxd

Littlefork–Vermillion Uplands

Southeast of the Agassiz Lowlands, the landscape transitions to the Littlefork–Vermillion Uplands, where the topography becomes more variable, but relief generally is less than 50 feet. Water resources in this subsection generally are restricted to forested or scrub-shrub wetlands drained by highly sinuous, but poorly developed rivers and streams (Minnesota DNR 2013c). Watersheds located within this subsection and crossed by the Route Alternatives include the Upper and Lower Red Lake, and Littlefork and Bigfork Watersheds (see Figure 6.17-1).

Although forested and scrub-shrub wetlands are abundant and widely dispersed, there are relatively few large and contiguous peatlands when compared to the Agassiz Lowlands. While still present, large peatlands in this ecological subsection only occur in its north and central portions and consist of the Koochiching Peatlands and the Myrtle Lake Peatlands (Minnesota DNR 1999). The Myrtle Lake Peatland SNA (see Appendix A, sheets 34-35) was established to protect an extensive raised bog, large water track, and ribbed fen patterns present in this area (Minnesota DNR 2013e). While minor tributaries to the Little Fork and Big Fork rivers originate in the vicinity of the Myrtle Lake Peatland, this peatland is not located at the headwaters of major rivers in the Study Area (see Figure 6.17-2).

Rivers in this ecological subsection are developed poorly and highly meandering, especially in the western portion of the subsection. Major rivers in this area include the Big Fork, Little Fork, and Bear, rivers, and Reilly Creek. These rivers flow in a more or less northerly direction to their confluence with the Rainy River. Few linear drainage canals are present along section lines in the Koochiching Peatlands, but are less abundant than drainage canals in the Agassiz Lowlands. Elsewhere in the Littlefork-Vermillion Uplands, watercourses follow a more natural channel (see Figure 6.17-3).

Lakes are absent mostly from the ecological subsection and generally restricted to peatland lakes or man-made impoundments.

The Orange Route crosses a shorter portion of this ecological subsection than the Blue Route, and will be located in the southwestern portion of the subsection, with abundant forested wetlands and the headwaters of the Big Fork River. The Blue Route crosses this ecological subsection by following a more or less north to south orientation and would transect both the Koochiching Peatlands and the Myrtle Lake Peatlands.

Saint Louis Moraines

South of the Littlefork-Vermillion Uplands, the landscape transitions into the St. Louis Moraines Ecological Subsection, which is characterized by undulating to rolling terrain of end moraines dominated by upland forest communities of northern hardwoods and mixed conifers. In this ecological subsection, numerous lakes occupy pockets of low elevation, which were formed by ice disintegration (Minnesota DNR 2013j). A poorly developed drainage network is the result of the variable terrain. The Laurentian Divide straddles this ecological subsection, which is the watershed divide between waters that flow south to the Mississippi River and Gulf of Mexico and waters flowing north to the Red River and Hudson Bay. The northern portion of this ecological subsection is located in the Little Fork and Big Fork watersheds, which flow to the

Red River and the southern portion is located in the Mississippi River Watershed (see Figure 6.17-1).

Extensive peatlands and large wetland complexes generally are absent from this ecological subsection, with the exception of two large lowland conifer wetlands in the northern portion of the subsection, which are associated with lake and till plains (see Figure 6.17-2). These wetland complexes do not exhibit the patterns of the diverse peatlands in the northwestern portion of the Study Area and are not part of an SNA.

Rivers in this ecological subsection relatively are sparse with flow paths restricted by variable topography. Noteworthy PWI watercourses in the northern portion of this ecological subsection and in the vicinity of the Study Area include Coon Creek (see Appendix A, sheet 77) and Deer Creek (see Appendix A, sheet 39), which are tributaries of the Big Fork River and the Bear River (which is a Little Fork River tributary). The Prairie River (see Appendix A, sheets 46 and 48) is located in the southern portion of this ecological subsection and is a tributary of the Mississippi River (see Figure 6.17-3).

Numerous lakes are present in the St. Louis Moraines Ecological Subsection, especially when compared to the northwestern portions of the Study Area. Lakes are abundant especially in the Marcell Moraine, which occupies the west central portion of the ecological subsection. This area is characterized by variable topography and generally avoided by both Route Alternatives. However, lakes of small or moderate size are still present in the eastern portion of the ecological subsection (Minnesota DNR 2013j), which is crossed by the Route Alternatives.

The Orange Route and the Blue Route would follow a similar, north to south configuration through the ecological subsection. They were sited to avoid the lake district associated with the Marcell Moraine to the east. Each Route Alternative would cross a lowland conifer wetland in the northeastern portion of the ecological subsection, although the Blue Route would have a longer segment within this complex. The Blue Route would follow the most direct alignment across the ecological subsection.

Watersheds

Table 6.17-1 displays the major watersheds crossed by each of the Route Alternatives.

Table 6.17-1. Watersheds within Each Route Alternative by Percentage of Overall Length

Watershed	Orange Route	Blue Route
Big Fork River	18.3%	24.1%
Lake of the Woods	9.5%	9.6%
Little Fork River	4.2%	4.2%
Mississippi River-Grand Rapids	16.4%	14.2%
Rainy River-Baudette	6.4%	12.9%
Rainy River-Manitou	--	15.0%
Rapid River	11.1%	2.5%
Roseau River	17.5%	17.5%
Upper and Lower Red Lake	16.7%	--

Public Waters

Public waters are water basins and watercourses in Minnesota with significant recreational or natural resource value as defined in Minnesota Statutes Section 103G.005. Minnesota DNR has regulatory jurisdiction over these waters.

Each Route Alternative would cross PWI basins and PWI watercourses. PWI watercourse crossings of each route are summarized by county in Table 6.17.2 and Table 6.17-3 summarizes PWI crossings of each alternative segment. The locations and type of the PWI water bodies within each ROW are summarized by county in Table 6.17-4.

Table 6.17-2. Public Water Inventory Watercourses Crossings by Route Alternative

County Name	Stream or River Name	Orange Route (Number of Crossings)	Blue Route (Number of Crossings)
Itasca	Balsam Creek	1	
	Bear River	1	1
	Big Fork River	1	
	Bowerman Brook	1	
	Day Brook	1	
	Deer Creek		1
	East River	1	
	Prairie River	3	1
	Prairie River, West Fork		1
	Sucker Brook	1	1
	Swan River	1	1
	Unnamed Stream 17	1	
	Unnamed Stream 18		1
	Unnamed Stream 19	1	1
	Unnamed Stream 20		1
	Unnamed Stream 23		1
	Unnamed Stream 24		1
	Unnamed Stream 26		2
	Unnamed Stream 27	1	1
	Unnamed Stream 30	1	
	Unnamed Stream 43	1	
Koochiching	Big Fork River		1
	Black River		1
	Cadwell Brook	1	
	Elm Creek	1	
	Little Tamarac River	1	
	Lost River	1	
	Plum Creek	1	
	Rapid River		1
	Rapid River, East		1

County Name	Stream or River Name	Orange Route (Number of Crossings)	Blue Route (Number of Crossings)
	Branch		
	Reilly Brook		1
	Reilly Creek		1
	Tamarac River	1	
	Unnamed Stream 10		1
	Unnamed Stream 12	1	
	Unnamed Stream 13	1	
	Unnamed Stream 41		1
	Unnamed Stream 42	1	
	Unnamed Stream 44		1
	Unnamed Stream 7		1
	Unnamed Stream 8		1
	Unnamed Stream 9		1
	Wade Brook	1	
Lake of the Woods	Baudette River		1
	Baudette River, West Fork		1
	Chase Brook	1	
	Peppermint Creek		1
	Pitt Grade Creek		1
	Rapid River	1	
	Rapid River, North Branch	1	
	Troy Creek	1	
	Winter Road River	1	1
Roseau	Clausner Creek	1	1
	Lost River	1	1
	Pine Creek	1	1
	Sprague Creek	1	1
	Warroad River	1	1
	Warroad River, West Branch	1	1
Total Number of PWI Watercourse Crossings		37	37

Source: Minnesota DNR Data Deli

Table 6.17-3. Public Water Inventory Watercourses Crossings by Segment Option

County Name	Stream or River Name	Segment Options			
		C1	C2	J1	J2
Itasca	Big Fork River			1	1
	Bowerman Brook			1	
	Plum Creek				1
	Unnamed Stream 43			1	1
Koochiching	Armstrong Creek				1
	Battle River, South Branch				1
	Big Fork River	1	1		
	Black River	1	1		
	Cadwell Brook			1	
	Elm Creek			1	
	Hoover Creek				1
	Plum Creek			1	
	Unnamed Stream 10	1			
	Unnamed Stream 11		1		
	Unnamed Stream 12			1	
	Unnamed Stream 13			1	
	Unnamed Stream 32				1
	Unnamed Stream 42			1	
	Unnamed Stream 44	1			
	Unnamed Stream 9	1			
	Wade Brook			1	1
Total Number of PWI Watercourse Crossings		5	3	10	8

Source: Minnesota DNR Data Deli

In most cases, PWI watercourses would only be crossed a single time. However, the natural meander and topography in the vicinity of the Prairie River three separate crossings by the Orange Route (see Appendix A, sheets 46, 47, and 49).

PWI stream crossings tend to be most abundant in locations where the Route Alternatives are positioned in the upper portions of regional watersheds or along the transition from the extensive peatlands, which dominate the Agassiz Lowlands Ecological Subsection and central portion of the Study Area, to glacial lake or till plains along the northern fringe of the peatlands. In these areas the poorly developed natural drainage network within the peatlands give way to dendritic watersheds, which generally occupy lake and till plains (Minnesota DNR 1999). PWI stream crossings also are abundant along the transition from the Littlefork-Vermillion Uplands and Agassiz Lowlands, where highly dendritic watersheds flow from the uplands to the peatlands or Big Fork River (that is, north to south) and within the St. Louis Moraines Ecological Subsection, where the Route Alternatives follow a similar orientation as the Prairie River and include many crossings of its named and unnamed tributaries.

For example, the portion of the Blue Route in eastern Lake of the Woods County and Koochiching County will follow a more northward course than the Orange Route, and will be located along the transition between peatlands to the south and till plains to the north. This portion of the Blue Route has more PWI crossings than the portion of the Orange Route, which follows a more direct crossing of the peatlands, where natural drainage systems are less well developed.

The Orange Route will have relatively abundant PWI crossings where it transitions between the Agassiz Lowlands and Littlefork-Vermillion Uplands ecological subsections. In this area, the Orange Route will cross a beach ridge that marks this transition, and features a network of short, but dendritic streams that drain from the uplands in the south to the peatlands in the north. The Orange Route also crosses the dendritic Big Fork River headwaters, where numerous PWIs act as tributaries to this river are crossed by the Orange Route (see Appendix A, sheet 77).

Due to the similar orientation and proximity of the routes in the Roseau River Watershed in Roseau County and in the Mississippi River-Grand Rapids Watershed in Itasca, the number of PWI crossings by each Route Alternative in this area is the same.

Public Water Inventory Basins are so widely distributed in the vicinity of the project, it was not feasible to completely avoid every basin, but crossings were minimized to the extent practicable. Table 6.17-4 provides a list of PWI basin crossings, summarized by county, in the anticipated ROW for each Route Alternative.

Table 6.17-4. Public Water Inventory Basins (acres) within the Route Alternatives

County Name	PWI Basin Type	PWI Basin Name	Orange Route		Blue Route	
			PWI Basin Crossing Width (feet)	Pole Placement Required	PWI Basin Crossing Width (feet)	Pole Placement Required
Itasca	Public Water Basin	Deer Lake	--	--	136	No
		Foot Lake	641	No	--	--
		Klingenpiel Lake	457	No	--	--
	Public Water Wetland	Grass Lake	--	--	1,220	Yes
Roseau	Public Water Basin	Unnamed 10	2,118	Yes	2,118	Yes
Total			3,216	--	3,474	--

Source: Minnesota DNR Data Deli

The Orange Route will cross or include portions of an unnamed basin in Roseau County (see Appendix A, sheet 10) and Foot and Klingenpiel lakes in Itasca County (see Appendix A, sheets 53 and 42). The Blue Route will cross or include portions of the same unnamed basin in Roseau County crossed by the Orange Route, in addition to Deer Lake and Grass Lake in Itasca County.

The unnamed basin in Roseau County crossed by both the Orange and Blue Routes is located in the east central portion of the county (see Appendix A, sheet 10). Although classified as a public water basin, it is dominated by emergent vegetation with little to no open water on 2011 and 2013 aerial images. The portion of the basin in the Blue Route's anticipated ROW is listed as a saturated, deciduous scrub-shrub and palustrine emergent wetland in the NWI database. The crossing width of this PWI Basin is approximately 2,118 feet.

Klingenpiel Lake is located in northeastern Itasca County (see Appendix A, sheet 42) and is approximately 30.2 acres. It is situated along an unnamed PWI watercourse, which is a tributary of the Bear River and its shoreline is undeveloped. The anticipated ROW of the Orange Route will cross the northeastern corner of the PWI basin, with a span width of approximately 457 feet.

Foot Lake is located in southeast Itasca County (see Appendix A, sheet 53) and is an approximately 38.1 acre complex of open water and scrub-shrub and emergent wetlands. The western half (approximately) of the area mapped within the PWI basin is open water, with the east half listed as a saturated, scrub-shrub and emergent wetland by the NWI. The Orange Route's anticipated ROW will be configured to span the emergent portion of this basin with a span width of approximately 641 feet.

The unnamed basin in Roseau County crossed by the Blue Route ROW is located in the east central portion of the county (see Appendix A, sheet 10). Although classified as a public water basin, it is dominated by emergent vegetation with little to no open water on 2011 and 2013 aerial images. The portion of the basin in the Blue Route's anticipated ROW is listed as a saturated, deciduous scrub-shrub and palustrine emergent wetland in the NWI database.

Deer Lake is located in northeast Itasca County (see Appendix A, sheets 39-40) and is approximately 1,962.4 acres. This PWI basin is associated with the headwaters of Deer Creek, which is a designated PWI watercourse. Deer Lake is mapped in the PWI to include the main basin of the lake in addition to approximately 2.5 miles of Deer Creek, which flows from the northwest corner of the lake. The anticipated ROW of the Blue Route is configured to avoid the main basin of the lake and will cross the riverine portion of the PWI basin approximately 1.9 miles west of the lake body. The span width of the PWI crossing will be approximately 136 feet, although the riparian corridor includes a large scrub-shrub and forested wetland complex.

Grass Lake is a public water wetland located in southeastern Itasca County (see Appendix A, sheet 49), which is approximately 50.8 acres. This PWI is mostly open water and is undeveloped. The anticipated ROW of the Blue Route will cross the main body of this lake with a span width of approximately 1,220 feet, which is the widest span over open water of either Route Alternative.

Segment options C1, C2, J1 and J2 would not cross any portion of basins mapped as PWIs.

Trout Streams

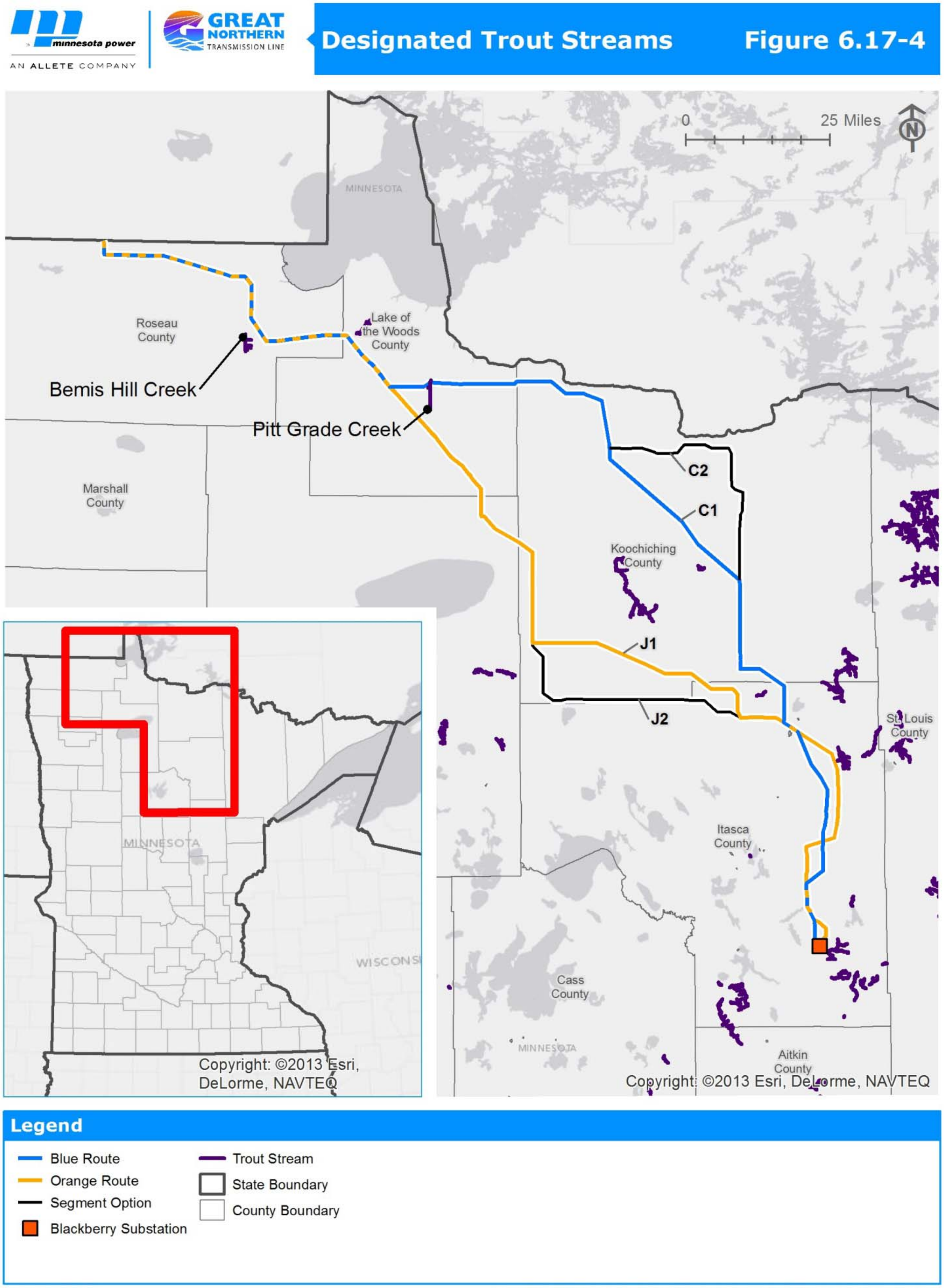
To protect the propagation of trout, Minnesota DNR has identified lakes and portions of streams and tributaries as designated trout lakes and streams. Special fishing regulations have been established for these water features.

The Blue Route would cross a single designated trout stream, Pit Grade Creek, which is located in northwest Lake of the Woods County, approximately 12 miles southwest of Baudette, Minnesota (see Appendix A, sheet 16). Pit Grade Creek is a non-PWI tributary of Peppermint Creek, which is not designated as a trout stream. The portion of Pit Grade Creek designated as a trout stream has been restricted to a linear drainage channel that runs parallel to Pit Grade Trail. The linear nature of this watercourse likely restricts the trout habitat present in this stream. Figure 6.17-4 displays the location of designated trout streams crossed by the Project.

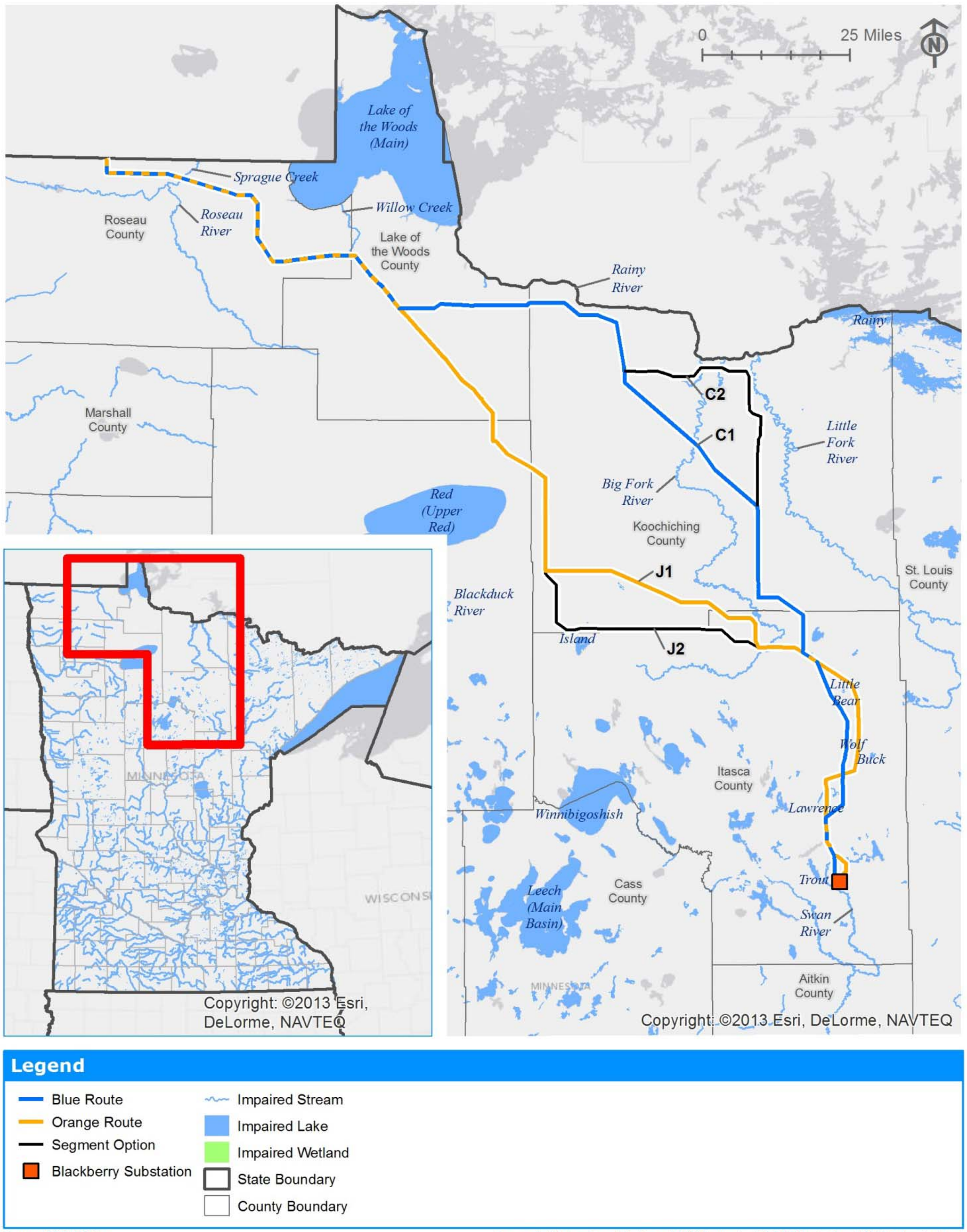
The Orange Route would not cross any designated trout streams.

Water Quality

The Minnesota Pollution Control Agency (MPCA) oversees water quality studies and regulations in Minnesota. Table 6.17-5 lists the waterbodies within the Study Area that MPCA has identified as impaired and Figure 6.17-5 displays the location of those imapired waterbodies.


minnesota power
AN ALLETE COMPANY
GREAT NORTHERN TRANSMISSION LINE
Designated Trout Streams
Figure 6.17-4
0
25 Miles
N
MINNESOTA
Roseau County
Lake of the Woods County
Bemis Hill Creek
Pitt Grade Creek
Marshall County
Koochiching County
C2
C1
J1
J2
St. Louis County
Itasca County
Cass County
Aitkin County
MINNESOTA
WISCONSIN
Copyright: ©2013 Esri, DeLorme, NAVTEQ
Copyright: ©2013 Esri, DeLorme, NAVTEQ
Legend
Blue Route
Orange Route
Segment Option
Blackberry Substation
Trout Stream
State Boundary
County Boundary
Sources: ESRI,DNR
\\mspe-gis-file\GISProjLarge\MinnPower\182035\map_docs\CLIENT\Route_Permit\0617-4_Trout.mxd

Impaired Waterbodies Figure 6.17-5



Sources: ESRI,MPCA

\\mspe-gis-file\gisprojlarge\MinnPower\182035\map_docs\CLIENT\Route_Permit\0617-5_Impaired.mxd

Table 6.17-5. Impairment Type and Number of Impaired Waters crossings by each Route Alternative

Stream or River Name	Reach Description	Impairment	Orange Route (Number of Crossings)	Blue Route (Number of Crossings)
Big Fork River	Coon Creek to Deer Creek	Mercury in Fish	1	--
	Sturgeon River to Bear River	Mercury in Fish	--	1
Sprague Creek	Minnesota-Manitoba Border to Roseau River	Turbidity	1	1
Swan River	Swan Lake to Mississippi River	Mercury in Fish	1	1
Total Number of Crossings			3	3

Source: MPCA 2012

Segment Option C2 would cross all of the impaired waters crossed by the Blue Route, but would also cross the Black River, in northern Koochiching County, which is located approximately 18 miles southwest of International Falls (see Appendix A, sheet 79). This reach of is listed as impaired by mercury in the water column.

Floodplains

Floodplains are low-lying areas that are subject to periodic inundation due to heavy rains or snow melt. Floodplain areas generally are adjacent to lakes, rivers, and streams. In their natural state, floodplains provide necessary temporary water storage during flooding events. The periodic flooding and drying in these areas creates a unique habitat that supports a wide variety of plant and animal species.

To identify areas at risk of flooding, the Federal Emergency Management Agency (FEMA) has produced floodplain maps and developed Geographic Information System (GIS) shapefiles for a portion of the Study Area. A GIS shapefile of FEMA floodplain data is not available for Koochiching County, so floodplain crossings in this county were identified using information obtained from FEMAs Map Service Center and digitized into GIS to estimate potential impacts, using 1 meter Light Detection and Ranging (LiDAR) elevation data as a reference.

The most extensive floodplains are in Roseau County, where the relatively flat topography and abundant water resources allow for broad floodplains in comparison to the eastern and southern portion of the Study Area. These floodplains are associated with the Roseau River (Main Branch and South Fork), Sprague Creek, Hay Creek, West Branch Warroad River, and East Branch Warroad River. Floodplains in Lake of the Woods County are associated with Lake of the Woods, Rainy River, Winter Road River, and Peppermint Creek. In Koochiching County, floodplains generally are associated with the Tamarack River, Caldwell Brook, Wade Brook, Plum Creek, Rapid River, Black River, and Big Fork River. Floodplains in Itasca County mostly are associated with Prairie River and Swan River (FEMA 2003a-e).

Based on the available data, the Blue Route would contain approximately 6,000 more feet of FEMA floodplain than the Orange Route (see Table 6.17-6). For both Route Alternatives, a majority of the floodplain acreage is in Roseau County due to the broad floodplains in this county. Elsewhere in the Study Area, floodplains are contained within a narrower riparian corridor.

Other floodplain areas likely are present within the Study Area, but have not been mapped by FEMA. For example, the Hay Creek Flood Impoundment, located in northeast Roseau County along Hay Creek, has not been mapped by FEMA. The purpose of the impoundment is to reduce flood flows on the Roseau River near and downstream from the municipality of Roseau, by providing approximately 9,500 acre feet of storage. Figure 6.17-6 displays the location of this impoundment. Each route will cross the northeast corner of the impoundment area. The crossing width will be approximately 1.0 miles and which will require structure placement within the impoundment area (assuming 1,000 foot span width).

Table 6.17-6. Crossing Width[1] (feet) of FEMA Floodplains within the Route Alternatives

County Name	Associated Watercourse	Orange Route Floodplain Crossing Width (feet)	Blue Route Floodplain Crossing Width (feet)
Itasca	Prairie River, North[2]	2,853	
	Prairie River, South[2]	2,916	
Koochiching	Big Fork		557
	Black River[3]		1,223
	Cadwell Brook	234	
	Plum Creek	235	
	Rapid River		373
	Rapid River, East Branch		278
	Reilly Brook		744
	Tamarack River	440	
	Wade Brook	171	
Lake of the Woods	Baudette River, West Fork		350
	Chase Brook	243	0
	Peppermint Creek		712
	Rapid River	403	
	Rapid River, North Branch	508	
	Troy Creek	222	
	Winter Road River	274	274
Roseau	Roseau River/Sprague Creek	72,287	72,287
Total Length of Floodplain Crossings		79,706	73,622

Source: FEMA 2003a-e

Notes:

[1]Crossing widths are based on available FEMA floodplain GIS data, which does not include Koochiching County. Koochiching County floodplains were identified using resources only available through FEMAs online Map Service Center to digitize their approximate extent into GIS format.

[2]The Orange Route would cross the Prairie River in three locations, but FEMA floodplains are only mapped at two of these crossings.
[3]The configuration of the route and sinuous stream pattern would require two Black River Floodplain Crossings by the Blue Route.

Table 6.17-7 presents floodplain crossings within the Segment Options. Segment Option C2 would cross the same number of floodplains as Segment Option C1; however, Segment Option C2 would cross the Big Fork River lower in the watershed, where flatter topography has allowed for a wider floodplain to become established. The crossing width of the Big Fork River Floodplain by Segment Option C2 would be 5,585 feet and would require pole placement in the floodplain. In comparison Segment Option C1 crossing of the Big Fork River Floodplain would be approximately 557 feet.

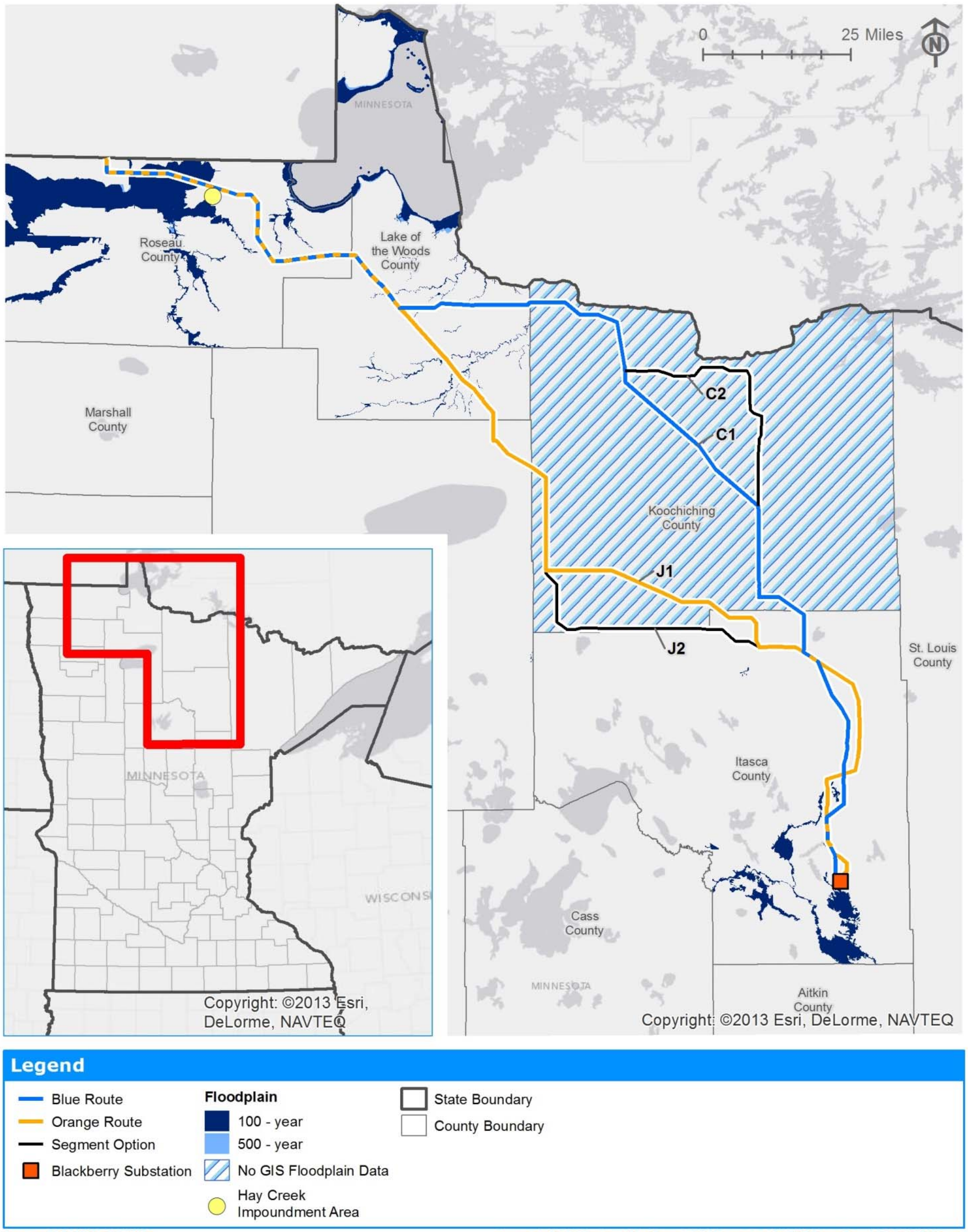
Segment Option J1 does not cross any floodplains. Segment Option J2 would cross three floodplains; Each floodplain crossed by Segment Option J2 is narrow enough to be spanned.

Table 6.17-7. Crossing Width[1] (feet) of FEMA Floodplains within the Segment Options

County Name	Associated Watercourse	Floodplain Crossing Width (feet)			
		C1	C2	J1	J2
Koochiching	Big Fork	557	5,585		
	Black River[3]	1,223	445		
	Cadwell Brook			234	--
	Plum Creek			235	--
	Wade Brook			171	--
Total Length of Floodplain Crossings		1,780	6,028	641	0

[1]Crossing widths are based on available FEMA floodplain GIS data, which does not include Koochiching County. Koochiching County floodplains were identified using resources only available through FEMAs online Map Service Center to digitize their approximate extent into GIS format.

FEMA Floodplains Figure 6.17-6



Sources: ESRI,FEMA, RRWMD

\\mspe-gis-file\GISProjLarge\MinnPower\182035\map_docs\CLIENT\Route_Permit\0617-6_FEMA.mxd

Groundwater

The primary groundwater resources in the Study Area are unconsolidated Quaternary aquifers comprised of glacial outwash- and lake-derived sand and gravel deposits. These Quaternary aquifers occupy small portions of the Study Area (Hobbs and Goebel 1982). Much of the Study Area is covered by non-aquifer materials such as peat and glacial till, although glacial till can be suitable for small domestic supplies if sufficient coarse material is present. Precambrian and Cretaceous bedrock aquifers are scattered throughout the Study Area, the most significant being the Precambrian-aged Biwabik Formation, which exists near the surface on the Mesabi Iron Range. Most of the bedrock formations in the Study Area are relatively impermeable and typically are not the target of water supply wells, especially where water of sufficient quantity and quality is available from shallow unconsolidated aquifers.

Depths to the water table vary throughout the Study Area, from less than 5 feet to more than 50 feet, according to water well records in the County Well Index. Generally, groundwater in the Study Area is within 30 feet of the surface. Groundwater quality in Itasca and Koochiching counties is suitable, and the water quality signature of the Quaternary aquifers is different from similar aquifers in the remainder of the state, possibly due to close interaction with the often shallow Precambrian bedrock (MPCA 1999a). In Beltrami, Lake of the Woods, and Roseau counties the groundwater quality is relatively suitable, although arsenic is a potential chemical of concern in the buried Quaternary aquifers (MPCA 1999b). High arsenic concentrations in the buried Quaternary aquifers are not expected to impact Project construction because those aquifers are beyond the depth of installation of structure foundations.

A number of wells exist in the Study Area. The wells primarily are used for domestic supply, with few wells used for other purposes such as monitoring.

6.17.2 Direct and Indirect Effects

Table 8.17-8 is a comparison of impacts to water resources for the anticipated ROW for the Route Alternatives; Table 8.17-9 provides this information for the Segment Options. Because GIS information of FEMA floodplains in Koochiching County is not available, the analysis of floodplain crossings is based upon information obtained from the FEMA Map Service Center.

Table 6.17-8. Summary of Water Resources within the Anticipated ROW

Resource Type[1]	Orange Route	Blue Route
PWI basin crossings less than 1,000 feet	2	1
PWI basin crossings greater than 1,000 feet	1	2
PWI watercourse crossings	37	37
MPCA impaired waters crossings	3	3
FEMA floodplain crossings less than 1,000 feet	9	7
FEMA floodplain crossings greater than 1,000 feet	3	2

Note:
[1]For impact calculations, crossings greater than 1,000 feet were assumed to require placement of at least one structure within the resource. The actual number of structures required, if any, to cross any water resource will depend on several factors including topology, alignment, and other physical constraints.

Table 6.17-9. Water Resources within the Segment Alternatives

Resource Type[1]	Segment Options			
	C1	C2	J1	J2
PWI basin crossings less than 1,000 feet	0	0	0	0
PWI basin crossings greater than 1,000 feet	0	0	0	0
PWI watercourse crossings	5	3	10	8
MPCA impaired waters crossings	1	2	1	1
FEMA floodplain crossings less than 1,000 feet	2	1	3	0
FEMA floodplain crossings greater than 1,000 feet	0	1	0	0

Note:
[1]For impact calculations, crossings greater than 1,000 feet were assumed to require placement of at least one structure within the resource. The actual number of structures required, if any, to cross any water resource will depend on several factors including topology, alignment, and other physical constraints.

Public Waters

Orange Route

Direct impacts on surface water resources likely will occur at the unnamed PWI basin in Roseau County (see Table 6.17-4 and Appendix A, sheet 10). The span width of the unnamed PWI basing in Roseau County is approximately 2,118 feet wide, which may require one or more structures to be placed within this basin. This feature is a scrub-shrub and emergent wetland with little to no standing water. Each structure placed in a PWI basin will result in approximately 33 square feet of permanent impacts.

Direct impacts to other PWI basins or watercourses because of construction of the Project are not likely to occur. The Applicant anticipates that surface water features that are 1,000 feet wide or less may be avoided by spanning the transmission line over waterbodies or shifting the route to avoid these areas, unless precluded by other constraints. With the exception of the unnamed basin in Roseau County, there are no unspanable waterbodies along the Route Alternative.

Indirect effects on public waters will include the removal of riparian or shoreline forests where present (see Table 6.17-2). In addition to the habitat changes this would cause, it could also increase light penetration to the waterbody. These indirect effects have potential to cause increased water temperature and changes to aquatic plant community.

In some locations, it may be necessary to draw water from public waters to facilitate temporary ice roads required to support construction. The amount of water required for the construction of ice roads will be negligible and have little to no impact on surface waters as the water will be returned to the source upon melt. A Water Appropriations Permit from the Minnesota DNR will be obtained if necessary.

Finally, temporary access across PWI watercourses (see Table 6.17-2) may be required to facilitate construction of portions of this Route Alternative, especially where located in isolated areas and where access to the ROW from public roads will be limited. These locations have been identified after an alternative is selected, during final design.

Blue Route

Direct impacts on surface water resources likely will occur at the unnamed PWI basin in Roseau County and at Grass Lake in Itasca County (see Table 6.17-4 and Appendix A, sheets 10 and 49). The span width of the unnamed PWI basing in Roseau County is approximately 2,118 feet wide, which may require one or more structures to be placed within this basin. This feature is a scrub-shrub and emergent wetland area with little to no standing water.

The span width of Grass Lake in Itasca County would be approximately 1,220 feet wide, which may require one or more structures to be placed within this basin. This PWI is mostly open water and is undeveloped.

Based on the anticipated ROW developed for impact calculations, it is anticipated that structure placement will be necessary in two PWI waterbodies. Each structure placed in a PWI basin will result in approximately 33 square feet of permanent impacts.

The Applicant anticipates that the remaining PWI Basins and Watercourses may be avoided by spanning the transmission line over the waterbodies and watercourses or adjusting the alignment of the ROW within the route to avoid these areas entirely, unless precluded by other constraints.

Indirect effects on these resources will include the removal of riparian or shoreline forests where present (see Table 6.17-2). In addition to the habitat changes this would cause, it could also increase light penetration to the waterbody. These indirect effects have potential to cause increased water temperature and changes to aquatic plant community.

Indirect effects on riparian wetlands from removal of trees and shrubs are discussed in Section 8.18, Wetlands. Visual impacts associated with stream and river crossings are discussed in Section 8.10, Aesthetics, and Section 8.22, Recreation and Tourism.

In some locations, it may be necessary to draw water from public water sources to facilitate temporary ice roads required to support construction. The amount of water required for the construction of ice roads will be negligible and have little to no impact on surface waters. A Water Appropriations Permit from the Minnesota DNR will be obtained if necessary.

Finally, temporary access across PWI watercourses (see Table 6.17-2) may be required to facilitate construction of portions of this Route Alternative, which are located in isolated areas where access to the ROW from public roads will be limited, however, these locations have not yet been determined.

Segment Options

Segment Option C2 will have three PWI stream crossings, which is two less PWI watercourse crossings than Segment Option C1 (see Table 6.17-3). This is because Segment Option C2 will be situated lower in the watershed, downstream (that is, north) from the confluence of many minor tributaries to Black River and Big Fork River, which are crossed by Segment Option C1. Each PWI stream crossing will be spanned with no permanent impacts anticipated. No PWI basins are located in either Segment Option C1 or C2.

Segment Option J2 will have eight PWI stream crossings, which is two less PWI watercourse crossings than Segment Option J1 (see Table 6.17-3). This is because Segment Option J1 will be situated below the beach ridge which forms the transition between the Vermillion Uplands Ecoregion and Agassiz Lowlands, where numerous streams originate. Segment J2 is situated above these streams in the watershed and therefore avoids crossings some of the streams which originate downslope. Each PWI stream crossing will be spanned with no permanent impacts anticipated. No PWI basins are located in either Segment Option J1 or J2.

Trout Streams

The Blue Route crosses one trout stream, Pitt Grade Creek, in Lake of the Woods County (see Appendix A, sheet 79). This creek is channelized. The proposed crossing is next to an existing 230 kV line. Additional clearing may be necessary for Project construction. The Applicant will work with Minnesota DNR to determine if there would be any effects to this creek as a result of the Project.

The Orange Route and Segment Options do not cross any trout streams.

Water Quality

Each route will cross three impaired waterways. See Table 6.17-5. Segment Option C2 has an additional impaired water crossing. Direct impacts on surface water resources are not likely to occur to MPCA impaired watercourses during construction of the Project, because the impaired water features will be avoided by spanning the transmission line over the watercourse.

Many of the watercourses crossed by the Route Alternatives are impaired by the presence of mercury (MPCA 2012). The Project will reduce northeastern Minnesota's reliance on coal fired power plants, which are a source of atmospheric mercury, and replace it with hydro power, which is an emission free and mercury free power source. This could have long-term, beneficial effects on water quality in the region, as regional emissions are responsible for approximately 40 percent of atmospheric mercury deposition in Minnesota (MPCA 2013).

Turbidity is identified as the other type of impairment for the watercourses crossed by the Route Alternatives. Indirect impacts that might affect turbidity are from stormwater runoff during construction, due to the presence of exposed topsoil or disturbed vegetation within the

ROW. The Applicant will implement a sediment and erosion control plan during construction to minimize potential sedimentation of all surface waters within the selected route.

Floodplains

Construction of the Project is not expected to alter existing drainage patterns or floodplain elevations due to the small footprint of the structures and their relatively wide spacing. The transmission structures placed in floodplains have a small cross section, resulting in negligible fill. No change in floodplain functions will occur due to construction of the Project. If floodplain contours are disrupted during construction, they will be returned to their pre-construction profile once construction is complete. See Table 6.17-6 for a listing of floodplain crossings within the Route Alternatives and Table 6.17-7 for the Segment Options.

Orange Route

The Orange Route will cross floodplains associated with the Roseau River/Sprague Creek, Winter Road River, Troy Creek, Rapid River (Main & North Branch), Chase Brook, Wade Brook, Tamarack River and the Prairie River (see Appendix A, sheets 4, 14, 58, 74, 65, and 46).

Floodplain crossings greater than 1,000 feet may require the placement of one or more structures within the floodplain. In Roseau County, approximately 72,287 feet of the Orange Route are located in the Roseau River/Sprague Creek Floodplain. In addition, the Prairie River Floodplain would be crossed in two locations by the Orange Route in Itasca County where FEMA floodplains are present (there are no FEMA floodplains mapped at the remaining Prairie River Crossing). The northern crossing is approximately 2,850 feet wide and the southern crossing would be approximately 2,920 feet wide. Other floodplains crossed by the Orange Route are narrow enough that impacts could be avoided by spanning. The Orange Route would cross approximately 6,000 feet more floodplain than the Blue Route.

In total, approximately 79,706 feet (15.1 miles, approx.) of the Orange Route is located in floodplains. Where complete avoidance of floodplains is not feasible, structure placement will have little to no effects on water flow, flood water storage capacity, or flooding in those floodplains because the volume displaced by the structures will be so small as to be negligible.

Approximately one mile of the Orange Route crosses the Hay Creek Impoundment Area, located within the Roseau River Watershed. The impacts on water flow, flood water storage, and flooding will be negligible due to the small volume displaced by the structures compared to the approximately 9,500-acre-feet capacity of the impoundment.

Blue Route

The Blue Route will cross floodplains associated with the Roseau River/Sprague Creek, Winter Road River, Peppermint Creek, Baudette River West Fork, Rapid River, Rapid River East Fork, Black River, Big Fork River, and Reilly Brook (see Appendix A, sheets 4, 14, 15, 17, 18-19, 24, 28, and 37).

Floodplain crossings greater than 1,000 feet may require the placement of one or more structures within the floodplain. Approximately 72,286 feet (13.7 miles, approx.) of the Blue Route crosses the Roseau River/Sprague Creek Floodplain in Roseau County and approximately

1,223 feet of the route crosses the Black River Floodplain in Koochiching County. Other floodplains crossed by the Blue Route are narrow enough that impacts could possibly be avoided by spanning the width of these features.

In total, approximately 73,622 feet (13.9 miles, approx.) of the Blue Route are located in floodplains. Where complete avoidance of floodplains is not feasible, structure placement will have little to no effects on water flow, flood water storage capacity, or flooding in those floodplains because the volume displaced by the structures will be so small as to be negligible.

Approximately one mile of the Blue Route crosses the Hay Creek Impoundment Area, located within the Roseau River Watershed (see Appendix A, sheets 5-6). The impacts on water flow, flood water storage, and flooding will be negligible due to the small volume displaced by the structures compared to the approximately 9,500-acre-feet capacity of the impoundment.

Segment Options

Segment Option C2 is the only segment crossing a floodplain that is more than 1,000 feet wide. See Table 6.17-7. Approximately 5,586 feet of Segment Option C2 is located in the Big Fork Floodplain in northern Koochiching County and may require structure placement within the floodplain. Segment C1 would span the Big Fork River in a location where the floodplain is approximately 557 feet wide, so pole placement would not be required (see Appendix A, sheets 78-80).

All other floodplain crossings made by the Segment Options are narrow enough that they could be spanned. Therefore, additional impacts are not anticipated.

Groundwater

Permanent impacts on groundwater resources are not anticipated to occur as a result of this Project. Temporary impacts during construction could occur if dewatering is necessary to install the transmission structures. Due to the depth of groundwater in the Study Area (that is, generally less than 30 feet below ground surface), groundwater resources might be encountered during excavations for transmission line structures or surface grade changes in low-lying and/or wet areas. In areas where shallow groundwater is encountered, dewatering prior to structure installation may possibly be required. Depending on the need for and scale of dewatering activities, it will be possible that shallow groundwater levels could be directly affected from dewatering. However, because installation of structure foundations will be installed at depths of at least 10 to 15 feet below ground surface, changes in groundwater levels will be confined to shallow groundwater with no resulting effect on deep aquifers.

In the event temporary concrete batch plants are constructed to make concrete for structure foundations, groundwater might be used to supply the plants. Depending on the depth of the pumping, groundwater levels in shallow aquifers could be directly affected in the short term.

Any effects on groundwater levels from dewatering activities will be localized and short term. The Project will not impact groundwater availability or quality for municipal or private water users in the Study Area. Water supply wells in the Study Area primarily are used for domestic purposes. Landowners will be contacted to determine the presence of wells. There is sufficient room within the Route Alternatives to avoid most or all wells, and detailed ROW planning within the Route Alternatives will provide the opportunity to refine the position of the transmission line and avoid existing wells. If a well could not be avoided, it will be relocated under an agreement with the well owner and the old well will be properly abandoned.

Except for the potential use in concrete production, no water for storage, reprocessing, or cooling will be required for the construction or operation of the transmission line or substations. The Project will not be expected to result in violations of groundwater quality standards unless a significant fuel or chemical spill associated with construction equipment or substation operations were to occur. The potential for spills to occur during construction or substation operations will be reduced through development and maintenance of Spill Prevention, Control, and Countermeasures (SPCC) plans for both the construction phase and operations phase of the Project.

6.17.3 Mitigation

Public Waters

The Applicant will maximize span widths to the extent practicable to place the smallest number of structures in Public Waters.

The Project likely will require a number of water resource permits, including a Stormwater Pollution Prevention Plan (SWPPP), National Pollutant Discharge Elimination System (NPDES) Permit, License to Cross Public Waters, Public Waters Work Permit, Section 10 Permit, and Temporary Water Appropriations General Permit. The Applicant will work with permitting agencies to develop mitigation measures appropriate for these permits.

The Applicant will maintain sound soil and water conservation practices during construction and operation of the Project to protect topsoil and adjacent water resources, and to minimize soil erosion. Best management practices (BMPs) may include:

- → The Applicant will retain an environmental inspector (EI) during Project construction. Working on behalf of the Applicant, the EI will be responsible for understanding all of the conditions of the Project's environmental permits and to ensure that the contractors abide by these conditions.
- → Utilize matting, ice roads, and low ground pressure equipment to the extent practical to minimize wetland and peatland impacts during construction.
- → Locate structures and disturbed areas away from rivers and lakes, where practicable
- → Contain stockpiled material away from stream banks and lake shorelines
- → Install sediment and erosion control prior to construction in accordance with sediment and erosion control plans and permits
- → Use turbidity control methods prior to discharging wastewater from concrete batching or other construction operations to streams or other surface waters
- → Spread topsoil and seed in a timely manner
- → Restrict vehicular activity within riparian corridors

- → Minimize use of heavy equipment when clearing riparian corridors

Floodplains

Structures will be located outside of floodplains to the extent practicable. The Applicant will work with the jurisdictional agencies to determine the best ways to minimize impacts and create appropriate mitigation measures.

Water Quality

The Applicant proposes the following mitigation measures:

- → To mitigate any impacts to water quality, the Applicant will implement the BMP's outlined in the SWPPP, required by the NPDES permitting process. Adjustments may be made in the field to address site specific conditions.
- → To minimize contamination of wetlands due to accidental spilling of fuels or other hazardous substances, the Applicant will develop and implement spill prevention procedures to aid in the prevention of potential contamination due to a fuel or hazardous substance spill. Refueling will occur at sites away from wetlands and waters.

Groundwater

The Applicant proposes the following mitigation measures:

- → Temporary impacts during construction may occur if dewatering is necessary to install the transmission structures or if pumping wells are installed to supply water for concrete batch plant operations. If dewatering or pumping is necessary, water appropriations permits will be obtained from Minnesota DNR. If the dewatered groundwater contains substantial quantities of suspended sediments, then the water will be filtered though silt fence or bio-rolls prior to discharge.
- → The Applicant expects to avoid constructing the transmission line over existing wells. If crossing over wells cannot be avoided, the Applicant will work with existing landowners to develop appropriate mitigation measures.
- → To minimize the potential for contamination of groundwater, SPCC plans will be developed and maintained during the construction and operation of the Project. Oil products and hazardous materials will be stored inside appropriate containment, and any spills of oil or hazardous materials will be mitigated immediately in accordance with the procedures in the SPCC plan.

This page intentionally left blank

6.18 Wetlands

This section describes wetland resources that are crossed by the Route Alternatives and Segment Options and the potential impacts of the Route Alternatives and Segment Options on those resources.

Data from the National Wetland Inventory (NWI) Geographic Information System (GIS) shapefiles were used to determine acreage, length, and type of wetlands impacted by the Route Alternatives and Segment Options.

6.18.1 Existing Conditions

Wetlands serve many valuable functions including, but not limited to, providing groundwater discharge and recharge; flood attenuation; important fish and wildlife habitat; nutrient and sediment removal and storage; shoreline and riverbank stabilization; and toxicant removal. As such, wetland impacts are regulated by a combination of federal, state, and local regulatory authorities in the U.S. Activities that would discharge dredge or fill material into waters of the U.S. require a permit from the U.S. Army Corps of Engineers (USACE). Such permits must be in compliance with both USACE regulations and the Section 404(b)(1) Guidelines promulgated by the U.S. Environmental Protection Agency (EPA), including the implementation of steps to avoid, minimize and mitigate effects on wetlands.

State and local wetland protection in Minnesota is regulated by the Wetland Conservation Act of 1991. The purpose of the Wetland Conservation Act is to maintain and protect wetlands and their associated benefits within the state. The Wetland Conservation Act is administered by local government units, which may include cities, counties, watershed management organizations, soil and water conservation districts, and townships. Some activities, including linear utility corridors, are exempt from regulation under the Wetland Conservation Act. Because this exemption for linear utility corridors includes transmission lines, the Applicant anticipates that the impacts to wetlands from the transmission line will be exempt from the Wetland Conservation Act's (WCA) rules on replacement pursuant to Minnesota Rules 8420.0420, subpart 6.A(1). Substations, which are not considered part of the linear portion of a Project under the WCA exemption, may require a state wetland permit and associated replacement.

National Wetland Inventory Wetlands

Wetlands within the Study Area for the Route Alternatives and Segment Options were identified using National Wetlands Inventory (NWI) Geographic Information System (GIS) shapefiles, which represent the best estimate of wetland resources at a broad, planning scale. Delineation of wetland boundaries and required mitigation will occur through the Clean Water Act Section 401 and Section 404 permit process.

To provide an easily understood classification system with unified concepts and terms, the U.S. Fish and Wildlife Service (USFWS) developed the *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin et al.1979). This approach, referred to as the Cowardin Classification System, provides a hierarchical framework for classifying all wetland and deepwater areas. Cowardin classification is a widely accepted standard for the classification of wetland types on a state and national level. This approach is used as the basis for USFWS NWI mapping as the means to classify wetlands on a national level. The hierarchical classification divides wetlands and deep water habitats into Systems, Subsystems, Classes, and Subclasses. The NWI Type provided in Table 6.18-1 and 6.18-2, below, is based on the Cowardin Classification System. Both a full description and an abbreviated description of wetland types are available on USFWS' website (1979). Figure 6.18-1 shows NWI wetlands along the Route Alternatives; detailed maps are provided in Appendix A.

Table 6.18-1. Wetlands (acres) within Each Route Alternative

Wetland Type[1]	Orange Route	Blue Route
PEM	5,525	5,877
PSS	15,984	13,249
PFO	22,418	24,680
PUB	218	91
Lake	89	169
River	13	53
Total wetlands within Route Alternative (acres)	**44,247**	**44,120**
Total Route Alternative area (acres)	75,879	71,547
Percent wetlands (%)	**58%**	**62%**

Source: Minnesota DNR - Division of Waters (2003)
Note:
[1]Palustrine emergent wetland (PEM), Palustrine shrub wetland (PSS), Palustrine forested wetland (PFO), Palustrine pond (Palustrine Unconsolidated Bed [PUB]). Palustrine is defined as a freshwater wetland system.

Table 6.18-2. Wetlands (acres) within Each Segment Option

Wetland Type[1]	C1	C2	J1	J2
PEM	161	447	327	480
PSS	1,230	1,382	1,581	1,391
PFO	9,241	4,322	5,547	3,560
PUB	10	19	81	146
Lake	-	12	-	18
River	23	51	-	-
Total wetlands (acres)	**10,665**	**6,233**	**7,536**	**5,596**
Total Segment Option area (acres)	11,971	8,672	15,489	16,532
Percent area as NWI wetlands (%)	**89%**	**72%**	**49%**	**34%**

Source: Minnesota DNR - Division of Waters (2003)
Note:
[1]Palustrine emergent wetland (PEM), Palustrine shrub wetland (PSS), Palustrine forested wetland (PFO), Palustrine pond (Palustrine Unconsolidated Bed [PUB]). Palustrine is defined as a freshwater wetland system.

Both the Orange Route and the Blue Route cross substantial wetland areas, including emergent, shrub, and forested wetlands. The Orange and Blue Route Alternatives include a similar number of total wetland acres (44,247 acres and 44,120 acres, respectively). The Blue Route includes more lake and river wetland acres than the Orange Route.

The Orange Route takes a more direct trajectory than the Blue Route, crossing the vast peatland complex of the Agassiz Lowlands Ecological Subsection (see Section 6.4, Vegetation, for a figure and description of Ecological Subsections). The Blue Route, which follows a more northerly and easterly direction, skirts the northern edge of the Agassiz Lowlands Ecological Subsection and traverses a greater portion of the Littlefork-Vermillion Uplands Ecological Subsection. The Littlefork-Vermillion Uplands Ecological Subsection contains more heterogeneous landscapes and consequently, a greater number of smaller basins than the Agassiz Lowlands Ecological Subsection with more opportunity for spanning of wetlands along the Blue Route. The Orange Route traverses more areas of uninterrupted wetland basins, particularly peatlands north of Red Lake.

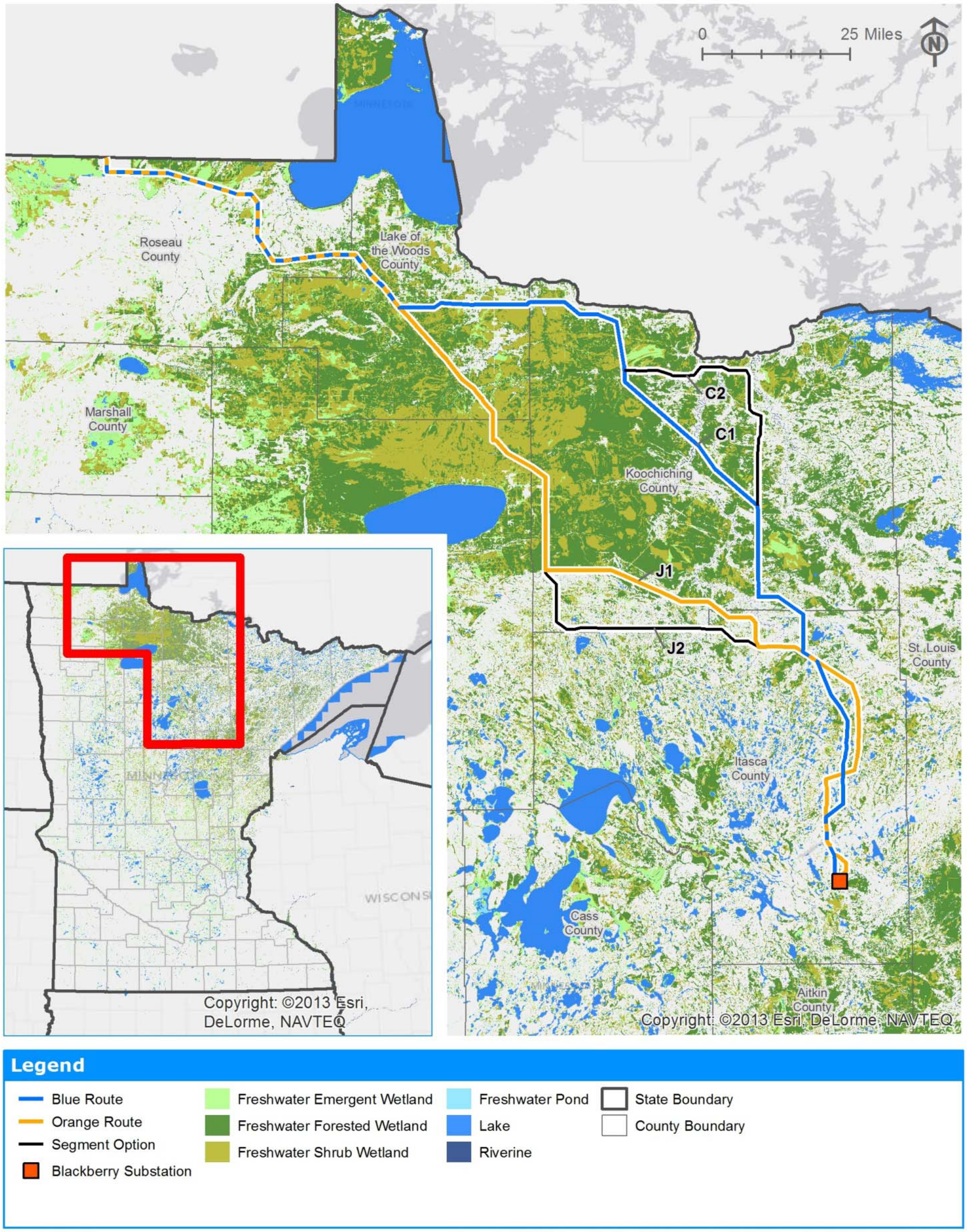
Segment Options C1 and C2 each have more than 70 percent wetland coverage, consisting of mostly woody wetland cover in Segment Option C1, with Segment Option C2 weighted slightly more toward shrubs than forest.

Segment Options J1 and J2 are located within the Littlefork-Vermillion Uplands Ecological Subsection, but Segment Option J1 borders the edge of the vast peatlands of the Agassiz Lowlands Ecological Subsection and thus crosses more peatland areas. These options include 35 to 50 percent wetland. The landscape of Segment Option J2 is more heterogeneous, with wetlands of smaller basins throughout.

minnesota power
AN ALLETE COMPANY
GREAT NORTHERN TRANSMISSION LINE

National Wetland Inventory (NWI) Wetlands

Figure 6.18-1



Sources: ESRI,NWI

\\mspe-gis-file\GISProjLarge\MinnPower\182035\map_docs\CLIENT\Route_Permit\0618-1_NWI_Wetlands.mxd

Public Water Inventory Wetlands

The Minnesota Department of Natural Resources (DNR) Public Waters Inventory (PWI) wetlands are included in the NWI data presented above and independently are regulated by Minnesota DNR as public waters (see Figure 6.18-2). PWI wetlands are discussed in Section 6.17, Water Resources and Floodplains.

Peat and Muck Soil Wetlands

Peatlands are a particularly sensitive type of wetland resource in the Study Area (see Figures 6.18-3 and 6.17-2). Peat soils develop in wetland settings where decomposition of organic material is slowed by lack of oxygen in continuous and fully saturated conditions. Muck soils form when peat soils are drained, triggering weathering of the peat and associated micro-organism activity. Muck formation involves the partial mineralization of peats and the subsequent transformation of its colloidal constituents (Myślińska 2003). Regeneration of peat is a slow process, estimated to reproduce at a rate of less than 1millimeter per year (Keddy 2000). The Study Area contains vast peatland communities including open and forested bogs and rich, poor, and calcareous fens. Most peatlands in the Study Area are dominated by Sphagnum mosses and are located within the large peatlands of the Agassiz Lowlands Ecological Subsection through the central portion of the Orange Route. Wetlands of this area largely are comprised of acidic peat bogs. Peat and muck soils were identified for the Study Area using U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) soils descriptions (USDA NRCS 2013).

Calcareous Fens

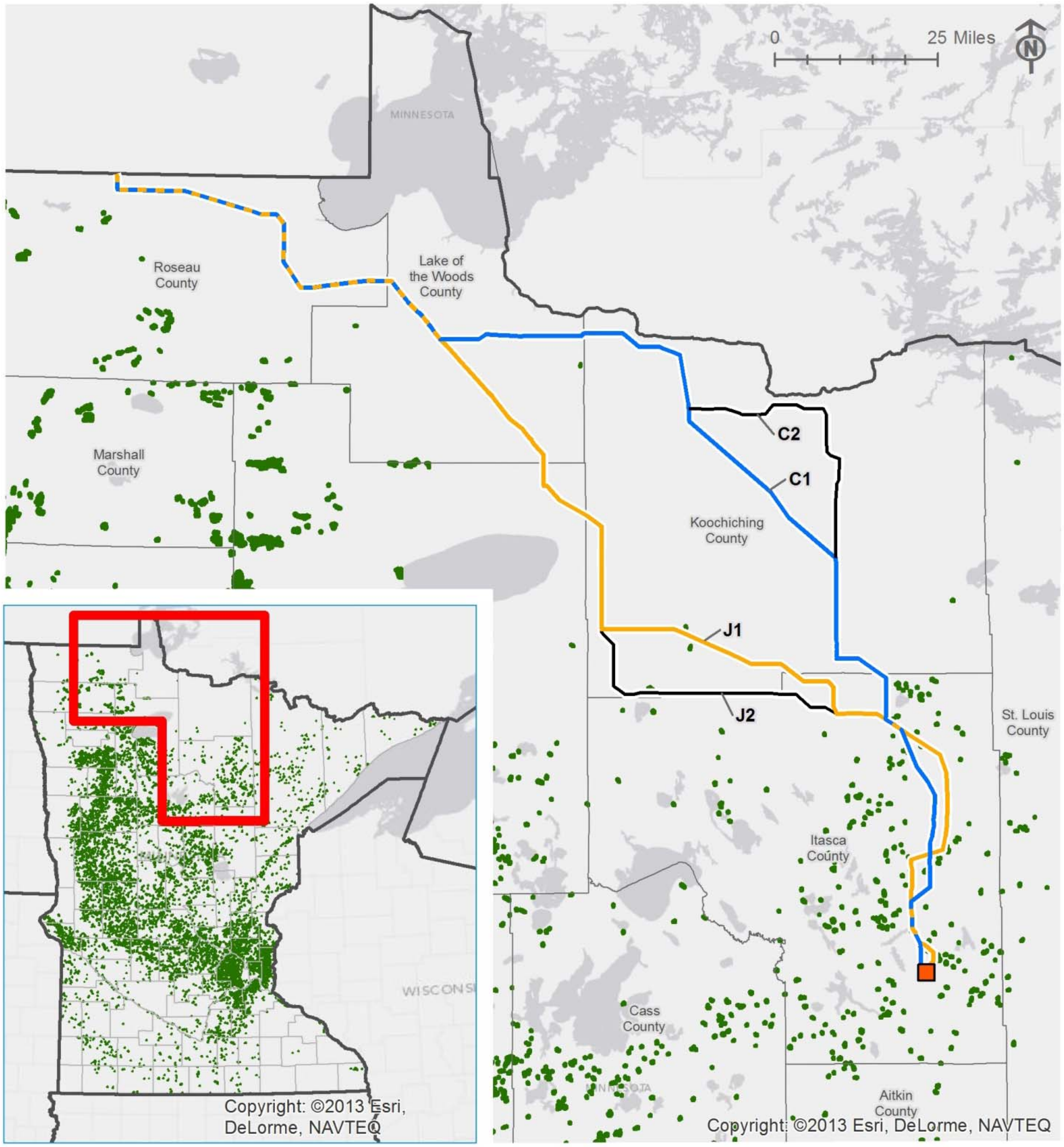
Calcareous fens are a globally rare and unique groundwater fed wetland type found in high concentrations in Minnesota. Under Minnesota Administrative Rule 8420.0935, "Calcareous fens, as identified by the commissioner, must not be impacted or otherwise altered or degraded, wholly or partially by any action, unless the commissioner, under an approved management plan, decides some alteration is necessary." These wetland communities are the only natural community specifically protected by the Minnesota Peatland Protection Act (Minnesota Statutes 84.035 and 84.036). Minnesota DNR has established WPAs for peatlands throughout the state. WPAs are in place in areas surrounding the following Scientific and Natural Areas (SNAs): Pine Creek Peatland (see Appendix A, sheet 3), Sprague Creek Peatland (see Appendix A, sheet 3), Red Lake Peatland (see Appendix A, sheet 61), North Black River Peatland (see Appendix A, sheets 23-24), and Lost River Peatland (see Appendix A, sheets 64-65). None of the SNAs are within Route Alternatives, but WPAs for all of these SNAs are crossed by the Project.

The adjacent WPAs for Lost River Peatland SNA, Pine Creek SNA, and Sprague Creek SNA are specifically intended to provide protective buffers for core areas of known calcareous fen complexes. As groundwater fed natural communities, calcareous fens are susceptible to off-site impacts to groundwater flows and chemistry. A determination of potential effects to known fen complexes will require coordination with Minnesota DNR. Large peatland expanses have the potential to support calcareous fen complexes not yet identified. See Section 6.4, Vegetation, Table 6.4-6 for SNA-WPA locations.

minnesota power
AN ALLETE COMPANY
GREAT NORTHERN TRANSMISSION LINE

Public Water Inventory (PWI) Wetlands

Figure 6.18-2



Legend

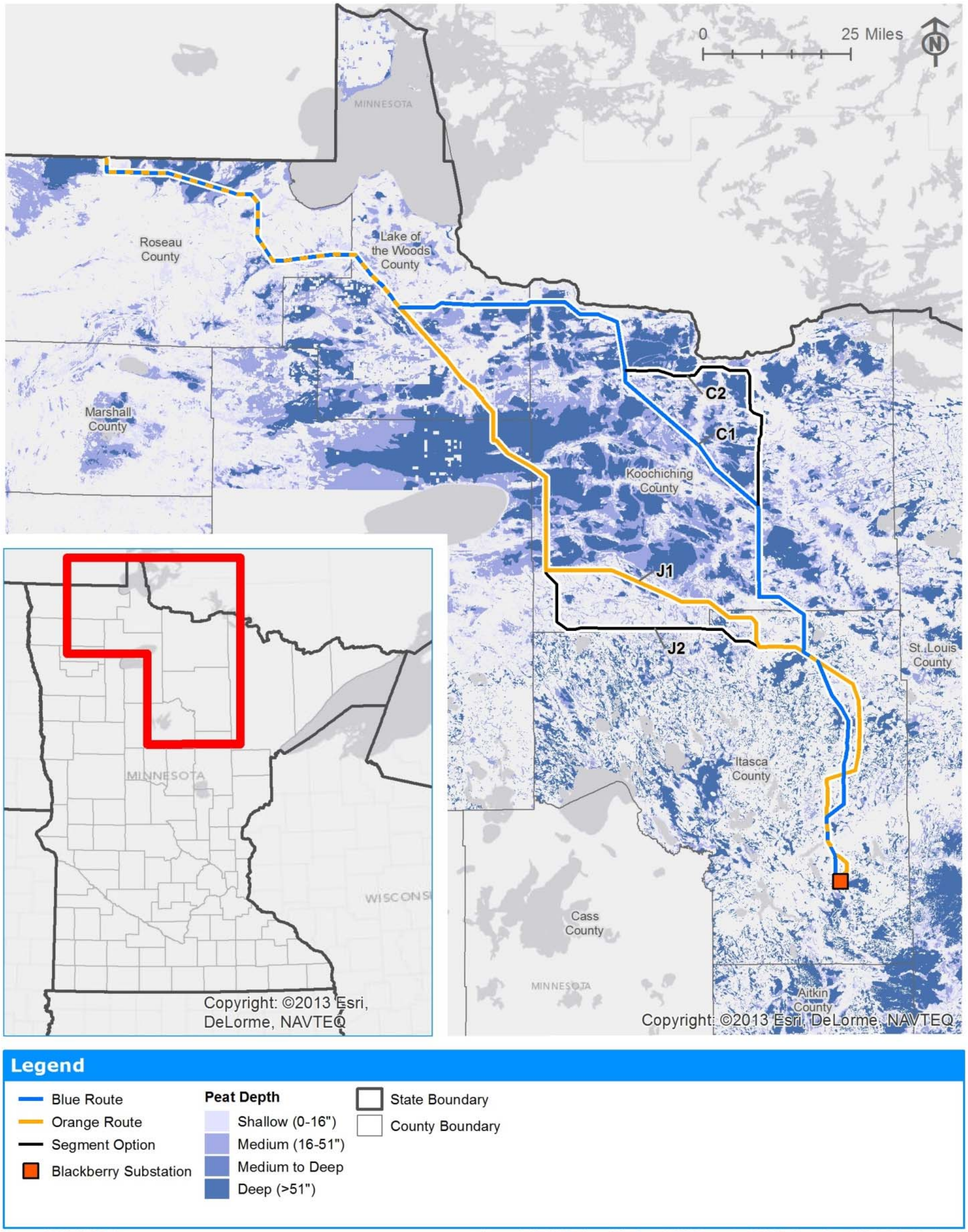
- Blue Route
- Orange Route
- Segment Option
- Blackberry Substation
- PWI Wetland
- State Boundary
- County Boundary

Sources: ESRI,PWI

\\mspe-gis-file\GISProjLarge\MinnPower\182035\map_docs\CLIENT\Route_Permit\0618-2_PWI_Wetlands.mxd

minnesota power
AN ALLETE COMPANY
GREAT NORTHERN TRANSMISSION LINE

Peatlands **Figure 6.18-3**



Sources: ESRI,SSURGO

\\mspe-gis-file\GISProjLarge\MinnPower\182035\map_docs\CLIENT\Route_Permit\0618-3_Peatlands.mxd

6.18.2 Direct and Indirect Effects

Wetlands make up approximately 63 to 69 percent of the area within the anticipated right-of-way (ROW) for the Route Alternatives (see Table 6.18-3), and 31 to 91 percent of the area within the anticipated ROWs for the Segment Options (see Table 6.18-4). All impacts are expected to be direct impacts. No indirect impacts are expected.

Table 6.18-3. NWI Wetlands within the Anticipated ROW for Each Route Alternative

Wetland Type[1, 2] (Cowardin Classification)	Orange Route (acres)	Blue Route (acres)
PEM	234	2,256
PEMA	5	3
PEMB	165	299
PEMC	4	13
PEMF	3	6
PEMG	2	1
PFO	1,667	1,908
PSS	1,287	1,183
PUB	10	6
Lake	2	7
River	1	5
Total wetlands (acres)	**3,380**	**3,656**
Total ROW area (acres)	5,332	5,321
Percent of ROW as wetland (%)	**63%**	**69%**

Source: Minnesota DNR - Division of Waters (2003)
Notes:
[1]Palustrine emergent wetland temporarily flooded (PEMA), Palustrine emergent wetland saturated (PEMB), Palustrine emergent wetland seasonally flooded (PEMC), Palustrine emergent wetland seasonally flooded or saturated (PEME), Palustrine emergent wetland semipermanently flooded (PEMF), Palustrine emergent wetland intermittently exposed (PEMG) Palustrine emergent wetland artificially flooded (PEMK), Palustrine shrub wetland (PSS), Palustrine forested wetland (PFO), Palustrine pond (Palustrine Unconsolidated Bed [PUB]). Palustrine is defined as a freshwater wetland system.
[2]For these calculations, wetland classifications that are combined in the NWI (that is, PSS/PFO; PSS/PEM; and PFO/PSS) were classified using the first designation. It was presumed that the first designation represents the dominant wetland type.

Table 6.18-4. NWI Wetland (acres) within the Anticipated ROW for Each Segment Option

Wetland Type[1]	Segment Option			
	C1	C2	J1	J2
PEM	-	-	7	17
PEMA	-	-	2	1
PEMB	6	36	9	3
PEMC	4	28	4	4
PEMF	4	2	<1	6

Wetland Type[1]	Segment Option			
	C1	C2	J1	J2
PFO	633	585	426	253
PSS	80	175	101	102
PUB	<1	1	5	13
RIVER	1	2	1	1
Total Wetlands	**729**	**830**	**556**	**399**
Total ROW Area	797	1,116	1,212	1,284
Percent of ROW as Wetland	**91%**	**74%**	**46%**	**31%**

Source: Minnesota DNR - Division of Waters (2003)
Notes:
[1]Palustrine emergent wetland temporarily flooded (PEMA), Palustrine emergent wetland saturated (PEMB), Palustrine emergent wetland seasonally flooded (PEMC), Palustrine emergent wetland seasonally flooded or saturated (PEME), Palustrine emergent wetland semipermanently flooded (PEMF), Palustrine emergent wetland intermittently exposed (PEMG) Palustrine emergent wetland artificially flooded (PEMK), Palustrine shrub wetland (PSS), Palustrine forested wetland (PFO), Palustrine pond (Palustrine Unconsolidated Bed [PUB]). Palustrine is defined as a freshwater wetland system.
[2]For these calculations, wetland classifications that are combined in the NWI (that is, PSS/PFO; PSS/PEM; and PFO/PSS) were classified using the first designation. It was presumed that the first designation represents the dominant wetland type.

Wetland Fill

Direct permanent wetland impacts would occur where dredging or filling is required for structure foundation installation. The area of permanent impact is anticipated to be 33 square feet per structure. Permanent impacts would only occur if a wetland cannot be spanned. The estimate of the total amount of wetland area that would need to be filled to install structures within an anticipated ROW, assuming a 1,000 foot span length, is shown in Table 6.18-5. Fill calculations are considered to be conservative estimates based on preliminary design assumptions, where structures will be placed between 1,000 and 1,400 apart.

The estimated wetland fill area would be approximately 0.60 acre for the Route Alternatives. Based on the anticipated siting of the Blackberry Substation and 500 kV Series Compensation Station, the estimated combined wetland fill area for those two facilities would be 5.3 acres. Estimated impacts for the Segment Options range from less than 0. 1 acre to 0.14 acre, with Segment Option C2 having the highest impact.

Table 6.18-5. Total Fill for the Route Alternatives and the Blackberry 500 kV Substation/Series Compensation Station

Route Alternative or Segment Option	Approximate Number of Structures	Total Wetland Fill (Acres)
Route Alternatives		
Orange Route	1,162	0.56
Blue Route	1,159	0.60
Substation		
Blackberry 500 kV Substation and 500 kV Series Compensation Station	-	5.30
Segment Options		
C1	174	0.12
C2	243	0.14
J1	264	0.09
J2	280	0.06

NWI source: Minnesota DNR - Division of Waters (2003)

Forest Wetland Conversion

Conversion of forested wetlands is likely the greatest impact on wetlands associated with the Project. Removal of trees within the ROW is required to ensure the safe and efficient operation of the transmission line. Removal of woody vegetation within a forested wetland area would not require dredging or filling, nor would it reduce overall wetland acreage, but would convert the forested wetland area to a different vegetative class and thus a different wetland type.

The forested wetland conversion associated with the Project occurs because the Project is located in a region of the state where forested wetland is a predominant land cover. Both Route Alternatives cross this region. This conversion would impact a small percentage of the total amount of this land cover in the Study Area.

The Orange Route and the Blue Route would convert 1,667 acres and 1,908 acres of forested wetland, respectively. See Table 6.18-6.

Segment Option C1 has more acres wetland forest conversion than Segment Option C2 (that is, 633 to 585 acres). Segment Option J1 would convert 426 acres of forested wetland, mostly contiguous forested peatlands, whereas Segment Option J2 would convert 253 acres.

Shrub Wetland Conversion

Permanent conversion of shrub wetlands would occur within a 70-foot-wide corridor beneath the transmission line. In these areas, all woody vegetation will be kept cleared as a part of regular maintenance to ensure safe and reliable operation of and access to the transmission line. Elsewhere within the ROW, woody vegetation that typically grows less than 16 feet tall will be left in place. Vegetation taller than 16 feet will be removed. See Table 6.18-6.

Table 6.18-6. Permanent Conversion of Wetland Types by Route Alternative and Segment Option

Route Alternative or Segment Option	Conversion of Forested (PFO) Wetlands (Acres)[1]	Conversion of Shrub (PSS) Wetlands (Acres)[2]
Route Alternatives		
Orange Route	1,667	448
Blue Route	1,908	419
Segment Options		
C1	633	27
C2	585	56
J1	426	35
J2	253	35

NWI source: Minnesota DNR - Division of Waters (2003)
Notes:
[1] Based on 200 foot-wide cleared ROW
[2] Based on 70 foot-wide clearing beneath the transmission line

Calcareous Fens

Calcareous fens are protected by statute, thus project activities near these natural communities will require coordination with the Minnesota DNR to determine whether effects may occur due to alteration of groundwater sources. The Orange and Blue Routes and Segment Option C2 each cross one or more WPAs. See Section 6.4, Vegetation, Table 6.4-6 for WPA locations. No effects are anticipated.

General Construction Impacts

Temporary wetland impacts due to construction activities will occur to wetland areas that are not permanently impacted or permanently converted to another wetland type. Temporary impacts are expected to occur in emergent (that is, PEM Type) wetlands during construction. Temporary access paths and construction areas at structures will be matted and driven upon by heavy equipment. Potential for disturbance, compression, and/or compaction of soils generally increases in wetlands that have highly organic soils, floating bogs, or high water levels. The duration of these construction related impacts to wetland areas may be of longer duration.

In peatlands, soils tend to be highly compressible, often floating on top of water; compressed peat is slow to regenerate. Potential direct effects could impact vegetation communities if soils are compressed and sunken. The duration of these construction related impacts to wetland areas may be of longer duration. Peat soils were identified based on soils series descriptions (USDA NRCS 2013). The length of the route that crosses peat for each of the Route Alternatives and Segment Options is provided in Table 6.18-7.

The Blue Route has a greater length in peat soils than the Orange Route, by approximately 10 miles. The differences between Segment Options C1 and C2 roughly are proportionate to their overall length. Segment Option J1 and J2 cross similar miles of peat or muck.

Table 6.18-7. Peat and Muck Length within Anticipated ROW by Route Alternative and Segment Option

Route Alternative or Segment Option	Total Length (Miles) across Peat or Muck Soils
Route Alternatives	
Orange Route	117
Blue Route	127
Segment Options	
C1	25
C2	31
J1	19
J2	15

Source: USDA NRCS 2013

In addition to disturbance to peatland soils discussed above, the Project has potential to impact wetlands through soil erosion and sediment deposition due to construction activities. Sedimentation in wetlands can cause changes to vegetation, with greater potential for establishment of invasive species, such as reed canary grass.

6.18.3 Mitigation

The Applicant proposes the following mitigation measures:

- → To minimize contamination of wetlands due to accidental spilling of fuels or other hazardous substances, the Applicant will develop and implement spill prevention procedures to aid in the prevention of potential contamination due to a fuel or hazardous substance spill. Refueling will occur at sites away from wetlands and waters.
- → The Applicant will work with the St. Paul District of USACE to develop a mitigation approach that meets the compensatory requirements of the agency. These requirements will be incorporated into the Clean Water Act Section 404 permit and Section 401 certification issued by USACE and Minnesota Pollution Control Agency prior to construction.
- → The Applicant will avoid major disturbance of individual wetlands and drainage systems during construction. This may be done by spanning wetlands and drainage systems, where practical.
- → The Applicant will utilize construction best management practices (BMP's) such as matting, ice roads, and low ground pressure equipment to the extent practical to minimize wetland/peatland impacts during construction.
- → Crews will access the wetland with the least amount of physical impact on the wetland (that is, shortest practical route).
- → Temporary impacts to wetlands will be restored to pre-construction conditions to the extent practical.
- → Minnesota DNR PWI wetlands will be restored according to provisions in Land and Water Crossing permits. Section 6.17, Water Resources, discusses PWI wetlands.

In addition to the mitigation listed above, a National Pollution Discharge Elimination Service (NPDES) permit will be required by the Minnesota Pollution Control Agency. The conditions of the NPDES permit will limit movement of sediment and polluted waters overland and will, by extension, provide additional protection for wetlands. Best management practices (BMPs) for sediment and erosion control will be implemented to minimize impacts on water resources. These BMPs will protect topsoil and adjacent water resources by trapping sediments; this will avoid contributing sediment to wetlands and water resources. NPDES permitting and mitigation is discussed further in Section 6.17, Water Resources.

This page intentionally left blank

6.19 Wildlife

This section describes the wildlife resources that are within the Study Area for each of the Route Alternatives and Segment Options, and discusses the potential impacts of the Route Alternatives and Segment Options on those resources.

Information collected from Minnesota Department of Natural Resources (DNR) Minnesota Biological Survey (MBS), Minnesota's Comprehensive Wildlife Conservation Strategy, USGS Gap Analysis Program (GAP) analysis, and other sources were used to identify habitats and species that could occur within or near the Study Area.

6.19.1 Existing Conditions

As discussed in Section 6.4, Vegetation, the Study Area is located within three Ecological Provinces and six Ecological Subsections as classified by Minnesota DNR (2013) following the National Hierarchical Framework of Ecological Units (Cleland et al. 1997). Figure 6.4-1 displays the ecological province and ecological subsections containing the Study Area. The Study Area encompasses a range of landscape types and vegetative communities that provide a variety of habitats that change drastically from generally open grassland habitat types of the west to increasingly forested vegetation types toward the east. Faunal communities also change along the same vegetative gradient from west to east. Species associated with open grassland and shrub community types are more abundant in the Tallgrass Parklands of the western ecological subsections. Species associated with forested communities increase in the Laurentian Mixed Forest Province and its associated subsections to the east. The Blackberry Substation sits at the edge of the Tamarack Lowlands, but the Project does not cross the subsection, so it is not discussed in detail below. All habitat type descriptions and faunal associations are derived from Minnesota DNR Ecological Classification System descriptions (2013) and *Tommorrow's Habitat for the Wild and Rare an Action Plan for Minnesota Wildlife* (Minnesota DNR 2006). Ecological subsections within the Study Area and their characteristics are discussed from west to east below.

Lake Agassiz/Aspen Parklands Ecological Subsection

Lake Agassiz/Aspen Parklands Ecological Subsection within the Tallgrass Aspen Parklands Eco-region lies at the southern end of a province extending north and west into Canada. The subsection is considered a transitional landscape between prairies to the west and vast forest provinces to the east. Native community types located within this subsection provide habitat for species associated with grassland and woodland habitats; species include rare butterflies such as the Poweshiek skipperling and a variety of other wildlife including short-eared owl, greater prairie chicken, northern harrier, elk, Franklin's ground squirrel, marbled godwit, and upland sandpiper. Approximately 85 species designated as endangered, threatened, special concern, or Species of Greatest Conservation Need (SGCN) may occur within land types present within this subsection (Minnesota DNR 2006).

The Agassiz Lowlands Ecological Subsection

The Agassiz Lowlands Ecological Subsection within the Laurentian Mixed Forest Province is predominantly comprised of vast peatlands and upland sand ridges resulting from the retreat of Glacial Lake Agassiz to the west. The subsection is generally very flat and poorly drained. Native community types located within this subsection provide key habitat for species associated with Lowland Conifer, Dune, and non-forested wetland vegetative communities. Birds found there include white pelican, common, tern, American bittern, yellow rail, and numerous migratory species such as shorebirds and waterfowl. Typical mammals that occupy these habitats include beaver, otter, and bog lemming. Forest communities present in this subsection include habitats that harbor species such as spruce grouse, great gray owl, short-eared owls, sharp-tailed grouse, and bog copper. Approximately 88 species designated by either the federal or state government as endangered, threatened, special concern, or SGCN might occur within land types present within this subsection.

The Chippewa Plains Ecological Subsection

The Chippewa Plains Ecological Subsection of the Laurentian Mixed Forest Province is comprised of level to gently rolling till plain and lake plain settings. Soils are variable and vegetation communities form a mosaic based on this variability. Outwash plain settings tend toward sandy soils and support dry forest communities dominated by upland conifers. Native community types located within this subsection provide key habitat for species associated with Upland Conifer, Shrub and woodland uplands, and non-forested wetland vegetative communities. Bird species include bald eagle, Virginia rail, yellow rail, black-backed woodpecker, and numerous migratory species such as shorebirds and waterfowl. Typical mammals that occupy these habitats include fisher, beaver, and gray wolves. Forest communities present in this subsection include habitats that harbor species such as ruffed grouse, great gray owl, saw-whet owl, red-disked alpine, and bog copper. Approximately 83 species designated by either the federal or state government as endangered, threatened, special concern, or SGCN might occur within land types present within this subsection.

The Littlefork-Vermillion Uplands Subsection

The Littlefork-Vermillion Uplands Subsection is a transition zone between the vast peatlands to the west and the shallow to bedrock controlled, clayey soils to the east. The gently rolling to flat lake plain setting is dominated by clay and loam soils formed from lake-laid sediment and glacial till. This subsection contains a rich variety of vegetation types, much of it occupied by aspen-birch forest trending toward white pine, white spruce, and balsam fir. The eastern portion of the subsection is dominated by white pine, red pine, and jack pine dominated forest. Poor and rich fen, black spruce bog, and cedar-black ash swamp are typical of lowlands. Low moraines and beach ridges are dominated by jack pine, paper birch, and aspen. Forested community types within this subsection provide habitat for bald eagle, Canada lynx, great gray owl, boreal owl, and numerous game species such as ruffed grouse and white-tailed deer. Wetland habitats provide habitat for yellow rail, trumpeter swan, red-necked grebe, and a variety of waterfowl. Approximately 67 species designated by either the federal or state government as endangered, threatened, special concern, or SGCN might occur within land types present within this subsection.

The St. Louis Moraines Subsection

The St. Louis Moraines Subsection of the Laurentian Mixed Forest Province is dominated by steep slopes on end moraine settings. White and red pine forests historically dominated the northern portions of the subsection, whereas northern hardwood and aspen forest dominated moraines to the south. Mixed deciduous and coniferous forests were common on moraines (Minnesota DNR 2006). These mixed forest community types provide habitat for bald eagle, Canada lynx, northern goshawk, red-shouldered hawk, wood thrush, Canada warbler, four-toed salamander, and numerous game species such as ruffed grouse and white-tailed deer. Approximately 74 species designated by either the federal or state government as endangered, threatened, special concern, or SGCN might occur within land types present within this subsection.

The Nashwauk Uplands Ecological Subsection

The Nashwauk Uplands Ecological Subsection within the Laurentian Mixed Forest Province is dominated by Giant's Ridge, a narrow 200- to 400-foot-high bedrock feature extending northeast to southwest. Native community types located within this subsection provide habitat for bald eagle, gray wolf, northern goshawk, gray jay, Connecticut warbler, veery, black-billed cuckoo, Canada warbler, white-throated sparrow, osprey, Nabakov's blue, brook lamprey, and numerous game species such as ruffed grouse and white-tailed deer. Approximately 60 species designated by either the federal or state government as endangered, threatened, special concern, or SGCN might occur within land types present within this subsection.

6.19.2 Direct and Indirect Effects

Potential impacts on wildlife from the Project include the direct or indirect loss or conversion of habitat, increased habitat fragmentation, and the potential risk of avian collisions with transmission conductors and equipment. Temporary impacts may include displacement due to construction activities or compaction of grassland habitat along access roads. The Project will expand the existing right-of-way (ROW) or create new ROW, some of which will be converted from woodlands to maintained grass and shrub communities. Woody vegetation within the anticipated ROW will be cleared and result in either widening existing corridors or constructing new corridors through existing forests and shrublands where the Project is constructed. Clearing also will take place where the Blackberry 500 kV Substation and off-ROW access roads are constructed, and may be necessary for construction of the 500 kV Series Compensation Station depending on the final location of the facility. Species that rely upon forested habitat generally will be displaced within the anticipated ROW in favor of grassland, shrub land, or early successional forest-adapted species.

Habitat Conversion

Conversion of vegetation structure alters species use by changing plant community composition. When forested plant communities are changed to shrubby or grassland communities, there is a corresponding change in wildlife communities. Species that rely on well-developed forest canopies for nesting, foraging, or shelter are removed from the portion of the landscape where this alteration occurs. Species that rely on shrubby or grassland habitats are less susceptible to alterations associated with transmission lines. Grassland and shrubby communities are usually maintained as low-stature vegetation because these community types do not grow tall enough to interfere with the maintenance or function of transmission lines.

Wildlife Management Areas (WMAs) are part of Minnesota's outdoor recreation system and are established to protect those lands and waters that have a high potential for wildlife production, public hunting, trapping, fishing, and other compatible recreational uses. WMAs managed to maintain forest plant and wildlife communities will be affected where construction of a transmission line alters forested habitat. WMAs that are managed or maintained for wildlife that use grassland or shrubland communities will benefit from the maintenance of low-stature community types by the removal of trees where the Project crosses these properties. Habitat for species reliant upon tall shrub or tree species will be reduced in areas where vegetation will be permanently removed at structure locations, substation, or access roads, or where tall vegetation is removed along the Route Alternative.

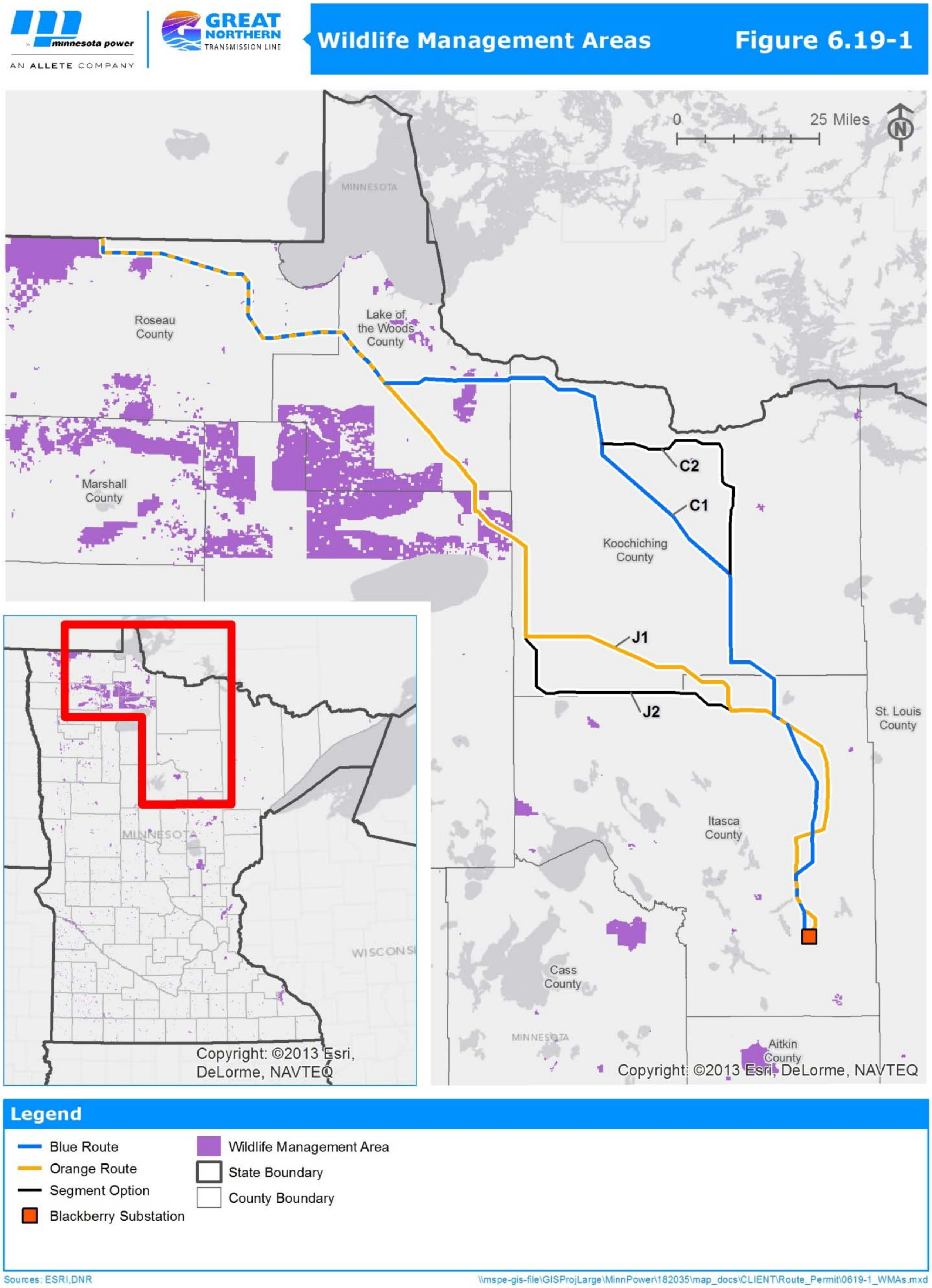
The anticipated ROW of the Orange Route contains 2,745 acres of forest that will be permanently converted to non-forest plant communities. Within the anticipated ROW of the Blue Route, 2,680 acres of forest will be permanently converted to non-forest plant communities (see Section 6.4, Vegetation, Table 6.4-7). Impacts on WMAs crossed by the Route Alternatives are summarized in the Table 6.19-1 (below). For this analysis, it was assumed that the entire ROW would be cleared. Figure 6.19-1 displays the location of WMAs in the proximity of the Route Alternatives. None of the Segment Options cross a WMA.

Table 6.19-1. Habitat Clearing within Wildlife Management Areas for Anticipated ROW of Each Route Alternative

Wildlife Management Area Unit Name	Habitat Management	Affected Habitat	Orange Route (Acres)	Blue Route (Acres)
Carp Swamp WMA (see Appendix A, sheet 17)	The WMA is managed to provide habitat for brushland wildlife species.	Open and brushland	--	47
Cedar Bend WMA (see Appendix A, sheets 7-8)	The WMA is managed to provide habitat for forest game birds, furbearers, brushland wildlife species, cavity nesting birds, and deer.	Forest and brushland	40	40
Red Lake WMA (see Appendix A, sheets 60-63)	The WMA is managed to provide habitat for forest song birds, forest game birds, small mammals, furbearers, reptiles, amphibians, deciduous forest species, coniferous	Forest, brushland, wetland, and grassland	277	--

Wildlife Management Area Unit Name	Habitat Management	Affected Habitat	Orange Route (Acres)	Blue Route (Acres)
	forest species, boreal forest species, hardwood forest species, brushland wildlife species, grassland species, wetland species, migratory waterfowl, raptors, cavity nesting birds, deer, moose, sharp-tailed grouse, trumpeter swans, and wood ducks.			
Roseau Lake (see Appendix A, sheet 3)	The WMA is managed to provide habitat for forest song birds, forest game birds, small mammals, furbearers, amphibians, deciduous forest species, coniferous forest species, boreal forest species, brushland wildlife species, grassland species, wetland species, migratory waterfowl, raptors, song birds, cavity nesting birds, deer, moose, ruffed grouse, sharp-tailed grouse, American woodcock, trumpeter swans, and wood ducks.	Forest, brushland, wetland, and grassland	25	25
Roseau River (see Appendix A, sheets 1-2)	The WMA is managed to provide habitat for forest song birds, forest game birds, small mammals, furbearers, amphibians, deciduous forest species, coniferous forest species, boreal forest species, brushland wildlife species, grassland species, wetland species, migratory waterfowl, raptors, song birds, cavity nesting birds, deer, moose, ruffed grouse, sharp-tailed grouse, American woodcock, trumpeter swans, and wood ducks.	Brushland, prairie, fen, and wet meadow	< 1	< 1
Total Acres			342	113

Source: Minnesota DNR 2013


minnesota power
AN ALLETE COMPANY
GREAT NORTHERN TRANSMISSION LINE
Wildlife Management Areas
Figure 6.19-1
0
25 Miles
N
MINNESOTA
Roseau County
Lake of the Woods County
Marshall County
Koochiching County
C2
C1
J1
J2
St. Louis County
Itasca County
Cass County
Aitkin County
MINNESOTA
WISCONSI
Copyright: ©2013 Esri, DeLorme, NAVTEQ
Copyright: ©2013 Esri, DeLorme, NAVTEQ
Legend
Blue Route
Orange Route
Segment Option
Blackberry Substation
Wildlife Management Area
State Boundary
County Boundary
Sources: ESRI,DNR
\\mspe-gis-file\GISProjLarge\MinnPower\182035\map_docs\CLIENT\Route_Permit\0619-1_WMAs.mxd

Permanent conversion of plant communities will reduce the availability of shrubby and woody habitat used by species such as palm warbler and Lincoln's sparrow. The change in vegetative community structure favors species that are capable of occupying a variety of community types. This vegetative change will alter species composition within the anticipated ROW. Short-statured perennial herbaceous vegetation is permitted along transmission line corridors for operational safety and is encouraged through ROW maintenance in unfarmed areas. Maintenance of this community type will not alter wildlife species composition in these areas. Removal of forested communities within the anticipated ROW will be a permanent change and will reduce the available habit for forest community species, but will not alter availability of shrub or open habitats used by other species present within the anticipated ROW. Clearing of shrubs and trees within some portions of the anticipated ROW will increase the available habitat used by open habitat specialists. Species using open dune habitat, open bogs, or prairie grasslands such as Poweshiek skipperling, and certain tiger beetles may benefit from the maintenance of an open transmission corridor with limited woody vegetation.

Fragmentation

Habitat fragmentation reduces the size of contiguous blocks of forest, shrubland, wetland, prairie, and grassland. See Table 6.4-9 in section 6.4, Vegetation. This reduces the total area of contiguous habitat available to wildlife species and increases the isolation of the habitat. In forested habitat, it leads to an increase in edge habitat that is successfully exploited by a variety of predatory and scavenging species. An edge occurs where two different habitat types meet, and where forest meets grasslands or shrublands areas; this edge is often very abrupt. Opportunistic and adaptable animals operate well in fragmented habitats. Species such as coyotes, raccoons, fox, skunks, some snakes, corvids, grackles, and feral dogs and cats exploit these edges while hunting. Brown-headed cowbirds parasitize some birds in fragmented habitats by laying their own eggs in the nests of other birds. Non-native invasive or pioneering plant species encroach where disturbance provides a competitive advantage such as where small habitat fragments occur. Areas affected by their encroachment limit the growth of native plants necessary for the development of some wildlife species, disrupting natural succession and limiting vegetative and structural diversity. The alteration of plant community composition and structure can negatively affect those species that are closely associated with the presence of certain plants such as some butterflies or birds. Fragmentation effects are greatest where large contiguous blocks are broken up into smaller patches that reduces interior forest habitat necessary for species such as red-shouldered hawk and numerous song bird species. The effects will be greatest where the Project deviates from existing ROW and creates new corridors through greenfields (that is, previously unfragmented and contiguous forest habitats).

Indirect effects on existing wildlife communities will occur as a result of habitat fragmentation. In those areas where trees or shrubs are permanently removed, there is a corresponding decrease in vertical structure. The resulting decrease in structure limits the number of species that can use these areas. This vegetation change also decreases populations of species intolerant of fragmented forest. Species associated with large contiguous blocks of forest such as northern goshawk and red-shouldered hawk will be expected to avoid areas where fragmentation changes the character of the forest. In addition, creation of new open corridors in previously forested areas increases edge effects within forests. These effects may include exploitation by predatory species that use forest edges as forage areas, especially where there is an overall reduction in core area habitats. Invasion by noxious weeds has the potential to alter existing wildlife community composition by displacing native plants used by species closely tied to existing vegetation, such as butterflies, and that preclude establishment of desired plantings following construction. For a summary of impacts due to fragmentation see Section 6.4, Vegetation, Table 6.4-9, Land Cover for Each Route Alternative.

WMAs crossed by the Project generally are fragmented less than the surrounding landscape. Wildlife using WMAs crossed by the Project may be affected where forested plant communities are removed for construction of the Project. Trees will be removed and maintained as grassland or shrubland communities. Wildlife associated with forest or woodland community types will be displaced and likely replaced by species that utilize grassland, prairie, or shrub community types. Where grassland, prairie, or shrub communities are crossed, the ROW will be maintained as open community types that are kept free of trees. The Roseau River WMA provides habitat for deer, and waterfowl and is managed with controlled burns (see Appendix A, sheets 1-2). This preserves the aspen parkland community types that are characterized by groves of aspen surrounded by grassland, prairies, and wetlands.

Avian Interaction

Increased avian and transmission line interactions in the form of collisions and potential electrocution are possible with the development of each of the Route Alternatives. Electrocution occurs when an arc is created between energized lines or an energized line and grounded tower equipment. Electrocution occurs more frequently with distribution lines than transmission lines, because the conductors are often closer together or closer to grounded hardware on distribution lines. Given the size of the structures and the phase spacing of the Project's conductors, avian electrocutions are unlikely.

Transmission lines may present the possibility for avian collisions. Several factors affect the potential for birds to collide with overhead power lines and include body size, weight, maneuverability, flight behavior, vision, sex, age, the health or condition of the bird, time of day or season, habitat use, weather conditions or visibility, sudden disturbance, diameter of lines, line orientation, line placement, and structure type. These factors can be divided into three broad categories: biological and physiological; environmental and ecological; and engineering.

Biological and physiological factors affecting avian power line collisions include factors such as body size, weight, maneuverability, flight behavior, vision, sex, age, and health or condition. These factors lie outside a company or industry's ability to control. Minimizing and mitigating risks to birds is limited to identifying what species may occur within a project footprint and, if necessary, increasing a transmission line's visibility so that these factors are limited.

Environmental and ecological factors include time of day, time of season, habitat use, and weather conditions or visibility. Minimizing and mitigating for these factors is very limited.

Mitigation may include transmission line marking at likely flyways and routing around landscape features that concentrate or attract birds, such as wetlands, lakes, or feeding sites.

Engineering factors include line diameter, line orientation, line placement, and structure types. Transmission line visibility affects a bird's ability to avoid collisions. Smaller diameter wires are more difficult to see than large diameter wires and are more difficult to avoid while flying. Larger transmission lines, like the Project, generally use larger structures and wire systems that are easier to see, improving a bird's ability to avoid collisions.

6.19.3 Mitigation

The Applicant will continue to work with the U.S. Fish and Wildlife Service (USFWS) and Minnesota DNR to minimize and avoid impacts on resident and migratory wildlife. The Applicant proposes the following mitigation measures:

- → Surveys will be conducted prior to vegetation removal to avoid impacts on nesting birds and to avoid active nest sites of sensitive species.
- → Appropriate construction windows will be incorporated into the construction schedule to minimize impacts on species such as bald eagle and goshawk in areas where these species are found to be present.
- → The Applicant will work with the US Fish and Wildlife Service and Minnesota DNR to identify potential locations for line marking, such as areas of high avian use, nest sites, feeding areas, and migratory corridors. The Applicant will incorporate industry best practices, which are consistent with APLIC's 2012 guidelines.
- → The Applicant will site the transmission line to avoid bird concentration sites, nesting areas, migratory pathways, and geographic features that act as a funnel, and avoiding habitats that act as breeding grounds or feeding areas to the extent practical.

This page intentionally left blank

6.20 Rare and Unique Species and Communities

This section describes rare and unique species and communities that are proximate to the Route Alternatives and Segment Options and the potential impacts of the Route Alternatives and Segment Options on those resources. Both federally and state listed species are included in this evaluation.

Several sources were used to compile a list of federally protected species that could occur within the Study Area. The U.S. Fish and Wildlife Service (USFWS) list of federally threatened, endangered, proposed, and candidate species was used to identify species protected under the Endangered Species Act of 1973 (ESA) (16 United States Code [USC] 1531-1544). Information on habitats and species protected by state statutes was evaluated using data collected during Minnesota Department of Natural Resources (DNR) Minnesota Biological Survey (MBS), Minnesota Natural Heritage Inventory System (NHIS), data compiled by Minnesota's Comprehensive Wildlife Conservation Strategy, Geographical Analysis Program (GAP) analysis, and other sources.

6.20.1 Existing Conditions

Federally Listed Species

Seven federally protected or candidate species occur in counties crossed by the Route Alternatives: Canada lynx, piping plover, Sprague's pipit, and Poweshiek skipperling. Additionally, USFWS proposed listing the northern long-eared bat as an endangered species October 2, 2013.

Critical habitat associated with federally protected species consists of "the specific areas within the geographical area occupied by the species, at the time it is listed…on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection" (50 CFR 1533[b][2]).

The following provides a summary of those species' characteristics, habitat requirements, and designated critical habitat.

Canada Lynx

Relatively little is known concerning the distribution and habitat associations of Canada lynx in northeastern Minnesota. The Canada lynx is an uncommon, solitary animal, which is near the limit of its range in Minnesota. Canada lynx live in boreal and mixed coniferous and deciduous forests with estimated home ranges varying from 20 to 47 square miles in Minnesota (Mech 1980). However, recent Canada lynx studies in Minnesota have suggested that in Minnesota, Canada lynx ranges may be larger than other reported home range sizes - approximately 58 square miles (Burdett 2008). The U.S. Forest Service divides Canada lynx populations in the 48 contiguous states into the western Great Lakes population, eastern U.S. population, and the western U.S. population (McKelvey et al. 2000). Historically, Minnesota had the highest numbers of Canada lynx in the western Great Lakes population. Harvest data document the persistence of a Canada lynx population in Minnesota through most of the twentieth century (Henderson 1978; Loch and Lindquist n.d.). However, it is unknown whether Canada lynx persist within Minnesota during lows in lynx-hare cycles or whether they are a result of dispersal from Canadian populations. They are rare in areas densely populated by humans (Hazard 1982). There is no reliable population estimate for Minnesota, but available information indicates that it is extremely low (USFWS 1998).

Mature forests with downed logs and windfalls provide cover for natal dens, escape, and protection from severe weather. Early successional forest stages provide habitat for the Canada lynx's primary prey, the snowshoe hare. Hare populations are highest in lowland coniferous forests, forests with dense shrub layers, and in 20-year-old stands with overhead cover (Jaakko Poyry Consulting 1992). Upland shrub, lowland deciduous shrub, lowland black spruce, and aspen and white birch were utilized the most by Canada lynx in an NRRI 2006 study. Some timber management, fire suppression, and grazing practices may temporarily reduce prey population, leading to low kitten survival. Conversion of native vegetation communities to forest types that are less suitable or unsuitable as Canada lynx habitat also may decrease prey populations. Road and trail access and recreational uses that result in snow compaction may allow ingress of coyotes into Canada lynx habitat, thereby increasing competition for limited winter prey resources (Buskirk et al. 2000).

Although suitable habitat is crossed by both the Orange Route and the Blue Route, there is no evidence of breeding in areas impacted by these Route Alternatives. There are records of individuals ranging as far west as Beltrami and Clearwater counties, which both Route Alternatives cross.

Neither the Orange Route nor the Blue Route likely is to affect breeding Canada lynx, because known breeding populations occur more than 100 miles east of either Route Alternative. The edge of the Orange Route is approximately 78 miles away from the nearest Canada lynx critical habitat. The edge of the Blue Route is approximately 28 miles away from the nearest Canada lynx critical habitat.

The Canada lynx is a federally listed threatened species. USFWS designated critical habitat for this species is east of U.S. Highway 53, which runs from International Falls to Virginia, Minnesota, just east of the Study Area. The Route Alternatives and Segment Options were developed, in part, to avoid the designated critical habitat. Thus, none of the Route Alternatives or Segment Options proposed will affect Canada lynx critical habitat.

Piping Plover

The northern Great Plains population of the piping plover was listed as a threatened species December 11, 1985. An endangered status was given to the population within the Great Lakes Region and threatened status was established for the northern Great Plains and Northeast Region populations (USFWS 2010). Both populations are protected as threatened species on their wintering grounds along the southern U.S. coast. Piping plovers that nest at the Lake of the Woods are part of the Great Plains population. The U.S. range of the northern Great Plains population includes Iowa, Minnesota, Montana, Nebraska, North Dakota, and South Dakota (*Federal Register* 67(176), 57638-57717, September 11, 2002; 50 Code of Federal Regulations [CFR] 17). No suitable habitat is crossed by either the Orange Route or the Blue Route, and there is no evidence of breeding in habitats impacted by these Route Alternatives. There also are no suitable migratory stopover sites crossed by either the Orange Route or the Blue Route. Both Route Alternatives are within approximately 22 miles of piping plover critical habitat at Lake of the Woods.

The piping plover has a breeding population documented in Lake of the Woods County crossed by the Study Area. The Northern Great Plains breeding population is listed as federally endangered. Critical habitat is in Lake of the Woods County at three specific locations: 100.4 acres within Rocky Point Wildlife Management Area (WMA) and 134.8 acres at two locations within Pine and Curry Island SNA. None of the designated critical habitat for the piping plover occurs within the Study Area. The nearest designated critical habitat at Lake of the Woods is located more than 20 miles from the Project and is not anticipated to impact this population of the piping plover.

Sprague's Pipit

The Sprague's pipit is closely associated with native grassland throughout its range and is less abundant (or absent) in areas of introduced grasses than in areas of native prairie. The Sprague's pipit constructs nests in depressions in the ground that are concealed in clumps of grass. Breeding typically occurs from late April through early August. Typically, nests with eggs are found in June. Plant species diversity in well drained areas is a positive indicator of Sprague's pipit use, as are residual vegetation from prior year's growth (Madden 1996, Sutter and Brigham 1998). Recent studies also found that the Sprague's pipit prefer breeding sites in grassland with a variety of vegetative structure (Davis et al. 1999). One author found that patch size influences habitat use by Sprague's pipit (Davis 2004). The use of a habitat patch was positively influenced by patch sizes greater than 145 hectares and negatively influenced when patch sizes were smaller than 29 hectares. In some areas, native pasturelands harbor the Sprague's pipit when less than10 percent of the ground is bare soil and less than 10 percent is clubmoss. Sites with a dominance of intermediate height grasses, such as Stipa, Bouteloua, Koeleria, and Schizachyrium, are preferred by this species (Dieni and Jones 2003). Berkey et al. (1993) found that the Sprague's pipit is tolerant of some grazing disturbance of grasslands and prairie, although heavily grazed areas will be considered poor habitat.

Spring migration period occurs from mid-April through mid-May. Fall migration occurs in September, when the Sprague's pipit gathers in large flocks with horned larks and longspurs to migrate south. Habitat during migration includes pastures and weedy fields, including grasslands with dense herbaceous vegetation or grassy agricultural fields.

The Study Area includes a variety of habitats that might be suitable for Sprague's pipit. Assorted prairie habitat is present within the Study Area. Often, these prairies are part of Scientific and Natural Areas (SNAs) or other lands managed by Minnesota DNR or the Nature Conservancy. Remnant tracks of native prairie also may be present on private lands. Known occurrences are more than 3 miles from the border crossing location along the Orange and Blue Route Alternatives.

Poweshiek Skipperling

Currently, the Poweshiek skipperling is afforded no legal protection as a candidate species under the ESA. Recent declines in Poweshiek skipperling populations noted by biologists and agencies across its range (Selby 2010) have caused USFWS to propose listing the Poweshiek skipperling as an endangered species. The proposed rule was published October 24, 2013, with a public comment period ending December 23, 2013. It is likely that USFWS will determine in 2014 whether the Poweshiek skipperling should be listed as an endangered species with regulatory protection afforded under the ESA.

Poweshiek skipperling is a small butterfly that is a member of the family Hesperiidae and subfamily Hesperiinae (grass skippers). The Poweshiek skipperling inhabits high quality native wet-mesic to dry tall-grass prairie from north-central Iowa through Minnesota and eastern South Dakota and North Dakota, and more disjunct wet-mesic prairie habitats in Wisconsin and fen habitats in Michigan (Selby 2005). The species is presumed to be extirpated from Indiana and Illinois and from many sites within occupied states. Recent surveys (2005–2012) have documented widespread population declines in every state and province where it occurs (Selby 2010).

The Poweshiek skipperling completes one generation per year and passes through four developmental stages. The four stages consist of egg, larva, pupa, and adult. The Poweshiek skipperling lives a majority of its life cycle in the larval stage and is dependent upon abundant native sedges, rushes, and grasses for food and shelter. The adult butterflies develop through possibly nine larval stages before developing a chrysalis and imago stages (McAlpine 1972). No studies of larval food plants have been conducted for the Poweshiek skipperling. However, recent observations suggest that some populations prefer prairie dropseed (*Sporobolus heterolepis*), little bluestem (*Schizachyrium scoparium*), and porcupine grass (*Stipa spartea*) (Dana 1989). Other cursory observations include oviposition on unidentified sedge and spike-rushes. The adult Poweshiek skipperling emerges from its larval form from mid-June through July, depending upon weather conditions. The flight period varies across the Poweshiek skipperling range and from year to year. Males emerge as adults earlier than females. In Iowa and Minnesota, adult Poweshiek skipperling flights are highly synchronous with the Dakota skipper (*Hesperia dacotae*), regal fritillary (*Speyeria idalia*), and wood nymph (*Cercyonis pegala*), where they occur together (Selby 2005). Nectar plant use varies across the geographic range of the Poweshiek skipperling. Yellow ox-eye (*Heliopsis helianthoides*) and purple coneflower (*Echinacea angustifolia*) were favorite nectar plants during surveys conducted in Iowa, Minnesota, and North Dakota from 1990–1997 (Swengel and Swengel 1999). On dry prairie habitats in Iowa, Minnesota, and South Dakota, purple coneflower is used to the exclusion of other species (Selby 2005). Black-eyed Susan (*Rudbeckia hirta*) and pale-spike lobelia (*Lobelia spicata*) are favorite nectar plants on wetter habitats in Michigan and Wisconsin (Bess 1988; Catling and Lafontaine 1986; Committee on the Status of Endangered Wildlife In Canada (COSEWIC) 2003; Holzman 1972; Sommerville and Clampitt 1999).

Poweshiek skipperling habitat is described as native tallgrass prairie; other habitat preferences across its range include fens, grassy lake and stream margins, moist meadows, and wet-mesic to dry tallgrass prairie (Opler and Krizek 1984). Prior to recent population declines, the Poweshiek skipperling was recorded on a full range of prairie vegetation including degraded, semi-degraded, and high quality prairie types. The abundance of this species is higher at topographically diverse sites that support wet and dry prairie. In Minnesota, where nearly half of the Poweshiek skipperling records occur, sites that have harbored the highest Poweshiek skipperling densities during the 1990s and early 2000 were characterized as large sites with a variety of topographic influence on habitat types. These sites harbor a variety of habitats that include wet-meadow, mesic, dry-mesic, and dry habitats.

Suitable Poweshiek skipperling habitat is present within the Study Area. Often, these prairies are part of SNAs or other lands managed by Minnesota DNR or the Nature Conservancy. Remnant tracks of native prairie also may be present on private lands. The nearest proposed critical habitat for the Poweshiek skipperling is located in Mahnomen County, Minnesota. The Study Area does not reach this county.

Northern Long-eared Bat

Currently, the northern long-eared bat is afforded no legal protection as a species proposed to be listed under the ESA. Recent declines in northern long-eared bat populations due to the spread of white nose syndrome have caused USFWS to propose listing this species as endangered. The proposed rule was published October 2, 2013, with a public comment period ending December 2, 2013. It is likely that USFWS will determine whether the northern long-eared bat should be listed as an endangered species with regulatory protection afforded under the ESA in 2014.

The northern long-eared bat's range includes all of Minnesota and eastern North Dakota in addition to most of the eastern United States. The northern long-eared bat is found in heavily forested areas throughout its range. These bats roost singly or in small groups in buildings, under shingles of buildings, under exfoliating tree bark, and in caves and mines. During summer, northern long-eared bats occupy a variety of day and night roosts. It favors trees roosts, although individuals have been found in human-made structures (Barbour and Davis 1969). Sexes roost separately and reproductive females form small maternity colonies of less than 60 individuals. Maternity groups roost in trees, under shingles, and in buildings (Brandon 1961; Clark et al. 1987; Foster and Kurta 1999; Mumford and Cope 1964; Nagorsen and Brigham 1993; Sasse and Pekins 1996). Home range size has been documented as approximately 150 acres. They also are associated with edge habitat or corridors for foraging and during migration (Owen et al. 2003; Foster and Kurta 1999)

Habitat of the northern long-eared bat generally is associated with moderate age to old growth mixed forests near wetlands or small ponds and they are known to select roosting locations in both dead and live trees. Roosting has been observed in various tree species including maple species and green ash. However, roosting likely could occur in any mature tree with exfoliating bark or cavities, as most research on this species occurred east and southeast of Minnesota where forest composition is different. Roost trees are present in areas of high canopy cover near wetlands or linear corridors.

Suitable northern long-eared bat habitat is present within the Study Area. Often, these wooded habitats are part of SNAs or other lands managed by Minnesota DNR, but they may also occur on private lands. Portions of the Route Alternatives and Segment Options contain these wooded habitats. Critical habitat for the northern long-eared bat has not been proposed at this time.

State Listed Species and Protected Natural Communities

Minnesota DNR Natural Heritage Rare Natural Features Database was reviewed to identify state listed threatened, endangered, and special concern species; colonial waterbird sites; and protected habitats that might occur within 1 mile of each of the Route Alternatives. Since the routes have not yet been surveyed, consideration of a 1 mile buffer provides a broader view of the species that may be present within the Study Area. State species that have been observed within 1 mile of the Project are shown in Table 6.20-1.

Calcareous fens are a globally rare and unique groundwater fed wetland type found in high concentrations in Minnesota. These wetland communities are the only natural community specifically protected by the State of Minnesota under the Minnesota Wetland Conservation Act. This type of fen is characterized by a substrate of non-acidic peat and is dependent on a constant flow of groundwater that is rich in dissolved calcium and magnesium bicarbonates. This supply of mineral rich groundwater supports plant communities that are dominated by calciphyllic plants or that tolerate the mineral rich environment. Species such as sterile sedge (*Carex sterilis*), twig-rush (*Cladium marscoides*), fen beak-rush (*Rhynchospora capillacea*), hairy fimbristylis (*Fimbristylis puberula*), nut-rush (*Scleria verticillata*), and beaked spike-rush (*Eleocharis rostellata*) are found almost exclusively in this community type. This community type is susceptible to disturbance and a reduction in the normal supply of groundwater results in displacement by shrubs and other pioneering vegetation that displaces calciphyllic species.

6.20.2 Direct and Indirect Effects

Potential impacts on rare and unique species from the Project include the direct or indirect loss or conversion of habitats and increased habitat fragmentation. The Project will expand the existing rights-of-way (ROWs) or create new ROW that will convert existing occupied habitat to maintained transmission ROW. Species that rely upon forested habitat generally will be displaced in favor of species that utilize grasslands, low stature shrub land, open peatland, or habitat generalists. Species occupying prairie habitats could be affected by the introduction of non-native species that reduce the native species diversity and suitable habitat. The creation of new ROW corridors within the forested portions of each Route Alternative will replace contiguous forest habitat with edge habitat and potentially provide new foraging corridors for predatory species or provide vectors for reduction in vegetative quality and structure. Impacts along the existing ROW will expand the current edge effects. Direct effects of the Project on rare and unique resources are associated with changes to vegetation communities and may include:

→ Conversion of vegetation structure where tall woody vegetation is present to a more open, herbaceous setting. This change provides more open and edge habitat that is used by parasitic species, invasive species, and community generalists that could outcompete or colonize areas once occupied by less competitive sensitive species or habitats. The alteration of vegetation affects which species use these habitats. Species reliant upon specific plants for completion of their life-cycle such as sensitive butterflies will be more affected by the changes in vegetation composition than habitat generalists. In areas where trees are cleared in the Prairie Parkland Province, prairie wildlife may benefit where native grasses and forbs colonize previously forested or shrubby areas. Prairie obligate butterflies will benefit from the advancement of larval food sources.

→ Fragmentation of forest habitat provides a travel corridor and edge habitat for parasitic and predatory species to exploit where relatively unfragmented forest precluded use by these species. Additionally, forest interior species will be affected where large blocks of forest are broken into smaller blocks of forest limiting their use by species such as goshawks, red-shouldered hawks, and some orchids such as *Cyprepedium arietinum*.

→ Increased disturbance associated with clearing and construction related equipment that may allow invasive species to colonize previously undisturbed plant communities or increased disturbance in areas adjacent to existing transmission lines

Where vegetation will be removed permanently at structure locations, habitat will be altered from its existing condition. In those areas where rare or unique resources occur, those species that rely on forested or tall shrub communities will lose habitats because of the conversion to low shrub or herbaceous dominated vegetation communities. Conversion of forested and shrubby plant communities reduces the availability of habitat used by species such as tubercled reined orchid and short-eared owl. Short statured perennial herbaceous vegetation is acceptable along transmission line corridors and is encouraged and maintained in unfarmed areas. Maintenance of this community type will not alter wildlife species composition in prairie or lowland herbaceous community types. Removal of forested communities within the ROW will be a permanent change and will alter wildlife community abundance, but will not alter general abundance of local populations. Clearing of shrubs and trees within some portions of the anticipated ROW will increase the available habitat used by open habitat specialists. Species using open sedge dominated habitat, open bogs, or prairie grasslands such as sterile sedge, beaked spike rush, and hair-like beaked spike rush, may benefit from the maintenance of an open transmission corridor with limited woody vegetation.

Increased disturbance associated with the construction and maintenance of the Project will provide the necessary disturbance for invasive species to colonize native plant communities. In some cases, invasive species may crowd-out or out-compete native desirable species.

The following discussion provides a general evaluation of potential impacts for the Project. The data evaluated was not restricted to the anticipated ROW or to the 1,000 foot-wide or 3,000 foot-wide routes. Rather, the data includes a one mile buffer on each side of the anticipated ROW to provide a conservative estimate of potential impacts.

Orange Route Alternative

There are 24 species listed as endangered threatened, special concern, or unique resources that have occurred in the Orange Route. Species protected by state statutes that occur within 1 mile of the Orange Route include 15 plants, 6 birds, 2 mollusks, 1 insect, and 3 terrestrial communities. One bird and one vascular plant are listed by Minnesota as endangered. Seven species are listed as state threatened. The remaining resources are listed as special concern or unique resources (see Table 6.20-1).

The listed vascular plants species are found in a wide range of habitats. The wide variety of wetland areas found in the Orange Route (for example, peatlands, fens, bogs, and wooded swamps) represents the largest portion of habitat types for the vascular plants listed as endangered, threatened, or special concern. However, some species are present in non-wetland forest, grasslands, and old field areas. All of these habitat types occur in the Orange Route. In general, the portion of this Route Alternative within Roseau County contains less native habitat than other parts of the route because of the dominance of tilled agricultural fields.

The Orange Route crosses Watershed Protection Areas (WPAs) for calcareous fens at the Pine Creek Peatland SNA, Sprague Creek Peatland SNA, Red Lake Peatland SNA, and Lost River Peatland SNA fen complexes (see Appendix A, sheets 3, 61, and 64-65). A determination of potential effects on known fen complexes will require coordination with Minnesota DNR.

Blue Route Alternative

There are 14 species listed as endangered threatened, special concern, or unique resources that have occurred within the Blue Route. Species protected by state statutes that occur within 1 mile of the Blue Route include 7 plants, 5 birds, 2 mollusks, 2 colonial waterbird sites and 3 terrestrial communities (see Table 6.20-1). In general, the northwestern end of the Blue Route Alternative, because of the dominance of tilled agriculture, contains less native habitat, and thus fewer protected species, than other parts of the route.

Minnesota DNR has established WPAs to minimize impacts that could affect groundwater sources for calcareous fens and peatland areas. The Blue Alternative crosses WPAs for the Sprague Creek Peatland SNA and Pine Creek Peatland SNA, which contain calcareous fens (see Appendix A, sheet 3). The WPA for the North Black River Peatland SNA and the Myrtle Lake Peatland SNA also are crossed by the Blue Route (see Appendix A, sheets 23-24 and 34-35). A determination of potential effects on known fen complexes will require coordination with Minnesota DNR.

Table 6.20-1. Rare and Unique Species and Communities within 1-Mile of Route Alternatives and Segment Options

Scientific Name	Common Name	Associated Habitat	Federal Status	State Status	Species occurs in the corresponding Alternative					
					Blue	Orange	C1	C2	J1	J2
Anthus spragueii	Sprague's Pipit	Large tracts of well drained native prairies and grasslands.	Candidate	Endangered	X	X				
Botrychium ascendens	Upward-lobed Moonwort	Disturbance related habitats such as old mine tailings basins in early successional forest.	None	Endangered	X	X				
Botrychium lunaria	Common Moonwort	Disturbance related habitats including drained tailing basins, as gravel banks, rocky ledges, and talus. Open or sparsely vegetated habitats with grasses and scattered shrubs are also habitats utilized by these species.	None	Threatened	X	X				
Carex sterilis	Sterile Sedge	Calcareous fens, as they occur in the prairie region of the state	None	Threatened		X				

Scientific Name	Common Name	Associated Habitat	Federal Status	State Status	Species occurs in the corresponding Alternative					
					Blue	Orange	C1	C2	J1	J2
Cypripedium arietinum	Ram's-head Lady's-slipper	Swamps, bogs, or lowland forests dominated by northern white cedar (*Thuja occidentalis*), tamarack (*Larix laricina*), balsam fir (*Abies balsamea*), or black spruce (*Picea mariana*). It also occurs in drier upland conifer forests dominated by white or jack pine (*Pinus strobus and P.banksiana)*	None	Threatened	X	X		X		
Eleocharis rostellata	Beaked Spike rush	Calcareous fens, as they occur in the prairie region of the state	None	Threatened		X				

Scientific Name	Common Name	Associated Habitat	Federal Status	State Status	Species occurs in the corresponding Alternative					
					Blue	Orange	C1	C2	J1	J2
Platanthera flava var. herbiola	Tubercled Rein-orchid	High quality habitats that show little impact from human activities. Its preferred habitats include wet prairies and meadows, swales in mesic prairies, or the sandy or peaty habitats along the edges of marshes, swamps, or lakeshores. These habitats are in full sun or in the partial shade of scattered shrubs such as willows (*Salix* spp.) and dogwoods (*Cornus* spp.).	None	Threatened	X	X				
Rhynchospora capillacea	Hair-like Beaked Spike rush	Calcareous fens, as they occur in the prairie region of the state	None	Threatened		X				
Spiranthes casei var. casei	Case's Ladies-tress Orchid	Disturbance related habitats including drained tailing basins within early successional forest.	None	Threatened	X	X				
Accipiter gentilis	Northern Goshawk	Large tracts of mature, closed canopy, deciduous, coniferous and mixed forests with an open understory	None	Special Concern		X				

Scientific Name	Common Name	Associated Habitat	Federal Status	State Status	Species occurs in the corresponding Alternative					
					Blue	Orange	C1	C2	J1	J2
Acipenser fulvescens	Lake Sturgeon	This species prefers moderately clear, large rivers and lakes with firm sand, gravel, or rubble bottoms.	None	Special Concern				X		
Ammodramus nelsoni	Nelson's Sharp-tailed Sparrow	This species breeds in sedge- or grass-dominated wetlands, particularly wet prairie, rich fens with narrow-leaved sedges, such as fen wiregrass sedge (*Carex lasiocarpa* ssp. *americana*), and wet meadows with wide-leaved sedges and grasses, such as lake sedge (*C. lacustris*) and bluejoint grass (*Calamagrostis canadensis*), and avoids cattail-dominated marshes	None	Special Concern	X	X				
Asio flammeus	Short-eared Owl	Large tracts of open habitats such as native prairie, pasture, Conservation Reserve Program grasslands, sedge wetlands, shrub swamps, and open peatlands.	None	Special Concern	X	X				

Scientific Name	Common Name	Associated Habitat	Federal Status	State Status	Species occurs in the corresponding Alternative					
					Blue	Orange	C1	C2	J1	J2
Botrychium pallidum	Pale Moonwort	Disturbance related habitats including drained tailing basins, rights-of-way, exposed soils in open or sparsely vegetated habitats grassy fields with scattered shrubs are also habitats utilized by these species.	None	Special Concern	X	X				
Botrychium simplex	Least Moonwort	Disturbance related habitats including drained tailing basins, rights-of-way, exposed soils in open or sparsely vegetated habitats grassy fields with scattered shrubs and forest edges are also habitats utilized by these species.	None	Special Concern	X	X				
Carex exilis	Coastal Sedge	Fen communities within a bog complex.	None	Special Concern		X				
Carex ormostachya	Necklace Sedge	Sporadically in the moderate shade of upland hardwood and hardwood-conifer forests.	None	Special Concern		X				
Cladium mariscoides	Twig-rush	Fen communities within a bog complexes or calcareous fens	None	Special Concern		X				

Scientific Name	Common Name	Associated Habitat	Federal Status	State Status	Species occurs in the corresponding Alternative					
					Blue	Orange	C1	C2	J1	J2
Coturnicops noveboracensis	Yellow Rail	This species breeds in sedge- or grass-dominated wetlands, particularly wet prairie and rich fens with narrow-leaved sedges, or wet meadows with wide-leaved sedges and grasses,	None	Special Concern	X	X				
Drosera anglica	English Sundew	This species is associated with fen communities of bog complexes were habitat is dominate by fine-leaved sedges low shrubs or stunted trees.	None	Special Concern		X				
Lasmigona compressa	Creek Heelsplitter	Occurs in creeks, small rivers, and the upstream portions of large rivers. Its preferred substrates are sand, fine gravel, and mud	None	Special Concern	X	X	X		X	
Ligumia recta	Black Sandshell	Found in the riffle and run areas of medium to large rivers in areas dominated by sand or gravel.	None	Special Concern	X	X	X	X		

Scientific Name	Common Name	Associated Habitat	Federal Status	State Status	Species occurs in the corresponding Alternative					
					Blue	Orange	C1	C2	J1	J2
Limos fedoa	Marbled Godwit	This species breeds in large expanses of native grasslands with sparse to moderate cover, adjacent to a complex of wetlands.	None	Special Concern	X	X				
Najas gracillima	Thread-like Naiad	This species is found in clear, healthy, softwater lakes.	None	Special Concern		X				
Oxyethira itascae	Itasca caddis fly	This species prefer meandering, silt-bottomed streams	None	Special Concern		X				
Colonial Waterbird Nesting Area	Colonial Waterbird Nesting Area	Nest sites can occur in trees or emergent vegetation over water and on upland locations.	None	Unique Resource	X					X
Native Plant Community, Undetermined Class	Native Plant Community, Undetermined Class	Terrestrial plant community – Tamarack Swamp	None	Unique Resource	X	X				
Native Plant Community, Undetermined Class	Native Plant Community, Undetermined Class	Terrestrial plant community – White Cedar Swamp	None	Unique Resource	X	X				
Spring Fen Type	Spring Fen Type	Calcareous seepage fen boreal subtype	None	Unique Resource		X				

Source: DNR NHIS Data 2013

This page intentionally left blank

Segment Option C1

There are 2 species listed as threatened, endangered, special concern, or unique resources that have occurred in Segment Option C1. Species endangered threatened, protected by state statutes that occur within 1 mile of this segment option include 2 mussels. All of the known occurrences are of resources listed as special concern (see Table 6.20-1).

The protected species in Segment Option C1 are found in rivers. Segment Option C1 crosses no WPA's for fens or fen complexes.

Segment Option C2

There are 3 species listed as endangered threatened, special concern, or unique resources that have occurred in Segment Option C2. Species protected by state statutes that occur within 1 mile of this segment option include 1 plant, 1 fish, and 1 mussel. One vascular plant is listed by Minnesota as threatened and the remaining fish and mussel are listed as special concern (see Table 6.20-1).

The protected species in Segment Option C2 are found in swamps, black spruce, cedar bogs, rivers or lakes. All of these habitat types occur in Segment Option C2. Segment Option C2 crosses the WPA for calcareous fens at the North Black River Peatland SNA (see Appendix A, sheet 78). A determination of potential effects on known fen complexes will require coordination with Minnesota DNR.

Segment Options J1

There is 1 species listed as endangered threatened, special concern, or unique resources that have occurred in Segment Option J1. Species protected by state statutes that occur within 1 mile of this segment option include 1 mussel that is listed as special concern (see Table 6.20-1). This segment option crosses no WMAs for known fens or fen complexes.

Segment Options J2

Two records of unique resources occur within 1 mile of Segment Option J2. The two unique resources that occur within 1 mile of Segment Option J2 include colonial waterbird sites (see Table 6.20-1). This segment option crosses no WMAs for known fens or fen complexes.

6.20.3 Mitigation

The Applicant will continue to work with USFWS and Minnesota DNR to identify pre-construction surveys for active nesting birds, nest sites, or other sensitive species, communities, or natural resources within the ROW. The Applicant proposes the following mitigation measures:

→ If the ROW is not cleared or mowed in the fall or winter before the breeding season, a qualified biologist will conduct surveys for active nesting birds prior to construction. If active nesting locations are identified during the surveys, the Applicant proposes to avoid nest sites during the breeding season and to identify construction restraints that will avoid disturbance to nesting birds.

- → The Applicant will conduct surveys for sensitive plants during appropriate periods of the growing season to properly identify their presence and/or absence along the selected ROW. If sensitive plants or communities are identified during surveys, individual avoidance and minimization measures will be evaluated and submitted to the appropriate regulatory agencies.
- → The Applicant will conduct surveys for native prairie areas and other sensitive plant communities such as calcareous fens along the selected ROW. If sensitive resources are encountered, construction plans that minimize the impacts, such as shifting structure locations or implementing construction techniques that avoid or minimize impacts on these resources, will be developed and submitted to the appropriate regulatory agencies.
- → Avoidance measures may include shifting the location of structures or implementing construction techniques that avoid and/or minimize impacts on sensitive resources.

6.21 Noxious Weeds and Exotic Organisms

This section describes the noxious weeds and exotic organisms in the Study Area and the potential impacts of the Route Alternatives and Segment Options on those resources.

Lists and information collected from the Minnesota Department of Agriculture (MDA) and the Minnesota Department of Natural Resources (DNR) was used to characterize the types of noxious weeds and exotic organisms.

6.21.1 Existing Conditions

Minnesota Department of Agriculture

MDA lists four categories of noxious weeds with differing levels of eradication, control, reporting, transport, sales, and propagation requirements (MDA 2014). There are 11 weeds on the eradicate list, 8 on the control list, 5 restricted species, and 3 specially regulated plants. Prohibited noxious weeds "are known to be detrimental to human or animal health, the environment, public roads, crops, livestock or other property" (MDA 2014). None of the plants on these lists is to be transported, propagated, or sold in the state. Weeds on the list include annual, biennial, and perennial plants. Counties may create and administer their own lists of noxious weeds. Within the Study Area, no counties have listed any species or rules above and beyond MDA noxious weed lists.

Eradicate List

Plants on the MDA eradicate list either are not present or rare in the state. If found in Minnesota, these species must be eradicated, including all above and below ground parts of the plant. Under no means should any of these species be introduced into the state.

- Brown knapweed (*Centaurea jacea*)
- Yellow star thistle (*Centaurea solstitialis*)
- Meadow knapweed (*Centaurea x moncktonii*)
- Oriental bittersweet (*Celastrus orbiculatus*)
- Black swallow-wort (*Cynanchum louiseae*)
- Grecian foxglove (*Digitalis lanata*)
- Common teasel (*Dipsacus fullonum*)
- Cut-leaved teasel (*Dipsacus laciniatus*)
- Giant hogweed (*Heracleum mantegazzianum*)
- Japanese hops (*Humulus japonicas*)
- Dalmatian toadflax (*Linaria dalmatica*)

Control List

Plants on the MDA control list are established in some or all parts of the state. These species must be controlled and efforts must be made to limit their spread. This includes inhibiting growth to maturation and preventing seed and propagules dispersal. The goal is to prevent their reproduction and spread beyond existing populations and if possible, reduce their prevalence.

- → Narrowleaf bittercress (*Cardamine impatiens*)
- → Plumeless thistle (*Carduus acanthoides*)
- → Spotted knapweed (*Centaurea stoebe* spp. *micranthos*)
- → Canada thistle (*Cirsium arvense*)
- → Leafy spurge (*Euphorbia esula)*
- → Purple loosestrife (*Lythrum salicaria)*
- → Wild parsnip (*Pastinaca sativa)*
- → Common tansy (*Tanacetum vulgare)*

Restricted List

Restricted noxious weeds are well established in Minnesota. Sale, transport, and import of propagating parts is prohibited. Propagating parts include seeds, stems, and roots as these are considered viable means of reproduction. The goal of control is preventing the spread of these species, given their widespread prevalence.

- → Garlic mustard (*Alliaria petiolata)*
- → Glossy buckthorn (and all cultivars) (*Frangula alnus*)
- → Common reed – non-native subspecies (*Phragmites australis*, ssp. *australis*)
- → Common or European buckthorn (*Rhamnus cathartica*)
- → Multiflora rose (*Rosa multiflora)*

Specially Regulated Plants List

MDA specially regulated plants may be native species or be of some economic value, but have the potential to cause harm.

- → Poison ivy (*Toxicodendron radicans*).
- → Japanese knotweed (*Polygonum cuspidatus*)
- → Giant knotweed (*Polygonus sachalinense*).

Project Area Occurrences

Table 6.21-1 provides a list of species identified within counties crossed by the Route Alternatives, as documented by the MDA Weed Integrated Pest Management Project (Early Detection and Distribution Mapping System 2013).

Table 6.21-1. MDA County Weed List for the Study Area

Species	MDA Designation	Known Occurrences by County
Spiny plumeless thistle (*Carduus acanthoides*)	Control	Itasca
Oriental bittersweet (*Celastrus orbiculatus)*	Eradicate	Roseau, Lake of the Woods, Beltrami, and Itasca
Brown knapweed (*Centaurea jacea*)	Eradicate	Koochiching
Spotted knapweed (*Centaurea stoebe* spp. *micranthos*)	Control	Roseau, Lake of the Woods, Koochiching, Beltrami, and Itasca
Canada thistle (*Cirsium arvense*)	Control	Roseau, Lake of the Woods, Koochiching, Beltrami, and Itasca
Leafy spurge (*Euphorbia esula*)	Control	Roseau, Lake of the Woods, Koochiching, Beltrami, and Itasca
Glossy buckthorn (*Frangula alnus*)	Restricted	Koochiching and Itasca
Purple loosestrife (*Lythrum salicaria*)	Control	Roseau, Lake of the Woods, Koochiching, Beltrami, and Itasca
Wild parsnip (*Pastinaca sativa*)	Control	Lake of the Woods, Koochiching, Beltrami, and Itasca
Common reed (*Phragmites australis,* spp. australis)	Restricted	Roseau, Lake of the Woods, Koochiching, Beltrami, and Itasca
Common buckthorn (*Rhamnus cathartica*)	Restricted	Roseau, Lake of the Woods, Koochiching, Beltrami, and Itasca
Multiflora rose (*Rosa multiflora*)	Restricted	Koochiching and Itasca
Common tansy (*Tanacetum vulgare*)	Control	Lake of the Woods, Koochiching, and Itasca

Minnesota Department of Natural Resources

Minnesota DNR maintains a list of prohibited invasive species that incorporates all federally listed and MDA listed noxious plant species. In addition to MDA terrestrial weeds listed above, Minnesota DNR specifically includes 9 invasive aquatic plants and 28 invasive terrestrial plants. "It is illegal to possess, import, purchase, sell, propagate, transport, or introduce prohibited exotic species, except as allowed by statute" (Minnesota DNR 2013).

Minnesota DNR invasive plants list includes the following:

- Amur maple (*Acer ginnala*)
- Norway maple (*Acer platanoides*)
- Tree of heaven (*Ailanthus altissima*)
- Hoary alyssum (*Berteroa incana*)
- Japanese barberry (*Berberis thunbergii*)
- Smooth brome grass (*Bromus inermis*)
- Flowering rush (*Butomus umbellatus*)
- Siberian peashrub (*Caragana aborescens*)
- Musk or nodding thistle (*Carduus nutans*)
- Oxeye daisy (*Chrysanthemum leucanthemum*)

- → Bull thistle (*Cirsium vulgare*)
- → Poison hemlock (*Conium maculatum*)
- → Crown vetch (*Coronilla varia*)
- → Queen Anne's lace (*Daucus carota*)
- → Brazilian elodea (*Egeria densa*)
- → Russian olive (*Elaeagnus angustifolia*)
- → Creeping Charlie (*Glechoma hederacea*)
- → Orange hawkweed (*Hieracium aurantiacum*)
- → British yellowhead (*Inula britannica*)
- → Yellow iris (*Iris pseudacorus*)
- → Butter and eggs (*Linaria vulagaris*)
- → Exotic honeysuckles (*Lonicera tartarica, L. morrowii. X bella*)
- → Birdsfoot trefoil (*Lotus corniculatus*)
- → White and yellow sweet clover (*Melitotus alba, M. officinalis*)
- → Amur silver grass (*Miscanthus sacchariflorus*)
- → Eurasian watermilfoil (*Myriophyllum spicatum*)
- → Brittle naiad (*Najas minor*)
- → Non-native waterlilies (*Nymphaea spp.*)
- → Reed canary grass (*Phalaris arundinacea*)
- → Curly-leaf pondweed (*Potamogeton crispus*)
- → Black locust (*Robinia pseudoacacia*)
- → Perennial sow thistle (*Sonchus arvensis*)
- → Japanese hedge parsley (*Torilis japonica*)
- → Siberian elm (*Ulmus pumila*)
- → Cow vetch & Hairy vetch (*Vicia cracca, Vicia villosa*)

6.21.2 Direct and Indirect Effects

Construction of any of the Route Alternatives could lead to the introduction or spread of noxious weeds or other invasive species in an area due to ground disturbance, leaving exposed soils for extended periods, introduction of contaminated topsoil, vehicles importing weed seed from a contaminated site to an uncontaminated site, and through conversion of landscape type, particularly from forested to open settings. Noxious weeds have potential to dominate and displace native plants and plant communities, permanently altering ecosystem functions. Frequent inspections, eradication of weeds, and revegetation will be implemented, as described below to minimize or eliminate the potential for the introduction or spread of weeds and other invasive species.

6.21.3 Mitigation

The Applicant proposes the following mitigation measures:

- → The Applicant will retain an environmental inspector (EI) during Project construction. Working on behalf of the Applicant, the EI will be responsible for understanding all of the conditions of the Project's environmental permits and to ensure that the contractors abide by these conditions.

- → Regular, frequent cleaning of construction equipment and vehicles on the right-of-way (ROW) as appropriate.
- → Minimization of ground disturbance to the greatest degree practicable; and rapid revegetation of disturbed areas with native or appropriate non-native, seed mixes.
- → The EI will conduct a field survey of the ROW prior to construction to identify areas that currently contain noxious weeds. Weed surveys during construction will identify infestations of the ROW and staging sites.
- → New infestations within the ROW will be addressed and eradicated as soon as practicable in conjunction with property owners input.
- → Construction vehicles, including the under carriage, will be inspected for weed seed and dirt prior to construction start particularly when traveling from an area identified as contaminated by noxious weeds to an uncontaminated area.
- → The introduction and establishment of noxious weeds will be minimized by prompt revegetation of disturbed areas using regional genotype native species where appropriate or by seed based on landowner agreements.
- → No MDA or Minnesota DNR prohibited noxious weed seeds will be allowed in any revegetation seed mix.
- → Seed mix composition will be coordinated with Minnesota DNR on all Minnesota DNR lands.
- → Seed mixes used for the Project will be certified as weed free.
- → Only clean straw mulch will be used; meadow hay will not be allowed as a mulch material.

This page intentionally left blank

6.22 Recreation and Tourism

This section describes the existing recreation areas and tourist attractions within the Study Area and the potential impacts of the Route Alternatives and Segment Options those resources.

Tourism in the Study Area is largely influenced by the outdoor recreational opportunities available. The Study Area contains areas that are viewed as recreational destinations within Minnesota because of the presence of numerous trails, lakes, and state lands. The Minnesota Department of Natural Resources (DNR) data deli and recreation compass was used to identify recreational resources in the Study Area. In addition, when County data was available, that was used to characterize local recreational resources.

6.22.1 Existing Conditions

State Recreation Areas

State Parks and Recreation Areas

State parks are managed by Minnesota DNR and provide a number of different recreation opportunities for visitors including nature viewing, camping, and hiking. No state parks or recreation areas are crossed by the Route Alternatives or Segment Options; however, Big Bog State Recreation Area in Beltrami County is located directly adjacent to the Orange Route Alternative (see Figure 8.22-1) (see Appendix A, sheet 62).

Scientific and Natural Areas

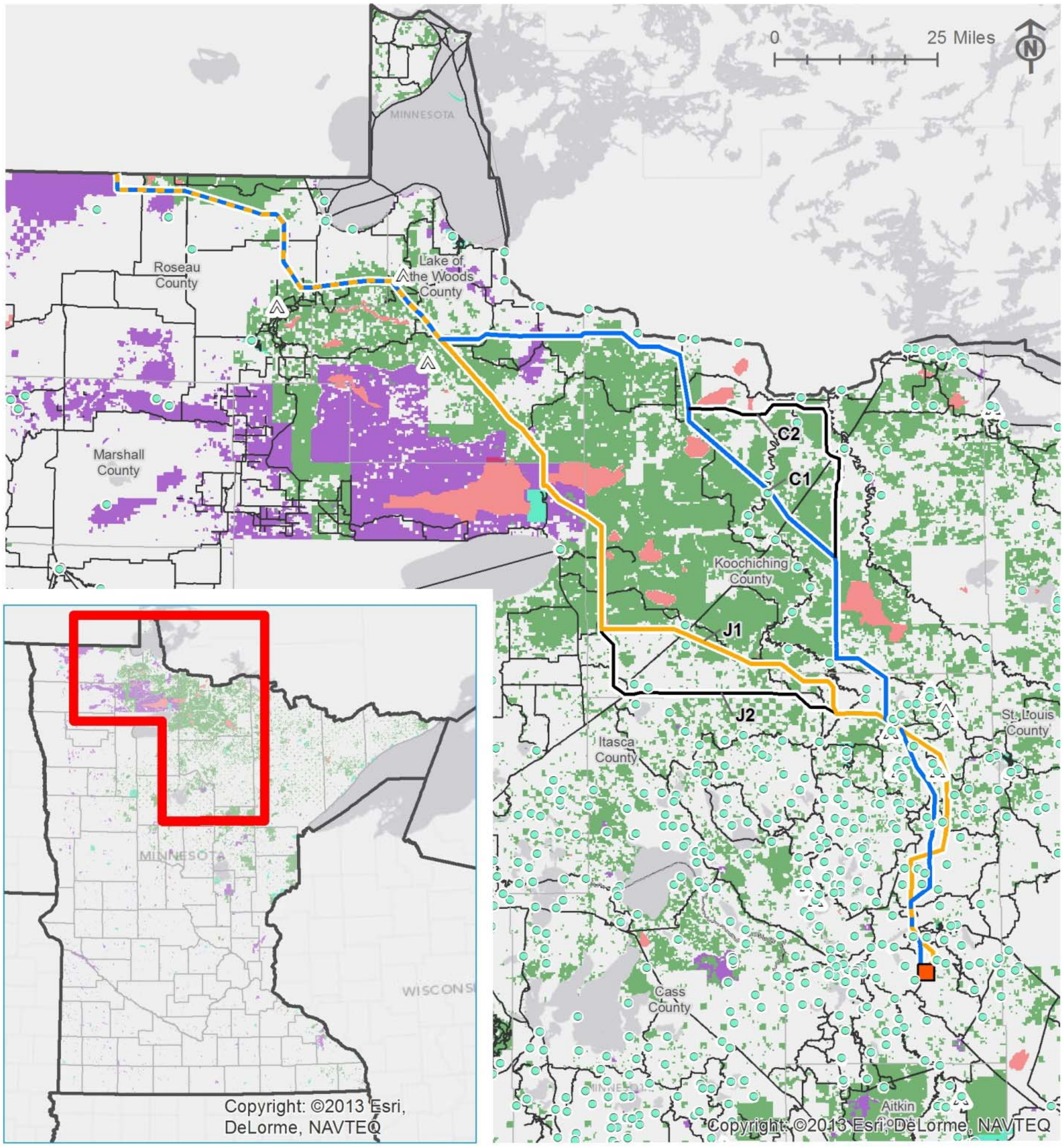
Scientific and Natural Areas (SNAs) are owned and managed by Minnesota DNR. They provide unique habitat for rare natural resources of exceptional scientific and educational value. SNAs largely are used for nature viewing and educational purposes; more intensive recreational activities are not allowed (Minnesota DNR 2013). No SNAs are crossed by the Route Alternatives or Segment Options; however, Red Lake Peatland SNA in Beltrami County is located directly adjacent to the Orange Route Alternative (Figure 6.22-1) (see Appendix A, sheets 60-63).

State Forest

Minnesota state forests are managed by Minnesota DNR and provide a variety of recreation and tourism opportunities such as fall color viewing, bird and nature watching, and other recreational opportunities described in this section (such as, camping, cross-country skiing, geocaching, horseback riding, hunting, and all-terrain vehicle [ATV] or off-highway vehicle [OHV] riding). The majority of these forests are mixed stands of aspen and conifers that are managed for timber harvest. Some parcels contain old growth stands that have been preserved from typical rotational harvest. More information about forestry can be found in Section 6.25.

Approximately 42 percent of the Orange Route and 49 percent of the Blue Route is within state forest land (see Figure 6.22-1 and Table 6.22-1). Segment Option C1 (included in the Blue Route) has substantially more state forest than Segment Option C2 and Segment Option J1 has more state forest than Segment Option J2.

Recreation Areas Figure 6.22-1



Legend

- Blue Route
- Orange Route
- Segment Option
- Blackberry Substation
- State Park
- Scientific & Natural Area
- State Forest
- Wildlife Management Area
- Public Water Access
- State Campground
- Trail
- State Boundary
- County Boundary

Sources: ESRI,DNR

\\mspe-gis-file\gisprojlarge\MinnPower\182035\map_docs\CLIENT\Route_Permit\0622-1_Recreation.mxd

State Wildlife Management Areas

The Study Area crosses portions of six State Wildlife Management Areas (WMAs) (see Table 6.22-2 and Figure 6.22-1). State WMAs provide recreation for upland game, waterfowl, and deer hunters, and wildlife viewing opportunities. Habitats of WMAs generally include wetlands, swamps, and forest land.

Approximately 7 percent of the Orange Route and 3 percent of the Blue Route contains State WMA lands. No Segment Options contain State WMA lands.

State Trails

Minnesota DNR manages thousands of miles of ATV, multi-use, and canoeing trails within the state of Minnesota. Table 6.22-3 and Figure 6.22-1 describes the number and types of trails crossed by the Route Alternatives and Segment Options.

Public Water Access

Minnesota DNR manages thousands of public water access points to lakes in Minnesota. No Route Alternatives or Segment Options directly cross a public water access point.

Non-Government Organization Recreational Resources

The Minnesota Audubon Society identifies 54 Important Bird Areas (IBAs) in the state of Minnesota, two of which are crossed by the Study Area: Big Bog and Chippewa Plains. IBAs provide essential habitat for breeding, wintering, or migrating bird species. IBAs provide bird watching opportunities all year round (Minnesota Audubon Society 2013).

This page intentionally left blank

Table 6.22-1. Acres of State Forest Lands within Route Alternatives and Segment Options

Route Alternative or Segment Option	State Forests (Acres)									Total Acres	Percent of Route within State Forests
	Beltrami Island	Big Fork	George Washington	Koochiching	Lake of the Woods	Lost River	Pine Island	Smokey Bear	Misc. Forestry Land		
Route Alternatives											
Orange	7,913	319	3,113	532	2,827	4,572	10,973	0	1,450	31,698	42
Blue	6,349	0	2,700	6,878	3,882	4,572	9,706	0	976	35,063	49
Segment Options											
C1	0	0	0	4,208	0	0	5,651	0	0	9,859	82
C2	0	0	0	748	0	0	496	567	1,815	3,623	42
J1	0	319	0	532	0	0	4,941	0	525	6,317	41
J2	0	631	0	0	0	0	3,045	0	1,069	4,746	29

Source: Minnesota DNR 2013

Table 6.22-2. Acres of WMA within Route Alternatives and Segment Options

Route Alternative[1]	Wildlife Management Area (Acres)						Total Acres	Percent of Route within WMA
	Carp Swamp	Cedar Bend	Red Lake	Roseau Lake	Roseau River	Silver Creek		
Orange Route	0	585	4,038	530	499	0	5,652	7
Blue Route	365	585	0	530	499	26	2,005	3

Source: Minnesota DNR 2013

Note:

[1] None of the Segment Options cross WMAs.

Table 6.22-3. Trails Crossed by Route Alternatives and Segment Options

Route Alternative or Segment Options	All-Terrain Vehicle (ATV)/ Off-Highway Vehicle (OHV) Trails		Multi-Use Trails (Snowmobile, Cross-Country Skiing, Hiking)														Canoe Trails	
	Bemis Hill ATV	Blue Ox ATV	Bear Lake Trail	Blue Ox/ Caldwell/ Lunstrom	Border	Circle L	Haggerman Voyager Lowman	Herb Brandstrom	Itasca Greenway	Keystone	Lawron	Lost River	Marcel	Pelan	Taconite	West Bowstring	Big Fork	Red Lake
Route Alternatives																		
Orange	X	X	X	X	X	X	-	X	X	X	X	X	X	X	X	-	X	X
Blue	X	X	X	-	X	X	X	-	X	X	X	-	X	X	X	-	X	-
Segment Options																		
C1	-	X	-	-	X	-	X	-	-	-	-	-	-	-	-	-	X	-
C2	-	X	-	-	-	-	X	-	-	-	-	-	-	-	-	-	X	-
J1	-	X	-	X	-	-	-	-	-	-	-	-	X	-	-	X	X	-
J2	-	X	-	X	-	-	-	-	-	-	-	X	X	-	-	-	X	-

Source: Minnesota DNR 2013

Local Recreational Areas

Roseau, Lake of the Woods, Beltrami, and Koochiching Counties

The Route Alternatives and Segment Options do not cross any known recreation areas in Roseau, Lake of the Woods, Beltrami, or Koochiching counties.

Itasca County

The Route Alternatives include one county recreation area: Scooty Lake Dispersed Recreation Area and associated campsite (see Appendix A, sheet 46). Two additional Dispersed Recreation Areas (Wolf Lake and Crooked Lake) are located within 1 mile of the Route Alternatives (see Appendix A, sheets 47 and 49-50). Each of these areas includes multiple campsites (Itasca County 2013b).

6.22.2 Direct and Indirect Effects

Potential impacts on recreation and tourism resources might include changes to or loss of scenic resources, hunting opportunities, and other wildlife recreational opportunities; impacts on water and forest resources used for recreation; temporary increase in noise levels; and increased OHV use following development of a new right-of-way (ROW). In some locations, the repetition of the structures may increase the visual impact of the Project. As such, an inclusion of man-made vertical features could affect the overall recreational experience. More information about the visual effects of the transmission line can be found in Section 6.4.

Constructing the Project next to an existing electric transmission line ROW will not substantially change the recreational uses of the area because the corridor previously was disturbed and the existing viewshed includes a linear-type feature. The Orange Route parallels existing transmission lines for approximately 66.4 miles; the Blue Route parallels existing transmission lines for approximately 84.2 miles. However, areas of both Route Alternatives diverge from existing electric transmission line ROW and will change the land cover and land use within the ROW.

Visual impacts will result from the inclusion of the structures and conductors, cleared ROW, or widened existing ROW within the viewshed of recreational users, and in particular, trail users. Generally, this impact on trail users will be brief as the conductors will be perpendicular to trails, where practical, and only observed for a short time. Where the Orange Route is adjacent to the Big Bog State Recreation Area in Beltrami County (see Appendix A, sheet 62), visual impact because of structures and conductors could be long-term if they can be viewed from the boardwalk. Additional study is required to determine potential impacts at this location.

Both of the Route Alternatives could temporarily impact hunting opportunities, because the Route Alternatives will limit access and disrupt the current habitat and vegetation. Potential impacts on fauna will include the direct or indirect loss or conversion of habitats, increased habitat fragmentation, and the potential risk of avian collisions, which could reduce the available hunting options.

During construction, some mortality could occur to ground-dwelling species, and abandonment of a nest site and the loss of eggs and/or young in avian species. Clearing of vegetation underneath the transmission line during construction and operation will alter wildlife habitat within the immediate vicinity, potentially affecting wildlife viewing. Interior forest-dependent wildlife might move to other areas. Additional information on vegetation, wildlife, and rare and unique species can be found in Sections 6.4, 6.19, and 6.20, respectively.

During some recreational uses of the land, such as bird and nature viewing, people may anticipate an uninterrupted view of forest cover or other natural setting.

The Project will have minimal impact on fishing and other water-based recreation because the construction and operation of the transmission line will not prevent access to lakes or rivers in the long term. No public water access points will be crossed by either of the Route Alternatives.

Trails, especially snowmobile and OHV trails, are often located within existing ROW on public lands and the creation of a new ROW may attract OHV use. ROW across private property remains private property and associated private property laws governing access and public OHV use apply. Generally, this impact on trail users will be brief as the conductors will be perpendicular to trails, where practical, and only observed for a short time. Another possible impact will be the availability of new or expanded ROW that people might use for ATV use. The use of the ROW could be a negative impact in sensitive areas located along the transmission line, because OHV use could result in illegal trespassing, interference with hunting, and increased noise levels.

During construction, increased levels of noise and dust will occur temporarily as machinery is moved throughout the Study Area, possibly resulting in an unsatisfactory visitor recreational experience. This could occur, for example, where the Orange Route is adjacent to the Big Bog State Recreation Area in Beltrami County (see Appendix A, sheet 62). Worker activity also will contribute to this impact; however, this noise will dissipate after the completion of construction. More information about noise and air quality can be found in Sections 6.11 and 6.12, respectively.

6.22.3 Mitigation

The Applicant proposes the following mitigation measures:

- → Constructing the Project along existing transmission ROWs could minimize impacts on existing recreational resources and tourism. Locating the Project ROW adjacent to other existing utility ROWs will help minimize impacts on previously undisturbed lands.
- → Long-term disturbance of wildlife habitat will be minimized by paralleling existing disturbed corridors. Therefore, impacts on hunting and wildlife could be lessened as a result of these actions. In locations where the corridors will be parallel and expanded, the additional acreage will be minimal and will not greatly change the existing conditions as compared to creating an entirely new corridor in an undeveloped area.
- → Working with landowners through the ROW acquisition process to address unauthorized access concerns.
- → Providing information during construction to inform visitors and residents of the activities associated with the Project will provide people with advance notice of what recreational activities may be affected. Signage will be used to inform local recreational

users, as appropriate. In this manner, people could plan for other activities or will be made aware of how their activities could be impacted by the construction of the Project.

→ Further evaluate potential visual impacts at the Big Bog State Recreation Area and work with Minnesota DNR to identify mitigation, as appropriate.

→ Creating location-specific mitigation and minimization plans, if necessary. These measures could include, but are not limited to, temporary or long-term trail detours and replacement of vegetation subject to vegetation management requirements.

This page intentionally left blank

6.23 Agricultural Production

This section describes the agricultural resources crossed by the Route Alternatives and Segment Options and the potential impacts of the Route Alternatives and Segment Options on those resources.

The U.S. Department of Agriculture's (USDA) Agricultural Census data was used to provide context to the agricultural setting within the Study Area. The National Land Cover Dataset (NLCD) was used to quantify acreages of certain agricultural land cover types across the Study Area. USDA Natural Resources Conservation Service (NRCS) Soil Survey Geographic (SSURGO) database was used to quantify acreages of prime farmland. Geographic Information System (GIS) was used to determine temporary and permanent impacts to land cover types and prime farmland.

6.23.1 Existing Conditions

Agriculture

Table 6.23-1 summarizes farmland, cropland, and agricultural production for Roseau, Lake of the Woods, Beltrami, Koochiching, and Itasca counties based on the 2007 USDA Census data (USDA 2007a-e). The most recent agricultural census data from 2012 had not been released at the time of this publication.

Table 6.23-1. Agricultural Census Data, 2007 and 2002

Agricultural Data	Roseau County	Lake of the Woods County	Beltrami County	Koochiching County	Itasca County
Number of farms in 2007 (in 2002)[1]	1,182 (1,238)	225 (266)	674 (746)	214 (258)	419 (494)
Average size of farms in 2007 (acres)	500 (568)	431 (573)	313 (312)	258 (288)	223 (243)
Land acreage in farmland in 2007	591,316 (702,918)	96,932 (152,491)	210,833 (232,735)	55,109 (74,318)	93,274 (120,176)
2007 percentage of county in farmland[2]	55%	8.5%	10.8%	2.7%	5%

Agricultural Data	Roseau County	Lake of the Woods County	Beltrami County	Koochiching County	Itasca County
Total market value of agricultural products sold in 2007	$84,792,000 ($44,544,000)	$7,414,000 ($5,601,000)	$20,972,000 ($17,314,000)	$4,565,000 ($3,817,000)	$7,419,000 ($6,440,000)
2007 market value of crops sold	$63,933,000	$6,386,000	$9,642,000	$1,322,000	$3,677,000
2007 market value of livestock and other uses sold	$20,859,000	$1,028,000	$11,330,000	$3,242,000	$3,742,000

Source: USDA 2007a-e
Notes:
[1]The census definition of a farm is any place from which $1,000 or more of agricultural products were produced and sold, or normally would have been sold during the census year.
[2]Farmland is defined as cropland, woodland, pasture, livestock, and other uses (for example, eggs and aquaculture).

The numbers of farms and the average farm size have decreased since 2002 for every county in the Study Area (see Table 6.23-1). Roseau County had the highest amount of agricultural land and the largest farms. Most of the agricultural land in Roseau County is evenly dispersed within the County. Lake of the Woods and Koochiching counties had relatively few acres of farmland in comparison to the overall size of each county. Agricultural farms are located generally in the northern portion of each county. Beltrami County had a moderate amount of farmland in the County when compared to the other counties in the Study Area. Koochiching County had the fewest acres of farmland, most of which are small parcels located in the northern portion of the county.

The types of agricultural land uses in the Study Area are diverse across all five counties. Roseau County's top grossing commodity was other crops and hay with wheat for grain being the top crop item. Lake of the Woods County's top grossing commodity was grains, oilseeds, dry beans, and dry peas with forage (land used for all hay and haylage, grass silage, and greenchop) being the top crop item. Beltrami County's top grossing commodity was cattle and calves with forage being the top crop item. Koochiching and Itasca counties produced fewer grains than Roseau and Lake of the Woods counties; the top grossing commodity was cattle and calves with forage being the top crop item.

All counties generally experienced a decrease in the number of farms, average size of farms, and land acreage in farmland from 2002 to 2007.

Agricultural Land Cover

The Route Alternatives and Segment Options largely avoid agricultural lands. Table 6.23-2 describes the NLCD agricultural land cover acreage across Route Alternatives and Segment Options.

Table 6.23-2. NLCD Agricultural Lands within the Route Alternative or Segment Option (acres)

Route Alternative or Segment Option	Pasture/Hay	Row Crops	Small Grains	TOTAL
Route Alternative				
Orange Route	2,827	4,009	1,054	7,890
Blue Route	2,250	4,237	1,075	7,562
Segment Option				
C1	5	1	-	6
C2	363	133	-	496
J1	472	128	1	601
J2	739	79	-	818

Source: National Land Cover Dataset (NLCD) 2000

The Orange Route has more agricultural land (7,890 acres) than does the Blue Route (7,562 acres).

Segment Option C1 has very little agricultural land. Segment Option J1 has less agricultural land than Segment Option J2 (see Table 6.23-2).

Additional information on total land cover within the Route Alternatives and ROWs of the Route Alternatives and Segment Options can be found in the Section 6.6, Land Use.

Prime Farmland

Prime farmland is defined by the Natural Resource Conservation Service (NRCS) as land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. NRCS has three levels for prime farmland, and each county's NRCS department is responsible for assigning prime farmland designations to each of the soil series found in its county. Prime farmland data is created by analyzing soil types found in each county, then assessing whether or not those soil types can sustain agricultural production. The NRCS Prime Farmland dataset can include areas of the county that are not currently being used for agricultural production; therefore, the acreages of prime farmland might not match the amount of agricultural land reported by the NLCD.

Three categories of farmland are identified by NRCS (see Table 6.23-3). The most important class is prime farmland, which is capable of producing high yields of crops. Prime farmland when drained includes soils that have the potential to be prime farmland but require drainage or hydrologic alteration to achieve high productivity. Farmland of statewide importance includes soils that are nearly prime, but are not as productive due to permeability, slope, erosion potential, or some other soil property.

Table 6.23-3 summarizes the acreages of prime farmland types within the Route Alternatives and Segment Options.

Table 6.23-3. Prime Farmland Types within the Route Alternatives and Segment Options (acres)

Route Alternative or Segment Option	All Areas are Prime Farmland	Farmland of Statewide Importance	Prime Farmland if Drained	TOTAL
Route Alternative				
Orange Route	8,876	3,557	13,355	25,788
Blue Route	6,450	4,613	10,713	21,775
Segment Option				
C1	30	1,105	1,238	2,373
C2	234	1,396	1,064	2,694
J1	1,027	979	5,092	7,098
J2	2,272	3,310	4,584	10,166

Source: USDA – NRCS. Soil Survey Geographic Database, 2006.

The Orange Route has more prime farmland (25,788 acres) than the Blue Route (21,775 acres).

Segment Option C1 has fewer total acres of prime farmland (2,373acres) than C2 (2,694 acres) Segment Option J1 has fewer total acres of prime farmland (7,098 acres) than J2 (10,166 acres). Segment Options J1 and J2 are located in an area that is more heavily used for agriculture than Segment Options C1 and C2.

6.23.2 Direct and Indirect Effects

Agricultural Land Cover

Table 6.23-4 summarizes the total temporary and permanent impacts on agricultural lands within the Study Area based on the anticipated ROW.

Table 6.23-4. Impacts on Agricultural Land Cover[1] within the Anticipated ROW (acres)

Route Alternative or Segment Option	Total Temporary Impacts[2]	Total Permanent Impacts[3]
Route Alternative		
Orange Route	79	4
Blue Route	90	4
Segment Options		
C1	<1	<1
C2	10	1

Route Alternative or Segment Option	Total Temporary Impacts[2]	Total Permanent Impacts[3]
J1	9	<1
J2	14	1

Source: National Land Cover Dataset (NLCD) 2000
Notes:
[1]Agricultural land cover includes pasture/hay, row crops, and small grain.
[2]Temporary impacts based on 0.52 acres per structure, 16-foot-wide construction access road ROW disturbance and a 1,000-foot span distance.
[3]Permanent impacts based on 1,936 square feet per structure using a 1,000-foot span distance.

Permanent impacts on agricultural land for the Orange Route and the Blue Route total approximately 4 acres, each. Temporary impacts on agricultural land for the Orange Route and the Blue Route total 79 and 90 acres, respectively (see Table 6.23-4).

The Segment Options (C1, C2, J1, and J2) have 1 acre or less of total permanent impacts on agricultural lands (see Table 6.23-4).

Prime Farmland

Table 6.23-5 lists the impacts (in acres) on prime farmland within the anticipated ROW of the Route Alternatives and Segment Options.

Table 6.23-5. Impacts on Prime Farmland within the Anticipated ROW (acres)

Route Alternative or Segment Option	Total Temporary Impacts[1] (acres)	Total Permanent Impacts[2] (acres)
Route Alternative		
Orange Route	324	16
Blue Route	289	14
Segment Option		
C1	34	2
C2	63	3
J1	116	6
J2	156	8

Notes:
[1]Temporary impacts based on 0.52 acres per structure, 16-foot-wide construction access road ROW disturbance and a 1,000-foot span distance.
[2]Permanent impacts based on 1,936 square feet per structure using a 1,000-foot span distance.

As shown in Table 6.23-5, the Route Alternatives will require the permanent conversion of approximately 16 acres of total prime farmland for the Orange Route and approximately 14 acres of total prime farmland for the Blue Route. Permanent impacts include the areas that will be taken out of production at the structure locations; other areas temporary disturbed could be put back into production after completion of construction.

Segment Options C1 and C2 have similar permanent impacts on prime farmland (2 and 3 acres, respectively). Segment Options H1 and H2 range from 6 to 8 acres, respectively.

During construction, temporary impacts such as soil compaction and crop damages within the ROW could occur, depending on the time of construction. Temporary impacts on agricultural lands from grading, clearing, and excavation activities and transportation of materials will occur. Additional information on total land cover within the Route Alternatives and the anticipated ROWs of the Route Alternatives and Segment Options can be found in Section 6.6, Land Use.

Some cultivated areas require the use of aerial application of pesticides and herbicides. Aerial application is typically conducted by smaller aircraft at low flying altitudes. Aerial application may be limited in some agricultural areas within the Route Alternatives. Applicators will need to avoid the transmission line, which may limit the application of chemicals.

Removal of the small amount of agricultural lands and prime farmland as shown in Tables 6.23-4 and 6.23-5 is not expected to negatively affect the general farm community in the Study Area. Once construction is completed, agricultural production within the ROW will resume. Long-term loss of agricultural production will only occur at the structure locations.

6.23.3 Mitigation

→ The Applicant will develop an Agricultural Impact Mitigation Plan (AIMP) as generally required as a Route Permit condition.

→ The Applicant will work with the Minnesota Department of Agriculture to ensure that appropriate mitigation efforts are included and implemented.

→ The Applicant will retain an environmental inspector (EI) during Project construction. Working on behalf of the Applicant, the EI will be responsible for understanding all of the conditions of the Project's environmental permits and to ensure that the contractors abide by these conditions.

→ To the extent practical, soil disturbance and excavation activities in steep slope areas will be avoided.

→ Where disturbance and excavation cannot be avoided entirely, it will be minimized using best management practices (BMPs).

→ Sediment and erosion control plans will be developed that specify the types of BMPs necessary. Depending on the site, BMPs may include installation of silt fence, straw bales, or ditch blocks, and/or covering bare soils with mulch, plastic sheeting, or fiber rolls to protect drainage ways and streams from sediment runoff.

→ Erosion control practices will be inspected during construction, especially during significant precipitation events.

→ Soil compaction in cultivated areas will be treated and restored through tillage operations, for example using a subsoiler.

→ Construction mats will be used as appropriate.

→ Where rutting occurs, the Project will repair the surface and restore ground vegetation upon completion of work in a given area.

- → All disturbed areas will be revegetated once construction is complete. Seed mixes will be specified based on site characteristics and in accordance with regulatory permits.
- → The introduction and establishment of noxious weeds will be minimized by prompt re-vegetation of disturbed areas using regional genotype native species where appropriate or by seed based on landowner agreements.

This page intentionally left blank

6.24 Transportation

This section describes the transportation infrastructure that is crossed by the Route Alternatives and Segment Options and the potential impacts of the Route Alternatives and Segment Options on this infrastructure.

Minnesota Department Transportation (DOT) data were used to describe the Study Area, as well as identify and describe potential impacts to transportation infrastructure.

6.24.1 Existing Conditions

This section provides an overview of the roadways, railways, airports, and pipeline facilities located in proximity to the Project. Figure 6.24-1 illustrates existing transportation infrastructure in the Study Area.

Roadways

The Study Area is accessible mostly by a system of roads, including local (that is, township and county), county state-aid highways (CSAHs), Minnesota trunk highways (THs), and U.S. Highways. There are, however, large areas that contain no roadways. Table 6.24-1 lists the annual average daily traffic (AADT) volumes for U.S. Highways and Minnesota THs crossed by the Route Alternatives.

The Waters of the Dancing Sky Scenic Byway (TH 11) travels from west of Roseau, Minnesota, to International Falls, Minnesota, following the Rainy River for much of its location. Scenic byways are designated by federal or state agencies because of their intrinsic qualities including scenic, cultural, recreational, natural, historic, and archeological characteristics. The Orange and Blue Routes cross this scenic byway (see Appendix A, sheet 7).

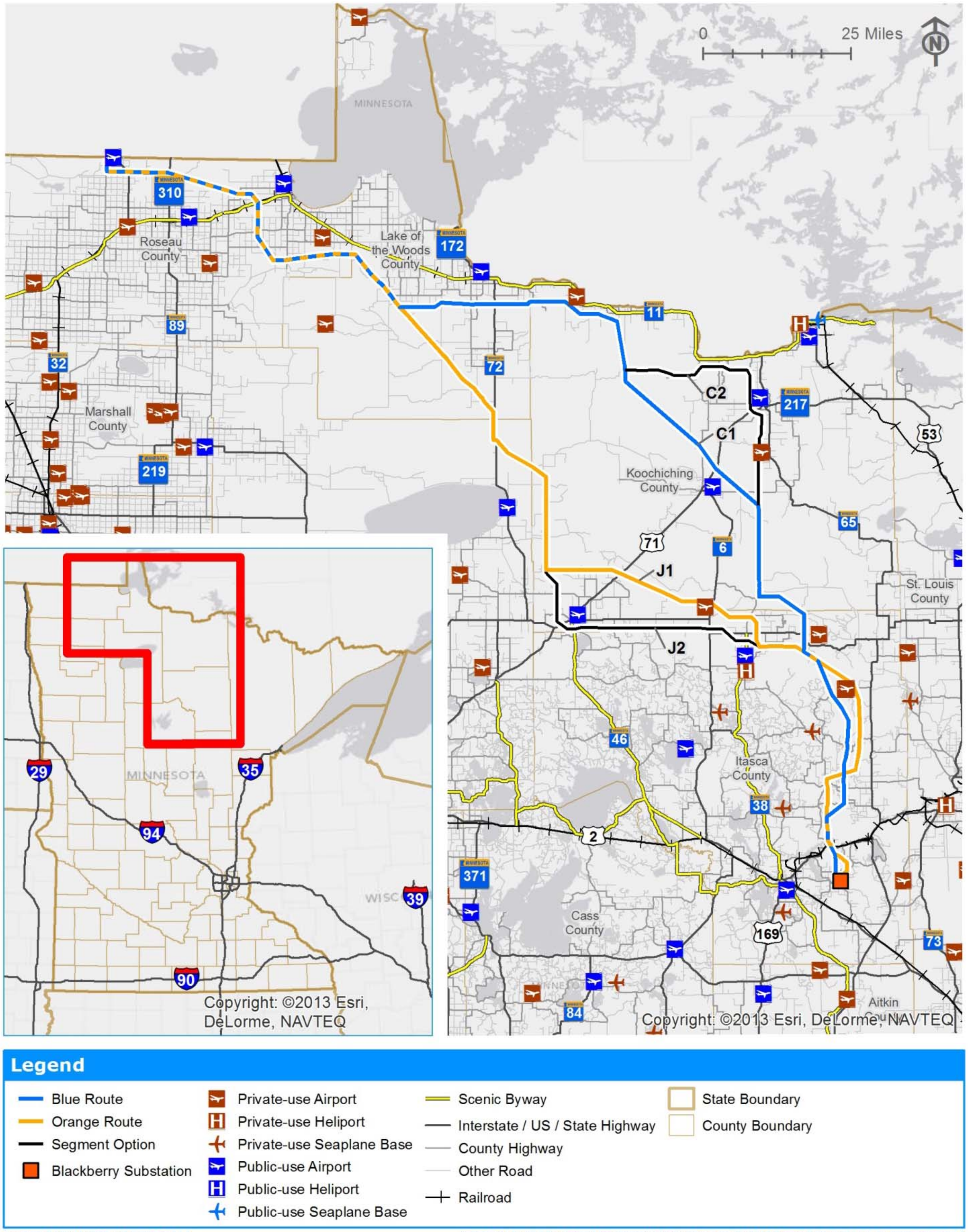
6.24.2 Orange Route

The Orange Route crosses two U.S. Highways (169 and 71) (see Appendix A, sheets 52 and 71), six Minnesota THs (1, 6, 11, 72, 89, and 310) (see Appendix A, sheets 76, 74, 7, 61, 2, and 4), and 12 CSAHs. CSAH's crossed include: 2, 3, 5, 8, 12, 13, 42, 52, 53, 57, 69, and 70. The Orange Route crosses some of these CSAHs more than once, with a total of 15 crossings. In Roseau County, the Orange Route parallels 390th Street/County Highway 118 for approximately 8 miles (see Appendix A, sheet 2).

The AADT rates were taken at the nearest point to where the Orange Route intersected the highways listed in the table below. U.S. Highway 169 east of Taconite, Minnesota, had the largest AADT rate in 2012 at a rate of 11,900. This is due largely to the higher population density in this area compared to the rest of the Orange Route, which largely crosses rural areas. TH 11 and TH 89 AADT rates for 2012 were 3,700 and 130, respectively. The rates on TH 310, TH 72, U.S. Highway 71, TH 6, and TH 1 were at or below 1,000 vehicles per day (see Table 6.24-1). AADT rates are not available for 390th Street/County Highway 118 (Minnesota DOT 2013a).

Existing Transportation Infrastructure

Figure 6.24-1



Sources: ESRI, MnDOT, US Census, FAA

\\mspe-gis-file\GISProjLarge\MinnPower\182035\map_docs\CLIENT\Route_Permit\0624-1_Transportation.mxd

Table 6.24-1. Orange Route Annual Average Daily Traffic Rates

Highway	County	Location	Annual Average Daily Traffic (AADT) 2012
Trunk highway (TH) 89	Roseau	South of the Minnesota-Manitoba border	130
TH 310	Roseau	South of the Minnesota-Manitoba border	325
TH 11	Roseau	Between Roseau and Warroad	3,700
TH 72	Lake of the Woods and Beltrami	Lake of the Woods and Beltrami county border	520
U.S. Highway 71	Koochiching	Northeast of Northome, Minnesota	1,000
TH 6	Koochiching	South east of Big Falls, Minnesota	345
TH 1	Itasca	North of Bigfork, Minnesota	570
U.S. Highway 169	Itasca	East of Taconite, Minnesota	11,900

Source: Minnesota DOT 2013a

6.24.3 Blue Route

The Blue Route crosses two U.S. Highways (169 and 71) (see Appendix A, sheet 52 and 29), five Minnesota THs (1, 11, 72, 89, and 310) (see Appendix A, sheets 40, 7, 17, 2, and 4), and 14 CSAHs. CSAHs crossed include: 1, 2, 3, 5, 8, 12, 13, 18, 31, 52, 53, 56, 57, and 70. Some CSAHs are crossed more than once along the Blue Route Alternative, with a total of 18 crossings. In Roseau County, the Route will parallel 390th Street/County Highway 118 for approximately 8 miles (see Appendix A, sheet 2).

The AADT rates were taken at the nearest point to where the Blue Route intersected the highways listed in the table below. U.S. Highway 169, east of Taconite, had the largest AADT rate in 2012 (that is, 11,900). This is due largely to the higher population density located in this area compared to the rest of the Blue Route that crosses rural areas. TH 89, TH 11 and U.S. Highway 71 AADT's for 2012 were 130, 3,700 and 1,100, respectively. Rates on TH 310, TH 72, and TH 1 were 1,000 vehicles per day (see Table 6.24-2). AADT rates are not available for 390th Street/County Highway 118 (Minnesota DOT 2013a).

Table 6.24-2. Blue Route Annual Average Daily Traffic Rates

Highway	County	Location	Annual Average Daily Traffic (AADT) 2012
Trunk highway (TH) 89	Roseau	South of the Minnesota-Manitoba border	130

Highway	County	Location	Annual Average Daily Traffic (AADT) 2012
TH 310	Roseau	South of the Minnesota-Manitoba border	325
TH 11	Roseau	Between Roseau and Warroad, Minnesota	3,700
TH 72	Lake of the Woods	South of Baudette, Minnesota	520
U.S. Highway 71	Koochiching	Northeast of Big Falls, Minnesota (southeast of Littlefork, Minnesota)	1,100
TH 1	Itasca	Northeast of Bigfork, Minnesota	385
U.S. Highway 169	Itasca	East of Taconite, Minnesota	11,900

Source: Minnesota DOT 2013a

Minnesota DOT District 1, which administers transportation projects for Itasca and Koochiching counties, and District 2, which administers transportation projects for Roseau, Lake of the Woods, and Beltrami counties, has plans for general reconstruction, bridge replacements, and upgrades to small segments of a number of highways in these counties. These improvements are planned to occur on an ongoing basis through 2020. District 1 has one major project in the vicinity of the Orange Route and the Blue Route along U.S. Highway 169 (in Itasca County) (personal communication, Bryan Anderson, November 22, 2013). District 2 has one project near the Orange Route (personal communication, Joseph McKinnon, November 25, 2013).

Railways

The Study Area contains portions of Burlington Northern Santa Fe (BNSF) Railway and Minnesota Northern Railroad (MNN). The rail network is not a prominent transportation mode in the majority of the Study Area, but does maintain a presence with these two lines; the MNN in the northwest and the BNSF in the southeast. The Orange and Blue Routes will cross the MNN at one location along State Highway 11 in Roseau County (see Appendix A, sheet 7). The BNSF Railway is important for moving a variety of commodities in the southeast part of the Study Area. The Orange and Blue Routes will cross the BNSF rail corridor within the city limits of Taconite (see Appendix A, sheet 52).

Airports

There is one Federal Aviation Administration (FAA) registered airport adjacent to the Orange and Blue Routes, the Piney Pinecreek Border Airport (FAA 2014) (see Appendix A, sheet 1). The Piney Pinecreek Border Airport is a public use airport that crosses the Minnesota-Manitoba border so that it is located in Manitoba, Canada and Minnesota (approximately 2 miles northwest of the town of Pinecreek in Roseau County). There are three private airstrips within 2 miles of the Orange Route (see Appendix A, sheets 73 and 44). There is one private airstrip within 2 miles of the Blue Route (not shown in Appendix A, outside of map coverage).

Information received at public open house meetings suggests that in addition to the land-based airstrips, lakes may be used for water landings. There is one reported private airstrip within 2 miles of Segment Option C2 (see Appendix A, sheet 85) and within 2 miles of Segment Option J1 (not shown in Appendix A, outside of map coverage).

There is no Very High Frequency (VHF) Omnidirectional Radio Range (VOR) navigation ground station associated with the Piney Pinecreek Border Airport (U.S. DOT 2013).

6.24.4 Direct and Indirect Effects

This section identifies the potential direct and indirect effects on traffic and transportation facilities. Tables 6.24-3 and 6.24-4 provide a summary of the crossings for Route Alternatives and Segment Options.

Table 6.24-3. Number of Airport, Roadway, and Railway Crossings by Route Alternative

Type of Crossing	Orange Route	Blue Route
U.S. Highway	2	2
Minnesota trunk highway (TH)	6	5
County state-aid highway (CSAH)	15	18
Railroad	2	2
Federal Aviation Administration (FAA) airport (within 2 miles of Route Alternative)	1	1
Airstrips (within 2 miles of Route Alternative)	3	1

Table 6.24-4. Number of Airport, Roadway, and Railway Crossings by Segment Option

Type of Crossing	Segment Option			
	C1	C2	J1	J2
U.S. Highway	1	1	1	1
Minnesota trunk highway (TH)	0	0	2	4
County state-aid highway (CSAH)	3	6	2	4
Railway	0	0	0	0
Federal Aviation Administration (FAA) airport (within 2 miles of Segment Option)	0	0	0	0
Airstrips (within 2 miles of Segment Option)	0	1	1	0

6.24.4.1 Roadways

Construction of Route Alternatives and Segment Options might result in temporary construction-related detours and road closures, resulting in a short-term change to traffic and travel times. Road or lane closures will occur where the Route Alternatives cross and (to some degree) parallel roads. Closures and detours typically will be necessary to string transmission lines across roads, or to allow for the movement of construction vehicles and the delivery of construction materials. Longer traffic delays due to road closures may occur on roads with high traffic volumes, such as U.S. Highway 169, U.S. Highway 71, and TH 11.

In accordance with Minnesota DOT policy, complete road closures and related detours likely will last for only short periods of time and likely could be anticipated, permitted, and advertised well in advance.

Road or lane closures are not anticipated during operation of the Project. The structures will be placed in accordance with Minnesota DOT's *Utility Accommodation and Coordination Manual* for the placement of aerial transmission lines, that is, immediately adjacent to but outside of the highway right-of-way (ROW) (Minnesota DOT 2013b). The Project ROW will be large enough for maintenance activities to be conducted without affecting traffic on adjacent roads. Road closures during operation only will be necessary when replacement of transmission line components becomes necessary—such as after storm events. In such cases, impacts on transportation will be similar to those experienced during construction, but for a shorter duration and over a more limited distance.

Vegetation bordering existing roadway ROWs acts as a living snow fence that protects the roadway from blowing snow drifts. Living snow fences are planted trees, shrubs, crops (typically corn), or native grasses along roadway easements. If living snow fences are removed during construction or operation of the Project, more frequent snow removal may be required.

The Project will utilize roads to transport personnel, equipment, and materials. Most roads proposed for access for the Project already allow for the passage of a range of vehicles, including high-clearance vehicles and logging trucks. There might be impacts such as surface damage to local roadways as a result of construction traffic.

Minnesota DOT District 1 has plans for a four-lane expansion in Itasca County. The expansion project is located along U.S. Highway 169 between CSAH 15 and 1 mile east of CSAH 7, and is scheduled for 2016. This expansion project is planned to be completed prior to the projected construction date of the Project (that is, 2017) and therefore no conflicts are anticipated (personal communication, Bryan Anderson, November 22, 2013).

Railways

Neither of the Route Alternatives parallels an existing railroad. Both Route Alternatives have at least one railroad crossing. Construction (including delivery and installation of materials, and stringing of transmission lines across the MNN or the BNSF Railway) likely could be timed to avoid most rail traffic. At locations where the Project crosses the MNN or the BNSF Railway, rail traffic may need to be temporarily halted or redirected during Project construction.

Required maintenance of the Project will be timed to avoid interruptions to rail traffic. Rail maintenance crews will need to exercise caution to avoid coming into contact with the Project, should they need to conduct work directly under the transmission line. This could require additional safety precautions or employee training, similar to precautions already taken to avoid existing transmission lines that cross the railroad.

When a high-voltage alternating current (AC) transmission line is located adjacent to or crosses a railway, the railway's tracks and signals might be subject to electrical interference from capacitive, electric and magnetic, and conductive effects. The American Railway Engineering and Maintenance-of-Way Association (AREMA) has specifications for steady state rail-to-ground and equipment-to-ground voltage levels to ensure the safety of railway operating personnel and the public.

Capacitive coupling results from the electric field from the transmission line's conductors coupling with above ground conductive objects that are insulated from the earth, such as the railway's tracks that typically are installed on high impedance ballast (that is, the rock bed used to support the tracks). Electric and magnetic induction results from the magnetic field produced by the AC flowing in the conductors of the transmission line coupling with the above ground and below ground metallic objects, such as railway tracks and buried communications cables, if present. Conductive interference results from fault currents entering the ground and raising the soil potential in the vicinity of the railway. If a transmission line is located in proximity and parallel to a railway for long distances, all of these interference mechanisms can cause high currents and voltages to develop on the railway's tracks and communication cables. If the AC interference is above certain thresholds, it can result in personal safety hazards, damage to signal and communication equipment, and false signaling of equipment. These AC interference effects could be predicted with computer modeling once a Route Alternative is selected and ROW identified. With proper planning and mitigation management, railways and high-voltage AC transmission lines can be safely co-located (BNSF 2011). In addition, railway signal and equipment manufacturers provide AC interference voltage tolerances for proper signal operation so that nearby transmission facilities can be designed to ensure that AC interference levels do not exceed the acceptable safety criteria or equipment voltage tolerance (Liu 2007).

Airports

The anticipated ROWs for the Orange and Blue Routes are adjacent to the Piney Pinecreek Border Airport and need to be reviewed for possible obstruction, in accordance with FAA 14 Code of Federal Regulations CFR 77.9. A Notice of Proposed Construction or Alteration will be filed with FAA (FAA 14 CFR 77.7). An object is considered an obstruction if it is greater than any airport imaginary surface. These surfaces include the horizontal, conical, approach, precision instrument approach, and transitional surfaces. For airports with one runway greater than 3,200 feet in actual length, the FAA Federal Aviation Regulations (FAR) Part 77 obstruction guidelines specify that notice must be submitted to FAA for developments greater than 150 feet, the maximum height of the horizontal plane above the established airport elevation (FAA 14 CFR 77.7). The Route Alternatives have been located outside of the identified flight zones, but confirmation of impact avoidance with airport officials will be required.

General aviation airports are publicly or privately owned airfields commonly used by small aircraft. There are three known airstrips, with grass runways, within 2 miles of the Orange Route anticipated ROW, and one private airstrip within 2 miles of the Blue Route anticipated

ROW. Based on the configuration of these airstrips, oriented in a variety of directions (for example, north to south and northwest to southeast), in relation to the Orange Route and the Blue Route, the Project might cause aircraft using those airstrips to alter their take-off and landing approach movements, but it will not impede the full operation of these facilities. Transmission lines are a potential hazard to aircraft during take off and landing near large water bodies that can accommodate small aircraft. Certain lakes in the eastern portion of the Route Alternatives were identified at public meetings as being used for water landings. The lakes mentioned are out of the Study Area; however, it is possible that lakes used for water landings exist near the Project that were not mentioned.

Many of the privately owned airstrips are used by aerial applicators. (See Section 6.23, Agricultural Production.) During the public open house meetings held for the Project, many farmers expressed concerns about how the Project will affect aerial application operations on their agricultural fields. The ability to aerial spray is important especially in this region of the state because the regionally high water table impedes surface application of agricultural chemicals during wet periods. The Project might cause aircraft using those airstrips to alter their take-off and landing approach movements, but it will not impede the full operation of these facilities.

6.24.5 Mitigation

As discussed below and in the following sections, the Applicant proposes the following mitigation measures:

- → The Project will be designed in accordance with National Electric Safety Code (NESC) to minimize impacts on transportation. The NESC defines the basic clearance requirements between transmission lines and transportation structures (for example, roadways and railways). The Applicant will work with state and local officials to coordinate and minimize any impacts during construction and operation of the Project.

Roadways

- → The Route Permit issued by the Minnesota Public Utilities Commission (PUC) will direct the Applicant to comply with Minnesota DOT and all applicable road authorities' management standards and policies during construction. The Route Permit also will direct the Applicant to provide written notice of construction to Minnesota DOT and applicable city, township, and county road authorities. Under the permit, the Applicant will be required to restore the ROW, temporary work space, access roads, abandoned ROW, and any other lands affected by construction. This could include the replacement of living snow fences affected by construction activities.
- → Placement of public utilities on or near state ROW will be designed in accordance with the Utility Accommodation Section of the Minnesota DOT Utility Accommodation and Coordination Manual (Minnesota DOT 2013b). Minnesota Rules 8810.3500, Aerial Lines, requires the placement of aerial lines in the outer 5 feet of the highway ROW. This standard was incorporated into the Accommodation Policy to ensure that lines are placed do not interfere with the free and safe flow of traffic, do not impair the highway

or its protected visual quality, do not conflict with any provision of federal, state, or local law, rule, or regulation, or do not unreasonably increase the difficulty or future cost of highway construction or maintenance (Minnesota DOT 2013b).

→ Installation of additional temporary access points will be subject to review and approval of highway officials. Construction staff will implement traffic control measures in accordance with the Minnesota DOT Manual on Uniform Traffic Control Devices (Minnesota DOT 2014).

→ Stringing of new overhead conductors over highways may require installation of temporary wooden pole guard structures or other measures to safeguard the public and construction forces during the stringing process.

Railways

Utilities that cross railroad property, to the extent feasible and practical, are to be perpendicular to the railroad alignment and preferably at not less than 45 degrees to the centerline of the track.

→ The Applicant will obtain the necessary permission for railroad crossings with the Railroad in accordance with the Railroad's requirements for clearances, structure placements, offsets, restoration, etc.

→ The Applicant will work with the Railroad to coordinate construction in accordance with the Railroad's requirements.

Airports

It is recommended that all public airports within 5 miles of the Project be notified and provided an opportunity to comment on compatibility of the Project and airport operations (Minnesota DOT 2013c).

→ FAA and Minnesota DOT Office of Aeronautics will be notified to address compatibility of the Project with the airport. The Applicant will avoid or minimize impacts to the Piney Pinecreek Border Airport consistent with Minnesota DOT and FAA requirements, as appropriate.

→ The Applicant will work with the owners of private airstrips and with aerial applicators to minimize potential impacts, as appropriate.

→ In areas where there may be regular use of lakes for landings and take off, the Applicant will work with those users, and determine methods to improve visibility, such as installing markers on the transmission line.

This page intentionally left blank

6.25 Forestry

This section describes the forest resources that are crossed by the Route Alternatives and Segment Options and the potential impacts of the Route Alternatives and Segment Options on those resources.

U.S. Geological Survey Gap Analysis Program (GAP) data and Minnesota Department of Natural Resources (DNR) land use data were used to describe the Study Area, as well as identify and describe potential impacts to the resource.

6.25.1 Existing Conditions

The Project stretches from northwestern to north central Minnesota (see Figure 6.25-1), a region that contains economically important forestlands. Timber harvest and associated wood products provide major benefits to the counties where the Project occurs. Forests supply pulpwood for paper and oriented strand board production both inside and outside the region.

The Route Alternatives cross through seven state forests, including Beltrami Island, Big Fork, George Washington, Koochiching, Lake of the Woods, Lost River, and Pine Island. The state forests are a primary source of timber products and are regularly used for recreation (for example, hunting; fishing; birding; ATV trails; and silent sports such as, skiing, hiking, biking, and canoeing) (see Section 6.22, Recreation and Tourism, Figure 6.22-1). The Study Area includes extensive county-owned lands, which are often managed for timber products and recreation.

Private, corporate, and industrial forestlands are located within the Orange Route, the Blue Route, and the Segment Options (see Section 6.6, Land Use, and Table 6.6-2). While data are not readily available on the best management practices (BMPs) within these private lands, many of these areas are managed for timber production. There are thousands of acres of privately owned forest under a working-forest conservation easement that relinquishes development rights—nearly 80 square miles in Itasca and Koochiching counties—yet keeps the land open to timber production and outdoor recreation.

Approximately 68 percent of the Orange Route and 65 percent of the Blue Route crosses public land owned by county, state, or federal governments (see Figure 6.25-1 and Section 6.6, Land Use, Table 6.6-1 and Figure 6.6-1).

Section 6.6, Land Use, Figure 6.6-2 identifies land cover types within the Study Area. Table 6.25-1 summarizes the acreage of forestland in the Orange Route and the Blue Route.

Table 6.25-1. Forested Land Cover for Each Route Alternative

Cover Type	Orange Route (Acres)	Blue Route (Acres)	Substation (Acres)
Conifer forest	17,988	21,265	-
Deciduous forest	23,720	18,376	5
Total forested	41,708	39,641	5
Total Acres within Route	75,897	71,547	25
Percent of Route that is Forested	54.9%	55.4%	20%

Source: U.S. Geological Survey (USGS), 1991-1993, GAP Level 1

Forestry management has moved toward sustainable methods, which use an ecosystem land management unit approach (Interagency Information Cooperative 2011). The management units used by Minnesota DNR are the subsection level of the Ecological Classification System (ECS) (Minnesota DNR 2013). The ECS management units are described in detail in Section 6.4, Vegetation, and depicted in Figure 6.4-1.

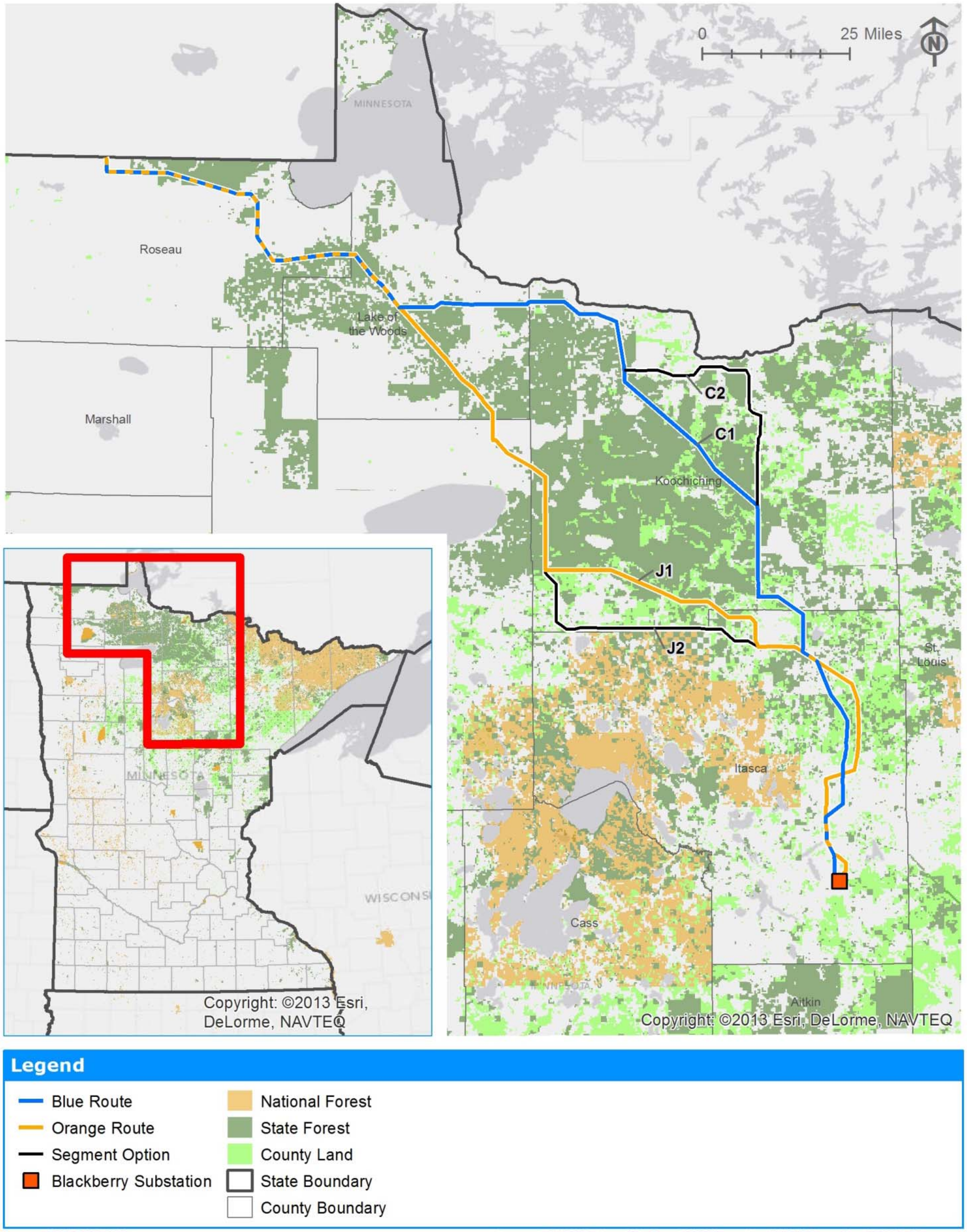
Minnesota DNR is the majority public owner and manager of forested lands within the Study Area. Therefore, the following summary uses statistics from Minnesota DNR to characterize forest management and timber harvesting conditions. Table 6.25-2 provides a summary of the ECS Subsections crossed by the Route Alternatives.

Aspen Parklands

The Aspen Parklands Subsection covers approximately 2.9 million acres (see Table 6.25-2) in northwestern Minnesota. (Minnesota DNR 2011) More than 60 percent of this subsection is in agriculture, mostly in the southern half. In the northern half, where the Project will be located, extensive areas recently have been cleared for farming (Minnesota DNR 2006a).

The state owns 12 percent of the land (that is, 355,000 acres) in the Aspen Parklands Subsection. Approximately 95,000 acres of state lands are forest and woodlands that are part of Minnesota DNR's forest management plan. From 2000 to 2009, an average of 21,524 cords per year was sold from Minnesota DNR forestlands in the subsection. The most commonly harvested timber was aspen (*Populus* spp.) and jack pine (*Pinus banksiana*). Aspen includes both aspen species and balm of Gilead (*Populus balsamea*). (Minnesota DNR 2011).

County, State, and National Forest Lands **Figure 6.25-1**



Sources: ESRI, DNR, FWS
\\mspe-gis-file\GISProjLarge\MinnPower\182035\map_docs\CLIENT\Route_Permit\0625-1_Forest.mxd

Table 6.25-2. Ecological Classification System Subsections Within Route Alternatives and Substation

ECS Sub-section	Sub-section Size (Acres)	Average Cords Sold Per Year	Orange Route			Blue Route			500 kV Substation[4]
			Route Within Subsection (Acres and % of Subsection)	State Land (Acres)	County Land (Acres)	Route Within Subsection (Acres and % of Subsection)	State Lands (Acres)	County Lands (Acres)	Area within Subsection (Acres and % of Subsection)
Aspen Parklands	2.9 million	21,524[1]	3,333 (0.1%)	64	0	3,333 (0.1%)	64	0	0
Agassiz Lowlands	3.7 million	205,500[2]	41,125 (1.1%)	25,112	2,891	36,080 (1.0%)	23,760	438	0
Littlefork-Vermillion Uplands; St. Louis Moraines; Nashwauk Uplands; Tamarack Lowlands	5.5 million	191,555[3]	31,392 (0.6%)	6,522	10,572	32,104 (0.6%)	11,238	7,978	25
TOTAL	12.1 million		75,850 (0.6%)	31,698	13,463	71,517 (0.6%)	35,063	8,416	25

Source: Minnesota DNR 2007, 2009, 2010a, 2010b, 2011

Notes

[1]Period: 2000-2009

[2]Period: 2003-2009

[3]Period: 1997-2006

[4]Substation is located entirely on private land.

Agassiz Lowlands

The Agassiz Lowlands Subsection covers 3.7 million acres (see Section 6.6, Land Use and Figure 6.6-1). All of Lake of the Woods County is within this subsection, also the eastern portion of Roseau County, the northern half of Beltrami County, and western half of Koochiching County. Minnesota DNR forestlands represent approximately 57 percent of the total land area ownership in the Agassiz Lowlands Subsection (Minnesota DNR 2010a).

Approximately 75 percent of this flat, poorly drained lake plain is covered with peat soils that form fens and raised bogs dominated by bog forest species (that is, black spruce, northern white cedar, and tamarack). Sandy beach ridges provide local topographic relief of less than 50 feet on most of the lake plain. These ridges commonly are vegetated by aspen birch and jack pine. Forestry is an important land use: black spruce, red and jack pine, and quaking aspen are used for paper manufacture and sawlogs. Recreation, another major benefit of forestland, primarily is associated with the three large lakes (that is, Lakes of the Woods, Upper Red Lake, and Lower Red Lake), and hunting, trapping, and wildlife viewing on public lands (Minnesota DNR n.d.).

During the period of 2003 to 2009, an average of 205,500 cords per year was sold from Minnesota DNR forestlands in the Agassiz Lowlands Subsection (see Table 6.25-1). The most commonly harvested timber was aspen, tamarack, black spruce, and jack pine (Minnesota DNR 2010a).

Littlefork-Vermilion Uplands, St. Louis Moraines, and Nashwauk Uplands

For forest management planning and evaluation, Minnesota DNR has combined these three subsections with a fourth, the Tamarack Lowlands Subsection, so these four subsections are discussed together:

- → The Littlefork-Vermilion Uplands Subsection covers 1.6 million acres (see Table 6.25-1), 70 percent of which is classified as forested.(Minnesota DNR 2006b)
- → The St. Louis Moraines Subsection covers 1.6 million acres, 64 percent of which is classified as forested. (Minnesota DNR 2006c)
- → The Nashwauk Uplands Subsection covers 810,000 acres, 54 percent of which is classified as forested. (Minnesota DNR 2006d)
- → The Tamarack Lowland subsection covers 1.5 million acres, 52 percent of which is classified as forested (Minnesota DNR 2006e)

Recreation, forestry, and tourism are major land uses in these subsections. Public agencies administer 50 percent of the land (approximately 2.75 million acres). The state portion comprises 1.24 million acres (that is, 22 percent) of the four subsections. Approximately 1.17 million acres of the state land are managed for wood products. State lands totaling 70,000 acres contain state parks and scientific and natural areas. Substantial areas of Koochiching and Itasca counties are owned and managed by county land departments, including 18 percent of the Orange Route and 12 percent of the Blue Route (see Section 6.6, Land Use, and Table 6.6-1). From Fiscal Year (FY) 1997 to FY2006, an average of 191,555 cords (see Table 6.25-2) were sold per year from Minnesota DNR forestlands in the four subsections combined (Minnesota DNR 2007). Aspen and birch cover types comprise 49 percent of this forest.

Economic contributions to the area from the wood sold are summarized in Minnesota DNR's *Littlefork Vermilion Uplands/St. Louis Moraines/Nashwauk/Tamarack Lowlands Subsection Forest Resource Management Plan Assessment (SFRMP)* (Minnesota DNR 2010b). Approximately $4.2 million worth of timber was sold from Minnesota DNR lands within the Littlefork-Vermilion Uplands Subsection, $1.2 million in Nashwauk Uplands, and $1.5 million in St. Louis Moraines in FY2006. Aspen is the most commonly harvested timber.

Corporate and Industrial Forest Lands

Corporate and industrial companies also manage timber in the Study Area. These companies include Blandin Paper Co., Potlach Corporation, and Meriwether Land and Timber. Small, private timber operations may also exist within the Study Area; however, they are not discussed in this document. The Orange Route contains 7,679 acres of known corporate and/or industrial forestland; the Blue Route contains 8,996 acres.

6.25.2 Direct and Indirect Effects

Construction of the transmission line would convert forestland within the right-of-way (ROW) to shrub and grasslands. Development of the Orange Route and the Blue Route will require permanently converting approximately 2,745 and 2,680 acres of forestland, respectively, within the anticipated ROW (see Table 6.25-3). The majority of the forest impacts within the ROW will occur to a similar amount of deciduous (primarily aspen), and coniferous forest communities (primarily black spruce-*Picea mariana*), and relatively minimal impacts occurring to mixed conifer-deciduous forest communities. Corporate/industrial forestland within the anticipated ROW varies from approximately 470 acres (8.8% of total ROW) within the Orange Route and approximately 719 acres (13.5% of total ROW) within the Blue Route.

Table 6.25-3. Forest Impacts Within the Anticipated ROW of the Route Alternatives

Cover Type	Orange Route	Blue Route	Substation
	Acres		
Conifer forest	1,209	1,489	0
Deciduous forest	1,537	1,191	5
Total forested	2,745	2,680	5
Total ROW area	5,332	5,321	--
Percent of ROW that is forested	51.5%	44.7%	--
Percent of ROW that is corporate/industrial forestland	8.8%	13.5%	

Source: County-level parcel data, 2012 & DNR forestry data, 2013

The Project will employ a clearing contractor to clear the ROW. The long-term impact of taking acreage out of forest production will be minimal because of the Project acreage is small in comparison to the regional timber resources. The amount of forested land that will be converted is small relative to the extent of forestlands in the region. For example, the approximately 2,700 acres of forest that will be cleared in the anticipated ROW of the Orange Route or the Blue Route is less than 0.4 percent of the amount of Minnesota DNR managed areas considered suitable for timber harvest in the four subsections (Littlefork-Vermilion Uplands, St. Louis Moraines, Nashwauk Uplands, and Tamarack Lowlands) described earlier. This percentage will decrease when county and privately managed forest lands are added, as there are also substantial harvestable timber on county and privately managed forestlands in those subsections.

Additional impacts on forestlands are likely for the 500 kV Substation. Approximately 5 acres of forest will be affected for substation construction. Temporary impacts for construction of access roads and creation of storage and lay-down areas will be calculated following determination of the final Route Alternative.

Table 6.25-4. Forest Impacts (acres) Within the Anticipated ROW of the Segment Options

Segment Option	Segment Length (miles)	Conifer Forest (acres)	Deciduous Forest (acres)	Conifer-Deciduous Mix (acres)	Total Forested (acres)	Total ROW Area (acres)	Percent of ROW that is Forested
C1	33	493	154	-	647	797	81.2
C2	46	353	215	-	568	1,116	50.9
J1	50	331	656	-	987	1,212	81.4
J2	53	134	914	7	1,055	1,284	82.2

Source: USGS, 1991-1993, GAP Level 1

6.25.3 Mitigation

Construction of the Project will result in a permanent conversion of forestland to non-forest use. The Applicant proposes the following mitigation measures:

- → The timber that is cleared remains the property of the landowner. To the extent practical, the Applicant will work with the landowner to determine a mutually agreeable means of disposing of the cleared material, such as chipping, burning, or stacking for landowner use or sale. Once construction is complete, the ROW will be managed to promote the establishment of forbs and grasses. Shrubs will be allowed to regenerate within the ROW as long as they do not interfere with maintenance, access, and the safe operation of the transmission line.
- → Construction staging areas will be located and arranged in a manner to preserve trees and vegetation to the maximum extent practicable.
- → To the extent practicable, staging areas will be restored to preconstruction conditions.
- → Temporary access roads outside of the ROW will be required. The Applicant will work with local property owners to identify suitable access locations. Temporary roads and other temporarily impacted areas will be restored as appropriate once construction is completed.
- → The Applicant will coordinate with regulatory agencies to identify appropriate measures to avoid and minimize effects on forest resources on federal, state, and county-owned properties.

6.26 Mining

This section provides a description of mining resources within the Study Area and an evaluation of the potential effects on those resources from constructing and operating the Project.

Mining data from the Minnesota Department of Natural Resources (DNR) was used to identify mining operations within the Study Area and GIS was used to determine any potential impacts to these areas.

6.26.1 Existing Conditions

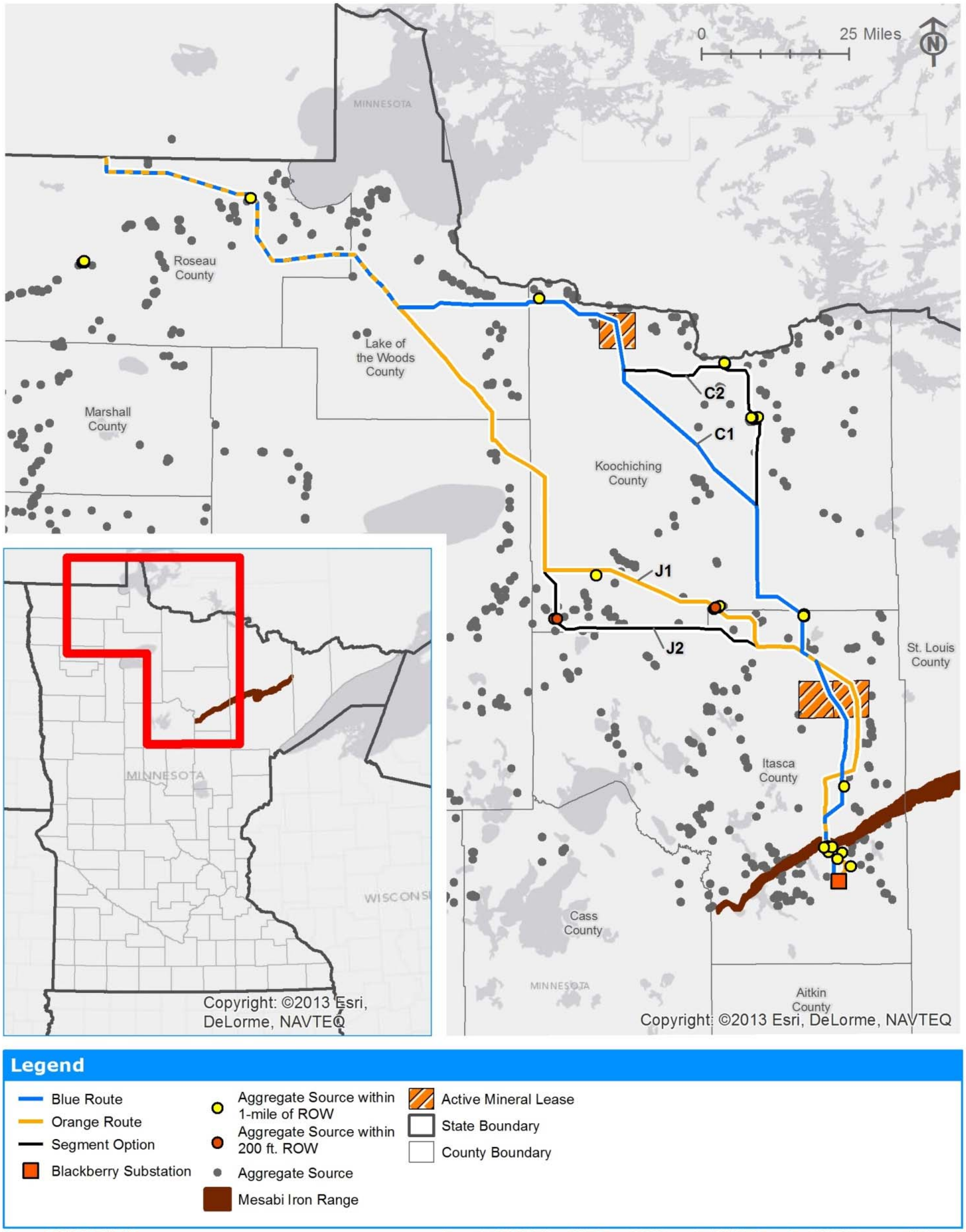
Large deposits of glacially derived sediments and iron-bearing bedrock are present within the Study Area (see Section 6.1, Geomorphic and Physiographic Environment, for a more detailed description of the geologic conditions). Due to the presence of these materials, aggregate and iron mining operations are located in the vicinity of the Study Area and within the Orange Route Alternative and Segment Option J2 (see Figure 6.26-1).

Minerals of economic significance found in Minnesota can be divided into two broad classes consisting of metallic minerals and industrial minerals. Metallic minerals include both ferrous minerals, which primarily contain iron, and non-ferrous minerals, which include manganese, copper, nickel, titanium, and platinum group metals. Minnesota has offered leases of its non-ferrous metallic mineral interests for exploration and development since 1966. There are currently 343 active state non-ferrous metallic mineral leases within six counties in northern Minnesota, but only one of those leases has resulted in a mining proposal subject to regulatory and environmental review. That proposal, the NorthMet Project near Hoyt Lakes, is not within the Study Area for the Project. The Blue Route Alternative intersects active state non-ferrous metallic mineral leases in north-central Koochiching County, specifically in Township 159 North, Range 27 West (see Appendix A, sheets 21-22). This area was explored for copper, nickel, and platinum group metals as recently as 2011 and the metals discovered there could lead to future exploration or development of the mineral resources. Active state non-ferrous metallic mineral leases currently intersect the Orange and Blue Route Alternatives in Itasca County, specifically in Township 60 North, Range 23 West and Township 60 North, Range 24 West (see Appendix A, sheets 42-45). This area was explored for gold as recently as 2010 (Minnesota DNR 2013b) (Figure 6.26-1). Except for the exploration activities mentioned above, little exploration for non-ferrous minerals has occurred since 1998 in the counties crossed by the Study Area, although significant exploration for gold, diamond, copper, nickel, and platinum group metals occurred near the Study Area from 1987 to 1998 (Minnesota DNR 2013c). The Applicant is not aware of any mining proposals related to the active mineral leases in the Study Area.

minnesota power AN ALLETE COMPANY | GREAT NORTHERN TRANSMISSION LINE

Aggregate and Iron Ore Mining Resources

Figure 6.26-1



Sources: ESRI,DNR, MnDOT

\\mspe-gis-file\GISProjLarge\MinnPower\182035\map_docs\CLIENT\Route_Permit\0626-1_Aggregate_Mining.mxd

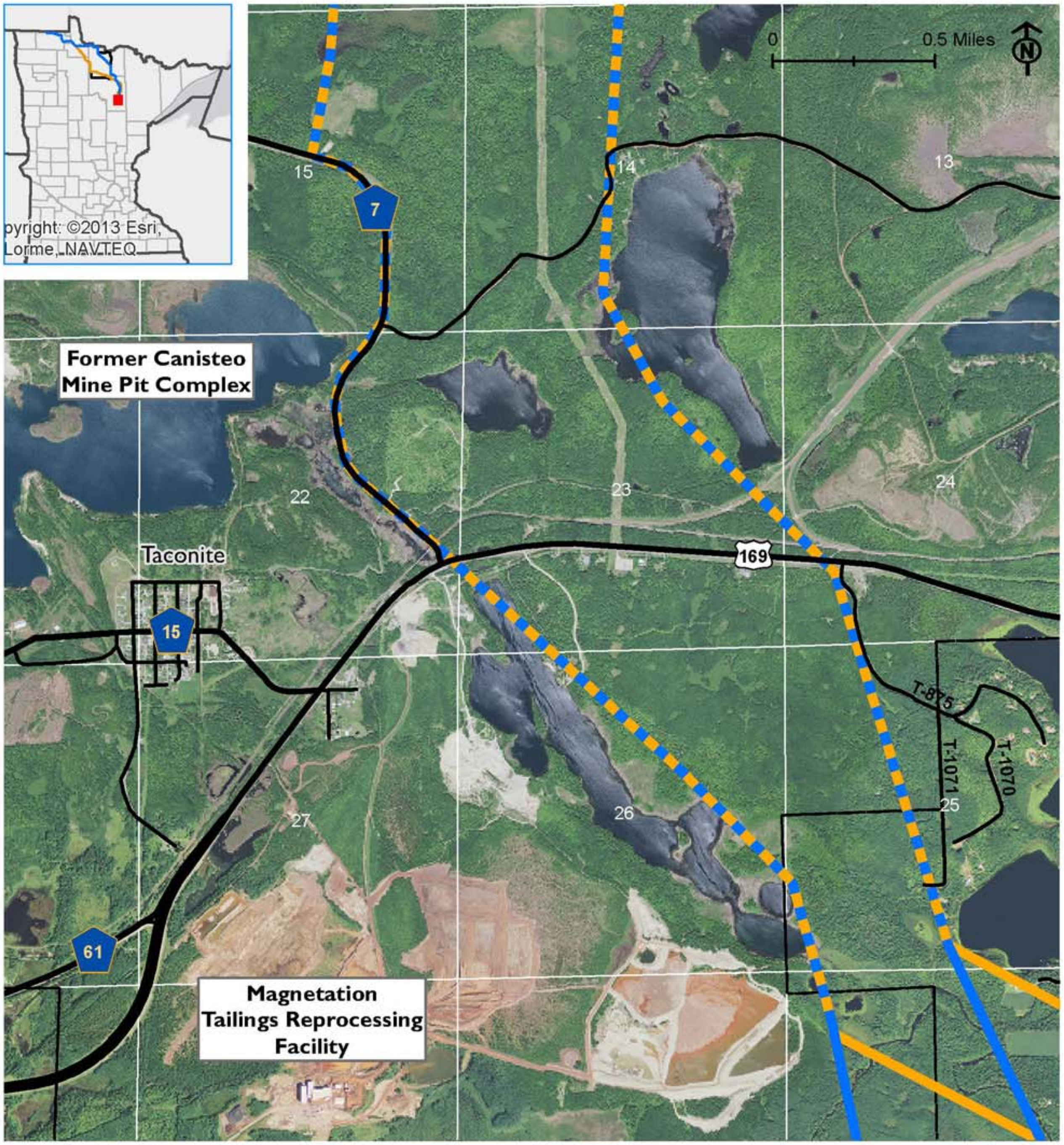
Ferrous minerals have been mined on the Mesabi Iron Range in the southeastern portion of the Study Area since the late 1800s. In 2009, Minnesota was the national leader in iron production (USGS 2009). Iron ore and taconite are the most abundant ferrous minerals in Minnesota and are actively mined on the Mesabi Iron Range. High-grade iron ore deposits have been largely depleted through mining, leaving the lower-grade taconite as the primary source of iron currently mined. Tailings from past iron ore mining are also being reprocessed to recover additional iron (see Figure 6.26-2).

One active and one inactive ferrous metallic mine occur in the vicinity of the Route Alternatives. An active tailings reprocessing facility and tailings disposal basin is located southeast of the City of Taconite in Itasca County, and is approximately 2,000 feet west of the Orange and Blue Route Alternatives (see Appendix A, sheet 52). To the northeast of the City of Taconite, the Blue Route Alternative is approximately 3,000 feet east of the inactive Canisteo mine pit complex, which is currently a lake and the site of iron ore mining until 1985 (see Appendix A, sheet 52). The metallic mine features are shown in Figure 6.26-2.

Industrial minerals in Minnesota include construction aggregate, peat, kaolin clay, dimension stone, landscape stone, and silica sand. Aggregate mining operations are found in nearly every county of Minnesota (Minnesota DNR 2013c). Construction aggregate production in Minnesota includes three general categories of material, which are sand and gravel mined from glacial deposits or alluvial deposits; crushed dolomite or limestone mined from bedrock in southeastern Minnesota; and crushed rock mined elsewhere from diabase, gabbro, gneiss, granite, quartzite, rhyolite, taconite, and trap rock (USGS 2005). Within Minnesota, aggregate operations fall primarily under the jurisdiction of the local government (Minnesota DNR 2013c). In 2009, Minnesota's nonfuel raw mineral production was valued at $2.15 billion (USGS 2009). While the counties included within the Study Area were contributors to this overall valuation, the major production was of industrial minerals in these counties. Beltrami, Itasca, and Roseau counties are listed as having principal producing areas of construction sand and gravel (USGS 2009). Additionally, Roseau County contains crushed stone quarries.

Iron Mining in the Project Vicinity

Figure 6.26-2



Legend

- Blue Route
- Orange Route
- Route Option
- City / Township Boundary

Sources: ESRI,DNR, MnDOT

\\mspe-gis-file\GISProjLarge\MinnPower\182035\map_docs\CLIENT\Route_Permit\0626-2_IronMining.mxd

The only industrial mineral mining operations that occur in or near the Study Area are aggregate mining sites. For this analysis, aggregate source information was obtained from Minnesota DOT's Aggregate Source Information System and downloaded into a geographic information system (GIS) program for location verification using aerial photographs. According to the Minnesota DOT data, 32 areas containing active and inactive aggregate resources are located within 1 mile of a Route Alternative or Segment Option (Minnesota DOT 2013). These resources are shown in Figure 6.26-1. The aggregate mining sites are spread out across the Study Area. The most notable concentration of such mining operations within the Study Area is located along U.S. Highway 71, approximately 2.5 miles southwest of Littlefork, within 1 mile of Segment Option C2 (see Appendix A, sheet 83). Four sites are within 500 feet of a Route Alternative or Segment Option, two of which are within the anticipated ROW. The Orange Route Alternative contains two gravel pits, located in Section 35 of Township 63 North, Range 27 West as identified by Minnesota DOT analysis. One of these sites is listed as active, the other inactive, and 2013 aerial photographs indicate one of the sites is within the anticipated ROW (see Figure 6.26-1 and Appendix A, sheet 74). The gravel pit within the anticipated ROW is approximately 150 feet wide, measured perpendicular to the anticipated ROW. Segment Option J2 contains two gravel pits in Sections 22 and 23 of Township 151 North, Range 26 West. Both of these sites are listed as active and appear to be one continuous pit on 2013 aerial photographs, and intersect the anticipated ROW (see Figure 6.26-1 and Appendix A, sheet 88)). The continuous gravel pit is approximately 2,200 feet wide, measured perpendicular to the ROW. There are no known aggregate resources located within the Blue Route Alternative or any other Segment Options.

Significant peat deposits exist in much of the Study Area as indicated by Hobbs and Goebel (1982), but are not actively mined near the Study Area.

6.26.2 Direct and Indirect Effects

The construction of a transmission structure within an aggregate resource, potential quarry, or mining area can reduce the development potential of these resources by limiting access to the underground mining resource and limiting use of heavy mining equipment and explosives (that is, blasting) near transmission lines. Because of this conflict, transmission line routes generally avoid aggregate resources and mining areas. Although the Orange and Blue Route Alternatives cross the Mesabi Iron Range, there are no historic or active iron ore or taconite mines within the Route Alternatives. Both Route Alternatives intersect active state non-ferrous metallic mineral leases. There are currently no active non-ferrous metallic mines on the leased land, although the potential exists for additional exploration and future mining in the Study Area. The Project has the potential to directly affect future development of metallic mineral resources. If a future metallic mining operation were to intersect the ROW, the Applicant would work with the interested parties to identify an appropriate solution.

One gravel pit is located within the anticipated ROW of the Orange Route Alternative and Segment Option H2. For the Orange Route Alternative, there should be sufficient room to route the final ROW to avoid the gravel pit shown in the 2013 aerial photographs. The gravel pit intersecting Segment Option H2 is approximately 2,200 feet wide, but detailed ROW planning within the Segment Option would provide the opportunity to refine the position of the transmission line and avoid existing gravel pit operations and resources. Therefore, no direct impacts on aggregate mining resources are expected to occur due to construction and operation of the Project.

6.26.3 Mitigation

The Applicant proposes that if mining resources cannot be avoided, the Applicant would work with existing mining operators and mineral lessees to identify the extent of current and planned mining operations and develop appropriate mitigation measures.

7.0 Cumulative Impacts

In addition to analyzing the individual impacts of a project, the federal environmental review process requires consideration of the cumulative environmental impacts of multiple projects within an area. In conformance with the National Environmental Policy Act (NEPA) requirements, this section discusses the cumulative significance of past, present, and reasonably anticipated future projects on the environment in conjunction with the Great Northern Transmission Line (GNTL) Project.

7.1 Regulatory Requirement

The Council on Environmental Quality (CEQ) Regulations for Implementing the Procedural Provisions of NEPA defines cumulative impacts as:

- → The impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of which agency (that is, federal or non-federal) or person undertakes such other actions (40 Code of Federal Regulations [CFR] 1508.7).
- → Cumulative impacts are considered direct effects, which are "caused by the action and occur at the same time and place" (40 CFR 1508.8).

7.2 Analytical Approach

This cumulative impacts review was developed in consultation with the federal, state, and local agencies responsible for the various environmental resources within the Route Alternatives and Segment Options, and is limited to those resources the agencies identified as being of concern and potentially requiring mitigation. This type of screening ensures that the analysis focuses on critical resources. The cumulative impacts analysis is based on existing conditions of the critical environmental resources in each of the Route Alternatives and Segment Options.

This analysis uses an approach that consists of the following steps:

- → Establish valued environmental components
- → Establish temporal and spatial study boundaries
- → Identify past, present, and reasonably foreseeable activities both direct and indirect
- → Analyze cumulative impacts through use of a matrix format (CEQ 1997)

7.3 Valued Environmental Components

Valued environmental components (VECs) are those components of the environment for which there is regulatory or public concern. VECs include the social, cultural, technical, economic, and natural components of the environment. This section follows two principles identified by CEQ when considering VECs: (1) focus only on the effects and resources within the context of the proposed action; and (2) present a concise list of issues that have relevance to the anticipated effects of the proposed action or eventual. Based on this guidance, the resources examined in Section 6.0, Affected Environment and Environmental Consequences were reviewed to determine which constituted VECs that may be affected by cumulative actions. The factors used to decide which resources to review are listed below:

→ Aesthetics – Further consideration required, because the aesthetics section of the Application discusses four general regions that the Project will be routed through. Visual impacts and overall changes in aesthetics will vary depending on the terrain, topography, and vegetative cover of the landscape. Views of the Project cannot be avoided completely due to its size and the open landscape in some areas of the Study Area.

→ Agricultural Production and Prime Farmland – No further consideration required, because analysis provided in the Application showed that less than 1 acre of impacts on agricultural land are anticipated for both the Orange Route and the Blue Route. Removal of the small amount of agriculture is not expected to affect the agriculture negatively in the Study Area.

→ Air Quality – No further consideration required, because all predicted emission levels will be caused by construction equipment during the construction period. The resulting emissions will be low and temporary, with concentrations likely not exceeding state and federal standards.

→ Archaeological and Historic Resources and Cultural Values – Further consideration required. The Applicant will work with U.S. Department of Energy to develop a Programmatic Agreement (PA) for the Project, and will conduct cultural resource surveys, and mitigation in accord with the PA.

→ Climate – No further consideration required, because the Route Alternatives and Segment Options will not cause an increase in greenhouse gas emissions.

→ Economic Factors – No further consideration required, because all Route Alternatives and Segment Options will affect economic conditions positively by improving the reliability of the local transmission system and reducing the potential for brown-outs.

→ Environmental Justice – No further consideration required, because the Project does not anticipate effects on minority populations.

→ Electric and Magnetic Fields – No further consideration required, because the Route Alternatives and Segment Options will be constructed following prudent avoidance guidance.

→ Wildlife – Further consideration required, because of the potential for bird strikes, habitat change, and habitat fragmentation.

→ Vegetation – Further consideration required to address any regional activities that may affect vegetation potentially impacted by the Project.

→ Forestry – Further consideration required, because the Route Alternatives and Segment Options are anticipated to impact forestlands permanently.

→ Geology, Soils, and Minerals – No further consideration required, because the Applicant will use approved and proven mitigation measures to minimize the potential for soil erosion.

→ Human Settlement – Further consideration required, because the Project may have an indirect effect on property values, although no residence displacement is anticipated.

- → Land Use – Further consideration is required, because the Route Alternatives and Segment Options have the potential to impact forestry activities. Land in the Project's ROW will not return to its pre-existing state as forestland, but it will be maintained in a shrub or grassland state.
- → Mining – Further consideration required, because the Orange Route and the Blue Route intersect active state metallic mineral leases.
- → Noise – Further consideration required, because the Orange Route and the Blue Route will parallel existing transmission lines.
- → Public Services – No further consideration required, because the Route Alternatives and Segment Options will not restrict the public from any public service.
- → Radio, Television, and Cellular Phone – No further consideration required, because transmission lines rarely result in any adverse impacts, and in the rare case that there are adverse impacts, they can be mitigated readily by tightening loose hardware or upgrading receiving antennas.
- → Recreation and Tourism – Further consideration required, because the Orange Route and the Blue Route cross state forests, state Wildlife Management Areas (WMAs) and state trails.
- → Rare and Unique Species and Communities – Further consideration required to address any regional activities that may affect special status species habitat potentially impacted by the Project.
- → Transportation – No further consideration required, because of the high capacity of the existing roadway system and likelihood of mitigating any impact from Project construction.
- → Water Resources – Further consideration required, because there are anticipated impacts on surface water resources for both routes including public watercourse crossings, as well as potential structure placement in public water basins and floodplains.
- → Wetlands – Further consideration required, because of the potential for additional losses and habitat conversion of waters of the United States.

7.4 Temporal and Spatial Boundaries

The temporal boundary is the design life of the Project facilities. Spatial boundaries are based on the Project Study Area, which generally includes all land within the Route Alternatives and Segment Options, but may vary somewhat depending on the resource at issue. The analysis was conducted considering other linear projects (such as, pipelines, roads and transmission lines) within a reasonable distance from the proposed Project. This approach was taken because these projects would impact the same or similar resources to those impacted by the proposed Project.

7.5 Past, Present, and Reasonably Foreseeable Activities

Regulations and case laws provide direction as to what constitutes a reasonably foreseeable action that should be included in a cumulative impacts review. Reasonably foreseeable activities include activities that are not speculative and that constitute an independent utility or function.

In addition, a reasonably foreseeable project should be planned and funded (Canter and Rumrill 1997).

The past, present, or reasonably foreseeable activities that may impact resources affected by the Project include the following:

→ Existing Winnipeg – Iron Range 500 kV transmission line
→ Existing Winnipeg – Iron Range 230 kV transmission line
→ Essar 230 kV transmission line project
→ Canisteo 115 kV transmission line project
→ Minnesota DOT completed an expansion of U.S. Highway 71

The Canisteo 115 kV transmission line project is currently being permitted. Because Minnesota DOC is reviewing the Canisteo project, it could be considered reasonably foreseeable activity. The routing process includes identifying opportunities to construct the Project along other linear features such as pipelines and transmission lines. The Applicant considered these opportunities and is proposing Route Alternatives and Segment Options that create the fewest impacts across the region, but could result in cumulative effects on some resources by constructing the transmission line in parallel with other linear projects.

The following provides a summary of the reasonably foreseeable activities identified within the Study Area that may contribute to direct or indirect cumulative impacts.

7.5.1 Transmission Lines

The following projects are on Minnesota DOC's Siting and Routing of Energy Facilities Docket.

Past Projects (have received permit)

Minnesota Power has constructed three out of the four 230 kV transmission lines permitted to supply reliable electric power to a single source entity: Essar Steel Minnesota. The four routes total 37 miles of new transmission line located in Itasca County. The Project will cross the transmission lines in this area.

Present Projects (have not received permit, but are open on Minnesota DOC's Siting and Routing of Energy Facilities Docket)

Minnesota Power has submitted an application to construct two, approximately 5-mile-long, 115 kV high-voltage transmission lines and a substation near Coleraine, Minnesota, located in Itasca County (the Canisteo 115 kV project). The two transmission lines, each 4.5 miles in length, will be constructed parallel to one another with an overlapping ROW of 160 feet. The nearest point of this project is approximately 1.5 miles from the proposed Project.

Reasonably Foreseeable Future Project

There are no projects currently identified within this category.

7.5.2 Roadway Infrastructure

The Minnesota Department of Transportation (DOT) Statewide Transportation Improvement Program identifies various transportation projects in the Route Alternatives and Segment Option areas for the period 2013–2016 (Minnesota DOT 2012).

Review of the planned projects for Minnesota DOT Districts 1 and 2 on November 19, 2013, showed that the transportation projects generally consist of routine maintenance activities such as road and highway re-surfacing, asphalt surface treatment, bridge repair, bituminous overlay, milling and overlay, concrete paving, railroad crossings, and pedestrian bike trail improvements. There are no other projects identified by Minnesota DOT.

7.5.3 Pipelines

The following projects are on Minnesota DOC's Siting and Routing of Energy Facilities Docket.

Past Projects (have received a permit)

Great Lakes Gas Transmission (Great Lakes) operates six natural gas pipelines within the Study Area. These 6 natural gas pipelines generally would follow Enbridge's existing Minnesota pipeline ROWs through the following counties: Kittson, Marshall, Pennington, Red Lake, Polk, Clearwater, Beltrami, Hubbard, Cass, Itasca, Aitkin, St. Louis, and Carlton.

Future Projects (have not received permit, but are open on Minnesota DOC's Siting and Routing of Energy Facilities Docket)

Minnesota DOC's Siting and Routing of Energy Facilities Docket includes a number of projects, however, they are all located at least 35 miles away from the GNTL. Therefore, these projects were not considered in the analysis matric, below.

7.6 Interaction Matrix

The assessment of potential impacts is possible through the use of an interaction matrix based on the identified relevant activities. An interaction matrix not only lists activities and environmental effects, but also incorporates an association between cause and effect using evaluation criteria (CEQ 1997).

Table 7-1, below, contains a general description of potential cumulative impacts for the VECs identified above. A more project-specific analysis of cumulative effects will be generated as more information is gathered. As previously noted, cumulative impacts result from spatial (that is, geographic) and temporal (that is, time) crowding of environmental impacts. Table 7-1 lists impacts criteria that reflect common categories cited in CEQ's Considering Cumulative Effects under the National Environmental Policy Act (1997). The cause-and-effect pathway criteria shown in Table 7-2 are used to evaluate potential interactions of past, present, and reasonably foreseeable activities shown in Table 7-1, which lead to potential cumulative impacts. Table 7-1 also suggests the types of mitigation measures that could be employed to mitigate cumulative effects, if they are determined to exist.

Table 7-1. Interaction Matrix

Resource	Project Impact	Past, Present, and Reasonably Foreseeable Activities	Cumulative Impacts	Potential Mitigation
Aesthetics	Introduce structures and change forest land to shrub-type landscape	Previous powerlines, pipelines, roadway infrastructure, and energy corridors	Fragmentation and compounding effects	Paralleling with existing linear utilities to minimize number of impacted locations and to focus similar activities in one area
Wildlife	Displacement, avian collisions, habitat change, and habitat fragmentation	Previous powerlines, pipelines, roadway infrastructure, and energy corridors	Fragmentation and compounding effects	Coordinate construction schedules where practical to minimize displacement of wildlife; develop avian protection plan, include avian protection design measures at critical stream crossings
Vegetation	Removal of vegetation and conversion from forest to grass or shrub lands	Previous powerlines, pipelines, roadway infrastructure, and energy corridors	Fragmentation and compounding effects	Revegetate with native species
Forestry	Removal of vegetation	Previous powerlines, pipelines, roadway infrastructure, and energy corridors	Compounding effects	Revegetate with native species
Human Settlement	Displacement and lower property values	Previous powerlines, pipelines, roadway infrastructure, and energy corridors	Compounding effects	Comply with applicable federal and state relocation and property acquisition requirements
Land Use	Removal of vegetation in forest areas	Previous powerlines, pipelines, roadway infrastructure, and energy corridors	Fragmentation and compounding effects	Develop a reclamation plan
Mining	Structure placement on state metallic lease land	Previous powerlines, pipelines, roadway infrastructure, and energy corridors	Indirect	Coordination with state agency to determine structure location

Resource	Project Impact	Past, Present, and Reasonably Foreseeable Activities	Cumulative Impacts	Potential Mitigation
Recreation and Tourism	Crosses state forest, WMAs, and trails	Previous powerlines, pipelines, roadway infrastructure, and energy corridors	Compounding effects	Minimize crossings of state lands as practical when identifying structure locations
Special status species	Displacement, mortality, habitat change, and habitat fragmentation	Previous powerlines, pipelines, roadway infrastructure, and energy corridors	Fragmentation and compounding effects	Coordinate with regulatory agencies and implement project-specific conservation measures
Water Resources/ Wetlands	Sedimentation, turbidity, runoff, and wetland fill and wetland type conversion	Previous powerlines, pipelines, roadway infrastructure, and energy corridors	Fragmentation and compounding effects	Comply with state and federal regulations, including development of wetland mitigation plan

Table 7-1. Cumulative Interaction Criteria

Pathway Criteria	Main Characteristics	Example
Time crowding	Frequent and repetitive effects on an environmental system	Forest harvesting rates exceeding regrowth
Time lags	Delayed effects	Exposure to carcinogens
Space crowding	High spatial density of effects on an environmental system	Pollution discharges into streams from nonpoint sources
Cross-boundary	Effects that occur away from the source	Acidic precipitation
Fragmentation	Change in landscape pattern	Fragmentation of natural habitat
Compounding effects	Effects arising from multiple sources or pathways	Synergism among pesticides
Indirect effects	Secondary effects	Commercial development following highway construction
Triggers and thresholds	Fundamental change in system behavior or structure	Global climate change

This page intentionally left blank

8.0 Other Required Considerations

8.1 Unavoidable Adverse Environmental Impacts

Unavoidable adverse environmental impacts are those that will occur from constructing and operating the Project after implementing standard and additional mitigation measures. Based on impact analyses, impacts will occur for soils; vegetation; human settlement; land use; environmental justice; aesthetics; water resources and floodplains; wetlands; wildlife and rare and unique species; recreation and tourism; agricultural production; forestry; and mining. Mitigation measures associated with these resources have been provided in their respective sections in Section 6.0.

8.1.1 Soils

Soil disturbance will be minimal and will be concentrated at structure locations. Actual surface soil disturbance, primarily due to vehicle traffic on access paths, is expected to be approximately 12.5 percent of the anticipated right-of-way (ROW) for all Route Alternatives.

8.1.2 Vegetation

Construction of the Project will require areas to be cleared of vegetation and trees. Approximately 2,745 acres of forest will be converted permanently for the Orange Route and approximately 2,680 acres for the Blue Route. In some cases, the clearing of forest areas within the Route Alternatives may include clearing small areas of what may be considered old growth forest.

8.1.3 Human Settlement

No residences are located within the anticipated ROW for either the Route Alternatives or Segment Options, thus, no residences will have to be modified or otherwise directly impacted for the construction or operation of the Project.

8.1.4 Land Use

The primary land use impacts will be the result of forest clearing and limitations on future development within the anticipated ROW. Permanent impacts to privately owned lands total approximately 11 acres for the Orange Route and 12 acres for the Blue Route. Approximately 2,517 acres of state forest land will be converted permanently to non-forested land for the Orange Route and approximately 2,881 acres for the Orange Route. Neither Route Alternative will impact zoning districts.

8.1.5 Environmental Justice

Neither Route Alternative is anticipated to have a disproportionately high or adverse affect on minority or low-income individuals or households, or have a high impact on any individual or population. While there will be permanent visual effects, there are no adverse economic or human health impacts.

8.1.6 Aesthetics

Construction of the Project will result in long-term, new, or additive adverse visual impacts within the viewshed, particularly in areas where the Route Alternatives intersect or run near recreational opportunities and/or scenic highways.

8.1.7 Water Resources and Floodplains

Structures will be located outside of floodplains to the extent practicable. The Applicant will work with the jurisdictional agencies to determine the best ways to minimize impacts and create appropriate mitigation measures.

Spanning streams and rivers is not likely to cause unavoidable adverse environmental impacts.

8.1.8 Wetlands

Unavoidable adverse environmental impacts will occur where forested wetlands are converted to emergent wetlands and where structures are placed within wetlands. The Orange Route will require approximately 0.56 acres of total wetland fill for structure placement within wetlands and the Blue Route will require approximately 0.60 acres of total wetland fill. The substation will require an additional 5.3 acres of wetland fill. The Orange Route and the Blue Route will require permanently converting approximately 1,667 acres and 1,908 acres of forested wetland to emergent or shrub wetland types, respectively.

8.1.9 Wildlife and Rare and Unique Species

Unavoidable adverse environmental impacts on wildlife species will include the loss or alteration of breeding and foraging habitats and increased habitat fragmentation. Mortality could occur in less mobile or burrowing species. Abandonment of a nest site and the loss of eggs and/or young may occur and the Applicant will need to schedule activities to avoid harming nests and to otherwise comply with the Migratory Bird Treaty Act. Unavoidable adverse environmental impacts on migrating and foraging birds may result from the increased potential for collision with the Project's overhead wires. However, these impacts are not expected to have an overall effect on local populations.

During construction, indirect unavoidable adverse environmental impacts may include habitat disruption resulting from elevated noise, increased human presence, and dust deposition. These impacts may extend beyond the boundaries of the construction area. These effects may result in changes in habitat quality, habitat loss, animal displacement, and changes in species composition. Special status species or their habitats are present within the Route Alternatives. Surveys for special status species will be conducted once the final Route Alternative is selected. Implementing mitigation in accordance with the U.S. Fish and Wildlife Service (USFWS) Biological Opinion, if necessary, and Minnesota Department of Natural Resources (DNR) guidance will reduce impacts on special status species.

8.1.10 Recreation and Tourism

Unavoidable adverse environmental impacts on recreation and tourism resources might include changes to or loss of scenic resources; changes to hunting opportunities and other wildlife recreational opportunities; impacts on water and forest resources used for recreation; temporary increase in noise levels; and increased off-highway vehicle (OHV) use following development of a new ROW. Indirect, irreversible adverse impacts will include visual impacts resulting from the Project crossing recreation trails. These effects may be relatively short term and only affect trail users as they are crossing under the transmission line.

8.1.11 Agricultural Production

Approximately 4 acres of agricultural land will be permanently impacted by each of the Orange and Blue Route Alternatives. Total permanent impacts on Prime Farmland will be approximately 16 acres and 14 acres for the Orange Route and the Blue Route, respectively.

8.1.12 Forestry

Construction of the Project will convert forestland within the anticipated ROW to shrub and grasslands. Potential direct impacts from the development of the Orange Route and Blue Route would require permanently converting approximately 2,745 and 2,680 acres of forestland, respectively.

8.1.13 Mining

The Orange Route and the Blue Route intersect active state non-ferrous metallic mineral leases. There are currently no active non-ferrous metallic mines on the leased land, although the potential exists for additional exploration and future mining in the Study Area.

8.2 Short-term Uses of the Environment

Construction of the Project will have short-term adverse impacts on environmental resources due to activities associated with installing the transmission line and substation. Short-term environmental impacts will be minimized through site restoration once construction is complete. Long-term productivity refers to the sustainability of the resources over a long period of time. Generally, the long-term impacts are localized to the anticipated ROW for most environmental resources. Restoration and mitigation practices minimize long-term impacts.

Impacts on physical, social, and biological resources by the Project are addressed in Section 6.0. The short-term uses of these resources by the Project will result in electricity generation and distribution for use in the areas serviced by the Applicant. The electricity will provide heating, cooling, lighting, and other residential and commercial benefits.

The Project and its associated substation will remain in operation for their given life, likely more than 50 years, as long as they are maintained and needed to transfer electricity through the region. The environmental resources within the Project Area generally will return to their long-term productivity with the following exceptions:

→ Wetlands will be unavoidably and adversely impacted by wetland type conversion and wetland loss due to the construction of the Project. These impacts will be mitigated through reclaiming, restoring, or permanently protecting other wetlands, resulting in an offset of wetland losses.

→ Construction of the Project permanently will alter the long-term productivity of impacted prime and unique farmlands within the final Route Alternative. Although these sites may be reclaimed for productive farming, they may no longer have the characteristics required for classification as prime and unique.

→ Long-term losses in the productivity of vegetation will occur where trees are replaced by grassland and shrubland within the ROW of the Project. This land will not return to forest productivity until the transmission line is removed.

8.3 Irreversible and Irretrievable Commitments of Resources

Construction and operation of the Project may result in either the irreversible or the irretrievable commitment of certain resources. A commitment of resources is irreversible when the impacts limit the future options for a resource. An irretrievable commitment refers to the use or consumption of a resource that is neither renewable nor recoverable for use by future generations. Irretrievable commitment of resources applies to loss of nonrenewable resources such as minerals or cultural resources, or to those factors, such as soil productivity, that are renewable only over very long periods of time.

Cultural resources are non-renewable, and a loss of a site is an irretrievable impact on those resources. Preservation of archaeological and historical sites will be pursued through cultural resource site avoidance and recovery as part of the proposed programmatic agreement for these resources.

Construction of the Project will require the irretrievable commitment of some non-recyclable building materials and fuel for construction equipment. Many components of the Project will be recycled after their life, particularly metal components.

9.0 Public Participation and Agency Coordination

From the outset of the Project development process, the Applicant recognized the importance of gathering data, input, and engaging members of the public, landowners, agencies, tribes, local government units, and non-government organizations (NGOs) in an upfront, comprehensive outreach program. During the initial stages of Project development, the Applicant developed a strategic communication plan that identified stakeholders for the Project, along with communication tools, schedule, and approach to engage those stakeholders early and often throughout the route development process. From August 2012 to November 2013, the Applicant organized more than 75 agency and public meetings. This section provides detailed information for each outreach phase of the Project. Additional information on public outreach as it relates to development of the Route Alternatives can be found in Chapter 4.0, Development and Screening of Alternatives. Appendix C includes summaries from each stakeholder workshop, comments received and agency coordination.

9.1 Stakeholder Workshops

Initial meetings with federal and state permitting authorities and stakeholder workshops kicked off the outreach process for the Project. Stakeholder workshops were held across the original Study Area (see Figure 9-1) August 1–9, 2012. Stakeholder workshop invitees included federal, state, local agencies, local officials, and tribal representatives.

The Applicant hosted 11 stakeholder workshops, one in each of the following cities: Baudette, Bemidji, Carlton, Grand Rapids, Hibbing, Lake Bronson, Littlefork, Marcell, Roseau, Thief River Falls, and Virginia. A total of 58 people attended the stakeholder workshops of the 298 people invited. The Applicant gathered 142 map comments (map comments refer to geographic based comments made on the large aerial meeting maps, on which attendees identified community information such as structures, irrigation, future projects, and ecological areas), and feedback surveys from 37 attendees, which helped the Applicant understand local community needs and preferences. The survey responses identified evening and online meetings were preferred, and that notification should be through the Project website, direct mail, email, and newspapers. The Applicant incorporated the map comments to narrow the Project Study Area to Study Corridors and reviewed the survey responses for open house meeting planning.

9.2 Open House Meetings

In an effort to engage all landowners located within the identified Study Corridors, Preliminary Route Alternatives, and Refined Route Alternatives, the Applicant used the September 2012 tax parcel data from each county to develop a landowner mailing list. Invitations were mailed to more than 40,000 landowners; federal, state, and local agencies; tribes; elected officials; and NGOs to attend either an in-person or online open house meeting. The goal of each open house meeting was to introduce the Project, answer questions, gather input, and collect comments.

Figures 9-1, 9-2, 9-3, 9-4, and 9-5 show the locations of the stakeholder workshops and four rounds of public open house meetings.

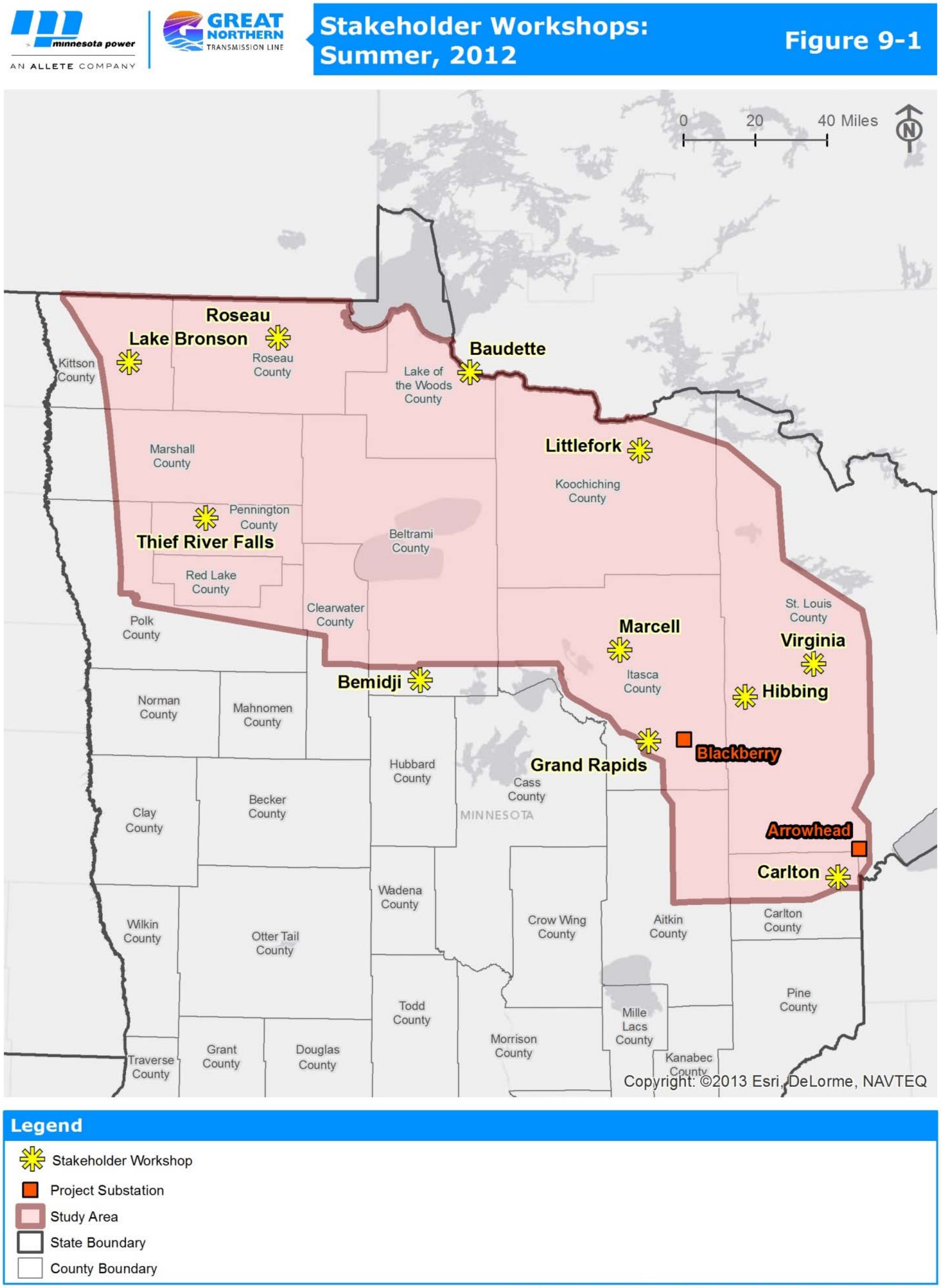
Table 9-1 summarizes each round of open house meetings held for the Project.

Table 9-1. Open House Meeting Summary

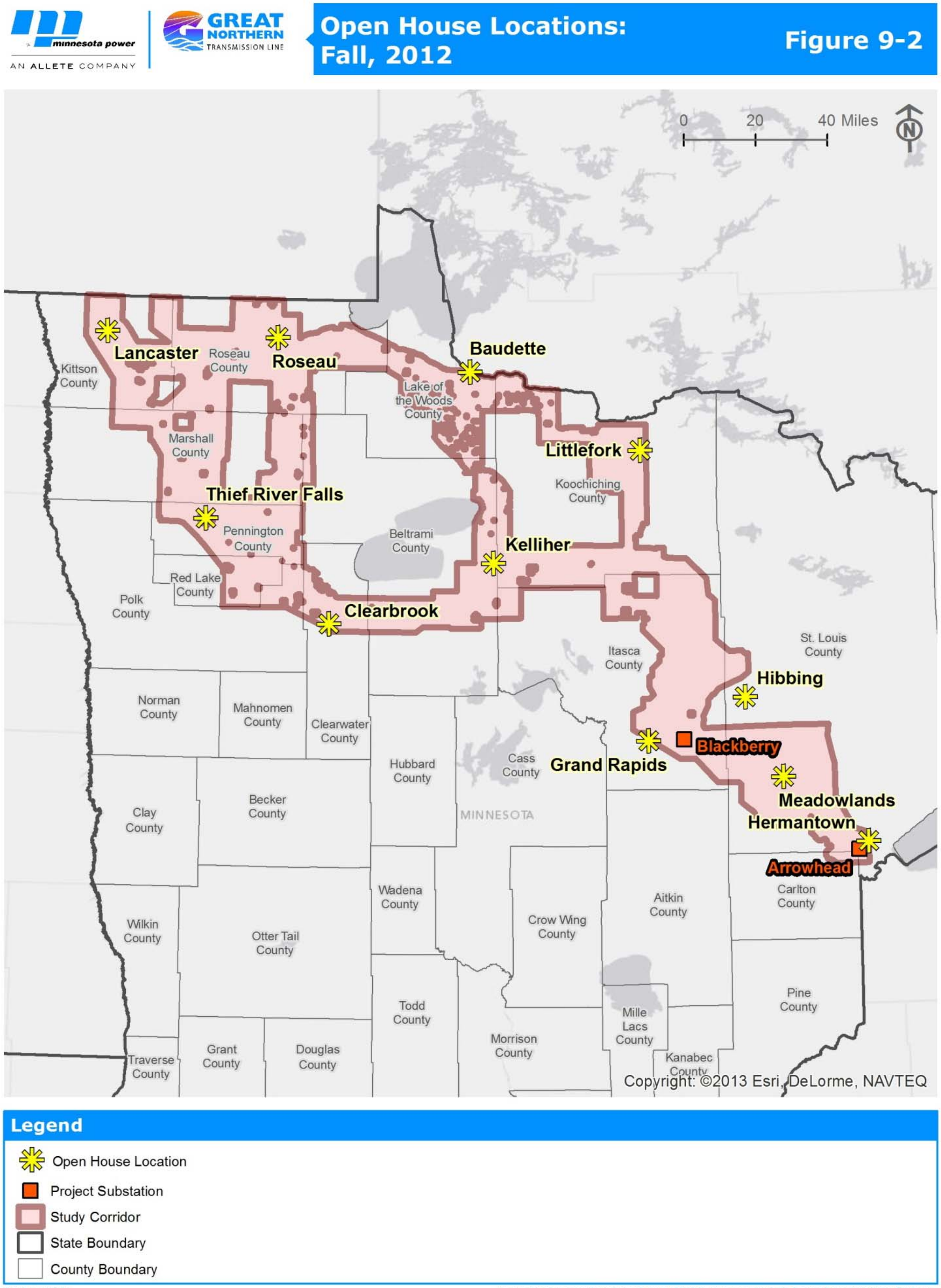
Number	Location	Notification Methods	Mailed Invites	Attendees	Comments
Round One: Study Corridors, October 29 — November 8, 2012					
11	Baudette, Clearbrook, Grand Rapids, Hermantown, Hibbing, Kelliher, Lancaster, Littlefork, Meadowlands,Roseau, Thief River Falls	Press releases sent to 25 media outlets) Newspaper advertisement in 30 local papers	Stakeholder letters: 278 Landowner postcards: 48,872	583 (in person) 80 (online)	154 (map[1]) 16 (meeting form)
Round Two: Preliminary Route Alternatives, April 15 — 25, 2013					
14	Baudette, Blackduck, Bigfork, Clearbrook, Grand Rapids, Greenbush, Grygla, Hermantown, Lancaster, Littlefork, Meadowlands, Roseau, Taconite, Thief River Falls	Press release sent to 71 media outlets Newspaper advertisement in 31 local papers	Stakeholder letters: 2,021 Landowner postcards: 40,354	747 (in person) 269 (online)	249 (map) 53 (meeting form) 38 (online form)
Round Two: Preliminary Route Alternatives July 23, 2013 (Requested by Solway Township)					
1	Solway Township	Solway Township July Newsletter Announced at July Board Meting		28 (in person)	1 (meeting form)
Round Three: Refined Route Alternatives September 9 - 19, 2013					
13	Clearbrook, Grygla, Thief River Falls, Lancaster, Greenbush, Roseau, Baudette, Taconite, Blackduck, Littlefork,	Press release sent to 29 media outlets Newspaper advertisement in 31 local papers	Stakeholder invites: 3470 Landowner invites: 40,982	683 (in person) 108 (online)	91 (map) 126 (meeting form) 23 (online)

Number	Location	Notification Methods	Mailed Invites	Attendees	Comments
	Northome, Bigfork, Grand Rapids				
Round Four: Additional Route Alternatives November 12 – 13, 2013					
3	Roseau, Warroad, Littlefork	Newspaper advertisement in 3 local papers	Landowner and stakeholder letters: 3,696	148 (in person)	6 (map) 27 (meeting form)

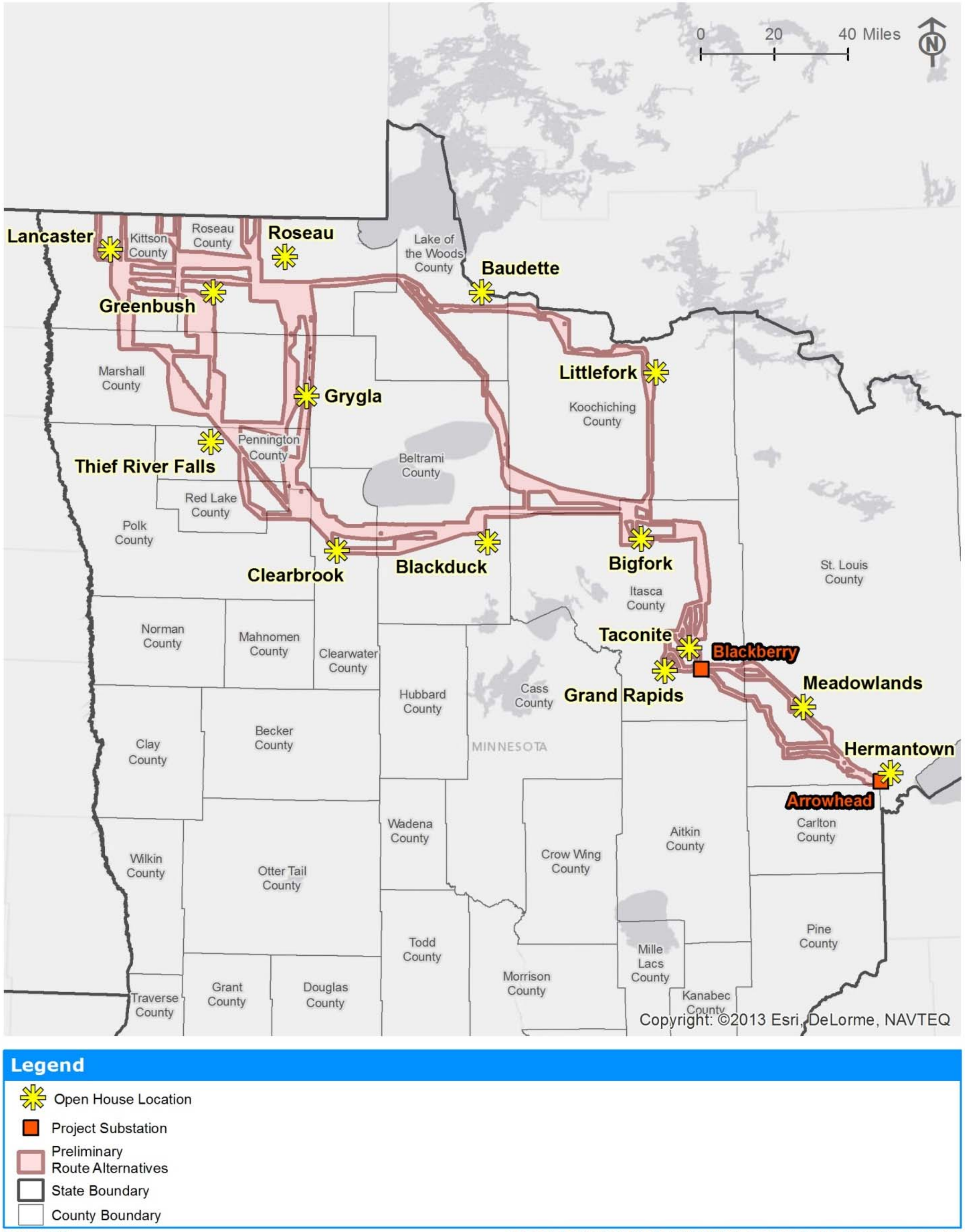
Note:
[1]Map comments are comment received that were directly related to a location within the Study Area



Stakeholder Workshops: Summer, 2012
Figure 9-1
0 20 40 Miles
Roseau
Lake Bronson
Kittson County
Roseau County
Baudette
Lake of the Woods County
Littlefork
Koochiching County
Marshall County
Pennington County
Thief River Falls
Red Lake County
Beltrami County
Clearwater County
Polk County
Marcell
Virginia
St. Louis County
Itasca County
Hibbing
Bemidji
Norman County
Mahnomen County
Hubbard County
Grand Rapids
Blackberry
Cass County
MINNESOTA
Arrowhead
Carlton
Clay County
Becker County
Wadena County
Wilkin County
Otter Tail County
Crow Wing County
Aitkin County
Carlton County
Todd County
Pine County
Mille Lacs County
Morrison County
Traverse County
Grant County
Douglas County
Kanabec County
Copyright: ©2013 Esri, DeLorme, NAVTEQ
Legend
Stakeholder Workshop
Project Substation
Study Area
State Boundary
County Boundary
Sources: ESRI
\\mspe-gis-file\gisprojlarge\MinnPower\182035\map_docs\CLIENT\Route_Permit\09-1_PI_WG.mxd


minnesota power
AN ALLETE COMPANY
GREAT NORTHERN TRANSMISSION LINE
Open House Locations: Fall, 2012
Figure 9-2
0 20 40 Miles
N
Lancaster
Roseau
Baudette
Littlefork
Thief River Falls
Kelliher
Clearbrook
Hibbing
Grand Rapids
Blackberry
Meadowlands
Hermantown
Arrowhead
Kittson County
Roseau County
Lake of the Woods County
Marshall County
Koochiching County
Pennington County
Beltrami County
Red Lake County
Polk County
Itasca County
St. Louis County
Norman County
Mahnomen County
Clearwater County
Hubbard County
Cass County
Clay County
Becker County
MINNESOTA
Wadena County
Aitkin County
Carlton County
Wilkin County
Otter Tail County
Crow Wing County
Pine County
Todd County
Mille Lacs County
Traverse County
Grant County
Douglas County
Morrison County
Kanabec County
Copyright: ©2013 Esri, DeLorme, NAVTEQ
Legend
Open House Location
Project Substation
Study Corridor
State Boundary
County Boundary
Sources: ESRI
\\mspe-gis-file\gisprojlarge\MinnPower\182035\map_docs\CLIENT\Route_Permit\09-2_PI_OH1.mxd

Open House Locations: Spring, 2013 **Figure 9-3**

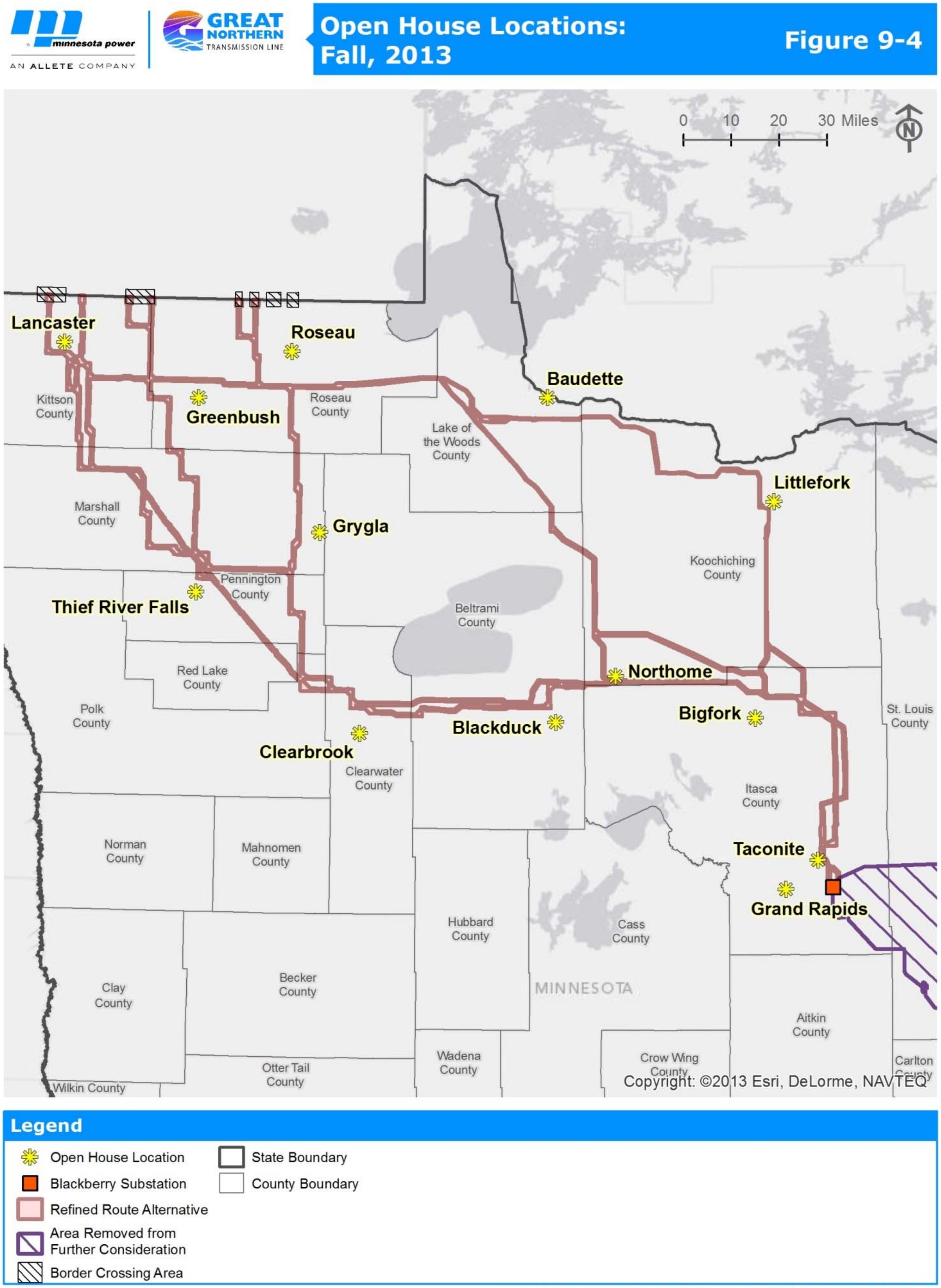


Sources: ESRI

\\mspe-gis-file\gisprojlarge\MinnPower\182035\map_docs\CLIENT\Route_Permit\09-3_PI_OH2.mxd

Open House Locations: Fall, 2013

Figure 9-4

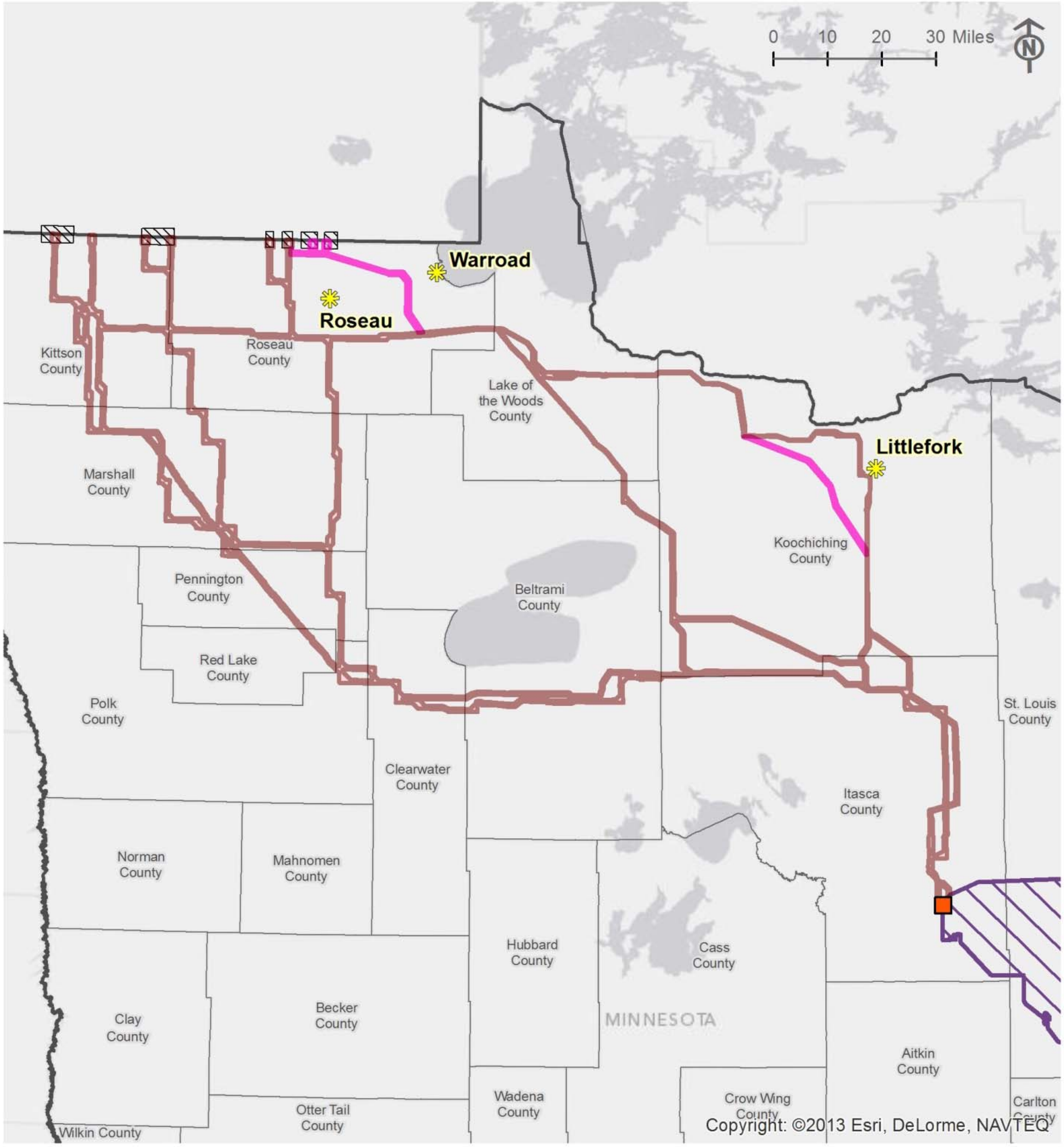


Sources: ESRI

\\mspe-gis-file\gisprojlarge\MinnPower\182035\map_docs\CLIENT\Route_Permit\09-4_PI_OH3.mxd

Open House Locations: November, 2013

Figure 9-5



Legend

- Open House Location
- Blackberry Substation
- Additional Route Segments
- Refined Route Alternative
- Area Removed from Further Consideration
- Border Crossing Area
- State Boundary
- County Boundary

Sources: ESRI,STATSGO

\\mspe-gis-file\gisprojlarge\MinnPower\182035\map_docs\CLIENT\Route_Permit\09-5_PI_OH4.mxd

9.3 Agency Coordination

Federal, state, and local agencies; tribes; elected officials; and NGOs were given updates about the Project through public open house stakeholder invitations, Project newsletters, and meetings with the Project team. Table 9-2 outlines in-person meetings held since June 2012. Additional agency coordination (such as letters, emails, and conference calls) has occurred throughout Project development, but is not listed in the table below.

A monthly, 1-hour conference call was held to update federal and state agencies on the Project's progress.

Table 9-2. Agency Coordination Summary

Agency	In-person Meetings
Federal	
Bureau of Indian Affairs (BIA)	December 11, 2012
Natural Resources Conservation Service (NRCS) U.S. Department of Agriculture (USDA)	December 11, 2012
The Advisory Council on Historic Preservation (ACHP)	December 11, 2012
U.S. Army Corps of Engineers (USACE)	June 7, 2012 December 11, 2012 April 22, 2013 August 8, 2013 September 17, 2013 October 30, 2013 January 29, 2014
U.S. Department of Energy (DOE)	December 11, 2012 September 16, 2013
U.S. Environmental Protection Agency (EPA)	December 11, 2012 March 26, 2014
U.S. Fish and Wildlife Service (USFWS)	June 20, 2012 December 11, 2012
U.S. Forest Service (USFS) Chippewa National Forest	October 30, 2012 December 11, 2012
State	
Minnesota Department of Agriculture (DOA)	September 5, 2012 November 19, 2013
Minnesota Department of Commerce (DOC)	July 12, 2012 September 4, 2012 December 11, 2012 June 14, 2013 September 16, 2013 November 4, 2013

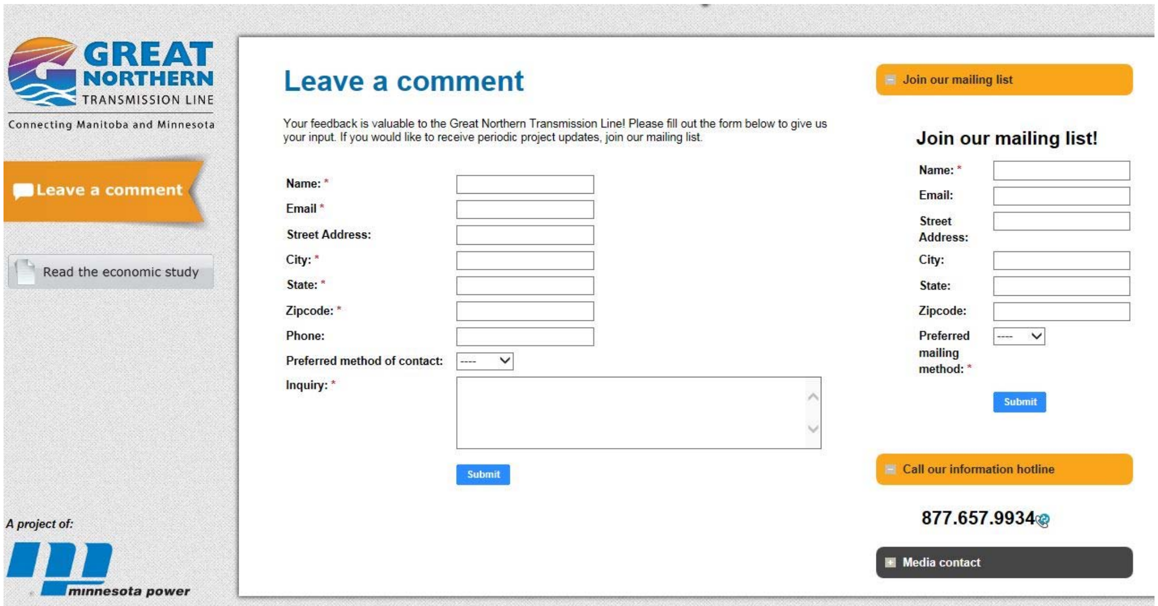
Agency	In-person Meetings
Minnesota Department of Natural Resources (DNR)	June 26, 2012 December 11, 2012 March 21, 2013 August 30, 2013 October 30, 2013
Minnesota Department of Transportation (DOT)	June 20, 2012 December 11, 2012
Minnesota Pollution Control Agency (MPCA)	September 4, 2012
Minnesota Public Utilities Commission (PUC)	June 6, 2012 December 11, 2012 June 14, 2013 November 19, 2013
State Historic Preservation Office (SHPO)	October 2, 2012
Local	
Beltrami County	March 19, 2013
Carlton County	February 12, 2013
Clearwater County	March 19, 2013
Itasca County	March 5, 2013 March 19, 2013
Kittson County	April 2, 2013
Koochiching County	February 5, 2013 November 26, 2013
Lake of the Woods County	March 12, 2013
Marshall County	February 5, 2013
Pennington County	February 26, 2012
Polk County	March 19, 2013
Red Lake County	February 26, 2012
Roseau County	March 12, 2013 June 11, 2013 November 12, 2013
Non-Government Organizations	
Midcontinent Independent System Operator (MISO)	December 11, 2012
Hartley Lake Lakeshore Owners Association	December 6, 2013

9.4 Outreach Tools

9.4.1 Website

On September 30, 2012, the Project's website was launched to the public. The interactive website provides updates on the Project and information about the route development process, mapping, permitting process, structures, and the Applicant. The website gives users the ability to submit comments or questions, and provides contact information to the Project team (http://www.greatnortherntransmissionline.com).

Figure 9-6. Website Comment Submission Example



9.4.2 Online Open House

During the second and third rounds of public open house meetings, the website featured an online open house meeting. This interactive open house featured videos explaining developments in the route development process. The Preliminary Route Alternatives online open house meeting was live from April 15–May 5, 2013, and the Refined Route Alternative online open house meeting was live from September 9–30, 2013.

9.4.3 Email

An email address was dedicated to the Project for the purpose of interacting with stakeholders [that is, info@greatnortherntransmissionline.com]. Stakeholders had the opportunity to ask questions, provide comments, or receive Project information through the Project email.

9.4.4 Hotline

A Project hotline (that is, [877] 657-9934) was set-up as an additional communication tool for the Applicant to provide updated Project information, collect contact information, and respond to stakeholder questions and comments. The hotline played a message that included the current status of the Project, and provided an opportunity to leave a comment and/or join the Project mailing list. Open house meeting information including time, date, and location of each meeting was listed for each round of open house meetings.

9.4.5 Project Newsletter

Great Northern News is a Project newsletter developed and distributed by mail and email to active participants on the Project mailing list to provide Project updates and progress. Active participants included key stakeholders; open house meeting attendees; those who had commented on the website, email, hotline, or through mail; and those who signed up for the mailing list via the website or hotline. See an example of the newsletters in Appendix C. Table 9-3 provides the number of newsletters distributed:

Table 9-3. Project Newsletter Publication Data

Newsletter Edition	Number of Mailing Recipients	Number of Email Recipients
February 2013	2,996	673
July 2013	4,306	1,003

9.5 Certificate of Need

As part of their Certificate of Need application, the Applicant executed the PUC approved Notice Plan that alerted potentially affected landowners and local authorities of the Certificate of Need application and process. The notification letters, distribution lists, legal notice, and newspaper affidavits are included in Appendix C. The Notice Plan consisted of the following:

- → Direct mail notice to landowners with property in the Study Corridor (see Figure 9-2)
- → Direct mail notice to others with mailing addresses within Study Corridor
- → Direct mail notice to local units of government, including tribal governments, within the Study Corridor
- → General notice to the public by publishing ads in local papers serving areas within the Study Corridor and one state-wide publication

9.6 Route Permit Notice

As required by Minnesota Statutes Section 216E.03, Subdivision 3a, all Local Government Units (LGUs) within the proposed routes received a letter stating the Applicant's intention to submit this Route Permit Application (Application). The LGU letter was sent December 11, 2013, to 131 LGU representatives and is included in Appendix C. As of February 25, 2014, no LGU representatives have requested a meeting. Additionally, the Applicant sent a letter to all landowners within the Study Corridor to inform them of this Application and to indicate the Route Alternatives under consideration. The landowner letter is included in Appendix C.

10.0 References

Executive Summary

Minnesota Public Utilities Commission (PUC). n.d. "Public Utilities Commission." <www.puc.state.mn.us>.

1.0 Introduction

2.0 Project Purpose and Need

3.0 Agency Action and Regulatory Approvals

4.0 Development and Screening of Alternatives

5.0 Proposed Action and Alternatives

6.0 Affected Environment and Environmental Consequences

6.1 Geomorphic and Physiographic Environment

Hobbs, H.C. and J.E. Goebel. 1982. Geologic Map of Minnesota Quaternary Geology. 1:500,000. Minnesota Geological Survey.

Jirsa, M.A., D.R. Setterholm, B.A. Bloomgren, and R.S. Lively. 2002. Bedrock Topographic and Depth to Bedrock Maps of the Western Half of the Mesabi Iron Range, Northern Minnesota. 1:100,000. Minnesota Geological Survey.

Jirsa, M.A., T.J. Boerboom, V.W. Chandler, J.H. Mossler, A.C. Runkel, and D.R. Setterholm. 2011. Geologic Map of Minnesota Bedrock Geology. 1:500,000. Minnesota Geological Survey.

Minnesota Department of Natural Resources (DNR). 2013a. Ecological Classification System. Accessed November 22, 2013. <http://www.dnr.state.mn.us/ecs/212Mb/index.html>.

———.2013b. Ecological Classification System. Accessed November 22, 2013. <http://www.dnr.state.mn.us/ecs/212Ma/index.html>.

———.2013c. Ecological Classification System. Accessed November 22, 2013. <http://www.dnr.state.mn.us/ecs/212Nb/index.html>.

———.2013d. Ecological Classification System. Accessed November 22, 2013. <http://www.dnr.state.mn.us/ecs/212Lc/index.html>.

Olsen, B.M. and J.H. Mossler. 1982. Geologic Map of Minnesota Depth to Bedrock. 1:1,000,000. Minnesota Geological Survey.

United States Geological Survey (USGS). 2013. Earthquake Hazards Program, Minnesota Seismic Hazard Map. Accessed November 25, 2013. <http://earthquake.usgs.gov/earthquakes/states/minnesota/hazards.php>.

6.2 Soils

Anderson, J.L., J.C. Bell, T.H. Cooper, and D.F. Grigal. 2001. Soils and Landscapes of Minnesota. Regents of the University of Minnesota. Accessed December 18, 2013. <www.extension.umn.edu/agriculture/tillage/soils-and-landscapes-of-minnesota>.

Cleland, D.T., P.E. Avers, W.H. McNab, M.E. Jensen, R.G. Bailey, T. King, and W.E. Russell. 1997. "National Hierarchical Framework of Ecological Units." In Ecosystem Management Applications for Sustainable Forest and Wildlife Resources, edited by M.S. Boyce, and A. Haney, 181–200. New Haven, Connecticut: Yale University Press.

Minnesota Department of Natural Resources (DNR). 2013. "Ecological Classification System: Ecological Land Classification Hierarchy." Accessed November 18, 2013. <http://www.dnr.state.mn.us/ecs/index.html>.

U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS). 2013. "Official Soil Series Descriptions: View by Name." Soil Survey Division. Accessed December 12, 2013. <https://soilseries.sc.egov.usda.gov/osdname.asp>.

6.3 Climate

Council on Environmental Quality (CEQ). 2010. *Draft NEPA Guidance on Consideration of the Effects of Climate Change and Greenhouse Gas Emissions.* Memorandum for Heads of Federal Departments and Agencies. Nancy H. Sutley. February 18. <http://www.whitehouse.gov/sites/default/files/microsites/ceq/20100218-nepa-consideration-effects-ghg-draft-guidance.pdf>.

Midwestern Regional Climate Center (MRCC). 2013. "cli-MATE." Accessed December 4, 2013. <http://mrcc.isws.illinois.edu/CLIMATE>.

National Climatic Data Center (NCDC). 2013. *Climate of Minnesota*. Accessed December 4, 2013. <http://cdo.ncdc.noaa.gov/climatenormals/clim60/states/Clim_MN_01.pdf>.

———. n.d.a. "Mean Temperature Monthly Normals (1981-2010)." Accessed December 4, 2013. <http://ggweather.com/normals/mean.html>.

———. n.d.b. "Precipitation Monthly Normals (1981-2010)." Accessed December 4, 2013. <http://ggweather.com/normals/precip.html>.

———. n.d.c. "Snowfall Monthly Normals (1981-2010)." Accessed December 4, 2013. <http://ggweather.com/normals/snow.html>.

6.4 Vegetation

Cleland, D.T., P.E. Avers, W.H. McNab, M.E. Jensen, R.G. Bailey, T. King, and W.E. Russell. 1997. "National Hierarchical Framework of Ecological Units." In Ecosystem Management Applications for Sustainable Forest and Wildlife Resources, edited by M.S. Boyce, and A. Haney, 181–200. New Haven, Connecticut: Yale University Press.

Minnesota Department of Natural Resources (DNR). 2009. Final Chippewa Plains – Pine Moraines and Outwash Plains Subsection Forest Resource Management Plan (CP-PMOP SFRMP). Appendix F. St. Paul, Minnesota: Minnesota DNR. <http://files.dnr.state.mn.us/forestry/subsection/cp_pmop/final/sfrmp_cppmop_appF.pdf>.

———. 2010. Minnesota DNR Forest Stand Inventory Version 2. Minnesota DNR – MIS Bureau. St. Paul, MN. <http://deli.dnr.state.mn.us/data_search.html>.

———. 2013a. "Ecological Classification System: Ecological Land Classification Hierarchy." Accessed November 18, 2013. <http://www.dnr.state.mn.us/ecs/index.html>.

———. 2013b. "Forest Certification." Accessed January 14, 2014. <http://www.dnr.state.mn.us/forestry/certification/hcvf.html>.

———. 2013c. "High Conservation Value Forests (HCVFs): Introduction and Status Update." HCVF Statewide Workgroup. November. Accessed January 14, 2014. <http://files.dnr.state.mn.us/forestry/certification/hcvf/HCVF-IntroSummary-Stakeholders.pdf>.

———. 2014. "DNR Old-growth Forest Policy – Goals and Results." Accessed January 14, 2014. <http://www.dnr.state.mn.us/forests_types/oldgrowth/policy.html>.

6.5 Human Settlement

Chalmers, James A., PhD and Frank A. Voorvaart, PhD. High-Voltage Transmission Lines: Proximity, Visibility, and Encumbrance Effects. The Appraisal Journal. Summer 2009.

Cowger, J., S. Bottemiller, and J. Cahill. 1996. Transmission Line Impact on Residential Property Values: A Study of Three Pacific Northwest Metropolitan Areas. Right of Way. September/October, 13–17.

Public Service Commission of Wisconsin (PSC). 2000. Arrowhead-Weston Electric Transmission Line Project: Final Environmental Impact Statement.

Solum, C.L. 1985. Transmission Line Easement Effect on Rural Land in Northwest Wisconsin. Right of Way. April 14–8.

U.S. Census Bureau. 2012a. 2008-2012 American Community Survey – Total Population, Race, and Ethnicity. Accessed March 2014. < http://factfinder2.census.gov/faces/nav/jsf/pages/guided_search.xhtml>.

6.6 Land Use

Arrowhead Regional Development Commission (ARDC). Koochiching County Comprehensive Land Use Plan. Publication. 2001. Print.

Beltrami County. 2002. Comprehensive Plan. Accessed November 25, 2013. <http://www.co.beltrami.mn.us/Departments/Env%20Services/resources/Comprehensive%20Plan%20-%20Section%201.pdf>.

Itasca County. 2013a. Comprehensive Land Use Plan. Accessed online: November 22, 2013. <http://www.co.itasca.mn.us/Home/Departments/Environmental%20Services/Documents/2013.04.02%20CLUP.pdf>.

Lake of the Woods County. 2000. Comprehensive Land Use Plan. Accessed online: October 21, 2013. <http://www.co.lake-of-the-woods.mn.us/PDF/Plans/Comp%20Land%20Use%20Plan.pdf>.

———.2002. Lake of the Woods County Wetland Plan. Accessed November 25, 2013. <http://www.co.lake-of-the-woods.mn.us/PDF/Plans/LOW%20County%20Wetland%20Plan%207-29-03.pdf>.

6.7 Environmental Justice

U.S. Census Bureau. 2012a. 2008-2012 American Community Survey – Total Population, Race, and Ethnicity. Accessed March 2014. <http://factfinder2.census.gov/faces/nav/jsf/pages/guided_search.xhtml>.

———. 2012b. 2008-2012 American Community Survey – Poverty, Income, Industry. Accessed March 2014. < http://factfinder2.census.gov/faces/nav/jsf/pages/guided_search.xhtml>.

———.2012c. 2008-2012 American Community Survey – Language. Accessed March 2014. <http://factfinder2.census.gov/faces/nav/jsf/pages/guided_search.xhtml>.

6.8 Socioeconomic Factors

U.S. Census Bureau. 2012a. 2008-2012 American Community Survey – Total Population, Race, and Ethnicity. Accessed March 2014. <http://factfinder2.census.gov/faces/nav/jsf/pages/guided_search.xhtml>.

———. 2012b. 2008-2012 American Community Survey – Poverty, Income, Industry. Accessed March 2014. < http://factfinder2.census.gov/faces/nav/jsf/pages/guided_search.xhtml>.

University of Minnesota. 2013. *Minnesota Power/Manitoba Hydro Great Northern Transmission Line Economic Impact on Northern Minnesota*. Draft. Duluth Labovitz School of Business and Economic Research. July.

6.9 Cultural Values

Woodard, Collin. 2012. American Nations: A History of the Eleven Rival Regional Cultures of North America. New York: Penguin Books.

Chinni, Dante, and James Gimpel. 2010. *Our Patchwork Nation: The Surprising Truth About the "Real" America*. New York: Gotham Books.

6.10 Aesthetics

Chalmers, James A., PhD and Frank A. Voorvaart, PhD. High-Voltage Transmission Lines: Proximity, Visibility, and Encumbrance Effects. The Appraisal Journal. Summer 2009.

Jackson, Thomas O. and Jennifer Pitts. 2010. The Effects of Electric Transmission Lines on Property Values: A Literature Review. Journal of Real Estate Literature. Volume 18, Number 2.

6.11 Noise

American National Standards Institute (ANSI). 2008. "Acoustical S12.9 Part 3."

Institute of Electrical and Electronics Engineers (IEEE). 1992. "656-1992 *Standard for the Measurement of Audible Noise from Overhead Transmission Lines."*

Minnesota Pollution Control Agency (MPCA). 2008. *A Guide to Noise Controls in Minnesota: Acoustical Properties, Measurement, Analysis and Regulation*. <http://www.pca.state.mn.us/index.php/view-document.html?gid=5355>.

6.12 Air Quality

Minnesota Administrative Rules 7009.0080 (2000)

Jeffers. 1999. "Electric and Magnetic Fields and Ecology." In Issues in Environmental Science and Technology, No. 11; Environmental Impact of Power Generation. The Royal Society of Chemistry.

U.S. Environmental Protection Agency (EPA). 2013. "National Ambient Air Quality Standards (NAAQS)." Accessed December 4, 2013. <http://www.epa.gov/air/criteria.html>.

6.13 Public Services

6.14 Radio, TV, and Cellular Telephone

Federal Communications Commission (FCC). 2012. "Licensing Database Extracts." Accessed January 2014. <http://wireless.fcc.gov/geographic/index.htm?job=licensing_database_extracts>.

6.15 Electric and Magnetic Fields

Elliot et al. 2013. "Adult Cancers Near High-Voltage Overhead Power Lines." Epidemiology 2013; 24 (2): 184 – 190.

Environmental Protection Agency (EPA). 2012. "Electric and Magnetic Fields (EMF) Radiation from Power Lines." Accessed January 2014. < http://www.epa.gov/radtown/power-lines.html>.

Institute of Electrical and Electronics Engineers (IEEE). 1995. "644-1944 IEEE Standard Procedures for Measurement of Power Frequency Electric and Magnetic Fields From AC Power Lines."

Minnesota Department of Health (MDA). 2002. *A White Paper on Electric and Magnetic Field (EMF) Policy and Mitigation Options.* The Minnesota State Interagency Working Group. September, 2002.

National Institute of Environmental Health Sciences (NIEHS). 1999. "Health Effects from Exposure to Power-Line Frequency Electric and Magnetic Fields." Print. June 15, 1999.

Scholten et al. 2005. "Unipolar Cardiac Pacemakers in Electromagnetic Fields of High Voltage Overhead Lines." J Med Eng Technol 2005; 29 (4): 170 – 175.

University of Minnesota. 2007. "Electromagnetic Compatibility of Active Implantable Medical Devices (AIMD) and Their Interactions with High Voltage Power Lines. Minnesota Power Systems Conference Proceeding.

6.16 Archaeological and Historic Resources

6.17 Water Resources and Floodplains

Federal Emergency Management Agency (FEMA). 2003a. Flood Insurance Rate Map, Beltrami County, Minnesota. Accessed November 2013. <https://msc.fema.gov/webapp/wcs/stores/servlet/mapstore/homepage/MapSearch.html?isFloodMap=true&AddressQuery=Beltrami%20County>.

———. 2003b. Flood Insurance Rate Map, Itasca County, Minnesota. Accessed November 2013. <https://msc.fema.gov/webapp/wcs/stores/servlet/mapstore/homepage/MapSearch.html?isFloodMap=true&AddressQuery=Itasca%20County>.

———. 2003c. Flood Insurance Rate Map, Koochiching, Minnesota. Accessed November 2013. <https://msc.fema.gov/webapp/wcs/stores/servlet/mapstore/homepage/MapSearch.html?isFloodMap=true&AddressQuery=Koochiching%20County>.

———. 2003d. Flood Insurance Rate Map, Lake of the Woods County, Minnesota. Accessed November 2013. <https://msc.fema.gov/webapp/wcs/stores/servlet/mapstore/homepage/MapSearch.html?isFloodMap=true&AddressQuery=Lake%20of%20the%20Woods%20County>.

———. 2003e. Flood Insurance Rate Map, Roseau County, Minnesota. Accessed November 2013. <https://msc.fema.gov/webapp/wcs/stores/servlet/mapstore/homepage/MapSearch.html?isFloodMap=true&AddressQuery=Roseau%20County>.

Hobbs, H.C. and J.E. Geobel. 1982. Geologic Map of Minnesota Quaternary Geology. 1:500,000. Minnesota Geological Survey.

Minnesota Pollution Control Agency (MPCA). 1999a. Baseline Water Quality of Minnesota's Principal Aquifers – Region 1, Northeast Minnesota. Prepared by Ground Water Monitoring and Assessment Program. St. Paul, Minnesota.

———. 1999b. Baseline Water Quality of Minnesota's Principal Aquifers – Region 3, Northwest Minnesota. Prepared by Ground Water Monitoring and Assessment Program. St. Paul, Minnesota.

———. 2012. The Final 2012 Impaired Waters List. Accessed November 2013. <http://www.pca.state.mn.us/index.php/water/water-types-and-programs/minnesotas-impaired-waters-and-tmdls/impaired-waters-list.html#the-final-2012-impaired-waters-list >.

———. 2013. Sources of Mercury Pollution and the Methylmercury Contamination of Fish in Minnesota. Accessed November 2013. < http://www.pca.state.mn.us/index.php/view-document.html?gid=288 >.

Minnesota Department of Natural Resources (DNR). 1999. Ecological Classification System, Land Type Associations. Accessed November 2013. <http://files.dnr.state.mn.us/natural_resources/ecs/subsection.pdf >.

———. 2013a. "Agassiz Lowlands Subsection." Accessed November 2013. <http://www.dnr.state.mn.us/ecs/212Mb/index.html>.

———. 2013c. "Littlefork-Vermillion Uplands Subsection." Accessed November 2013. <http://www.dnr.state.mn.us/ecs/212Ma/index.html>.

———. 2013d. "Lost River Peatland SNA." Accessed November 2013. <http://www.dnr.state.mn.us/snas/detail.html?id=sna02003>.

———. 2013e. "Myrtle Lake Peatland SNA." Accessed November 2013. <http://www.dnr.state.mn.us/snas/detail.html?id=sna02005>.

———. 2013f. "North Black River Peatland SNA." Accessed November 2013. <http://www.dnr.state.mn.us/snas/detail.html?id=sna01098>.

———. 2013g. "Pine Creek Peatland SNA." Accessed November 2013. <http://www.dnr.state.mn.us/snas/detail.html?id=sna02008>.

———. 2013h. "Red Lake Peatland SNA." Accessed November 2013. <http://www.dnr.state.mn.us/snas/detail.html?id=sna02009>.

———. 2013i. "South Black River Peatland SNA." Accessed November 2013. <http://www.dnr.state.mn.us/snas/detail.html?id=sna02011>.

———. 2013j. "St. Louis Moraines Subsection." Accessed November 2013. <http://www.dnr.state.mn.us/ecs/212Nb/index.html>.

6.18 Wetlands

Cowardin, L. M., V. Carter, F. C. Golet, E. T. LaRoe. 1979. Classification of Wetlands and Deepwater Habitats of the United States. Washington D.C.: U.S. Department of the Interior, Fish and Wildlife Service.

Keddy, Paul A. 2000. Wetland Ecology: Principles and Conservation. Cambridge, U.K.: Cambridge University Press.

Myślińska, E. 2003. "Development of Mucks from the Weathering of Peats: Its Importance as an Isolation Barrier." Bulletin of Engineering Geology and the Environment 62, no. 4: 389–392.

U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS). 2013. "Official Soil Series Descriptions: View by Name." Soil Survey Division. Accessed December 12, 2013. <https://soilseries.sc.egov.usda.gov/osdname.asp>.

6.19 Wildlife

Cleland, D.T., P.E. Avers, W.H. McNab, M.E. Jensen, R.G. Bailey, T. King, and W.E. Russell. 1997. "National Hierarchical Framework of Ecological Units." In Ecosystem Management Applications for Sustainable Forest and Wildlife Resources, edited by M.S. Boyce, and A. Haney, 181–200. New Haven, Connecticut: Yale University Press.

Minnesota Department of Natural Resources (DNR). 2006. Tomorrow's Habitat for the Wild and Rare: An Action Plan for Minnesota Wildlife (Comprehensive Wildlife Conservation Strategy). Division of Ecological Services, Minnesota DNR.

———. 2013. "Ecological Classification System: Ecological Land Classification Hierarchy." Accessed November 18, 2013. <http://www.dnr.state.mn.us/ecs/index.html>.

6.20 Rare and Unique Species and Communities

Barbour, R. W., and W.H. Davis. 1969. *Bats of America*. Lexington, Kentucky: The University Press of Kentucky.

Berkey, G., R. Crawford, S. Galipeau, D. Johnson, D. Lambeth, and R. Kreil. 1993. "A Review of Wildlife Management Practices in North Dakota: Effects on Nongame Bird Populations and Habitats." Report submitted to Region 6. U.S. Fish and Wildlife Service, Denver, Colorado.

Bess, J.A. 1988. “An Insect Survey of Eight Fens in Southern Michigan.” Unpublished report. Lansing, Michigan: Michigan Natural Features Inventory. 114.

Brandon, R.A. 1961. “Observations of Young Keen Bats.” *Journal of Mammalogy.* 42(3):300-1.

Burdett, C.L. 2008. “Hierarchical Structure of Canada Lynx Space Use and Habitat Selection in Northeastern Minnesota.” Doctoral Dissertation submitted to the faculty of the Graduate school of the University of Minnesota.

Buskirk, S.W., L.F. Ruggiero, and C.J. Krebs. 2000. “Fragmentation and Interspecific Competition: Implications for Lynx Conservation.” Chapter 4 in L.F. Ruggerio, K.B. Aubry, S.W. Buskirk (eds), *Ecology and Conservation of Lynx in the United States*. Boulder, Colorado: University Press of Colorado.

Catling, P.M. and J.D. Lafontaine. 1986. “First Documented Record of Oarisma Poweshiek (Lepidoptera, Hesperiidae) in Canada.” *The Great Lakes Entomologist*. 19:63-66.

Clark, B.K., J.B. Bowles, and B.S. Clark. 1987. “Summer Status of the Endangered Indiana Bat.” *Iowa American Midland Naturalist.* 118(1):32-9.

COSEWIC 2003. “COSEWIC Assessment and Status Report on the Poweshiek Skipperling Oarisma Poweshiek in Canada.” *Committee on the Status of Endangered Wildlife in Canada*. Ottawa.

Dana, R.P. 1989. “Biologies of the Prairie Skippers Hesperia dacotae and H. ottoe (Lepidoptera: Hesperiidae), and Factors Affecting Mortality in Prescribed Burning of their Habitat in Spring.” Ph.D. dissertation. University of Minnesota.

Dana, R.P. 1991. “Conservation Management of the Prairie Skippers Hesperia dacotae and Hesperia ottoe: Basic Biology and Threat of Mortality During Prescribed Burning in Spring” *Minnesota Agricultural Experiment Station Bulletin.* 594-1991 (AD-SB-5511-S). St. Paul, Minnesota: University of Minnesota.

Davis, S.K. 2004. “Area Sensitivity in Grassland Passerines: Effects of Patch Size, Patch Shape and Vegetation Structures on Bird Abundance and Occurrence in Southern Saskatchewan.” *Auk*. 121:1130-1145.

Davis, S.K., D.C. Duncan, and M. Skeel. 1999. “Distribution and Habitat Associations of Three Endemic Grassland Songbirds in Southern Saskatchewan.” *Wilson Bulletin*. 111:389-396.

Dieni, J.S., and S.L. Jones. 2003. “Grassland Songbird Nest Site Selection Patterns in Northcentral Montana.” *Wilson Bulletin*. 115:32-40.

Foster, R. W., and A. Kurta. 1999. "Roosting Ecology of the Northern Bat (Myotis Septentrionalis) and Comparisons with the Endangered Indiana Bat (Myotis sodalis)." *Journal of Mammalogy*. 80(2), 659-672.

Hazard, E.B. 1982. *The Mammals of Minnesota*. Minneapolis, Minnesota: University of Minnesota Press.

Henderson, C. 1978. "Minnesota Canada Lynx Report, 1977." *Minnesota Wildlife Research Quarterly*. 38:221-242.

Holzman, R.W. 1972. "Eastern Range Extension for Oarisma Poweshiek Parker (Lepidoptera, Hesperiidae)." *The Great Lakes Entomologist*. 5:111-114.

Jaakko Poyry Consulting, Inc. 1992. *Forest Wildlife, a Technical Paper for a Generic Environmental Impact Statement on Timber Harvesting and Forest Management in Minnesota*. St. Paul, Minnesota: Minnesota Environmental Quality Board. <http://iic.gis.umn.edu/download/geis/wild/wild_main.pdf>.

Loch, S. and E. L. Lindquist. n.d. "Reappearance of Canada Lynx in Minnesota." Unpublished Manuscript.

Madden, E.M. 1996. "Passerine Communities and Bird-habitat Relationships on Prescribe-Burned, Mixed-grass Prairie in North Dakota." M.S. thesis. Bozeman, Montana: Montana State University.

Mech, L.D. 1980. "Age, Sex, Reproduction, and Spatial Organization of Lynxes Colonizing Northeastern Minnesota." *Journal of Mammalogy.* 61:261-267.

McAlpine, W.S. 1972. "Observations on Life History of Oarisma Poweshiek (Parker) 1870." *Journal of Research on the Lepidoptera.* 11:83-93.

McCabe, T.L. 1979. *Report on the Status of the Dakota Skipper (Lepidoptera: Hesperiidae; Hesperia dacotae (Skinner)) within the Garrison Diversion Unit, North Dakota*.

McCabe, T.L. 1981. "The Dakota Skipper, Hesperia dacotae (Skinner); Range and Biology with Special Reference to North Dakota." *Journal of the Lepidopterists' Society.* 35(3), 179-193.

McKelvey, K.S., K.B. Aubry, and Y.K. Ortega. 2000. "History and Distribution of Lynx in the Contiguous United States." In *Ecology and Conservation of Lynx in the United States.* Ruggiero, K.B. Aubry, S. W. Buskirk, G.M. Koehler, C. J. Krebs, K.S. McKelvey and J.R. Squires, eds. Denver: University Press of Colorado.

Mumford, R.E. and J.B. Cope. 1964. "Distribution and Status of the Chiroptera of Indiana." *American Midland Naturalist*. 72(2),473-489.

Nagorsen, D.W., and R.M. Brigham. 1993. *Bats of British Columbia*. Royal British Columbia Museum Handbook. Volume 1. The mammals of British Columbia. UBC Press. Vancouver, British Columbia, Canada: UBC Press.

Natural Resources Research Institute (NRRI). 2006. "Habitat and Road use by Canada Lynx Making Long-Distance Movements." Technical Report No. NRRI/TR-2006-16.

Opler. P.A., and G.O. Krizek. 1984. *Butterflies East of the Great Plains*. Baltimore, Maryland: Johns Hopkins University Press.

Owen, S., M.A. Menzel, M.W. Ford, B.R. Chapman, K.V. Miller, J. Edwards, and P. Wood. 2003. "Home-range Size and Habitat Use by Northern Myotis (Myotis septentrionalis)." *American Midland Naturalist*. 150: 352-359.

Royer, R.A. 2003. "Butterflies of North Dakota: An Atlas and Guide." *Minot State University Science Monograph*. 2.

Royer, R.A. and G.M. Marrone. 1992. *Conservation Status of the Dakota Skipper (Hesperia dacotae) in North and South Dakota*. Unpublished Report. Denver: U.S. Fish and Wildlife Service. March.

Selby, G. 2010. *Status Assessment Update (2010): Poweshiek Skipperling (Oarisma Poweshiek (Parker) (Lepidoptera: Hesperiidae)*. Prepared for Twin Cities Ecological Services Field Office, U.S. Fish and Wildlife Service. Bloomington, Minnesota.

———. 2005. *Status Assessment and Conservation Guidelines: Poweshiek Skipperling (Oarisma Poweshiek (Parker) (Lepidoptera: Hesperiidae)*. Prepared for Twin Cities Field Office, U.S. Fish and Wildlife Service. Bloomington, Minnesota.

Sasse, D.B., and P.J. Pekins. 1996. "Summer Roosting Ecology of Northern Long-eared Bats (Myotis septentrionalis) in the White Mountain National Forest." Bats and Forests Symposium. *British Columbia Ministry of Forests.* Working Paper 23:91-101.

Sommerville, K.S., and C.A. Clampitt. 1999. "Habitat Characterization of Five Rare Insects in Michigan (Lepidoptera: Hesperiidae, Riodinidae, Satyridae; Homoptera: Cercopidae)." *Great Lakes Entomologist*. 32:225-229.

Sutter, G.C., and R.M. Brigham. 1998. “Avifaunal and Habitat Changes Resulting from Conversion of Native Prairie to Crested Wheat Grass: Patterns at Songbird Community and Species Levels.” *Canadian Journal of Zoology*. 76:869-875.

Swengel, A.B., and S.R. Swengel. 1999. “Observations of Prairie Skippers (Oarisma Poweshiek, Hesperia dacotae, H. ottoe, H. Leonardus pawnee, and Atrytone arogos iowa) (Lepidoptera; Hesperiidae) in Iowa, Minnesota, and North Dakota During 1988-1997.” *Great Lakes Entomologist.* 32(4), 267-292.

U.S. Fish and Wildlife Service (USFWS). 1998. “Canada Lynx would be Proposed for Endangered List under Lawsuit Settlement with 15 Plaintiffs.” Press release February 12. Bloomington, Minnesota: U.S. Fish and Wildlife Service.

———. 2010. Endangered Species – By County in North Dakota. Accessed January 2014. <http://www.fws.gov/northdakotafieldoffice/endspecies/endangered_species.htm>.

———. 2014. Endangered Species in Minnesota – County Distribution of Federally-Listed Threatened, Endangered, Proposed, and Candidate Species. Accessed January 2014 <http://www.fws.gov/midwest/endangered/lists/minnesot-cty.html>.

6.21 Noxious Weeds and Exotic Organisms

Early Detection and Distribution Mapping System. 2013. EDDMapS Species Distribution Maps. Center for Invasive Species and Ecosystem Health. University of Georgia. Accessed March 2014. < http://www.eddmaps.org/tools/choosecounty.cfm >.

Minnesota Department of Agriculture (MDA). 2014. 2014 Noxious and Invasive Weed Program. Accessed March 2014. <http://www.mda.state.mn.us/en/plants/badplants/~/media/Files/plants/weeds/noxiouslists.pdf>.

Minnesota Department of Natural Resources (DNR). 2014. Invasive Species – Aquatic & Terrestrial. Accessed March 2014. < http://www.dnr.state.mn.us/invasives/index.html >.

6.22 Recreation and Tourism

Itasca County. 2013b. County Dispersed Recreation Sites. Accessed online November 22, 2013. <http://www.co.itasca.mn.us/Home/Departments/Park%20System/Pages/County-Dispersed-Recreation-Sites.aspx>.

Koochiching County. 2009. Outdoor Recreation Map. Map. Accessed online November 22, 2013. <http://www.co.koochiching.mn.us/dept/land_&_forestry/2009%20Outdoor%20Rec.%20%20Map.pdf>.

Minnesota Audubon Society. 2013. Important Bird Areas. Accessed December 13, 2013. <http://mn.audubon.org/important-bird-areas-3>.

Minnesota Department of Natural Resources (DNR). 2013. Minnesota Scientific and Natural Areas. Accessed November 27, 2013. <http://www.dnr.state.mn.us/snas/index.html>.

6.23 Agricultural Production

US Department of Agriculture. 2007a. County Profile – Roseau County, Minnesota. Accessed online: November 8, 2013. <http://www.agcensus.usda.gov/Publications/2007/Online_Highlights/County_Profiles/Minnesota/cp27135.pdf>.

———. 2007b. County Profile – Lake of the Woods County, Minnesota. Accessed online: November 8, 2013. <http://www.agcensus.usda.gov/Publications/2007/Online_Highlights/County_Profiles/Minnesota/cp27077.pdf>.

———. 2007c. County Profile – Koochiching County, Minnesota. Accessed online: November 8, 2013. <http://www.agcensus.usda.gov/Publications/2007/Online_Highlights/County_Profiles/Minnesota/cp27071.pdf>.

———. 2007d. County Profile – Itasca County, Minnesota. Accessed online: November 8, 2013. <http://www.agcensus.usda.gov/Publications/2007/Online_Highlights/County_Profiles/Minnesota/cp27061.pdf>.

———. 2007e. County Profile – Beltrami County, Minnesota. Accessed November 27, 2013. <http://www.agcensus.usda.gov/Publications/2007/Online_Highlights/County_Profiles/Minnesota/cp27007.pdf>.

6.24 Transportation

Burlington Northern Sante Fe Railroad (BNSF). 2011. Utility Accommodation Policy. Accessed January, 2014. <http://www.bnsf.com/communities/faqs/pdf/utility.pdf>.

Federal Aviation Administration (FAA). 2014. Airport Data and Contact Information. Accessed March, 2014. < http://www.dot.state.mn.us/traffic/data/data-products.html#volume>.

LIU, Jie DAWALIBI, Farid Paul MA, Jinxi, 2007. Electromagnetic Interference of Transmission Lines on Nearby Railways Accounting for the Rail Track Arresters. Accessed January, 2014. <http://www.icee-con.org/papers/2007/Oral_Poster%20Papers/04/ICEE-219.pdf>

Minnesota Department of Transportation (DOT). 2013a. Traffic Forecasting & Analysis – Average Annual Daily Traffic Table. Accessed March, 2014. <http://www.dot.state.mn.us/traffic/data/data-products.html#volume>.

———. 2013b. Utility Accommodation on Highway Right of Way. Accessed March, 2014. <http://www.dot.state.mn.us/policy/operations/op002.html>.

———. 2013c. Airports and Avaition/HPDP. Accessed January, 2014. <http://dotapp7.dot.state.mn.us/edms/download?docId=608942>.

———. 2014. Minnesota Manual on Uniform Traffic Control Devices. Accessed January, 2014. <http://www.dot.state.mn.us/trafficeng/publ/mutcd/>.

U.S. Department of Transportation (USDOT). 2013. Air Traffic Organization Policy – U.S. Three Letter. Accessed March, 2014. <http://www.faa.gov/air_traffic/publications/atpubs/lid/l_b.htm>

6.25 Forestry

Interagency Information Cooperative. 2011. “Enhancing the access and use of forest resources data in Minnesota.” Accessed November 10, 2013. <http://iic.gis.umn.edu/finfo/ecs/why_is.htm>.

Minnesota Department of Natural Resources (DNR). 2006a. “Aspen Parklands Subsection Profile: Tomorrow's Habitat for the Wild and Rare: An Action Plan for Minnesota Wildlife, Comprehensive Wildlife Conservation Strategy Division of Ecological Services, Minnesota DNR. Accessed November 15, 2013. <http://files.dnr.state.mn.us/assistance/nrplanning/bigpicture/cwcs/profiles/aspen_parklands.pdf>.

———. 2006b. “Littlefork Vermillion Uplands Subsection Profile.” In Tomorrow's Habitat for the Wild and Rare: An Action Plan for Minnesota Wildlife (Comprehensive Wildlife Conservation Strategy). Division of Ecological Services, Minnesota DNR. Accessed November 20, 2013 <http://files.dnr.state.mn.us/assistance/nrplanning/bigpicture/cwcs/profiles/littlefork_vermillion_uplands.pdf>.

———. 2006c. “St. Louis Moraines Subsection Profile.” In Tomorrow's Habitat for the Wild and Rare: An Action Plan for Minnesota Wildlife (Comprehensive Wildlife Conservation Strategy). Division of Ecological Services, Minnesota DNR. Accessed November 20, 2013. <http://files.dnr.state.mn.us/assistance/nrplanning/bigpicture/cwcs/profiles/st_louis_moraines.pdf>.

———. 2006d. “Nashwauk Uplands Subsection Profile.” In Tomorrow's Habitat for the Wild and Rare: An Action Plan for Minnesota Wildlife (Comprehensive Wildlife Conservation Strategy). Division of Ecological Services, Minnesota DNR. Accessed November 20, 2013. <http://files.dnr.state.mn.us/assistance/nrplanning/bigpicture/cwcs/profiles/nashwauk_uplands.pdf>.

———. 2006e. “Tamarack Lowlands Subsection Profile.” In Tomorrow's Habitat for the Wild and Rare: An Action Plan for Minnesota Wildlife (Comprehensive Wildlife Conservation Strategy). Division of Ecological Services, Minnesota DNR. Accessed November 20, 2013. <http://files.dnr.state.mn.us/assistance/nrplanning/bigpicture/cwcs/profiles/st_louis_moraines.pdf>.

———. 2007. “Chapter 4: Timber Harvest, St. Louis Moraines, Tamarack Lowlands, Nashwauk Uplands, and Littlefork-Vermillion Uplands Subsections.” In St. Louis Moraines, Tamarack Lowlands, Nashwauk Uplands, and Littlefork-Vermillion Uplands Subsection Forest Resource Management Plan Assessment. Draft. Accessed November 21, 2013. <http://files.dnr.state.mn.us/forestry/subsection/north4/preliminary/n4Chapter4.pdf>.

———. 2009. “Aspen Parklands SFRMP Assessment, Chapter 4, Timber Harvest”. Accessed November 15, 2013. <http://files.dnr.state.mn.us/forestry/subsection/aspenparklands/preliminaryissues/sfrmp_aspenparklands-PrelimChapter4.pdf>.

———. 2010a. Agassiz Lowlands Subsection Forest Resource Management Plan. Public Review Document. Accessed November 15, 2013. <http://files.dnr.state.mn.us/forestry/subsection/agassiz/sfrmp_agassizLowlands_3yrExtensionPublicReview.pdf>.

———. 2010b. St. Louis Moraines, Tamarack Lowlands, Nashwauk Uplands, and Littlefork-Vermillion Uplands Subsections. Subsection Forest Resource Management Plan. Strategic Direction and Stand Selection. Division of Forestry. Accessed November 20, 2013. <http://www.dnr.state.mn.us/forestry/subsections/north4/finalplan.html>.

———. 2011. Aspen Parklands, Subsection Forest Resource Management Plan, Final Plan. Accessed November 10, 2013. <http://files.dnr.state.mn.us/forestry/subsection/aspenparklands/sfrmp_aspenparkland_finalplan.pdf>.

———. 2013. Ecological Classification System. Accessed November 10, 2013. <http://www.dnr.state.mn.us/ecs/index.html>.

———. n.d. Agassiz Lowland Assessment. Accessed November 15, 2013. <http://files.dnr.state.mn.us/forestry/subsection/agassiz/overview.pdf>.

6.26 Mining

Hobbs, H.C. and J.E. Geobel. 1982. Geologic Map of Minnesota Quaternary Geology. 1:500,000. Minnesota Geological Survey.

Minnesota Department of Natural Resources (DNR). 2013a. Division of Lands and Minerals. Accessed November 26, 2013. <http://www.dnr.state.mn.us/lands_minerals/metallic_nf/development.html>.

———. 2013b. Division of Lands and Minerals. Accessed November 26, 2013. <http://www.dnr.state.mn.us/lands_minerals/exploration.html#2>.

———. 2013c. Division of Lands and Minerals. Accessed November 26, 2013. <http://www.dnr.state.mn.us/lands_minerals/mining.html>.

Minnesota Department of Transportation (DOT). 2013. Aggregate Source Information System. Accessed November 25, 2013. <http://www.dot.state.mn.us/materials/asismap.html>.

U.S. Geological Society (USGS). 2005. 2005 Minerals Yearbook. Minnesota. Accessed November 27, 2013. <http://minerals.usgs.gov/minerals/pubs/state/2005/myb2-2005-mn.pdf>.

———. 2009. 2009 Minerals Yearbook. Minnesota. Accessed November 27, 2013. <http://minerals.usgs.gov/minerals/pubs/state/2009/myb2-2009-mn.pdf>.

7.0 Cumulative Impacts

Council on Environmental Quality (CEQ). 1997. “Considering Cumulative Effects Under the National Environmental Policy Act.” Accessed January 2014. <http://energy.gov/sites/prod/files/nepapub/nepa_documents/RedDont/G-CEQ-ConsidCumulEffects.pdf>.

Canter and Rumrill. 1997. "Addressing Future Actions in Cumulative Effects Assessment." Impact Assessment and Project Appraisal, 12(4): 207-218.

Minnesota Department of Commerce (DOC). 2014. "Siting and Routing of Energy Facilities." Accessed November 20, 2013. <http://mn.gov/commerce/energyfacilities/#ui-tabs-3>.

Minnesota Department of Transportation (DOT). 2012. *State of Minnesota 2013–2016 State Transportation Improvement Program (STIP).* <http://www.dot.state.mn.us/planning/program/pdf/STIP/2013-2016_STIP_11-14_revised.pdf>.

8.0 Other Required Considerations

9.0 Public Participation and Agency Coordination