ENVIRONMENTAL REPORT

MINNESOTA POWER
GREAT NORTHERN TRANSMISSION LINE PROJECT

PUC DOCKETS - E015/CN-12-1163

July 2014

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MINNESOTA DEPARTMENT OF COMMERCE

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Abstract

On October 21, 2013, Minnesota Power (MP) submitted an Application for a Certificate of Need (CN) to construct the Great Northern Transmission Line project to the Public Utilities Commission (Commission). In MP's CN application it has: 1) Found that a new transmission line is required, 2) Requested approval for a 500 kV line, and 3) Identified the end points as the Manitoba-United States border and the MP Blackberry Substation.

The application was submitted pursuant to the Certificate of Need provisions found in Minnesota Rules 7849.

Two separate approvals from the Minnesota Public Utilities Commission are required for the construction/operation of the Great Northern Transmission Line project – a certificate of need and a route permit. The CN application (PUC Docket E015/TL-CN-12-1163) was accepted as complete by the Commission on December 18, 2013. Minnesota Power submitted a high voltage transmission line (HVTL) route permit application (PUC Docket E015/TL-14-21) to the Commission on April 15, 2014. The route permit application was accepted as complete by the Commission on July 2, 2014.

The Energy Environmental Review and Analysis (EERA) staff of the Department of Commerce (Department) is responsible for administering the environmental review process in both the certificate of need and the routing permit procedures. The Commission is responsible for determining if the transmission lines proposed are needed, and if so, determining what route the lines should be constructed in.

The environmental review process under the certificate of need procedures includes public information/scoping meetings and the preparation of an environmental review document, the Environmental Report (ER). The environmental report is a written document that describes the human and environmental impacts of the proposed project, alternatives to the project and methods to mitigate anticipated adverse impacts. The ER must be prepared before the public hearing and before the Commission can make a decision on the certificate of need application.

The content of the environmental report addresses the issues required in Minnesota Rules 7849.1500, subpart 1, and as determined in the Scoping Decision of April 22, 2014.

Additional materials related to this project and its proceedings are available on the Department's website: http://mn.gov/commerce/energyfacilities/Docket.html?Id=33608 and on the State of Minnesota's eDockets system: https://www.edockets.state.mn.us/EFiling/search.jsp (enter the year "12" and the number "1163").

Following the release of this Environmental Report, a Public Hearing will be held in the project area.

Acronyms, Abbreviations and Definitions

ACSR	Aluminum Conductor Steel Reinforced
ALJ	Administrative Law Judge
Commission	Minnesota Public Utilities Commission
CN	Certificate of Need
CSP	Concentrated Solar Power Systems
CST	Concentrated Solar Thermal
CT	Combustion Turbine
DC	Direct Current
DG	Distributed Generation
DSM	Demand Side Management
EIS	Environmental Impact Statement
ER	Environmental Report
EERA	Department of Commerce Energy Environmental Review Analysis
EMF	Electromagnetic field
GW	Gigawatt
HCRRA	Hennepin County Rail Road Authority
HVTL	High voltage transmission line
kV	Kilovolt
kW	Kilowatt
mg/L	milligrams per liter – equivalent to parts per million (ppm)
MN DNR	Minnesota Department of Natural Resources
MN DOT	Minnesota Department of Transportation
MPCA	Minnesota Pollution Control Agency
NERC	North American Electric Reliability Council
NESC	National Electrical Safety Code
ppm	parts per million
ROW	Right-of-Way
RPM	Revolution per Minute
RUS	Rural Utilities Service
TES	Thermal Energy Storage

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1.0 Introduction

Minnesota Power (MP or Applicant) has made an application to the Minnesota Public Utilities Commission (Commission) for a Certificate of Need (CN) for the construction of a new 500 kV transmission line in Minnesota from the United States/Canadian border to Grand Rapids, Minnesota. The Minnesota counties likely to be impacted by the construction of the 500 kV Line (depending on final route selection) include: Beltrami, Clearwater, Itasca, Kittson, Koochiching, Lake of the Woods, Marshall, Roseau and Pennington.

The Department of Commerce (Department) Energy Environmental Review and Analysis (EERA) staff is tasked with conducting environmental review of applications for certificate of need and route permits. The intent of the environmental review process is to inform the public, the applicant, and decision-makers about potential impacts and possible mitigations for the proposed project and its alternatives.

This document meets the environmental review requirements of the certificate of need procedures (Minn. Rule 7849.1500, subp. 1 and subp. 3) by a) providing information in Section 2 on the regulatory framework, certificate of need and route permit processes; b) describing in Section 3 the proposed project, including design, construction and maintenance; c) discussing in Section 4 the alternatives means of meeting the stated need, and alternatives to the proposed project; and d) summarizing in Section 5 the potential effects on people and the environment of the proposed project.

1.1 Project Description

Minnesota Power, in partnership with Manitoba Hydro, proposes to construct a high voltage transmission line (HVTL) from the International border that would terminate at the Blackberry Substation in Itasca County.

The Great Northern Transmission Line (GNTL) project includes the construction of a new 500 kV transmission line in Minnesota from the United States/Canadian border to the Minnesota Power Blackberry Substation near Grand Rapids, Minnesota. The 500 kV Line will be approximately 235-270 miles in length, subject to final route approval by the Commission, and will be constructed on a 200 foot wide right-of-way. The line will provide 750 MW of transfer capability.

Minnesota Power anticipates requesting a route width that is 1,000 to 3,000 feet wide, with structures typically ranging in heights from approximately 100 feet to 150 feet above ground. The Applicant currently estimates between 4 to 5 structures per mile of transmission line. A variety of structure types (self-supporting suspension, guyed delta suspension, and guyed-V suspension) may be used along the route.

Minnesota Power anticipates that construction on the project will begin in the fall of 2016, with an in-service date of mid-year 2020.

The GNTL 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. 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 GNTL project also will require a 500 kV Series Compensation Station, the location of which, has not yet been determined.

1.2 Project Purpose

The genesis for the Great Northern Transmission Line project was Minnesota Power's 2013 Integrated Resource Plan and the companies EnergyForward resource strategy. On September 16, 2011, Minnesota Power petitioned the Commission for approval of a 250 MW capacity and associated energy Power Purchase Agreement (PPA) between MP and Manitoba Hydro (Docket No. E015/M-11-938). This was a voluntary filing on MP's part. However, it is standard practice for utilities to file PPAs for approval with the Commission even though it isn't required, generally, in order to reduce/eliminate the risk that costs related to a PPA will be rejected by the Commission at a later date.

Given MP filed the PPA for approval, there were three main issues to be addressed:

- Is there a need for capacity/energy?
- If there is a need, what is the most appropriate type of resource to meet the need (baseload, peaking, wind, etc)? and
- Is the PPA in the best interest of MP's ratepayers?

The Commission's order in the PPA docket dealt with those issues. The order, approving the PPA, was released on February 1, 2012. With the Commission's approval of the PPA, the question of whether Manitoba Hydro is the right resource was answered.

Further, Minnesota Power and Manitoba Hydro recently finalized a Term Sheet for an additional 133 MW (Renewable Optimization Agreement) by June 1, 2020. Minnesota Power will submit the new 133 MW Renewable Optimization Agreements to the Commission for approval upon the parties' finalization of terms and execution.

As stated by the Applicant, the primary objective of the GNTL project is to provide increased access to Manitoba hydropower. Additionally, MP states that 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 MP's significant wind energy investments and compliments MP's EnergyForward resource strategy.

The GNTL project would provide delivery and access to power generated by Manitoba Hydro's hydroelectric stations in Manitoba, Canada. Minnesota Power states in its CN application that the project is required to facilitate delivery of the combined 383 megawatts (250 MW PPA and the 133 MW Renewable Optimization Agreement) of hydropower and wind storage energy products to serve Minnesota Power, as well as additional hydropower to other utilities in the United States, thereby meeting future state and regional energy needs. While large hydropower transfers like this do not satisfy the current renewable energy mandates in Minnesota, such a hydropower transfer could support compliance with renewable energy requirements for utilities in Wisconsin and other states.

1.3 Sources of Information

Much of the information used in this Environmental Report is derived from documents prepared by Minnesota Power. These include the Certificate of Need Application, October 21, 2013, and the HVTL Route Permit Application, April 15, 2014. Discussion of Electromagnetic Field (EMF) issues came primarily from the white paper developed by the Interagency Task Force led by the Minnesota Health Department, the National Institute for Environmental Health and the World Health Organization. Additional information comes from earlier Department environmental review documents in similar dockets, other state agencies, such as the Department of Natural Resources, and additional research. First hand information was gathered by site visits along the proposed line.

2.0 Regulatory Framework

In Minnesota, transmission line projects above certain size and length thresholds must go through a two stage regulatory process. First, application is made to the Minnesota Public Utilities Commission for a Certificate of Need. If a CN is granted, the utility must then obtain a HVTL Route Permit from the Commission that designates a specific route for the line.

Additionally, the project will require approvals from other state and federal agencies with permitting authority for actions related to the project. These agencies and their approvals are summarized in Section 2.5.

2.1 Certificate of Need

Before any large HVTL can be constructed in Minnesota, the Commission must determine that they are necessary and in the best interest of the state (Minn. Statute 216B.243). The certificate of need process includes environmental review and public hearings, and typically takes 12 months. This process is the only proceeding in which a no-build alternative and the size, type, timing, system configuration and voltage of the proposed project will be considered.

Minnesota Power's GNTL project, a 500 kilovolt (kV) transmission line with a length of approximately 250 miles, qualifies as a large energy facility and thus requires a CN.

The Applicant applied for a Certificate of Need on October 21, 2013; on December 18, 2013, the Commission determined that the application was complete.

A copy of the certificate of need application, along with other relevant documents, can be viewed at the Energy Environmental Review and Analysis web page at:

http://mn.gov/commerce/energyfacilities/Docket.html?Id=33608

The Energy Environmental Review and Analysis (EERA) staff is responsible for administering the environmental review process. The Commission is responsible for determining if the transmission lines proposed are needed.

Potential routes that the transmission line would follow, if approved, are put forth and evaluated in the HVTL route permit proceeding (See Below).

Environmental Review
The environmental review process under the certificate of need procedures includes public information/scoping meetings and the preparation of an environmental review document, the Environmental Report (ER). The environmental report is a written document that describes the human and environmental impacts of the proposed project, alternatives to the project and

methods to mitigate anticipated adverse impacts. The ER must be prepared before the Commission can make a decision on the certificate of need application.

2.2 Scoping Process CN

On January 15, 2014, Commission staff sent notice of the places, dates and times of the Public Information and ER Scoping meetings to those persons on the General List, the agency technical representatives list and the project contact list.[1]

Additionally, mailed notices were sent to those persons on Minnesota Power's property owners list and to the local units of government within the Study Area identified in the CN application. Notice of the public meeting was also published in the local newspapers.

Meetings were held along the identified study area between the proposed end points; a list is provided below:

COUNTY	CITY	MEETING LOCATION	DATE AND TIME
Roseau	Roseau	Roseau Civic Center 121 Center Street E	Tuesday, February 11, 2014 6:00 pm
Lake of the Woods	Baudette	Baudette Ambulance Garage 111 First Avenue SW	Wednesday, February 12, 2014 6:00 pm
Koochiching	International Falls	AmericInn 1500 Hwy 71	Thursday, February 13, 2014 6:00 pm
Pennington	Thief River Falls	Ralph Engelstad Arena, Imperial Room 525 Brooks Avenue N	Tuesday, February 18, 2014 6:00 pm
Beltrami	Bemidji	The Sanford Center 1111 Event Center Drive NE	Wednesday, February 19, 2014 6:00 pm
Itasca	Grand Rapids	Sawmill Inn 2301 S Highway 169	Thursday, February 20, 2014 6:00 pm

On the dates, times and venues listed above, Commission staff and EERA staff jointly held six public information/scoping meetings. The meetings began at 6:00 pm. The purpose of the meetings was to provide information to the public about the proposed project, to answer questions, and to allow the public an opportunity to suggest CN alternatives and potential impacts that should be considered during preparation of the environmental review document.

Approximately 90 people attended the public information and scoping meetings; 20 individuals took the opportunity to speak on the record. A court reporter was present to document oral statements. A variety of topics were discussed during the presentation. Topics included: the certificate of need process, schedule, statutes and rules; Minnesota Power's description of the purpose and need, and project components; environmental review procedures; and, the scoping of alternatives and impacts.

[1] Notice of Information/Scoping Meeting, eDocket No. 20141-95492-01

Written comments were due no later than Friday, March 14, 2014. Twenty-eight written comments were received.

Many of the comments received, both oral and written, were more relevant to the routing process, meaning that they dealt with issues that are route specific (i.e., paralleling existing infrastructure, potential impacts to specific parcels, sites, or features, the so called "buy the farm" provisions of the law (Minn. Statute 216E.12 Subd 4), and maximizing use of public lands). These comments will be carried forward into the HVTL routing docket and evaluated during that docket's environmental review scoping process.

Other comments have relevance to both the CN and the routing dockets, and will therefore be covered in the environmental review documents for both proceedings. These issues include: the potential for a transmission line to interfere with wireless communications and those systems that depend on it (i.e., emergency services, farm GPS controlled operations and radio/television reception); electrical/magnetic fields; and, potential impacts to the natural and built environments (i.e., noise, aesthetics, stay voltage, loss or changes in habitat, corridor fatigue, and direct and indirect impacts to wildlife/vegetation).

The difference in how these topics are covered in the respective environmental review documents is in the level of detail. In this Environmental Report (i.e., the CN docket) these issues are described and discussed from a generic "transmission line" perspective and on a regional scale. In the Routing docket (i.e., Environmental Impact Statement) these issues will also be considered relative to the specific routes and rights-of-way being evaluated and the potential impact to specific receptors or features "on the ground."

The remaining relevant comments dealt with issues specific to the size, type, timing, system configuration and/or voltage of the proposal contained in MP's Certificate of Need application. These comments were: upgrading the existing transmission system; alternative voltages (230 kV, 345 kV), direct current (DC) alternative; demand side management; line losses; and double circuiting along the Dorsey-Forbes 500 kV line.

In addition, there were a few comments that are outside the scope of the Environmental Report. These comments were: the use of domestic energy sources (coal and nuclear) and environmental review of the Canadian components (i.e., building of the reservoir/dam and transmission lines) of the project.

The Commission may not issue a CN for the construction of nuclear power plants pursuant to Minn. Stat. Section 216B.243, subdivision 3b. For a variety of reasons, additional electrical power from coal power plants is not a realistic option in Minnesota at this time.

The approvals required for the development and construction of those components of the project that are occurring within the Canadian jurisdiction are subject to the environmental review procedures of the provincial government and, therefore, will not be covered in this

Environmental Report. The Manitoba Hydro Act requires the provincial government to approve any development of new generating stations, transmission interconnections, or power exports and imports. That approval will be given only after a *Need For and Alternatives To* (NFAT) review process, conducted by the provincial Public Utilities Board. The review will examine the "need-for-and-alternatives-to" the Manitoba Hydro's proposal to build two new dams and associated transmission in northern Manitoba.

In addition to the NFAT review and approval process, each individual generation and transmission project is subject to the required regulatory and environmental approvals at both Canada's federal and provincial levels, including:

- Federal Fisheries Act
- Federal Navigable Waters Protection Act
- National Energy Board Approvals
- Manitoba Environment Act
- Manitoba Water Power Act
- Manitoba Hydro Act

No alternative endpoints (i.e., system configurations) were put forth through the scoping process for this ER.

Minnesota Power did consider and evaluate several alternative endpoints in its CN application. On a regional basis, the primary alternative endpoint considered by the Applicant was in the Fargo-Moorhead area; after consideration of these alternative endpoints, Minnesota Power has stated that they do not provide a preferred solution when compared to the proposed project.

After consideration of the public comments, the Department issued its *Scoping Decision* on April 22, 2014. A copy of this decision is attached in **Appendix A**.

2.3 Public Hearing

The Commission is required by Minn. Rule 7849.5710 subp 1, to hold a public hearing once the ER has been completed. It is anticipated that this hearing will be held in October, 2011, in the project area, and will be conducted by an Administrative Law Judge (ALJ). The hearing will be noticed separately; docket details can be found online at:

http://mn.gov/commerce/energyfacilities/Docket.html?Id=33608

Interested persons may comment on the ER at the public hearing. The hearings will be presided over by an administrative law judge (ALJ) from the OAH in accordance with the Commission's order in this matter. At the public hearings, citizens will have an opportunity to submit comments, present evidence and ask questions. After the public hearings, an evidentiary hearing

will be held in St. Paul, Minn. The ALJ will submit a report to the Commission with findings of facts, conclusions of law and recommendations regarding a CN for the project.

A final decision on a CN application will be made by the Commission at an open meeting within a couple of months after the public hearing, depending on scheduling opportunities. The process anticipates a decision within 12 months of application acceptance.

If issued a certificate of need and route permit by the Commission, Minnesota Power may exercise the power of eminent domain to acquire the land necessary for the project pursuant to Minnesota Statute 216E.12 and Minnesota Statute 117.

2.4 Route Permit

Minnesota Statutes Section 216E.03, subd. 2, provides that no person may construct a HVTL without a route permit from the Commission. An HVTL is defined as a transmission line of 100 kV or more and greater than 1,500 feet in length in Minnesota (Minn. Statutes Section 216E.01, subd. 4). The proposed transmission lines are HVTLs and therefore a route permit is required prior to construction.

On April 15, 2014, Minnesota Power submitted a HVTL Route Permit application to the Commission for the proposed GNTL project. The application was submitted pursuant to the provisions of the Full Permitting Process outlined in Minnesota Rules 7850.1700 to 7850.2700.

The Commission accepted the HVTL Route Permit Application as complete on July 2, 2014, which marked the beginning of the full permitting review process.

Route permit applications are subject to environmental review conducted by Department of Commerce, Energy Environmental Review and Analysis staff. Projects proceeding under the full permitting process require the preparation of an environmental impact statement (EIS) (Minnesota Statute 216E.03, Subd. 5). Public information and scoping meetings are held to solicit comments on the scope of the EIS. The Department determines the scope of the EIS. The Department may include alternative sites or routes suggested by the public in the scope of the EIS if such alternatives will aid in the Commission's decision on the route permit application (Minnesota Rule 7850.2500). The Department must include those site or routes "the Commission deems necessary that [were] proposed in a manner consistent with rules concerning the form, content, and timeliness of proposals for alternate site or routes."

Certificate of Need and Joint Environmental Review

If an applicant for a certificate of need applies for a route permit (for the same project) prior to completion of the ER, the Department may elect to prepare an EIS in lieu of an ER (Minnesota Rule 7840.1900). If an EIS is prepared in lieu of an ER, the EIS must include an analysis of alternatives to the project required by Minnesota Rule 7849.1500.

Minnesota Power has submitted a route permit application (Docket No. E015/TL-14-21) and a certificate of need application (Docket No. E015/CN-12-1163) for the proposed GNTL project, however, the route permitting and need processes for the project are not proceeding concurrently. The Department released its Scoping Decision for the CN's Environmental Report on April 22, 2014, and the ER was nearly complete prior to the Commission accepting the HVTL Route Permit Application as complete.

Thus, separate environmental review documents are being developed for the Certificate of Need and the Route Permit dockets regarding the GNTL project.

2.5 Other Permits

Besides the certificate of need, construction of the project will require a High Voltage Transmission Line (HVTL) permit from the Commission (Minnesota Statutes, section 216E.03, subdivision 2). Potentially required permits and approvals are listed in **Table 1** below. The table also includes applicable executive orders and regulations that may guide regulating agencies in the permit or approval processes, and standards that require compliance or verification on the part of the Applicant in the design, construction, and operation of the project.

Table 1. Potential Permits/Approval Required

Jurisdiction	Permit/Approval/Consultation
FEDERAL	
Army Corps of Engineers	Clean Water Act Section 404 – Wetlands
Army Corps of Engineers	Clean Water Act Section 10 – Navigable Waters
Bureau of Land Management	To be determined through consultation
Customs and Border Protection	Reviewed as part of NEPA process; Need for additional permitting to be determined
Department of Agriculture – Farm Service Agency	Conservation Reserve Program (CRP) or Conservation Reserve Enhancement Program (CREP) Crossing Coordination
Department of Energy	NEPA Environmental Impact Statement (EIS) Record of Decision
Department of Energy	Presidential Permit
Department of Energy	Section 106 Consultation; Programmatic Agreement
Environmental Protection Agency	Section 401 Permit (if crossing tribal lands)

Jurisdiction	Permit/Approval/Consultation
Federal Aviation Administration	Part 7460 review - Parts 1 & 2 (Obstruction Evaluation/Airport Airspace Analysis)
U.S. Fish & Wildlife Service	Migratory Bird Treaty Act Consultation
U.S. Fish & Wildlife Service	Bald & Golden Eagle Protection Act Incidental Take Permit
U.S. Fish & Wildlife Service	Section 7 of Endangered Species Act
National Park Service	Land and Water Conservation Fund Act, Permission to cross LWCF properties
Natural Resource Conservation Service	NRCS Conservation Easement Program approvals
STATE	
Public Utilities Commission	MN Certificate of Need
Public Utilities Commission	MN Route Permit
Board of Water and Soil Resources	RIM Easement Releases (Coordination with landowners)
Board of Water and Soil Resources	Local/State/Federal Application for Water/Wetland Projects – Public Waters Work Permit
Department of Agriculture	Agriculture Impact Mitigation Plan – Implementation/ Oversight/Coordination
Department of Natural Resources	Local/State/Federal Application for Water/Wetland Projects – Public Waters Work Permit
Department of Natural Resources	License to Cross Public Waters License to Cross State Lands (May also require coordination with National Park Service for land crossings)
Department of Natural Resources	Coastal Zone Management Consistency Determination
Department of Natural Resources	Minnesota Endangered Species Act Coordination/Consultation
Department of Transportation	Utility, Drainage, Driveway, Overweight/Oversized Permits
Pollution Control Agency	National Pollution Discharge Elimination System Permit (Stormwater)

Jurisdiction	Permit/Approval/Consultation
Pollution Control Agency	Section 401 Clean Water Act Permit
State Historic Preservation Office	National Historic Preservation Act and Minnesota Historic Sites Act
LOCAL	
Local Governmental Units (LGUs)	Exemption or No Loss Determination (under the Wetland Conservation Act) Road Crossing/Right-of-way Permits Lands Permits Building Permits Overwidth Load Permits Driveway Access Permits
TRIBES	
Indian Tribes and other Consulting Parties	Section 106 Consultation

Once the Commission issues a Route Permit, local zoning, building and land use regulations and rules are preempted per Minn. Statute 216E.10, subd 1. However, the Applicant is still required to obtain relevant permissions, such as road crossing permits.

2.6 Applicable Codes

The transmission line, regardless of route location, must meet all requirements of the National Electrical Safety Code (NESC) for High Voltage Transmission Lines. These standards are designed to protect human health and the environment. They also ensure that the transmission line and all associated structures are built from high quality materials that will withstand the operational stresses placed upon them over the expected lifespan of the equipment provided normal routine operational and maintenance is performed.

Utilities must comply with the most recent edition of the National Electric Safety Code, as published by the Institute of Electrical and Electronics Engineers, Inc., and approved by the American National Standards Institute, when constructing new facilities or reinvesting capital in existing facilities. See Minn. Statute 326B.35 and Minn. Rule 7826.0300 subp 1.

The NESC is a voluntary utility developed set of standards intended to ensure that the public is protected. The NESC covers electric supply stations and overhead and underground electric

supply and communication lines, and is applicable only to systems and equipment operated by utilities or similar systems on industrial premises. For more information, go to standards.ieee.org/faqs/NESCFAQ.html#q1. The RUS provides leadership and capital to "upgrade, expand, maintain, and replace America's vast rural electric infrastructure." For more information, go to http://www.usda.gov/rus/electric/index.htm.

2.7 Issues Outside the Scope of the ER

The following issues will not be considered or evaluated in the ER:

- Route alternatives
- Any alternatives that do not meet the underlying need for or purpose of the project
- The impacts and issues associated with components of the project that are within the Canadian jurisdiction
- The manner in which land owners are paid for transmission rights-of-way easements
- Contested issues or disputes of fact with respect to the representations made in the CN application

3.0 Proposed Project

The Applicant's Great Northern Transmission Line includes a 500 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. The new substation facilities required for the GNTL project (Blackberry 500 kV Substation) will be constructed adjacent to and east of the existing Blackberry 230/115 kV Substation.

Figure 1 illustrates the Study Area between the two identified end points in which routes will be brought forth in the HVTL Route Permit Application (RPA). From the study area, the Applicant through a iterative process involving both the stakeholders and the public, narrows this area between the identified end points down to Study Corridors (**Figure 2**), then into Preliminary Route Alternatives (**Figure 3**), and finally into the Route Alternatives that are included in the HVTL RPA.

The factors used in the evaluation of the study area to reach potential route alternatives include potential constraints (those items that may limit or prevent transmission line development), opportunities (those items that may facilitate project development, such as, pre-existing linear infrastructure or public land survey divisions), and technical guidelines (specific engineering requirements and objectives associated with the construction of the project).

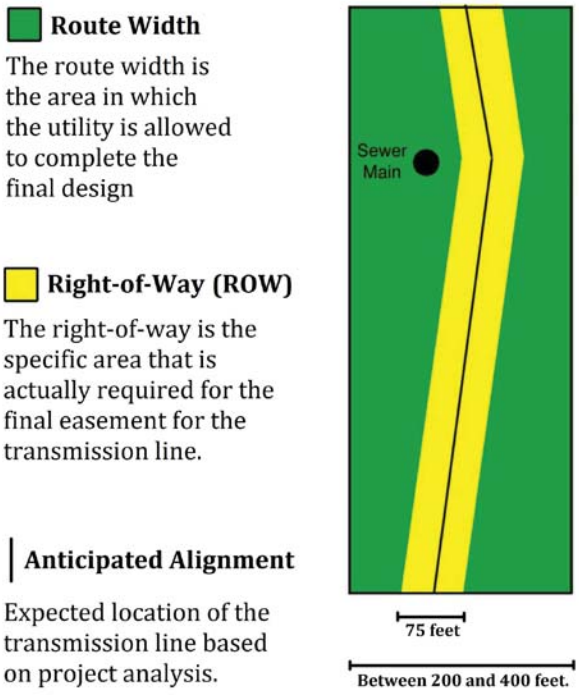
The technical guidelines for the project include the engineering requirements (separation distances, land requirements, tower and conductor design, etc.) and are discussed below, along with other procedures and methodologies that apply to the project regardless of siting considerations.

3.1 Route Width vs Right-of-way

The Power Plant Siting Act, Minnesota Statutes Chapter 216E, directs the Commission to locate transmission lines in a manner that "minimize(s) adverse human and environmental impact while ensuring continuing electric power system reliability and integrity and ensuring that electric energy needs are met and fulfilled in an orderly and timely fashion" (Minn. Stat. § 216E.02, subd. 1). The Act further authorizes the Commission to meet its routing responsibility by designating a "route" for a new transmission line when it issues a HVTL Route Permit. A route may have "a variable width of up to 1.25 miles," within which the right-of-way (ROW) for the facilities can be located (Minnesota Statute, section 216E.01, subdivision 8).

The route width is the area in which the utility is allowed to complete the final design for placement of structures and conductors. The right-of-way (ROW), on the other hand, is the specific area that is actually required for the final easement for the transmission line. In this case, it is anticipated that the Applicant will request varying route widths from 1,000 to 3,000

feet wide. However, the ROW actually needed for the transmission line facilities is only 200 feet wide, and may be even less in areas where the transmission line can share ROW with other infrastructure such as roads or highways, or in areas where the ROW for an existing transmission line can be share to a degree. The example below illustrates this concept for a 115 kV HVTL project in which a permitted route width of between 200 and 400 feet is requested, while the required ROW is 75 foot.



A wider ROW may be required for areas where longer spans between the structures is required, at angle and corner structures, for guyed structures, or where special design requirements are dictated by topography. Requesting a route width wider than the actual ROW needed gives the utility flexibility to make alignment adjustments to work with landowners, avoid sensitive natural resources or cultural resource areas, and to manage construction constraints (i.e., steep slopes, poor soils, etc.).

The ROW requirements are based upon National Electrical Safety Code (NESC) clearances from the electrical conductor (i.e., the transmission line) for trees, buildings, or other objects, and take into consideration the lateral movement of overhead transmission lines due to wind. The clearance also allows for occupation safety requirements regarding tree maintenance. In addition, the clearance limits the planting of vegetation that can potentially interfere with installation. Activities and other installations that do not interfere with the transmission line structure, such as sidewalks or roads, are permissible within the ROW.

3.2 Right-of-Way Acquisition

The acquisition of utility easement on private land consists of a multi-step process that involves contacting the land owner, conducting a land survey, preparation of legal documentation, and negotiating and purchase of the easement.

Owners of private land located within the desired ROW easement would be contacted by a ROW agent acting on behalf of the Applicant to discuss the land use needs specific to their parcel and any site-specific concerns of the land owner. The ROW agent would request permission to access the property to conduct a land survey and soil borings. The purpose of the survey is to identify natural features, man-made features, and elevations needed for detailed engineering design of the transmission line.

The ROW agent conducts negotiations with the land owner to acquire easement rights to build, operate, and maintain the transmission line and associated structures. The ROW agent would offer compensation for the easement. The specific location of structures associated with the transmission line would be staked during easement negotiations.

The monetary offer made for the easement is intended to compensate the land owner for any diminution in value of the fair market value of the property due to the encumbrance of the easement. The land owner would be allowed a set amount of time to consider the offer and present the ROW agent with additional information needed to determine the easement's value. If the land owner does not agree with the easement value offered by the ROW agent, the land owner and/or the Applicant may have an appraisal made. Reimbursement for the cost of the appraisal, up to $3,000, is available (Minn. Statutes, section 117.189).

Substation and Compensation Station

The Applicant has secured new land adjacent to and east of the existing Blackberry 230/115 kV Substation to accommodate the Blackberry 500 kV Substation. 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.

Additional property will also be required for the GNTL'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 approved Route Alternative. 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.

3.3 Engineering and Design

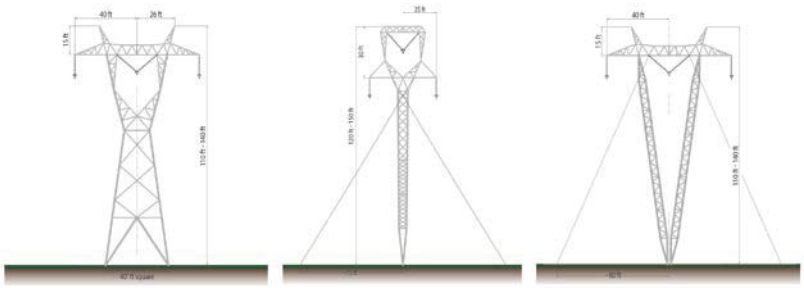
The project would be designed and constructed to meet the requirements of the National Electric Safety Code (NESC), North American Electric Reliability Corporation (NERC), and all applicable local and state design codes. The specific engineering design of the transmission line and substations would depend on the specific substation locations and route selected and location of the structures within the rights of way (ROW). This section provides an overview of the proposed engineering design of the transmission line and substations.

The Applicant proposes to construct a single-circuit 500 kV AC overhead transmission line. The nominal three phase operating voltage for the GNTL project will be 500 kV AC and will be operated at a frequency of 60 Hertz (Hz). The GNTL project is designed to increase the total transfer capability between Manitoba and the United States by at least 750 MW.

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 GNTL 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.

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

Several structure types and configurations are being considered for the GNTL project to accommodate variations in terrain and land use across the study area. These include: 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 or approximately 1,000 to 1,450 feet apart. The type of structure in any given section of transmission line will be dependent on land type and land use.



500 kV Self-Supporting Suspension Tower

500 kV Guyed Delta Suspension Tower

500 kV Guyed-V Suspension Tower

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 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 GNTL needs to cross existing transmission lines, taller structures may be required. In cultivated lands or in areas of intensive land use, the Applicant anticipates utilizing self- supporting lattice structures. In other areas where guy wires will not significantly interfere with land use, the Applicant may install one of the guyed structure types.

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.

Substation and Compensation Station

The GNTL 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. 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.

The GNTL project also requires 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. 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.

Based on preliminary studies, candidate sites in Minnesota for the compensation station include the overall midpoint of the line and at one-third of the overall transmission line distance from Blackberry to Dorsey.

3.4 Construction and Maintenance

Prior to construction of the project, the Applicant would conduct pre-construction soil and land-based surveys, develop location-specific engineering designs, and acquire right-of-way (ROW) easement rights.

Regardless of the route or design selected, similar construction equipment would be required. Equipment that would be used for construction includes: tree removal equipment, mowers, cranes, backhoes, digger-derrick line trucks, track-mounted drill rigs, dump trucks, front end loaders, bucket trucks, bulldozers, flatbed tractor-trailers, flatbed trucks, pickup trucks, concrete trucks and various trailers.

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

Construction

Construction of the project would require lay down and staging areas, which may be located outside the project ROW. These areas are used for the temporary storage of construction materials and equipment. The exact location of lay down and staging areas would be determined once the route is selected. These areas are temporarily leased from local landowners through rental agreements and would not require permanent ROW or easement acquisition.

Substation and 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.

Maintenance and Operation

Generally, 500 kV transmission lines are inspected annually for problems by foot, all-terrain vehicle, truck, snowmobile or aircraft. 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 landowner are generally contacted before repairs are performed. If damages are incurred during maintenance or repairs, the landowner will be compensated appropriately.

The ROW is managed to remove vegetation that interferes with the operation of the transmission line. 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.

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.

3.5 Project Implementation/Schedule

The GNTL project has a target 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 GNTL project construction will begin in fall 2016, as shown in **Table 2**, below.

Table 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
	July	Route Permit/Presidential Permit Scoping Meetings
	July	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 schedule is based on the best information available as of the date of this ER and upon planning assumptions that balance the timing of implementation with the availability of crews, materials, and other practical considerations. This schedule may be subject to adjustment and revision as further information is developed.

3.6 Project Costs

The cost of the GNTL project includes materials, construction, right-of-way acquisition and project management. The cost estimates are based on preliminary engineering consideration; the Applicant estimates that the construction of the GNTL project will cost between $495.5 million and $647.7 million (2013 dollars). Depending on final routes selected by the Commission, these projected cost estimates may also change. The major components of these preliminary estimates are shown in **Table 3**, below.

Table3. Project Costs

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

4.0 Alternatives to the Proposed Project

In addition to need, the CN process reviews possible alternatives to the proposed project that may be able to fill that need. A general description of these alternatives is required per Minn. R. 7849.1500, Subp. 1 (B). The requirements of this rule include an investigation into the feasibility of the following alternatives:

- The no-build alternative,
- Demand side management,
- Purchased power,
- Facilities of a different size than proposed by the applicant,
- Generation rather than transmission,
- Renewable energy sources

The following section discusses the feasibility (that is, can the alternative be engineered, designed and constructed) and availability (that is, is the alternative readily obtainable, suitable, accessible and sufficient) of potential alternatives to the proposed GNTL project which could eliminate the need for the proposed project. If an alternative fails to meet the Applicant's stated purpose and need, is not feasible or available that alternative is not carried forward into the evaluation of potential impacts described in Section 5 of the environmental report.

4.1 No Build Alternative

Under the no build alternative no transmission line would be constructed, nor would the proposed substation be built.

The immediate and direct impact to Minnesota Power would be the inability of MP to take delivery of the power from Manitoba Hydro under the Commission-approved 250 MW Agreements. Additionally, MP would lose the ability to receive the benefits of the additional 133 MW Renewable Optimization Agreements, along with the loss of the advantages brought about by the synergies possible through the coordination of wind and hydropower contemplated by Minnesota Power and Manitoba Hydro, as identified in the Manitoba Hydro Wind Synergy Study.

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 GNTL project will reduce loading on the existing tie line and enhance the performance of the transmission system during this contingency.

The no build alternative may require MP to seek other sources of energy to meet its forecasted load growth that are less optimal or that could potentially be more environmentally harmful than the proposed hydroelectric power and required transmission lines.

This is not a feasible alternative and does not meet the Applicant's stated purpose and need.

4.2 Demand Side Management/Conservation alternative

This alternative would seek to address, at a minimum, the need of 383 MW with Demand Side Management (DSM). The alternative would use a slate of energy conservation measures that would ultimately reduce load in the area to a level allowing the current system to operate in a reliable manner. This conservation effort would most likely be phased in, and would be above and beyond the companies' current efforts. In addition, any load growth occurring in the area would also need to be met through aggressive conservation efforts.

While conservation is an important component of Minnesota Power's overall resource planning, it cannot eliminate the need for the GNTL project to deliver at least 383 MW to Minnesota Power's customers as well as other load growth driving the need for the GNTL project. Minnesota Power's Conservation Improvement Program (CIP) is integral part of its resource planning. The CIP program focuses on increased efficiencies that reduce the amount of energy needed for MP's service territory. Minnesota Power's CIP includes residential, commercial, and small scale renewable programs. The Next Generation Energy Act of 2007 introduced, in addition to a minimum spending requirement of 1.5 percent, an energy-saving goal of 1.5 percent of gross annual retail electric energy sales by 2010. Since 2010 Minnesota Power has exceeded the 1.5 percent annual savings goal. While conservation is an important component of Minnesota Power's overall resource planning, it cannot eliminate the need for the GNTL project to deliver at least 383 MW to Minnesota Power's customers as well as other load growth driving the need for the GNTL project.

Conservation programs will continue to be implemented by Minnesota Power to maximize efficient use of electricity; however, these programs cannot slow load growth sufficiently to mitigate the projected inadequacies in the transmission system that require delivery of an additional 750 MW from Manitoba to the United States. Minnesota Power's demand side management and conservation effort are detailed in Appendix K of the Certificate of Need Application.

This is not a feasible alternative given that an unrealistic amount of conservation would have to be achieved in the project area to meet the needs that would otherwise be met by the proposed project.

4.3 Purchased Power

Another alternative generally reviewed in a Certificate of Need case is whether the Applicant could purchase power to meet the increased load growth in the area. Typically, this would be more relevant in a power plant application.

Minnesota Power's Certificate of Need Application didn't discuss purchases directly, but generation is covered in Section 7.3 of the document. MP has selected a power purchase agreement, so one could view this as the alternative they selected. They could have selected an alternative PPA (not Manitoba Hydro), such PPAs clearly are available. However, there likely isn't another source for large quantities of hydro power and the emissions/risk profile of hydro would be hard for another source to match.

In this transmission application, purchased power from another source would not eliminate the need for new transmission or solve any system inadequacies in the area. Power, produced or purchased, would have to be transferred and delivered along an arguably inadequate transmission system.

An alternative power purchase arrangement is not a feasible alternative to the GNTL project as it would not meet the Applicant's stated purpose of:

- Providing Minnesota Power Customers and the region with emission-free hydroelectric energy;
- Advancing Minnesota Power's EnergyForward strategy;
- Strengthening system reliability;
- Fulfilling Minnesota Power's obligations under the power purchase agreements.

4.4 Facilities of a Different Size or Type

In its certificate of need application Minnesota Power evaluated the possibility of developing transmission lines of different design voltages to accommodate increased hydropower transfers between Manitoba and the United States. The voltages considered include 230 kV, 345 kV and 765 kV.

230 kV Alternative
It is doubtful that a smaller line, such as 230 kV, would be able to meet the area's long term needs of 750 MW contained in the Applicant's forecast, however, it is likely that this alternative could service the 250 MW capacity needed to facilitate the Minnesota Power-Manitoba Hydro 250 MW power purchase agreements.

Additionally, carbon dioxide (CO_2) regulation is looming on the horizon, and utilities and regulators have been planning for that for a number of years (ramping up wind and solar, retiring small, old coal plants, etc). There is no reason to think the long term trend toward decreased

CO_2 emissions will change. Given a goal of ramping down CO_2 emissions, it is very hard to see how achieving this goal will be realized without retiring the larger coal plants (Sherco, Boswell, et al). Retiring those large coal plants will require additions of large amounts of CO_2 free energy production. Manitoba Hydro will likely be a key player in replacing such plants.

The proposed financing and ownership structure of the project also influences the consideration of a 230 kV alternative. As Minnesota Power and Manitoba Hydro have structured the project, Minnesota Power ratepayers will gain the economy of scale capital cost reduction advantages of a 500 kV project as compared to the 230 kV project.

Design and construction of a 500 kV line to meet the forecasted load growth and demand for CO_2 free energy will reduce the proliferation of new transmission line corridors in the future, thereby reducing the human and environmental impacts that would be associated with these future transmission line expansions.

While the 230 kV alternative is feasible at the 250 MW capacity of the PPA, its availability at this lower capacity may be impacted by the economies of scale and other contracting constraints.

The 230 kV alternative does not meet the Applicant's stated purpose and need.

345 kV Alternative

As with the 230 kV alternative, it is doubtful that a single circuit 345 kV line would be able to meet the area's long term needs, however, it is likely that this alternative could service both the 250 MW capacity needed to facilitate the Minnesota Power-Manitoba Hydro 250 MW power purchase agreements and the pending 133 MW capacity of the 133 MW Renewable Optimization Agreements between Minnesota Power and Manitoba Hydro.

An equivalent project to a single 500 kV line would be a double circuit 345 kV line from Winnipeg to the Iron Range, which the Applicant reports would be similar in cost to a 500 kV line. The 500 kV line would be better suited to move power over the long distance from Winnipeg to the Iron Range because it has a higher voltage and therefore higher surge impedance loading; line losses between the two may also be a consideration.

Compounding issues associated with a 345 kV alternative is that there is no existing 345 kV equipment in the Winnipeg area where the line originates. If a double circuit 345 kV line was built instead of the proposed 500 kV line, expensive new substation equipment would be required at the Canadian endpoint to step down the voltage from 500 kV to 345 kV.

While the single circuit 345 kV alternative is feasible at the 250 MW capacity of the PPA, plus the 133 MW capacity of the Renewable Optimization Agreements, its availability at this lower capacity may be impacted by the economies of scale, conflicts associated with equipment and systems compatibilities, and other contracting constraints.

The single circuit 345 kV alternative does not meet the Applicant's stated purpose and need.

The double circuit 345 kV alternative is feasible at the 750 MW capacity forecasted by Minnesota Power; its availability may be constrained by the economies of resolving conflicts associated with equipment and system compatibilities north of the border.

The double circuit 345 kV alternative does meet the Applicant's stated purpose and need.

765 kV Alternative
Similar to the 345 kV alternative and existing equipment in the Winnipeg area, there is currently no 765 kV transmission system in MISO north of Illinois; this means expensive transformation equipment would be required at each substation to interconnect with existing 500 kV and 230 kV systems in Manitoba and Minnesota.

The Applicant reports that the increased construction costs of a higher voltage line, along with the overall cost increase and operational complexity, would not justify the additional capacity gained by a 765 kV line compared to a 500 kV line.

While the 765 kV alternative would meet the 750 MW capacity forecasted by Minnesota Power, it does not appear to be feasible or availability given the extensive incompatibilities associated with the engineering and system design of the electrical grid on both the United States and Canadian sides of the border.

DC Alternative
Historically, the transfer of electricity between regions of the United States has been over high voltage alternating current (AC) transmission lines, which means that both the voltage and the current on these lines move in a wave-like pattern along the lines and are continually changing direction. In North America, this change in direction occurs 60 times per second (defined as 60 hertz [Hz]). The electric power transmitted over AC transmission lines is exactly the same as the power we use every day from AC outlets, but at a much higher voltage.

Unlike an AC transmission line, the voltage and current on a direct current (DC) transmission line are not time varying, meaning they do not change direction as energy is transmitted. DC electricity is the constant, zero-frequency movement of electrons from an area of negative (-) charge to an area of positive (+) charge.
Advantages of High voltage direct current (HVDC) lines include[2]:

- More efficient: Over long distances, DC transmission can move more power with less electrical losses than an equivalent AC transmission line.
- Lower Cost: Higher efficiency means a lower transmission cost, helping renewable energy compete against other power sources.

[2] http://www.princeton.edu/~achaney/tmve/wiki100k/docs/High-voltage_direct_current.html

- Improved Reliability: HVDC transmission can enhance system stability, allow the operators complete control over power flow, and facilitate the integration of renewable energy from different resource areas.
- Smaller Footprint: DC transmission lines require narrower right-of-way footprints, using less land, than equivalent AC lines.

While the line loss savings associated with an HVDC line may be economically beneficial, HVDC lines also have their disadvantages, such as[3]:

- Expensive components: Converter substations, needed to connect to AC power grids, are more complicated than HVAC substations, not only in additional converting equipment, but also in more complicated control and regulating systems. Converter substations generate current and voltage harmonics, while the conversion process is accompanied by reactive power consumption. As a result, it is necessary to install expensive filter-compensation units and reactive power compensation units.
- Complex components: In contrast to AC systems, designing and operating multi-terminal HVDC systems is complex. Controlling power flow in such systems requires continuous communication between all terminals, as power flow must be actively regulated by the control system instead of by the inherent properties of the transmission line.
- Power faults: During short-circuits in the AC power systems close to connected HVDC substations, power faults also occur in the HVDC transmission system for the duration of the short-circuit. During short-circuits on the inverter output side, a full HVDC transmission system power fault can be caused. Power faults due to short-circuits on the rectifier input side are usually proportional to the voltage decrease.
- Potential radio interference: The high-frequency constituents found in direct current transmission systems can cause radio noise in communications lines that are situated near the HVDC transmission line. To prevent this, it may be necessary to install expensive "active" filters on HVDC transmission lines.
- Grounding difficulties: Grounding HVDC transmission involves a complex and difficult installation, as it is necessary to construct a reliable and permanent contact to the Earth for proper operation and to eliminate the possible creation of a dangerous "step voltage."
- Electrochemical corrosion: The flow of current through the earth in monopole systems can cause the electro-corrosion of underground metal installations, mainly pipelines.
- Capacities: The number of substations within a modern multi-terminal HVDC transmission system can be no larger than six to eight, and large differences in their capacities are not allowed. The larger the number of substations, the smaller may be the differences in their capacities. Thus, it is practically impossible to construct an HVDC transmission system with more than five substations.

The Applicant has stated that given these advantages/benefits and disadvantages/costs of HVDC transmission, the break-even line length at which HVDC becomes economically feasible

[3] http://www.princeton.edu/~achaney/tmve/wiki100k/docs/High-voltage_direct_current.html

compared to AC transmission is usually between 400 and 500 miles. Since the total length of the GNTL project plus its Canadian counterpart will be less than 400 miles, Minnesota Power believes that a HVDC alternative would not be economically justified.

Manitoba Hydro expressed concerns with the HVDC alternative early in the development of the GNTL project. Manitoba Hydro's concerns stem from the technical risks associated with having multiple HVDC links in a common area. Currently, Manitoba Hydro operates two HVDC bi-poles that connect their northern generation to the Winnipeg area, terminating at the Dorsey converter station. Manitoba Hydro is also in the process of developing a third HVDC bi-pole, which will terminate at the Riel converter station near Winnipeg. If a fourth HVDC link were developed (to accommodate the GNTL project) with a terminus in the Winnipeg area, the risk of control interaction or frequency response issues would be considerable. For example, three phase AC faults in the Winnipeg area could cause simultaneous commutation failure on all four bi-poles, which could lead to load shedding.

This is not a feasible alternative to the proposed GNTL project.

4.5 Upgrading Existing Transmission Lines

The existing interface between Manitoba and the United States consists of three 230 kV lines and one 500 kV line. The three 230 kV lines from Manitoba to the United States are the G82R (from Glenboro to Rugby - North Dakota), the L20D (from Letellier to Drayton - North Dakota), and the R50M (from Richer to Moranville - Minnesota). The Dorsey – Forbes 500 kV line (D602F), originates at the Dorsey Substation near Winnipeg, Manitoba and connects to the Forbes Substation on Minnesota's Iron Range and then continues on to the Chisago Substation near the Twin Cities.

Current total firm transfer capability on the Manitoba – United States interface is 2,175 MW southward and 700 MW northward.

Increased transfer levels from Manitoba to the United States with no new transmission tie lines across the interface would require additional capacity on some or all of the existing tie lines. While it is technically feasible to increase the rating of D602F from 2,000 amps (1732 MVA) to 2,500 amps (2165 MVA) by upgrading the Roseau series capacitors, this upgrade would be highly complex and raise a number of potential issues relating to the operation of the line and terminal equipment as well as the reliability of the regional transmission system. A study conducted by Manitoba Hydro (*Summary of Potential Issues with Increasing the Rating of D602F (M602F) from 2000 Amp to 2500 Amp*) in July, 2013, highlighted these technical and economic issues associated with this approach.

Minnesota Power believes that upgrading existing facilities is not a feasible long-term solution given the likelihood of significant increases in hydroelectric power imports from Manitoba including and exceeding Minnesota Power's power purchase and Renewable Optimization

Agreements representing 383 MW. The Applicant continues in stating that the long-term capacity for the interface between Manitoba and the United States can be achieved more efficiently, economically, and reliably with a single new transmission line build large enough to facilitate Minnesota Power's 383 MW and additional transfer capability up to 750 MW to meet future needs in the region.

4.6 Generation Alternatives

The Commission's order in the PPA docket (E015/M-11-938) was released on February 1, 2012, and determined that Manitoba Hydro was the right resource to address Minnesota Power's stated need.

During the Environmental Report scoping process, several commenters expressed support for the use of domestic energy sources (coal and nuclear) to meet the projected energy needs of Minnesota. The Commission may not issue a CN for the construction of nuclear power plants pursuant to Minn. Stat. Section 216B.243, subdivision 3b. For a variety of reasons, additional electrical power from coal power plants is not a realistic option in Minnesota at this time. Relative to CO_2 emissions and pertinent to coal fire power plants; Minn. Statute 216H.03 contains the following:

- No Large Energy Facility (LEF) can add to statewide CO_2 emissions (216H uses the LEF definition from 216B.2421 subd 2);
- No importing or commitment to import from outside the state power from a new large energy facility that would contribute to statewide power sector carbon dioxide emissions;
- No entering into a new long-term power purchase agreement that would increase statewide power sector carbon dioxide emissions;
- Natural gas units are exempted.

There are other exceptions (CO_2 offsets, CO_2 sequestration) in 216H.03 subd 4, but they make the cost for a coal plant rise above that which is economically feasible.

While a natural gas fired power plant (simple cycle combustion turbine or combined cycle plant) could provide the minimum requirement of generating approximately 383 MW of capacity for delivery to Minnesota Power's service area, it would fail to meet the stated purpose and need of the Commission approved PPA, the load growth forecasted by MP, the system reliability improvements between Manitoba and the US, and the increased access to emission free electricity that would result from the GNTL project.

Although combustion turbines (CT) are one of the primary workhorses of the power industry, nearly all new central station power plants use combined cycle (combustion turbines, heat recovery steam generator, steam turbine) arrangements. Smaller, single CTs (simple cycle) have characteristics favorable for use as a distributed energy resource and peaking supply applications, and because of this, are frequently used by independent power producers. Because

combustion turbines have low efficiency in simple cycle operation, the output produced by the steam turbine accounts for about half of a combined cycle plant's output. There are many different configurations for combined cycle power plants, but typically each CT has its own associated heat recovery steam generator (HRSG), and multiple HRSGs supply steam to one or more steam turbines. A combined cycle plant can achieve a thermal efficiency of around 60 percent, in contrast to a single cycle CT power plant which is limited to efficiencies of around 35 to 42 percent.

Any generation alternative, such as a centralized natural gas combined cycle power plant, would most likely require the construction of new transmission line infrastructure.

Distributed generation (DG) refers to the placement of individual, smaller sized electric generation units at residential, commercial, and industrial sites of use. Typically, electricity is generated in large, centralized power plants. However, deregulation in the electricity industry, coupled with new technology and environmental regulations have resulted in the development of distributed energy resources. This refers to the practice of generating electricity on-site, instead of in a large centralized power plant. Distributed generation offers opportunities across all sectors, from very small residential and commercial on-site generators, to larger output industrial generators.

DG can take many forms, from small, low output generators used to back up the supply of electricity obtained from the centralized electric utilities, to larger, independent generators that supply enough electricity to power an entire factory. Distributed generation is attractive because it offers electricity that maybe more reliable, more efficient, and cheaper than purchasing power from a centralized utility, depending on the site specific situation. DG also allows for increased local control over the electricity supply, and cuts down on electricity losses during transmission.

Minnesota Power has examined distributed generation opportunities, including opportunities with its large industrial customers in its Resource Plan filings. However, MP believes that while distributed generation resources play a role in the Company's overall resource strategy going forward, they cannot displace the need for the GNTL project and the substantial energy and capacity deliveries the project makes available.

5.0 Potential Impacts of the Proposed Project

The GNTL project includes the construction of a new 500 kV transmission line in Minnesota from the United States/Canadian border to the Minnesota Power Blackberry Substation near Grand Rapids, Minnesota. The 500 kV Line will be approximately 235-270 miles in length, subject to final route approval by the Commission, and will be constructed on a 200 foot wide right-of-way. The line will provide 750 MW of transfer capability. The Minnesota counties likely to be impacted by the construction of the 500 kV Line (depending on final route selection) include: Beltrami, Itasca, Koochiching, Lake of the Woods, and Roseau.

It is anticipated that Minnesota Power will be requesting, in its route permit application (RPA), a route width of 1,000 to 3,000 feet wide, with structures ranging in heights from approximately 100 feet to 150 feet above ground. Structure placement is estimated to be on the order of 4 to 5 structures per mile of transmission line. A variety of structure types (self-supporting suspension, guyed delta suspension, and guyed-V suspension) may be used along the route.

Minnesota Rule 7850.1900, subpart 2 requires that the Applicant proposed two routes for consideration in its RPA. The RPA (filed April 15, 2014) indicates two routes, identified as the orange and the blue, both located along the northern portion of the notice plan Study Area.

This chapter of the ER includes a general discussion of the various resources within the Study Area and the potential impacts to those resources. Here, these issues will be described and discussed from a generic "transmission line" perspective and on a regional scale. In the Routing docket and the corresponding environmental review document (i.e., Environmental Impact Statement) these issues will be considered relative to the specific routes and rights-of-way being evaluated and the potential impact to specific receptors or features "on the ground."

The reader is directed to the EIS, which will be developed as part of the HVTL Route Permit Application procedures, for a detailed discussion of these issues.

All of the non-voltage project alternatives described in Section 4.0 failed to meet the Applicant's stated purpose and need, or were deemed not feasible or unavailable. None of those alternatives have been carried forward into this Section depicting the potential impacts.

The three voltage alternatives (230 kV, 345 kV and 765 kV) would include the engineering, design and construction of high voltage transmissions lines through the same geographical area, and would have either an incremental lesser (230 kV and single circuit 345 kV) degree or an incrementally greater degree (double-circuit 345 kV and 765 kV) of impacts to the natural and built environments as described below for the proposed 500 kV HVTL.

5.1 Air Quality

There are minimal air quality impacts associated with transmission line construction and operation. The only potential air emissions from the operation of a transmission line result from corona. Corona can produce ozone and oxides of nitrogen in the air surrounding the conductor. Corona consists of the breakdown or ionization of air in a few centimeters or less immediately surrounding conductors.

The ozone levels generated from 500-kV lines have been found to be significantly below natural levels and fluctuations in natural levels.[4] Calculations done for a 345 kV project showed that the maximum one hour concentration during foul weather (worst case) would be 0.0007 parts per million (ppm) ozone. This is well below both the federal (0.075 ppm 8 hour) and state standards (0.08 ppm 8 hour) for ozone.

The most recent study found regarding ozone and transmission lines was conducted in Europe by Valuntait and Girgdiene, published in 2009.[5] That study found ozone concentration close to the high voltage lines in rural areas were on average 2 percent higher than the background ozone concentration, and up to a maximum of 38 percent higher in some cases. Concentrations near the lines were highest when the air was calm. Absolute concentration levels were reported in the range of 40 parts per billion (ppb) near the lines, falling to below 34 ppb approximately 50 meters from the lines.

Temporary fugitive dust emissions from construction activities may occur. Along the proposed route, clearing vegetation and driving the utility poles may create exposed areas susceptible to wind erosion. In addition, tailpipe emissions may generate exhaust from the construction vehicles.

Fugitive dust is considered particulate matter (PM) under air quality regulations. The concentrations of fugitive dust that is fine particulate matter (P.M. less than 2.5 microns or PM2.5) is generally small or approximately 3 percent to 10 percent of total particulate matter (USEPA's AP-42, Sections 13.2 and 11.9). Since fine particulate matter has the potential to travel further into the lungs, it is of greater concern than larger particle size ranges.

Commonly used best management practices (BMP), such as frequent cleaning of construction equipment and vehicles, dust suppression, and the restoration/re-vegetation of disturbed areas, can minimize potential for temporary impacts to air quality during construction.

5.2 Biological Resources

The Study Area is located within three Ecological Provinces and five Ecological Subsections, as classified by the Minnesota Department of Natural Resources (**Figure 4**). The area includes a

[4] http://efw.bpa.gov/environmental_services/Document_Library/Libby/Appendices/AppendixH_EMF.pdf
[5] http://efw.bpa.gov/environmental_services/Document_Library/Grand_Coulee/GrandCouleeLineReplacementProjectPrelimEA.pdf

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 (**Figure 5**).

Flora

A small amount of vegetation will be permanently removed at each structure location. The total structures footprint across the GNTL project (based on 4 to 5 structures per mile, total length of 235 to 270 miles) is estimated to be approximately 1.6 acres. 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.

Impacts to non-forested areas would be temporary and would primarily occur during construction of the project. To minimize impacts to trees along the GNTL, tree clearing and removal is limited to the transmission line ROW and areas that impact the safe operation of the facilities. Trees outside the ROW that may need to be trimmed or removed would primarily include trees that are unstable and could potentially fall into the transmission facilities.

Fragmentation of vegetative 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.

A transmission line ROW can fragment a larger forest block into smaller tracts. Fragmentation makes interior forest species more vulnerable to predators, parasites, competition from edge species and catastrophic events. The continued fragmentation of a forest can cause a permanent reduction in species diversity and suitable habitat. This loss of forested habitat increases the number of common (edge) plants and animals that can encroach into what were the forest interiors. This encroachment can have impacts on the number, health, and survival of interior forest species, including some of which may be rare. Examples of edge species that can encroach into forest interiors via transmission ROWs include raccoons, cowbirds, crows, deer and box elder trees. Interior forest species include songbirds, wolves and hemlock trees.

The opening of the forest floor to sunlight through tree clearing of the ROW can further encourage these aggressive, invasive species to proliferate. Their spread can alter the ecology of a forest as they out-compete native species for sunlight and nutrients, further reducing suitable habitat and food sources for local wildlife.

Construction vehicles may inadvertently bring into forest interiors invasive and/or non-native plant species. Transmission line construction causes disturbance of ROW soils and vegetation through the movement of people and vehicles along the ROW, access roads, and laydown areas. These activities can contribute to the spread of invasive species. Parts of plants, seeds, and root stocks can contaminate construction equipment and essentially “seed” invasive species wherever

the vehicle travels. Invasive species' infestations can also occur during periodic transmission ROW maintenance activities especially if these activities include mowing and clearing of vegetation. Once introduced, invasive species will likely spread and impact adjacent properties with the appropriate habitat.

Examples of problematic invasive species are buckthorn, honeysuckle and garlic mustard. Invasive species, once introduced, have few local natural controls on their reproduction and easily spread.

BMPs for control of invasive species include marking and avoidance of invasive species, timing construction activities during periods that would minimize their spread, proper cleaning of equipment and proper disposal of woody material removed from the ROW.

Because construction measures may not be completely effective in controlling the introduction and spread of invasive species, post-construction activities are required. Sensitive areas such as wetlands and high quality forests and prairies should be surveyed for invasive species following restoration of the construction site. If new infestations are discovered, then measures should be taken to control the infestation. Each exotic or invasive species requires its own protocol for control or elimination. Techniques to control exotic/invasive species include the use of pesticides, biological agents, hand pulling, controlled burning, and cutting or mowing.

Fauna

The grasslands, wetlands, and woodlands in the area provide habitat for a variety of wildlife. Wildlife and other organisms that inhabit the project area include small mammals such as mice, voles, and ground squirrels; large mammals such as white-tailed deer; waterfowl and other water birds like pelicans and egrets, songbirds, raptors, upland game birds; and reptiles/amphibians such as frogs, salamanders, snakes, and turtles.

Wildlife that resides within the construction zone will be temporarily displaced to adjacent habitats during the construction process.

Birds have the potential to collide with all elevated structures, including power lines. Avian collisions with transmission lines can occur in proximity to agricultural fields that serve as feeding areas, wetlands and water features, and along riparian corridors that may be used during migration.

The electrocution of large birds, such as raptors, is more commonly associated with small distribution lines than large transmission lines. Electrocution occurs when birds with large wingspans come in contact with two conductors or a conductor and a grounding device. Utility transmission line design standards provide adequate spacing to eliminate the risk of raptor electrocution and will minimize potential avian impacts of the proposed project.

Plastic erosion control netting is frequently used for erosion control during construction and landscape projects and can negatively impact terrestrial and aquatic wildlife populations as well as snag in maintenance machinery, resulting in costly repairs and delays. Wildlife entanglement in, and death from, plastic netting and other man-made plastic materials has been documented in birds, fish, mammals, and reptiles.[6]

The use of swan flight diverters (SFD) can minimize avian impacts by visually marking the presence of the line.

Avoiding the use of photodegradable erosion-control materials where possible and the use of biodegradable materials (typically made from natural fibers), preferably those that will biodegrade under a variety of conditions, can minimize the impact to wildlife.

Threaten and Endangered Species

Endangered species are species whose continued existence is in jeopardy. Threatened species are likely to become endangered. Species of special concern have some problems related to their abundance or distribution, although more study is required.

Construction and maintenance of transmission lines might destroy individual plants and animals or might alter their habitat so that it becomes unsuitable for them. For example, trees used by rare birds for nesting might be cut down or soil erosion may degrade rivers and wetlands that provide required habitat.

In some limited cases, transmission line ROWs can be managed to provide habitat for endangered/threatened resources. An example includes osprey nesting platforms built on top of transmission poles.

The MnDNR Division of Ecological and Water Resources manage the Natural Heritage Information System (NHIS) which provides information on Minnesota's rare plants, animals, native plant communities, and other rare features. The NHIS is continually updated as new information becomes available, and is the most complete source of data on Minnesota's rare or otherwise significant species, native plant communities, and other natural features. Its purpose is to foster better understanding and conservation of these species and the natural features they inhabit.

In defining the route alternatives and developing a HVTL route permit application for the GNTL, the Applicant will review the NHIS data base, as well as, the Fish and Wildlife Service (USFWS) website. This information will be used to evaluate potential conflicts and to determine what, if any, biological surveys are necessary.

[6] http://files.dnr.state.mn.us/eco/nongame/wildlife-friendly-erosion-control.pdf

The environmental review procedures within the rules governing the HVTL route permit application process is designed to identify rare species and unique natural resources so that the various routing options can be designed to avoid encroachment and effects on these items to the greatest extent practicable

5.3 Cultural, Archaeological and Historic Resources

The Study Area incorporates parts of Roseau, Beltrami, Lake of the Woods, Koochiching, and Itasca counties. The communities in these counties are not marked by significant cultural differences. They are part of a larger area within the United States that Colin Woodard has termed "*Yankeedom*", and are described as sharing general values with communities in the New England states.[7] According to Woodard, these values can be described as a middle-class character, a general belief that government should be used for improving the lives of its citizens, and the exertion of local political control.

In the book, *Our Patchwork Nation*, authors Chinni and Gimpel draw on two years of research, interviews and U.S. Census data to offer regional portraits of the U.S. that look at political, social, economic, and cultural perspectives of the entire country county by county. They provide a list of 12 distinct types of communities that comprise the nation.[8] In Chinni and Gimpel's analysis, three of the five counties within the Study Area (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 (Beltrami County) or Service Worker Center (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 Study Area 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 the Study Area. Although not all American Indian populations share the same values, American Indian communities, and the Red Lake Band of Chippewa in

[7] Woodard, Colin. American Nations: A History of the Eleven Rival Regional Cultures of North America. ISBN: 978-1-101-54445-7.
[8] Chinni and Gimpel. Our Patchwork Nation: The Surprising Truth About the "Real" America. ISBN 1-101-46213-2.

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.

Neither of the two HVTL routes in development by Minnesota Power is anticipated to cross the Red Lake Reservation, Boise Forte Reservation or other tribal lands, however, it is likely that Tribes will still have an interest in the routing of the GNTL.

In defining the route alternatives and developing a HVTL route permit application for the GNTL, the Applicant will review the Minnesota State Historic Preservation Office (SHPO) data base, as well as, the list of National Register of Historic Places (NRHP) as part of its cultural resource assessment. This information will be used to evaluate potential conflicts and to determine what, if any, archaeological or cultural surveys are necessary.

As the GNTL project will involve a Presidential Permit[9]; the federal government has a responsibility to consult with American Indian Tribes on a government-to-government basis. This consultation will take place as the federal government (Department of Energy) and the Department work jointly on the environmental review (Environmental Impact Statement) associated with the HVTL Route Permit Application review procedures.

5.4 Soils, Geology, and Physiography

Soils lie in a complex mosaic across Minnesota and may seem to lack a pattern. This mosaic is not random, however, but is the result of five major environmental elements blended together. The five elements, or soil-forming factors, that lead to the pattern of soils we observe are: 1) the parent material, the geologic material from which the soil was originally formed; 2) the climate in which the material is found; 3) the relief or landscape properties upon which that material lay, such as the slope and aspect; 4) the organisms that can potentially live on or in the material; and 5) the length of time during which the previous four elements have interacted. This unique combination of factors produces a soil. At any location in the state, that combination of factors may be unique, and produce a unique soil; or a given combination may recur at many locations, producing similar soils.

The soils within the Study Area are largely a reflection of surficial geology developed under the influence of glacial activity (**Figure 6**). The soils within 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 the retreat of the glaciers, soils have developed in conjunction with advancing and retreating vegetation communities and changing climatic patterns.

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

[9] National Historic Preservation Act (NHPA), 36 Code of Federal Regulations (CFR) 800.

formed at the surface. The four major orders within the Study Area are: Mollisols, Alfisols, Histosols, and Entisols.

Impacts on soils are dependent, to some extent, on the conditions of the soil surface at the time of construction; most impacts should be temporary. Construction activities that occur on wet soils tend to have longer lasting impacts, regardless of the soil type, while those activities on dry or frozen soil should have minimal impact. 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 ROW). 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.

Wet organic soils (Histosols) pose a challenge for construction; the Study Area contains extensive areas of organic soils, which are anticipated to be encountered in approximately 28 percent of the project.

Impacts to soils can be minimized by following best management practices, which include:

- Avoid soil disturbance and excavation activities in steep slope areas to the extent practical;
- The use and application of matting, ice roads, and low ground pressure equipment to the extent practical;
- Development and adherence to sediment and erosion control plans, which 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;
- To relieve issues of soil compaction in cultivated areas, restoration through tillage operations such as using a subsoiler;
- Repairing the surface and restoring ground vegetation in areas where rutting has occurred;
- Re-vegetating all areas once construction is complete with seed mixes that are certified free of noxious weed seeds.

The Study Area has been shaped by the advance and retreat of glaciers (**Figure 7**). The northwestern two-thirds of the Study Area is a flat to gently rolling lake plain remnant of Glacial Lake Agassiz, with local topographic relief less than 50 feet in most areas. Bogs and swamps are common. This relatively flat lake plain changes to steeper topography to the southeast in southern Koochiching County, Minnesota. This portion 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; the upland areas are covered by aspen and pine.

The southeastern one-third of the Study Area is gently rolling to steeply sloping, characteristic of glacial end moraines and a pitted outwash plain. 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. The greatest elevation changes in the Study Area are at the Giants Ridge, near the cities of Taconite and Calumet, Minnesota. This portion 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.

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, and numerous lakes smaller than 1 mile across.

Approximately 50 to 300 feet of glacially derived sediments, along with areas of deep peat, overlie the bedrock within most of the Study Area, although there are areas where bedrock is at or near the surface. Areas where bedrock is within 0 to 50 feet of the surface include: the Giants Ridge near the City of Taconite; eastern and northern Itasca County, Minnesota; and central and northwestern Koochiching County. There are multiple isolated or grouped bedrock outcrops in these areas.

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.

The GNTL project will require minimal excavation or surface grading because transmission lines are constructed to conform to the local topography; impacts on topography or geology are not expected.

5.5 Health and Safety

The GNTL project will be designed to comply with local, state, NESC and Minnesota Power standards regarding clearance to ground, clearance to crossing utilities, clearance to buildings, strength of materials and ROW widths. Minnesota Power construction crews and/or contract crews would comply with local, state, NESC and Minnesota Power standards regarding installation of facilities and standard construction practices. Established industry safety procedures would be followed during and after installation of the transmission line. This would include clear signage during all construction activities.

Transmission lines must be equipped with protective devices to safeguard the public from the transmission line if an accident occurs and a structure or conductor falls to the ground. The

protective devices are breakers and relays located where the transmission line connects to the substation. The protective equipment would de-energize the transmission line, should such an event occur.

Electric and Magnetic Fields

Voltage transmitted through any conductor produces both an electric field and a magnetic field in the area surrounding the wire. The electric field associated with HVTLs extends from the energized conductors to other nearby objects. The magnetic field associated with HVTLs surrounds the conductor. Together, these fields are generally referred to as electromagnetic fields, or EMF. These effects decrease rapidly as the distance from the conductor increases.

Electric Fields

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

The intensity of electric fields is associated with the voltage of the transmission line and is measured in kilovolts per meter (kV/M). Transmission line electric fields near ground are designated by the difference in voltage between two points (usually 1 meter). **Table 4** provides the electric fields at maximum conductor voltage for the proposed transmission lines. Maximum conductor voltage is defined as the nominal voltage plus five percent.

The maximum electric field, measured at one meter above ground, associated with the project is calculated to be 7.122 kV/m.

Table 4. Calculated Electric Fields (kV/m)

Structure Type	Edge of Right-of-Way	Maximum Overall	
	E-Field Intensity (kV/m)	E-Field Intensity (kV/m)	Distance from ROW Centerline (ft.)
500 kV Single Circuit Guyed Delta Tower	1.330	6.613	31.2
500 kV Single Circuit Self-Supporting Tower	2.325	7.122	43.8
500 kV Single Circuit Guyed-V Tower	2.325	7.122	43.8

There is no federal standard for transmission line electric fields. The Commission, however, has imposed a maximum electric field limit of 8 kV/m measured at one meter above the ground. *In the Matter of the Route Permit Application for a 345 kV Transmission Line from Brookings County, South Dakota to Hampton, Minnesota,* Docket No. ET-2/TL-08-1474, Order Granting Route Permit (*adopting* ALJ Findings of Fact, Conclusions and Recommendation at Finding 194 (April 22, 2010 and amended April 30, 2010)) (September 14, 2010). The standard was designed to prevent serious hazards from shocks when touching large objects parked under AC transmission lines of 500 kV or greater.

Magnetic Fields

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

Table 5. Predicted Intensity of Magnetic Fields at Maximum Ampacity (milligauss)

Structure Type	Edge of Right-of-Way	Maximum Overall	
	B-Field Intensity (mG)	B-Field Intensity (mG)	Distance from ROW Centerline (ft.)
500 kV Single Circuit Guyed Delta Tower	52.94	258.11	0
500 kV Single Circuit Self-Supporting Tower	88.54	293.67	18.8
500 kV Single Circuit Guyed-V Tower	88.54	293.67	18.8

Predicted Intensity of Magnetic Fields at Projected Peak Loading

Structure Type	Edge of Right-of-Way	Maximum Overall	
	B-Field Intensity (mG)	B-Field Intensity (mG)	Distance from ROW Centerline (ft.)
500 kV Single Circuit Guyed Delta Tower	26.81	126.18	0
500 kV Single Circuit Self-Supporting Tower	44.76	144.68	18.8
500 kV Single Circuit Guyed-V Tower	44.76	144.68	18.8

The magnetic field profiles around the proposed HVTL for each structure and conductor configuration being considered for the project is shown in **Table 5**. Magnetic fields were calculated at the conductor's thermal limit based on the design of the HVTL. The peak magnetic field values are calculated at a point directly under the HVTL and where the conductor is closest to the ground. The same method is used to calculate the magnetic field at the edge of the right-of-way. The magnetic field profile data show that magnetic field levels decrease rapidly as the distance from the centerline increases.

Because the actual power flow on a transmission line could potentially vary widely throughout the day depending on electric demand, the actual magnetic field level could also vary widely from hour to hour. In any case, the typical loading of the transmission line will be far below the thermal limit of the line, resulting in typical magnetic fields well below those indicated in the table.

It can be noted that magnetic fields are not singularly associated with power lines. Every person has exposure to these fields to a greater or lesser extent throughout each day, whether at home or in schools and offices. The following table (**Table 6**) contains field readings for a number of selected, commonly encountered items. These reading represent median readings, meaning one might expect to find an equal number of readings above and below these levels.

Table 6. Magnetic Fields (milligauss) From Common Home and Business Appliances

Type	Distance From Source in Feet			
	0.5	1	2	4
Computer Display	14	5	2	-
Fluorescent Lights	40	6	2	-
Hairdryer	300	1	-	-
Vacuum Cleaners	300	60	10	1
Microwave Oven	200	40	10	2
Conventional Electric Blanket	39.4 peak 21.8 average			
Low EMF Electric Blanket	2.7 peak .09 average			

Source: EMF In Your Environment, EPA 1992

There are no federal or Minnesota state regulations for the permitted strength of a magnetic field on a transmission line; however both Florida and New York have standards ranging from 150 to 250 mG. **Table 7** summarizes the international and state guidelines for ELF and EMF that current exist.

The effect of EMF on human health has been the subject of study for over 25 years. Of particular concern is the link between EMF exposure and cancer. Numerous panels of experts have convened to review research data on whether EMF is associated with adverse health effects. The studies have been conducted by the National Institute of Environmental Health Sciences (NIEHS), the USEPA, the World Health Organization (WHO), and the Minnesota State Interagency Working Group (MSIWG) on EMF issues. Studies regarding EMF exposure and childhood leukemia and other cancer risks have had mixed results. Some organizations have determined that a link between EMF and cancer exists while others have found this link to be weak or nonexistent.

Table 7. ELF EMF International and State Guidelines

ELF-EMF Guidelines Established by Health & Safety Organizations		
Organization		**Magnetic Field**
American Conference of Governmental and Industrial Hygienists (ACGIH) (Occupational)		10,000 mG (for general worker) 1,000 mG (for workers with cardiac pacemakers)
International Commission on Non-Ionizing Radiation Protection (ICNIRP) (General Public, Continuous Exposure)		833 mG
Non-Ionizing Radiation Committee of the American Industrial Hygiene Association		4,170 mG
Institute of Electrical and Electronics Engineers (IEEE) Standard C95.6 (General Public, Continuous Exposure)		9,040 mG
U.K., National Radiological Protection Board (NRPB)		833 mG
Australian Radiation Protection and Nuclear Safety Agency (ARPANSA)		3,000 mG
State Standards and Guidelines		
State	**Line Voltage**	**Magnetic Field (Edge of ROW)**
Florida	69-230 kV	150 mG
	230-500 kV	200 mG
	>500 mG	250 mG
Massachusetts		85 mG
New York		200 mG

Source: EPRI, 2003; Union of the Electric Industry – EUROELECTRIC, 2003.

In 1992, Congress initiated U.S. EMF Research and Public Information Dissemination (EMF RAPID). EMF RAPID program studied whether exposure to electric and magnetic fields produced by the generation, transmission, or use of electric power posed a risk to human health. Program conclusions were presented to Congress on May 4, 1999 as follows:

- The scientific evidence suggesting that EMF-EMF exposures pose any health risk is weak.
- Epidemiological studies have serious limitations in their ability to demonstrate a cause and effect relationship whereas laboratory studies, by design, can clearly show that cause and effect are possible. Virtually all of the laboratory evidence in animals and humans and most of the mechanistic work done in cells fail to support a causal relationship between exposure to ELF-EMF at environmental levels and changes in biological function or disease status. The lack of consistent positive findings in animals or mechanistic studies weakens the belief that this association is actually due to ELF-EMFs, but it cannot completely discount the epidemiological findings.
- The NIEHS concludes that ELF-EMF exposure cannot be recognized as entirely safe because of weak scientific evidence that exposure may pose a leukemia hazard. In our opinion, this finding is insufficient to warrant aggressive regulatory concern. However, because virtually everyone in the Unite States uses electricity and therefore is routinely exposed to ELF-EMF, passive regulatory action is warranted such as a continued emphasis on educating both the public and the regulated community on means aimed at reducing exposures. The NIEHS does not believe that other cancers or non-cancer health outcomes provide sufficient evidence of a risk to currently warrant concern (NIEHS, 1999).

In October 1996, a National Research Council Committee of the National Academy of Sciences released a report which corroborated the findings of EMF RAPID. The report concluded:

> *Based on comprehensive evaluation of published studies relating to the effects of power-frequency electric and magnetic fields on cells, tissues, and organisms (including humans), the conclusion of the committee is that the current body of evidence does not show that exposure to these fields presents a human-health hazard.*

Currently the USEPA states the following viewpoint of the associated health effects of EMF on its website (USEPA: Electric and Magnetic Fields (EMF) Radiation form Power Lines, 2009):

> *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 due 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 (USEPA, 2009).*

In 2001, the World Health Organization (WHO) International Agency for Research on Cancer classified power-frequency EMF as a "possible carcinogenic to humans." Currently the WHO states the following viewpoint of the associated health effects of EMF on its website (WHO, 2009):

Extensive research has been conducted into possible health effects of exposure to many parts of the frequency spectrum. All reviews conducted so far have indicated that exposures below the limits recommended in the INNIRP (1998) EMF guidelines, covering the full frequency range from 0-300 GHz, do not produce any known adverse health effect. However, there are gaps in knowledge still needing to be filled before better health risk assessments can be made (WHO, 2009).

In September of 2002, the MSIWG on EMF Issues, published "A White Paper on Electric and Magnetic Field (EMF) Policy and Mitigation Options," referred to as the "White Paper." The MSIWG was formed to examine the potential health impacts of EMFs and to provide useful, science-based information to policy makers in Minnesota. Work Group members included representatives from the Department of Commerce, the Department of Health, the Pollution Control Agency, the Public Utilities Commission, and the Environmental Quality Board (MSIWG, 2002). The White Paper concluded the following findings:

- Some epidemiological results do show a weak but consistent association between childhood leukemia and increasing exposure to EMF (see the conclusion of IARC and NIEHS). However, epidemiological studies alone are considered insufficient for concluding that a cause and effect relationship exists, and the association must be supported by data from laboratory studies. Existing laboratory studies have not substantiated this relationship (see NTP, 1999; Takebe et al., 2001), nor have scientists been able to understand the biological mechanism of how EMF could cause adverse effects. In addition, epidemiological studies of various other diseases, in both children and adults, have failed to show any consistent pattern of harm from EMF.
- The Minnesota Department of Health concludes that the current body of evidence is insufficient to establish a cause and effect relationship between EMF and adverse health effects. However, as with many other environmental health issues, the possibility of a health risk from EMF cannot be dismissed. Construction of new generation and transmission facilities to meet increasing electrical needs in the State is likely to increase exposure to EMF and public concern regarding potential adverse health effects.
- Based upon its review, the Work Group believes the most appropriate public health policy is to take a prudent avoidance approach to regulating EMF. Based upon this approach, policy recommendations of the Work Group include:

    - Apply low-cost EMF mitigation options in electric infrastructure construction projects;
    - Encourage conservation;
    - Encourage distributed generation;
    - Continue to monitor EMF research;
    - Encourage utilities to work with customers on household EMF issues; and
    - Provide public education on EMF issues (MSIWG, 2002).

As noted above, research has not been able to establish a cause and effect relationship between exposure to EMFs and adverse health effects. However, a general consensus has been formed to continue research on the health effects of EMFs. At this time, there are no federal standards in the United States to limit EMF exposure.

EMF as it relates to public health and safety continues to be researched and reviewed.

Stray Voltage

Stray voltage encompasses two phenomena: Neutral to Earth Voltage and Induced Voltage. In general, stray voltage describes any case of elevated potential, but more precise terminology gives an indication of the source of the voltage.

Neutral to Earth Voltage (NEV) refers to a condition that can occur at the electric service entrances to structures, that is, where distribution lines enter structures. It is the phenomena most commonly referred to as "stray voltage." NEV is an extraneous voltage that appears on metal surfaces in buildings, barns and other structures, which are grounded to earth. NEV can be experienced, for example, by livestock who simultaneously come into contact with two metal objects (e.g., feeders, waterers, stalls). If there is a voltage between these objects, a small current will flow through the livestock. The fact that both objects are grounded to the same place (earth) would seem to prevent any voltage from existing between the objects. However, this is not the case – a number of factors determine whether an object is, in fact, grounded. These include wire size and length, the quality of connections, the number and resistance of ground rods, and the current being grounded.[10]

Neutral to Earth Voltage can result from damaged, corroded or poorly connected wiring or damaged insulation. Thus, NEV can exist at any business, house or farm which uses electricity, independent of whether there is a transmission line nearby. NEV is largely an issue associated with electrical distribution lines and electrical service at a residence or on a farm. Transmission lines do not create NEV as they do not directly connect to businesses, residences or farms.

NEV can be reduced in three ways: reducing the current flow on the neutral wire entering a home or building, reducing the resistance of the neutral system, or improving the grounding of the neutral system. Making good electrical connections and making sure that these connections have the proper wiring materials for wet and corrosive locations will reduce the resistance of grounded neutral system and thereby reduce NEV levels.

Induced Voltage refers to situations where an electric field extends to a nearby conductive object, thereby "inducing" a voltage on the object. The electric field from a transmission line in some instances can reach a nearby conductive object, such as a vehicle or a metal fence, which is in close proximity to the transmission line. This may induce a voltage on the object, which is

[10] Stray Voltage, NDSU Extension Publication #108, http://www.ag.ndsu.edu/extension-aben/epq/files/epq108.pdf.

dependent on many factors, including the weather conditions, object shape, size, orientation, capacitance and location along the right-of-way. If these objects are insulated or semi-insulated from the ground and a person touches them, a small current would pass through the person's body to the ground. This touch may be accompanied by a spark discharge and mild shock, similar to what can occur when a person walks across a carpet and touches a grounded object or another person.

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

While transmission lines do not, by themselves, create NEV because they do not connect to businesses or residences, they can induce voltage on a distribution circuit that is parallel and immediately under the transmission line. This induced voltage only occurs in the immediate vicinity of the distribution circuit; it does not travel along the transmission or distribution line. Standard industrial designs can mitigate potential for stray voltage to impact distribution lines.

Induced voltage can be reduced or eliminated using cancellation, separation or enhanced grounding. Cancellation can be achieved by configuring the conductors of the transmission line to minimize EMF levels. Separation literally increases the distance between the transmission and distribution lines by physically placing the lines in different locations or by increasing the vertical distance between transmission and distribution lines collocated on the same poles. Enhanced grounding connects counterpoises to the distribution neutral wire and the transmission shield wire.

Radio, Television, Communication and GPS Interference

Corona on transmission line conductors can generate electromagnetic noise at frequencies at which radio and television signals are transmitted. This noise can cause interference (primarily with AM radio stations and the video portion of TV signals) with the reception of these signals depending on the frequency and strength of the radio and television signal. However, this interference is often due to weak broadcast signals or poor receiving equipment.

The most significant factor with respect to radio and television interference is not the magnitude of the transmission line induced noise, but how the transmission line induced noise compares with the strength of the broadcast signal. The potential for television interference due to radio frequency noise caused by transmission lines is even lower now that the United States has completed the transition to digital broadcasting. Digital reception is in most cases considerably

more tolerant of noise than analog broadcasts. Due to the higher frequencies of television broadcast signals (54 MHz and above) a transmission line seldom causes reception problems within a station's primary coverage area.

If radio interference from transmission line corona does occur with AM radio stations presently providing good reception, satisfactory reception can be obtained by appropriate modification of (or addition to) the receiving antenna system.

Interference with FM broadcast station reception is generally not a problem 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 (MHz)), and
- the excellent interference rejection properties inherent in FM radio systems make them virtually immune to amplitude type disturbances.

A two-way mobile radio located immediately adjacent to and behind a large metallic structure (such as a steel tower) may experience interference because of signal blocking effects. Movement of either mobile unit so that the metallic structure is not immediately between the two units should restore communications. This would generally require a movement of less than 50 feet by the mobile unit adjacent to a metallic tower. Noise in the frequency range of cellular type phones is almost non-existent and the technology used by these devices is superior to that used in two-way mobile radio.

As in the case with AM radio interference, corona-generated noise could cause interference with TV picture reception because the picture is broadcast as an AM signal. The level of interference depends on the TV signal strength for a particular channel (TV audio is an FM signal that is typically not impacted by transmission line radio frequency noise).

Due to the higher frequencies of the TV broadcast signal (54 MHz and above), transmission lines seldom result in reception problems within a station's primary coverage area. In the rare situation that the proposed transmission line would cause TV interference within a broadcast station's primary coverage area where good reception is presently obtained the problem can usually be corrected with the addition of an outside antenna.

Global Positioning Systems

With global positioning systems (GPS) increasingly being used in the farming industry, there has been speculation about the impact transmission lines may have on effective operation of GPS equipment.

Studies examining the use of standard GPS receivers under or near transmission facilities have shown that interference with the reception of GPS signals is unlikely. The interference produced by transmission facilities is usually only significant at frequencies lower than 30 megahertz (MHz) and is not expected to cause issues with GPS receivers that operate at much higher

frequencies (between 10 and 100 times higher). GPS receivers also use multiple satellites and decoding techniques which help to prevent loss of signal.

According to a study by the Institute of Electronics and Electrical Engineers (IEEE), power line conductors are unlikely to cause signal degradation to GPS signals. The study noted no loss of satellite signals as the GPS receiver moved across a power line easement. A GPS receiver relies on a dispersed constellation of satellites – at least four and often more.[11]

Major manufacturers of GPS navigation systems have not found any degradation of the GPS signal as a direct result of transmission lines.

5.6 Land Use

Transmission lines have the potential to impact land-based economies. Transmission lines and poles are a physical presence on the landscape. This presence can prevent or otherwise limit use of the landscape for other purposes. In general, and for safe operation of the line, buildings and tall growing trees are not allowed in transmission line rights-of-way. This limitation can create impacts for commercial businesses and land or resource based economies (for example forestry, agricultural, mining).

Portions of the GNTL project will require the acquisitions of easements or property from private landowners; portions of the project will also cross public owned lands (i.e., federal land/easements, state land and county land). It is anticipated that up to one third of the total acreage required for the GNTL could be private property.

Private landowners would experience temporary and permanent loss of land use within the anticipated ROW acquired for the GNTL project. The landowner will still own the property, but certain activities and uses will be limited. Residences in the Study Area are scattered primarily along county roadways, near lakeshore areas, and in municipal areas where residences tend to be concentrated.

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.

Public lands that could potentially be crossed by the GNTL include state forest and game lands and wildlife management areas (**Figure 8**). 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

[11] Use of Global Positioning System (GPS) Receivers Under Power-Line Conductors, IEEE Transactions On Power Delivery, Vol. 17, No. 4, October 2002

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 (**Figure 9**).

Federal lands within the Study Area include lands owned and managed by the U.S. Fish and Wildlife Service (USFWS) for the protection and conservation of natural habitat and wetlands, small parcels owned by the Bureau of Land Management (BLM) and the U.S. Forest Service (USFS) lands.

It is anticipated that the greatest permanent impacts will occur in forest lands and woody wetlands (generally located on public lands). 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 at the footprint where a structure is installed.

Permanent impacts on forest lands and woody wetlands would occur within 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 GNTL 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 line. Low growing vegetation will remain under the transmission line following construction and once the construction area is restored.

Based on the anticipated arrangement and location, the expansion of the Blackberry 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.

Impacts to land-based economies can be minimized by prudent routing and will be developed during the HVTL route permitting process; such measures may include tower design, adjustments in final alignment within a proposed route, ROW sharing/overlap with existing infrastructure, and selection of span width and tower placement.

Agriculture

Based on the 2007 USDA Census data, the most recent available agricultural census data, the numbers of farms and the average farm size within the Study Area have decreased since 2002. 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 the Study Area. Beltrami County had a moderate amount of farmland 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; Roseau County's top grossing commodity was wheat for grain. Lake of the Woods County's top grossing commodity was grains, oilseeds, dry beans, and dry peas with forage (land used for all hay, 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.

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. Once construction is completed, agricultural production within the ROW will resume. Long-term loss of agricultural production will only occur at the structure locations.

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 depending on where a transmission line is sited. Aerial applicators will need to avoid the transmission line, which may limit the application of chemicals.

Development of an Agricultural Impact Mitigation Plan (AIMP) within the HVTL route permitting process and following of BMPs (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, tillage of compacted soils) will mitigate or minimize the potential impacts.

Forestry

The GNTL project stretches from northwestern to north central Minnesota, 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.

Minnesota DNR is the majority public owner and manager of forested lands within the Study Area. 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.

The Applicant will employ a clearing contractor to clear the ROW; construction of the transmission line would convert forestland within the right-of-way (ROW) to shrub and grasslands. 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.

Mining

Large deposits of glacially derived sediments and iron-bearing bedrock are present within the Study Area; aggregate and iron mining operations have the potential to be impacted by the GNTL project (**Figure 10**).

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.

Little exploration for non-ferrous minerals has occurred since 1998 in 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 Power has state that it is unaware of any mining proposals related to the active mineral leases in the Study Area.

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; 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.

One active and one inactive ferrous metallic mine occur in the vicinity of the Study Area. 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 Study Area. The Study Area 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.

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. 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. Within Minnesota, aggregate operations fall primarily under the jurisdiction of the local government.

The only industrial mineral mining operations that occur in or near the Study Area are aggregate mining sites; 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.

Significant peat deposits exist in much of the Study Area, but are not actively mined near the Study Area.

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 near transmission lines. Because of this conflict, Applicants generally avoid aggregate resources and mining areas when developing the HVTL route permit application.

Transportation

The Study Area is accessible mostly by a system of roads, including local (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 (**Figure 11**).

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.

Construction of the GNTL project may 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 transmission line 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 GNTL 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). The GNTL 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, or

native grasses along roadway easements. If living snow fences are removed during construction or operation of the GNTL project, more frequent snow removal may be required.

The Applicant will utilize roads to transport personnel, equipment, and materials. Most roads proposed for access for the GNTL 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.

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 BNSF Railway is important for moving a variety of commodities in the southeast part of the Study Area.

It is not anticipated that the GNTL project will parallel an existing railroad, but railroad crossings will be required. 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 GNTL 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 GNTL project would be timed to avoid interruptions to rail traffic. Rail maintenance crews will need to exercise caution to avoid coming into contact with the transmission line, should they need to conduct work directly under the transmission line. This could require additional safety precautions or employee training.

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). 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. 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.

With proper planning and mitigation management, railways and high-voltage AC transmission lines can be safely co-located. 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.

Transmission lines are a potential hazard to aircraft during takeoff and landing. To ensure safety, local ordinances and Federal Aviation Administration (FAA) guidelines limit the height of objects in the vicinity of the runways. There are approximately 80 airports in the Study Area including 20 public use airports. Many of the private airstrips are located in the western portion of the study area and are used by crop dusters.

During the Public Information/ER Scoping meetings for the certificate of need, representatives for the Piney Pinecreek Border Airport expressed concern regarding the potential conflict between the GNTL project and the planned expansion (cross wind runway) at the airport. The Piney/Piney Pinecreek Border Airport is one of four "international airports" that cross the Canada–United States border. It is shared by the rural communities of Piney, Manitoba and Pinecreek, Minnesota. The Piney Pinecreek Border Airport covers an area of 61 acres at an elevation of 1,082 feet above mean sea level. It has one asphalt paved runway designated 15/33 which measures 3,297 by 75 feet. For the 12-month period ending May 31, 2011, the airport had 3,000 general aviation aircraft operations, an average of 250 per month.

Given the location of the Piney Pinecreek Border Airport relative to potential border crossings for the GNTL project, any transmission line routes developed through the HVTL Route Permitting process will need to be reviewed for possible obstruction, in accordance with FAA 14 Code of Federal Regulations CFR 77.9.

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).

Many of the privately owned airstrips located in the Study Area are used by aerial applicators. During the Public Information/ER Scoping meeting for the certificate of need many farmers expressed concerns about how the GNTL 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 presence of transmission lines might cause aircraft using those airstrips to alter their take-off and landing approach movements.

To accommodate airports utilities can route transmission lines outside of the safety zone, use special low-profile structures, construct a portion of the line underground, or install lights or other attention-getting devices on the conductors.

Large brightly colored balls or markers may be installed on overhead transmission line conductors to improve their visibility to pilots and lessen the risk of collision. These markers are often employed near airports or airstrips, in or near fields where aerial applications of pesticides or fertilizers occur, and in areas where tall machinery, such as cranes, are frequently operated.

5.7 Noise

Noise is measured in units of decibels (dB) on a logarithmic scale. The A weighted decibel (dBA) scale corresponds to the sensitivity range for human hearing. For example, a noise level change of 3 dBA is barely perceptible to average human hearing while a 5 dBA change in noise level is noticeable. Two sources of noise would be associated with the completed Project: conductors and substations.

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.

The primary land uses in the Study Area are forest and agricultural lands, with rural residential populations. Typical noise sensitive receptors along potential 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. Existing noise levels in the Study Area were estimated by the Applicant using methods contained in American National Standards Institute (ANSI) acoustical standard ANSI S12.9 Part 3 2008.

Land use activities associated with residential, commercial, and industrial land are grouped together into Noise Area Classifications (NAC). Residences, which are typically considered sensitive to noise, are classified as NAC 1. Each NAC is assigned both daytime (7 a.m. to 10 p.m.) and nighttime (10 p.m. to 7 a.m.) noise limits for land use activities within the NAC. Table 8 shows the Minnesota Pollution Control Agency (MPCA) daytime and nighttime limits in dBA

for each NAC (**Table 8**). The limits are expressed as a range of permissible dBA within a 1-hour period; L50 is the dBA that may be exceeded 50 percent of the time within an hour, while L10 is the dBA that may be exceeded 10 percent of the time within 1 hour.

Table 8. MPCA Daytime and Nighttime Noise Limits

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

Noise concerns for the GNTL project may be associated with both the construction and operation of the energy transmission system.

Construction noise is expected to occur during daytime hours as the result of heavy equipment operation and increased vehicle traffic associated with the transport of construction personnel to and from the work area. Any exceedences of the MPCA daytime noise limits would be temporary in nature and no exceedences of the MPCA nighttime noise limits are expected for this project. **Table 9** provides noise levels experienced for typical construction equipment within 50 feet from the source of the noise.

Operational noise would be associated with the transmission conductors and transformers at substations that may produce audible noise under certain operational conditions. The level of noise depends on conductor conditions, voltage level and weather conditions. Noise emission from a transmission line occurs during heavy rain and wet conductor conditions. In foggy, damp or rainy weather conditions, transmission lines can create a subtle crackling sound due to the small amount of electricity ionizing the moist air near the wires. During heavy rain, the general background noise level is usually greater than the noise from a transmission line and few people are in close proximity to the transmission line in these conditions. For these reasons, audible noise is not noticeable during heavy rain. During light rain, dense fog, snow and other times when there is moisture in the air, the proposed transmission lines may produce audible noise higher than rural background levels. During dry weather, audible noise from transmission lines is an imperceptible, sporadic crackling sound.

Table 9. Typical Noise from Construction Equipment (dBA)

Typical Sources	Sound Pressure Level (dBA)
Pump	76
Backhoe	80
Air Compressor	81
Mobile Crane	83

Typical Sources	Sound Pressure Level (dBA)
Concrete Mixer	85
Jack Hammer	88
Paver	89
Rock Drill	98
Pile Driver	101

The EPRI "Transmission Line Reference Book, 345kV and Above", Chapter 6, provides empirically-derived formula for predicting audible noise from overhead transmission lines. Computer software produced by the Bonneville Power Administration (BPA) is also frequently used to predict the level of audible noise from power transmission lines that is associated with corona discharge. Audible noise is predicted for dry and wet conditions, with wet conditions representing a worst case. These procedures are considered to be reliable and represent International best practice.

The predicted L50 audible noise levels associated with the various structure configurations of the GNTL project are given in **Table 10** for the edge of the ROW (100 feet from centerline). Where the GNTL 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 also given.

As indicated in Table X 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 GNTL project demonstrate that the audible noise associated with the GNTL will be within the most stringent MPCA limitations in nearly all scenarios. Where the GNTL 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.

Table 10. 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

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
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

Structure Type	L50 Noise (dBA) Edge of ROW
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

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 GNTL project includes new 500/230 kV transformation located at the Blackberry 500 kV Substation. New substations and substation upgrades will be designed and constructed to comply with state noise standards established by MPCA.

5.8 Socioeconomics

The Study Area incorporates parts of Roseau, Beltrami, Lake of the Woods, Koochiching, and Itasca counties. In 2012, these counties had the following populations: 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). The top-employing industries within the five counties include manufacturing; retail trade; arts, entertainment and recreation; accommodation and food services; and educational services; and health care and social assistance. Unemployment rates in the five counties were reported as follows: Roseau County at 2.7 percent; Lake of the Woods County at 2.4 percent; Beltrami County at 6.9 percent; Koochiching County at 4.8 percent; and Itasca County at 5.9 percent.

The Applicant has stated that the increased transmission outlet capability and improved reliability resulting from the GNTL project will benefit northern Minnesota on a regional basis, with direct benefits to Minnesota Power customers, particularly near the Iron Range. The Applicant also stated that the increased capability and reliability of the electric system to supply energy to commercial and industrial users is anticipated to 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.

The University of Minnesota–Duluth's Labovitz School of Business and Economics conducted a potential economic impact study of the GNTL project in 2013; the study found that an estimated 213 jobs would be directly created and another 73 indirect jobs (industries such as food service, healthcare, and building and professional services) would be created. These economic benefits

are temporary, lasting the duration of construction; it is not anticipated that the GNTL project will create new, permanent jobs in the area.

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 study also found that an estimated 28 million dollars would be generated by the GNTL project 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.

Property Values

Large electric generation facilities have the potential to impact property values. Because property values are influenced by a complex interaction between factors specific to each individual piece of real estate as well as local and national market conditions, the effect of one particular project on the value of one particular property is difficult to determine.

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

In the Final Environmental Impact Statement (EIS) on the Arrowhead-Weston Electric Transmission Line Project, the Wisconsin Public Service Commission addressed the issue of property value changes associated with high voltage transmission lines[12]. This document looked at approximately 30 papers, articles and court cases covering the period from 1987 through 1999.

> *In general there are two types of property value impacts that can be experienced by property owners affected by a new transmission line. The first is a potential economic impact associated with the amount paid by a utility for a right-of-way (ROW) easement. The second is the potential economic impact involving the future marketability of the property.*

[12] Final Environmental Impact Statement , Arrowhead –Weston Electric Transmission Line Project, Volume I, Public Service Commission of Wisconsin Docket 05-CE-113, October 2000, pg 212-215

> *However, substantial differences may exist between people's perceptions about how they would behave and their actual behavior when confronted with the purchase of property supporting a power line.*
>
> *The presence of a power line may not affect some individual's perceptions of a property's value at all. These people tend to view power lines as necessary infrastructure on the landscape, similar to roads, water towers and antenna. They generally do not notice the lines nor do they have strong feelings about them.*

The Arrowhead-Weston Electric Transmission Line Project Final EIS provides six general observations from the studies it evaluated. These are:

- The potential reduction in sale price for single family homes may range from 0 to 14 percent.
- Adverse effects on the sale price of smaller properties could be greater than effects on the sale price of larger properties.
- Other amenities, such as proximity to schools or jobs, lot size, square footage of a house and neighborhood characteristics, tend to have a much greater effect on sale price than the presence of a power line.
- The adverse effects appear to diminish over time.
- Effects on sale price are most often observed for property crossed by or immediately adjacent to a power line, but effects have also been observed for properties farther away from the line.
- The value of agricultural property is likely to decrease if the power line poles are placed in an area that inhibits farm operations.

Later, the Final EIS stated, "In coastal states, such as California and Florida, the decrease in property values can be quite dramatic; in states within the Midwest (Minnesota, Wisconsin and the Upper Peninsula of Michigan), the average decrease appears to be between 4 and 7 percent."

Finally, the EIS succinctly summarizes the dilemma in its closing paragraph which stated, "It is very difficult to make predictions about how a specific transmission line will affect the value of specific properties."

Based on the research that has been ongoing since at least the 1950s, several generalizations about the effect of transmission lines on property values can be made:[13]

[13] Final Environmental Impact Statement , Arrowhead –Weston Electric Transmission Line Project, Volume I, Public Service Commission of Wisconsin Docket 05-CE-113, October 2000, pg 212-215

- Studies have found a potential reduction of sale price for single-family homes of between 0 to 14 percent. Studies conducted in the upper Midwest (Minnesota, Wisconsin, and the Upper Peninsula of Michigan) have shown an average decrease of 4 to 7 percent.
- Although proximity to a transmission line does not appear to affect appreciation of a property, it can sometimes result in increased selling time.
- Property characteristics such as the neighborhood, proximity to schools, lot size, square footage of the house, and other amenities, tend to exert a greater effect on sales place than the presence of a power line.
- High-value properties are more likely than lower-value properties to experience a reduction in sales price.
- The sales price of smaller properties could be more adversely affected than for larger properties.
- For upgrade projects, the level of opposition may affect the size and duration of any reduction in sales price.
- Adverse effects on property prices tend to be greatest immediately after a new transmission line is built and diminish over time.
- The sales price for properties crossed by or immediately adjacent to a transmission line appear to be more adversely affected than prices for homes that are not adjacent to the transmission line right-of-way or are greater than 200 feet from the transmission line right-of-way.
- Mitigation measures such as setback distance, landscaping and integration of the right-of-way into the neighborhood, and visual and noise shielding have been shown to reduce or eliminate the impact of transmission structures on sales price.
- Impacts to the value of agricultural property can be reduced by placing structures to minimize disruption to farm operations.[14]

Interviews with residents along existing transmission lines show that a high proportion of residents were aware of the lines at the time they purchased their home and between one-half and three-fourths expressed concerns about the lines. The concerns were related to health effects, aesthetics, and effects on property values. Despite the concerns expressed, 67 to 80 percent of survey respondents with negative feelings about transmission lines reported that their decision to purchase the property and the price they offered to pay was not affected by the lines.[15]

Although results of the studies have not been able to provide a basis for accurately predicting the effect of a particular transmission line on a particular property, researchers have attributed the effects of HVTLs on property values to an interaction between five factors:[16]

[14] Adapted from Wisconsin Public Service Commission, June 2001. *Environmental Impacts of Transmission Lines.* http://psc.wi.gov/thelibrary/publications/electric/electric10.pdf, p. 17.
[15] Chalmers, James A. and Frank A. Voorvaart. "High-Voltage Transmission Lines: Proximity, Visibility, and Encumbrance Effects." *The Appraisal Journal.* Summer, 2009. http://www.analysisgroup.com/uploadedFiles/Publishing/Articles/2009_HVTLs_and_Property_Values.pdf
[16] Pitts, Jennifer M. and Thomas O. Jackson. 2007. "Power Lines and Property Values Revisited." *The Appraisal Journal. Fall, 2007.*

- Proximity to the transmission towers and lines
- The view of the towers and lines
- Size and type of HVTL structures
- Appearance of easement landscaping
- Surrounding topography

Federal Housing Administration Regulations

The Federal Housing Administration (FHA) provides mortgage insurance on home loans made by FHA-approved lenders throughout the United States. In order to qualify for FHA mortgage insurance, a property must go through an appraisal and property condition assessment performed by an FHA-qualified appraiser. FHA qualified underwriters and appraisers are responsible for adhering to current the policies contained in the FHA's *Homeownership Center (HOC) Reference Guide.* With respect to overhead HVTLs, FHA guidance requires appraisers to review properties under consideration for FHA loans for presence of utility easements. The US Department of Housing and Economic Development provides the following guidance:

- *The appraiser must indicate whether the dwelling or related property improvements is located within the easement serving a high-voltage transmission line, radio/TV transmission tower, cell phone tower, microwave relay dish or tower, or satellite dish (radio, TV cable, etc).*
- *If the dwelling or related property improvement is located within such an easement, the DE Underwriter must obtain a letter from the owner or operator of the tower indicating that the dwelling and its related property improvements are not located within the tower's (engineered) fall distance in order to waive this requirement.*
- *If the dwelling and related property improvements are located outside the easement, the property is considered eligible and no further action is necessary. The appraiser, however, is instructed to note and comment on the effect on marketability resulting from the proximity to such site hazards and nuisances*.[17]

Overall, the socioeconomic impacts resulting from construction activities associated with the project would be primarily positive with an influx of wages and expenditures made at local businesses during the project construction.

In the matter of property values (for those properties receiving an easement) potential impact would typically be a negotiated settlement in an easement agreement between the Applicant and the landowner. During the development of the route permit application locating the line away from homes to the extent possible and using line design and landscaping to minimize visual intrusions from the line can be used to minimize impacts to property values from the transmission line.

[17] U.S. Department of Housing and Urban Development. *Is a Property eligible for FHA if there are overhead or high voltage power lines nearby?* http://portalapps.hud.gov/FHAFAQ/controllerServlet?method=showPopup&faqId=1-6KT-2009

The presence of an HVTL easement on a property does not preclude qualification for FHA mortgage insurance, although the location of an easement on the property does require further documentation than would be required on properties without such easements.

5.9 Visual Impacts and Aesthetics

The landscape within the Study Area, from the northern Minnesota-Canadian border to the Blackberry 500 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 many potential observation points where the GNTL might be viewed.

The GNTL project is prohibited from being placed in specific types of protected lands under Minn. R. 7849.5930. These lands include wilderness areas, Scientific and Natural Areas (SNAs), national parks and state parks. The Study Area does not contain any wilderness areas or national parks nor is the GNTL project anticipated to be close enough to be visible from either type of these protected lands. Depending on the routes developed in the HVTL Route Permit process, the GNTL project may be visible from other protected lands such as SNAs and state parks, as well as from scenic byways. There are numerous WMA's within the Study Area which are used for recreational purposes and potentially could be within the viewshed of the GNTL project. The Bog State Recreation Area (Beltrami County) is located within the Study Area and is considered a scenic vantage point. There are many trails located within the Study Area that could be considered scenic vantage points, a sampling of these trails include: the Taconite Trail; the Mesabi Trail; the Bemis Hill ATV Trail; the Pine to Prairie Birding Trail; the Lost River Snowmobile Trail; the Blue Ox/Caldwell/Lunstrom Trail; the Big Fork Canoe; the Red Lake Canoe Trail; and numerous snowmobile trails sponsored and maintained by local clubs, or maintained within the state forests.

In wooded areas, visual impacts are expected to be minimal because of the natural screening. Visual impacts in agricultural areas or naturally open (peatlands, bogs) areas may be more prominent given the lack of topography and lack of natural visual screening.

The Study Area contains existing transmission structures up to 500 kV in size, which are of similar height as the structures for the proposed GNTL project. The highest density of existing transmission lines is in the Iron Range, due to the heavy electrical use by mining and the higher density of population centers in the area. Due to the topographic variation in this area and the higher density of population, it is likely that transmission line structures will have increased visibility on the Iron Range.

Motorists along any roadways crossed by the GNTL will be able to view the transmission line; this may include scenic byways such as the *Waters of the Dancing Sky Scenic Byway* (state highway 11 in Roseau, Lake of the Woods, and Koochiching counties) and the *Edge of the Wilderness National Scenic Byway* (state highway 38 in Itasca County). 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 any state highway crossing.

The structure type, configuration, spacing and height will influence the visual effects of the GNTL project. Minnesota Power 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. Generally, structures will be spaced approximately 1,000 to 1,400 feet apart, with longer or shorter spans as necessary; the current estimate is for approximately four to five structures per mile of transmission line.

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.

In the northwest portion of the Study Area the land use is dominated by agricultural lands, open prairie, shrubland, with some forested lands. In agricultural areas, where the natural landscape generally is flat with few visual obstructions, a 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, and 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

In the central and eastern portions of the Study Area the landscape is 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. 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.

The southern portion of the Study Area has lakes, wetlands, and greater changes in elevation. In areas where a transmission line may be near or adjacent to lakes the viewshed of cabin owners and residents located around those lakes will be impacted. 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.

5.10 Water Resources

Public waters are wetlands, water basins and watercourses of significant recreational or natural resource value in Minnesota, as defined in Minnesota Statutes Section 103G.005; the DNR has regulatory jurisdiction over these waters. The MnDNR Public Water Inventory (PWI) identifies lakes, wetlands, and watercourses over which the MnDNR has regulatory jurisdiction. Minnesota law (Minnesota Statutes Section 84.415 administered through Minnesota Rules Chapter 6135) requires that a license be obtained from the MnDNR Division of Lands & Minerals for the passage of any utility over, under, or across any state land or public waters

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. The Federal Emergency Management Agency (FEMA) maintains floodplain maps and Geographic Information System (GIS) shapefiles for flood plains.

Wetlands are important resources for flood abatement, wildlife habitat, and water quality. Wetlands that are hydrologically connected to the nation's navigable rivers are protected federally under Section 404 of the Clean Water Act. In Minnesota, wetlands are also protected under the Wetland Conservation Act. The United States Fish and Wildlife Service (USFWS) has produced maps of wetlands based on aerial photographs and Natural Resources Conservation Service soil surveys starting in the 1970s; these wetlands are known as the National Wetland Inventory (NWI).

Surface Waters

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 GNTL project. 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 the undulating moraines and outwash plains with numerous lakes in the southeast portion of the Study Area (**Figure 12**).

Water resources within the Agassiz Lowlands, which generally occupies the northwestern half of the Study Area, 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. Watersheds within the Agassiz Lowlands include the Roseau River, Lake of the

Woods, Rainy River–Baudette, Rapid River, Rainy River–Manitou, and Upper and Lower Red Lake watersheds. 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 (e.g., the Red Lake Peatland SNA).

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. Watersheds located within the Littlefork–Vermillion Uplands include the Upper and Lower Red Lake, and the Littlefork and Bigfork Watersheds. Major rivers in this area include the Big Fork, Little Fork, and Bear Rivers, and Reilly Creek. Lakes are absent mostly from the Littlefork–Vermillion Uplands and generally restricted to peatland lakes or man-made impoundments.

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. The Laurentian Divide is located in this area and 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. Watercourses in the northern portion of this ecological subsection include Coon Creek and Deer Creek, which are tributaries of the Big Fork River and the Bear River. The Prairie River is located in the southern portion of this ecological subsection and is a tributary of the Mississippi River. Numerous lakes are present in the St. Louis Moraines Ecological Subsection and are abundant especially in the Marcell Moraine, which occupies the west central portion of the ecological subsection.

Impacts, both indirect and direct, to surface waters from the construction of the GNTL project could occur as a result of vegetation clearing within the ROW, and site grading and structure placement at each of the transmission line pole locations. Indirect effects 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.

Direct impacts resulting from project related activities could result in erosion that could lead to sediment runoff into adjacent lakes, rivers or streams. Impacts are most likely to occur at HVTL construction or ROW clearing locations adjacent to water bodies or at stream or lake utility crossings.

There may be some hazardous materials used and stored temporarily during the construction of the GNTL project such as transmission fluid or diesel fuel. If not handled and stored properly a spill of these materials could create an impact to local surface waters.

Flood Plains

The Study Area's 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. Other floodplain areas likely are present within the Study Area, but have not been mapped by FEMA (**Figure 13**).

Wetlands

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 (**Figure 14**). The hierarchical classification divides wetlands and deep water habitats into Systems, Subsystems, Classes, and Subclasses.

The Study Area is in a region of Minnesota that contains abundant wetlands of varying types dominated by shrub swamps, wooded swamps, and conifer bogs.

The types of wetland impacts that would potentially occur from the GNTL project include permanent impacts, temporary impacts, and conversion of wetland type.

Permanent impacts would occur from dredging or filling during installation of structures associated with the HVTL. Permanent impacts to wetlands would occur from filling activities that would be necessary wherever a structure would be installed within a wetland. Structures would be installed within wetlands that could not be avoided by spanning; the Applicant estimates that 4 to 5 structures per mile, with typical spans being 1,000 to 1,450 feet, will be required for the GNTL project.

Temporary impacts to wetlands within the ROW would occur from construction activities within the wetland basins including temporary vegetation removal or soil compaction. Temporary impacts may also be caused by crossing the wetland during construction of the HVTL.

Impacts classified as conversion of wetland type would occur wherever vegetation is permanently cleared within the HVTL ROW. Woody forested vegetation would likely be the only vegetation type that would be permanently cleared. As a result, the GNTL project would

potentially convert wetland types with woody vegetation, shrub swamp and wooded swamp, into wetland types such as wet meadow or shallow marsh that would have similar hydrologic regimes but would be dominated by non-woody species.

Figures

Appendix A – Scoping Decision

FIGURE 1 GNTL STUDY AREA

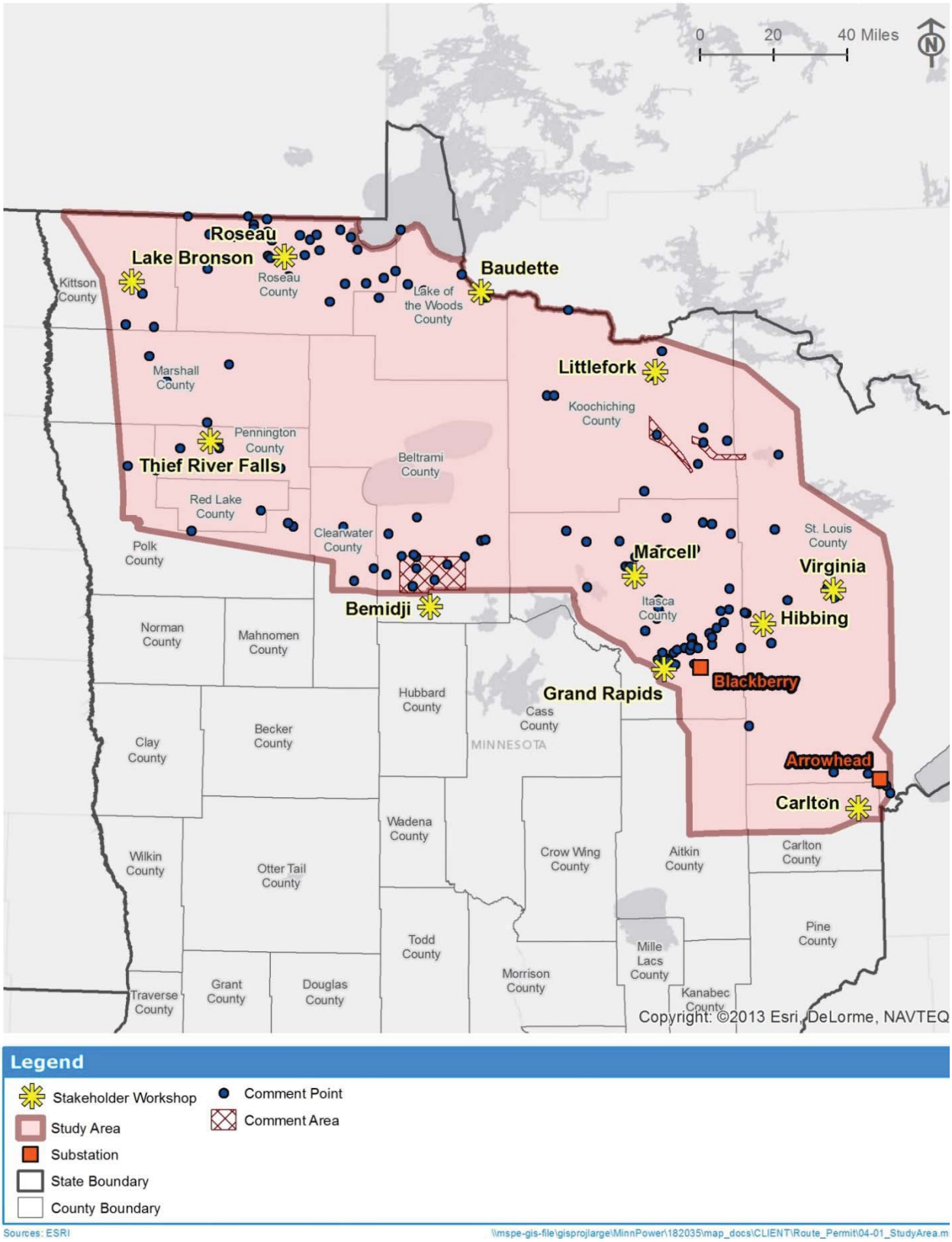


FIGURE 2 GNTL STUDY CORRIDORS

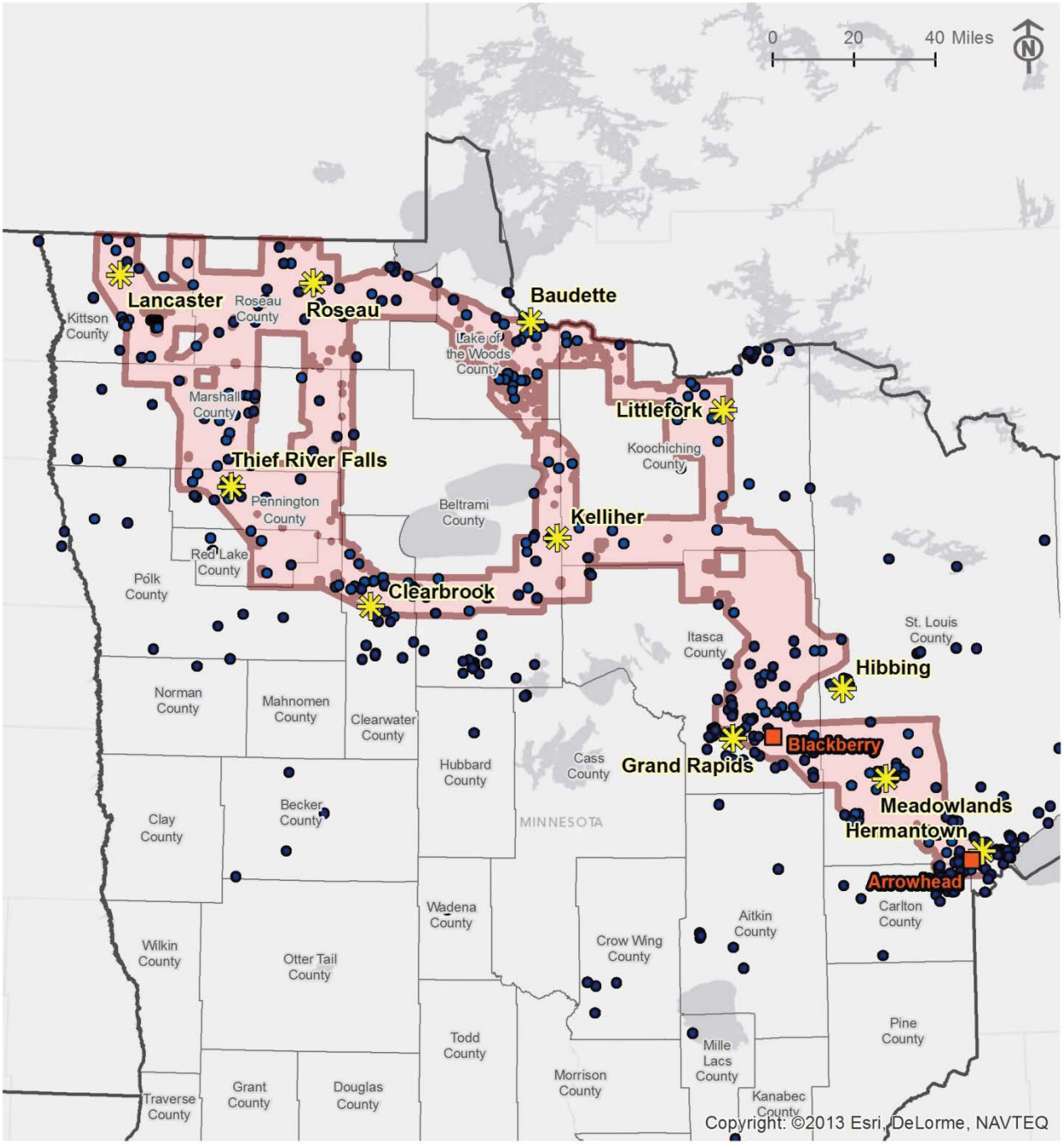


FIGURE 3 GNTL PRELIMINARY ROUTE ALTERNATIVES

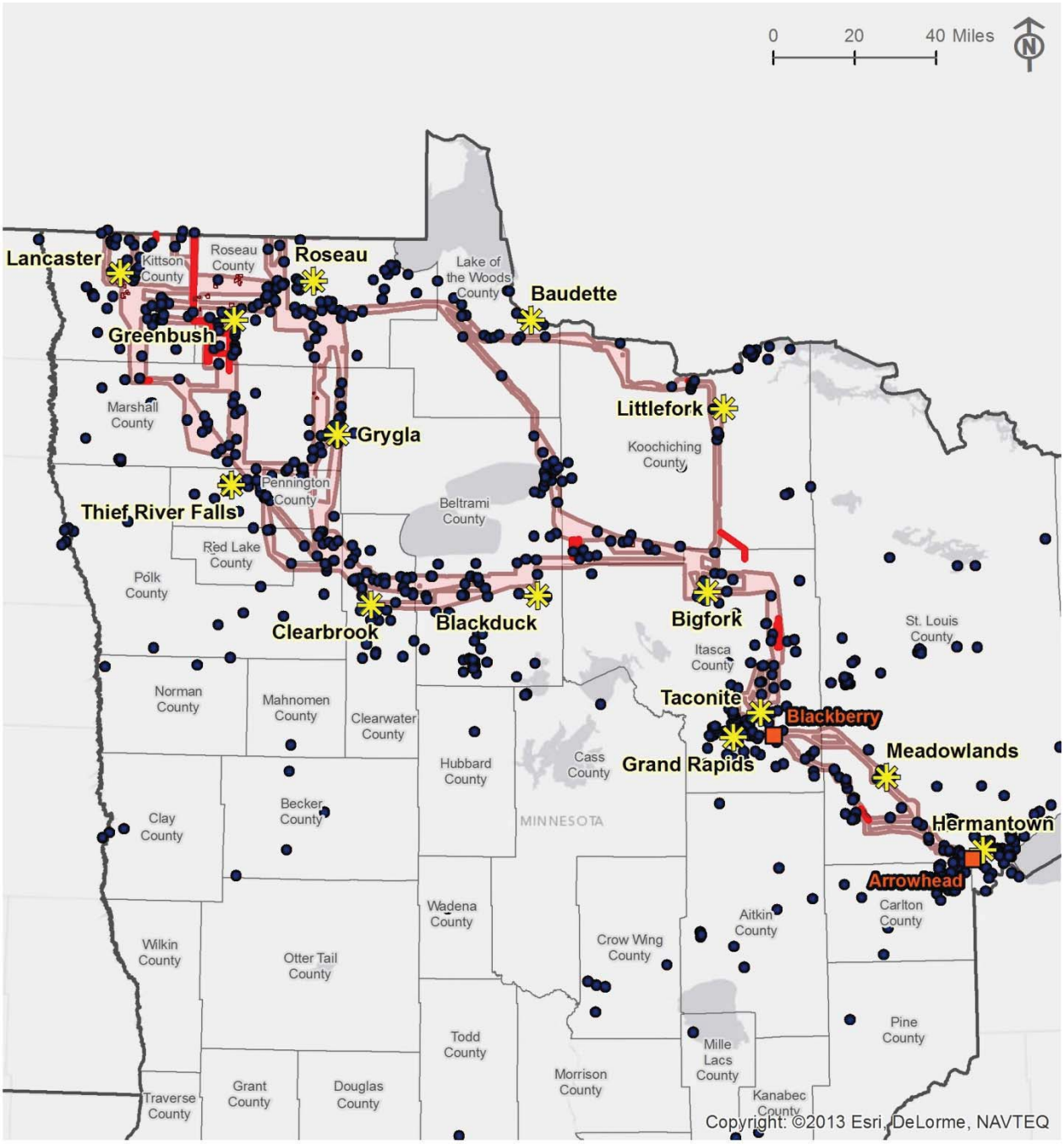


FIGURE 4 ECOLOGICAL SUBSECTIONS

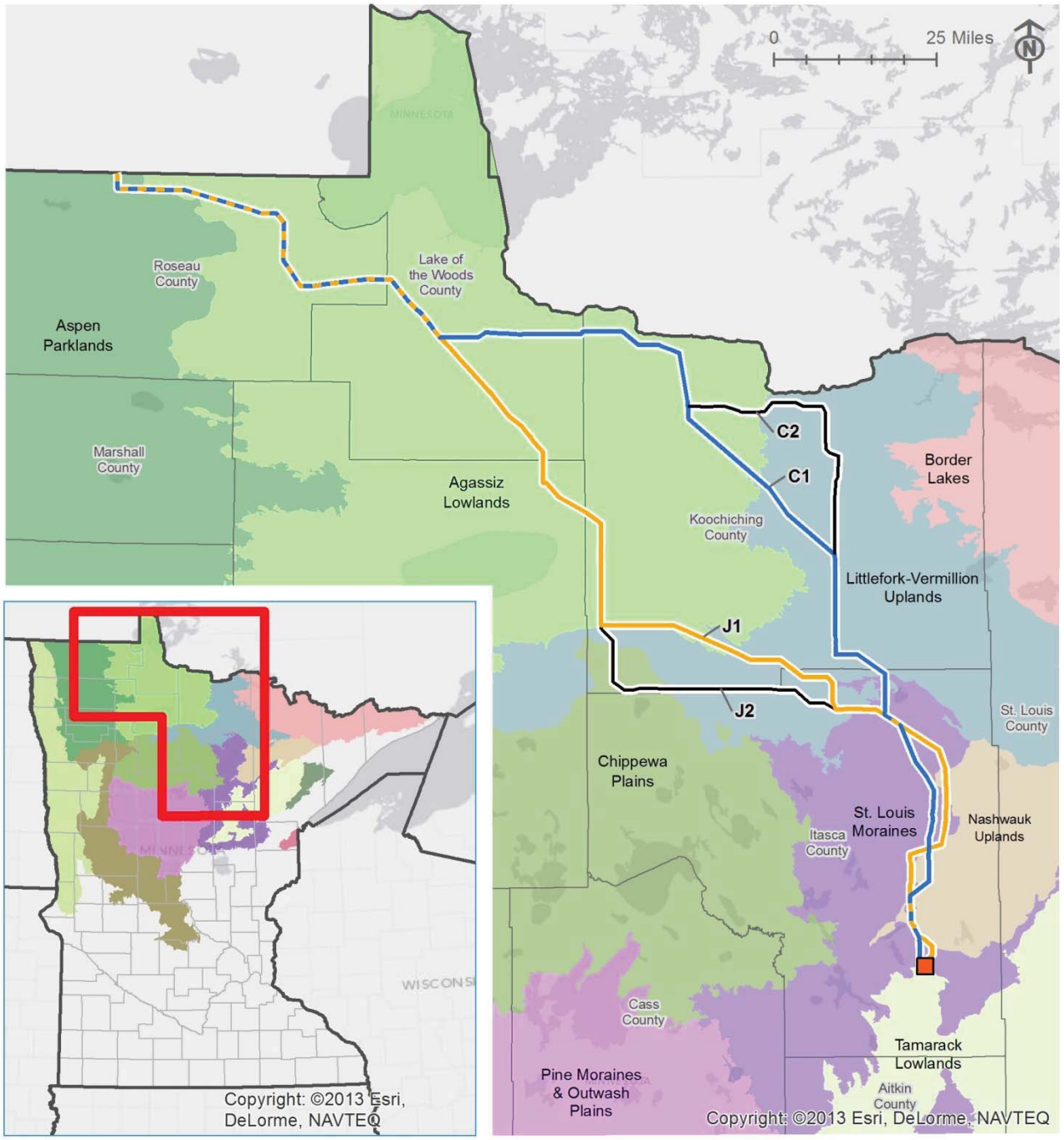
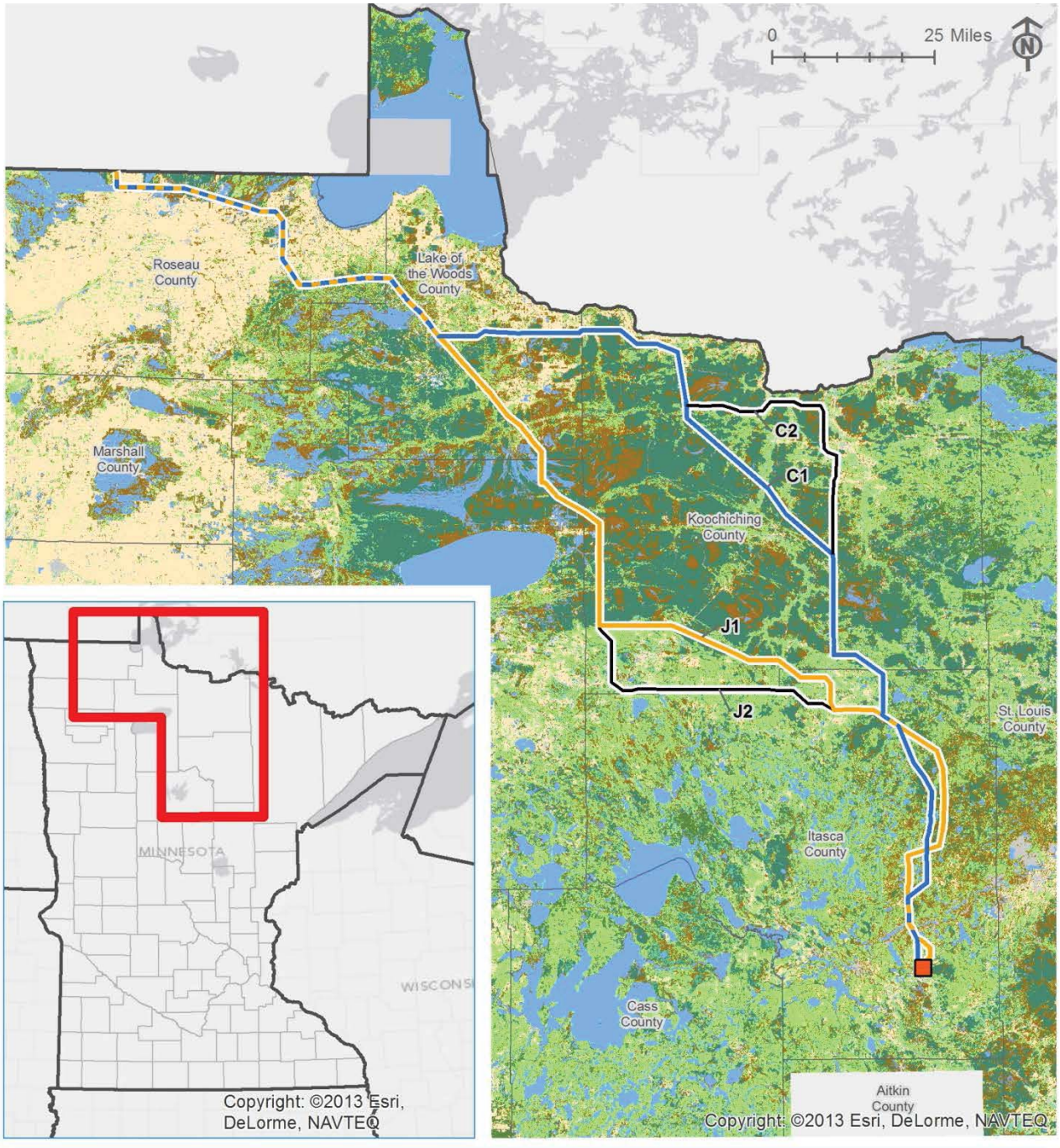


FIGURE 5 VEGETATION AND LAND COVER



Legend

- Blue Route
- Orange Route
- Segment Option
- Blackberry Substation
- Aquatic Environments
- Crop/Grass
- Lowland Conifer Forest
- Lowland Conifer-Deciduous mix
- Lowland Deciduous Forest
- Non-Vegetated
- Shrubland
- Upland Conifer Forest
- Upland Conifer-Deciduous mix
- Upland Deciduous Forest
- State Boundary
- County Boundary

Sources: ESRI,DNR

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

FIGURE 6 DOMINANT SOIL ORDERS

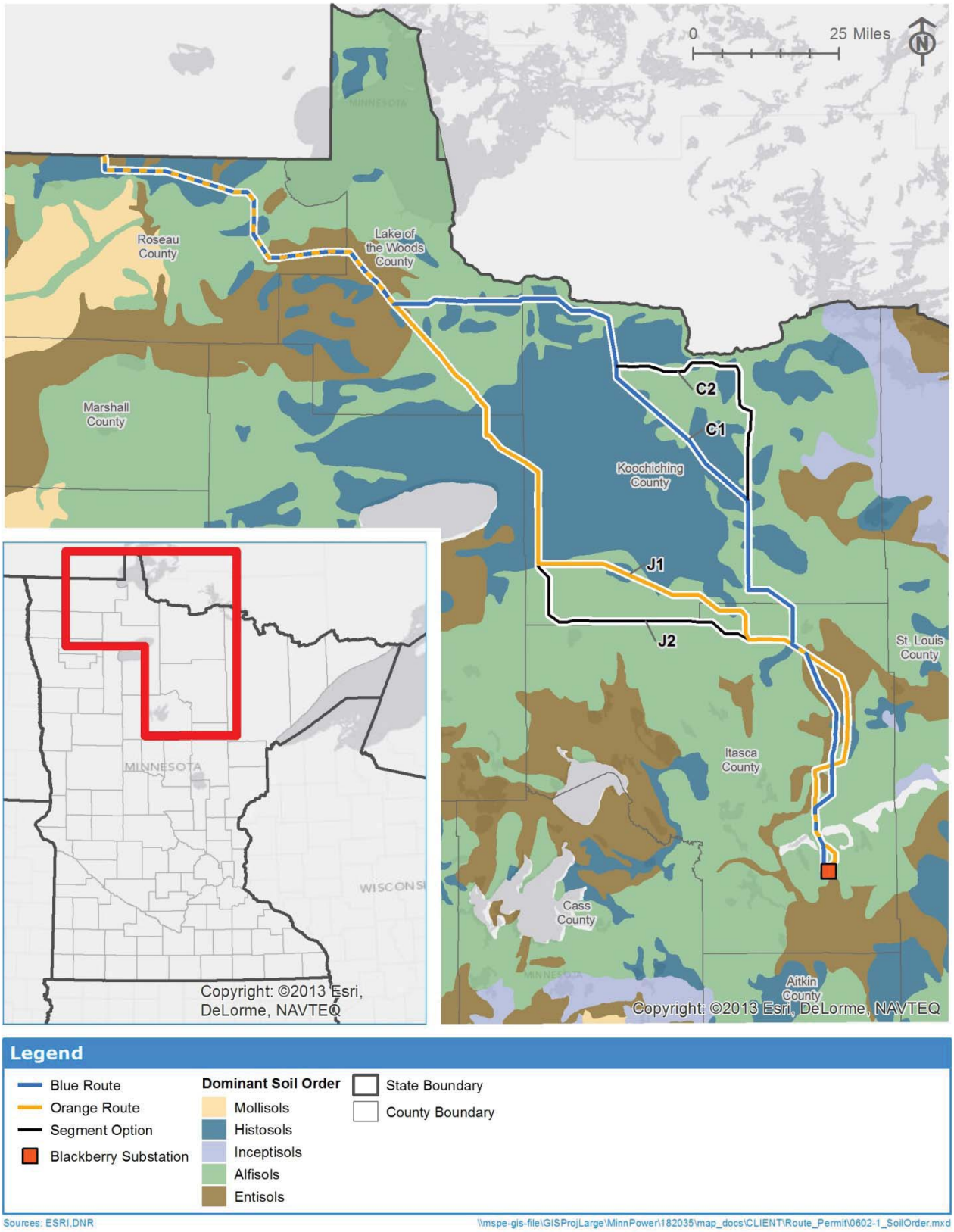
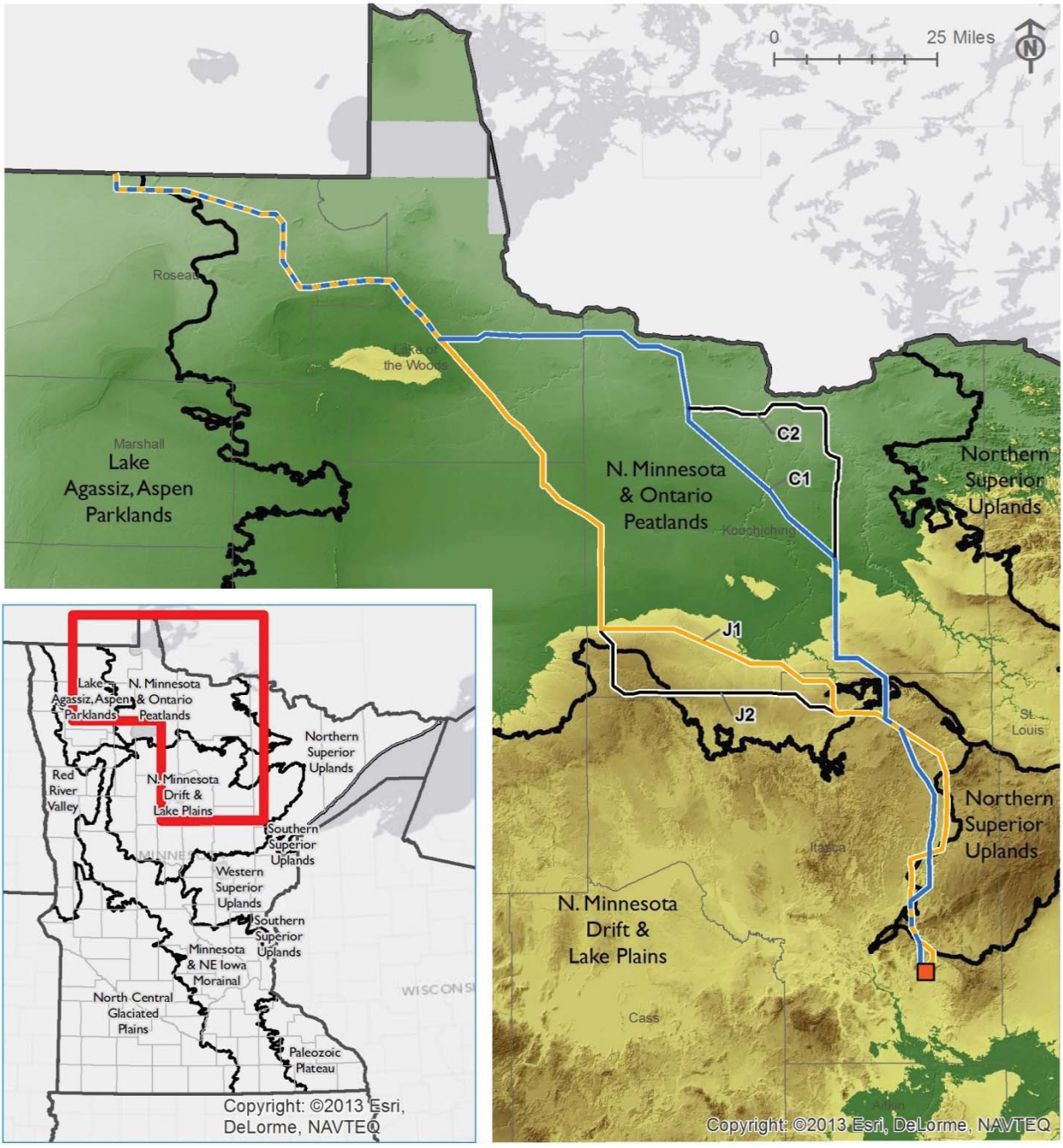


FIGURE 7 TOPOGRAPHY



Legend

- Blue Route
- Orange Route
- Segment Option
- Blackberry Substation
- Ecological Section
- State Boundary
- County Boundary

Elevation (ft)

High : 1752

Low : 1010

Sources: ESRI, DNR, NED

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FIGURE 8 COUNTY, STATE AND NATIONAL FOREST LANDS

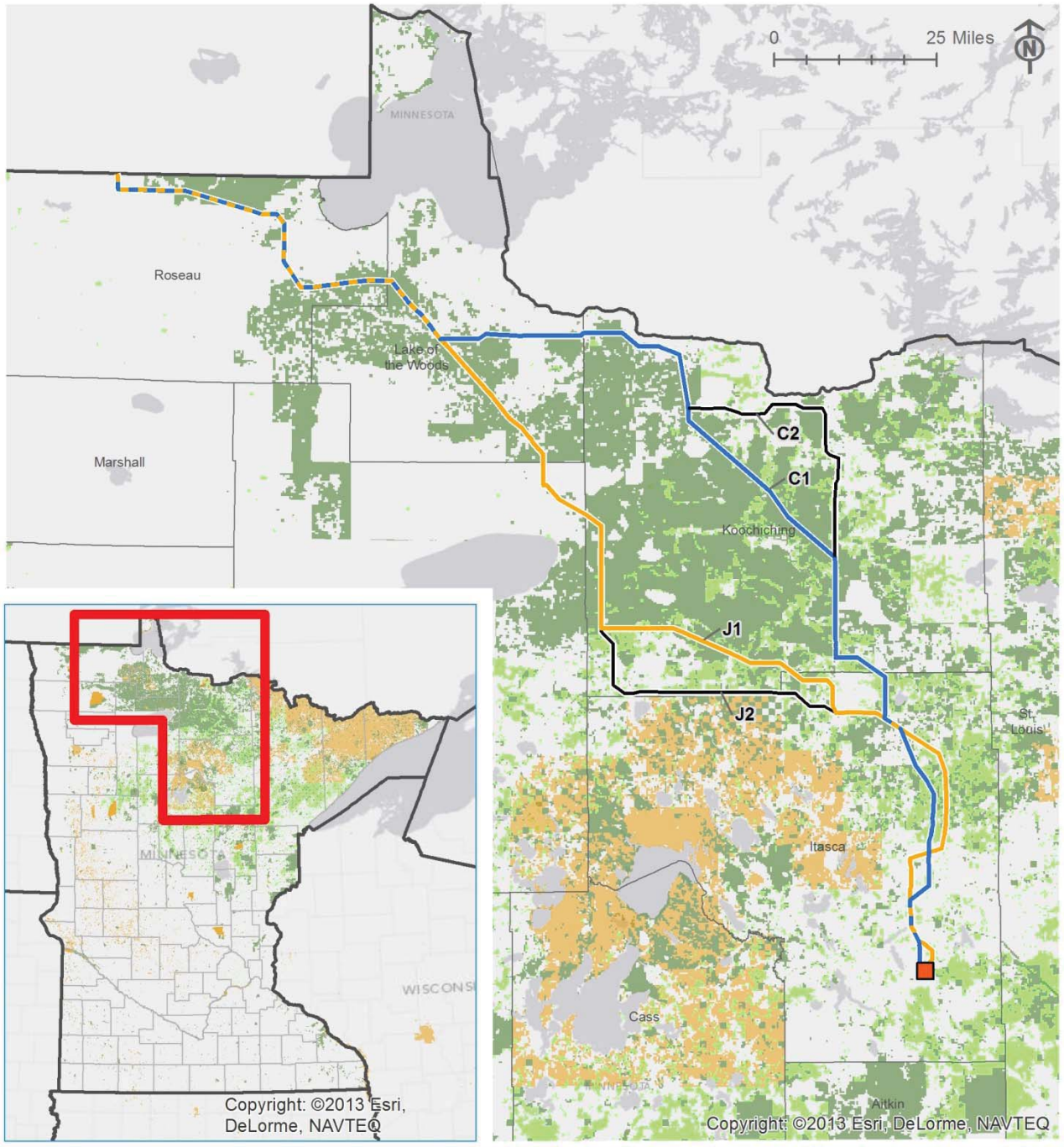
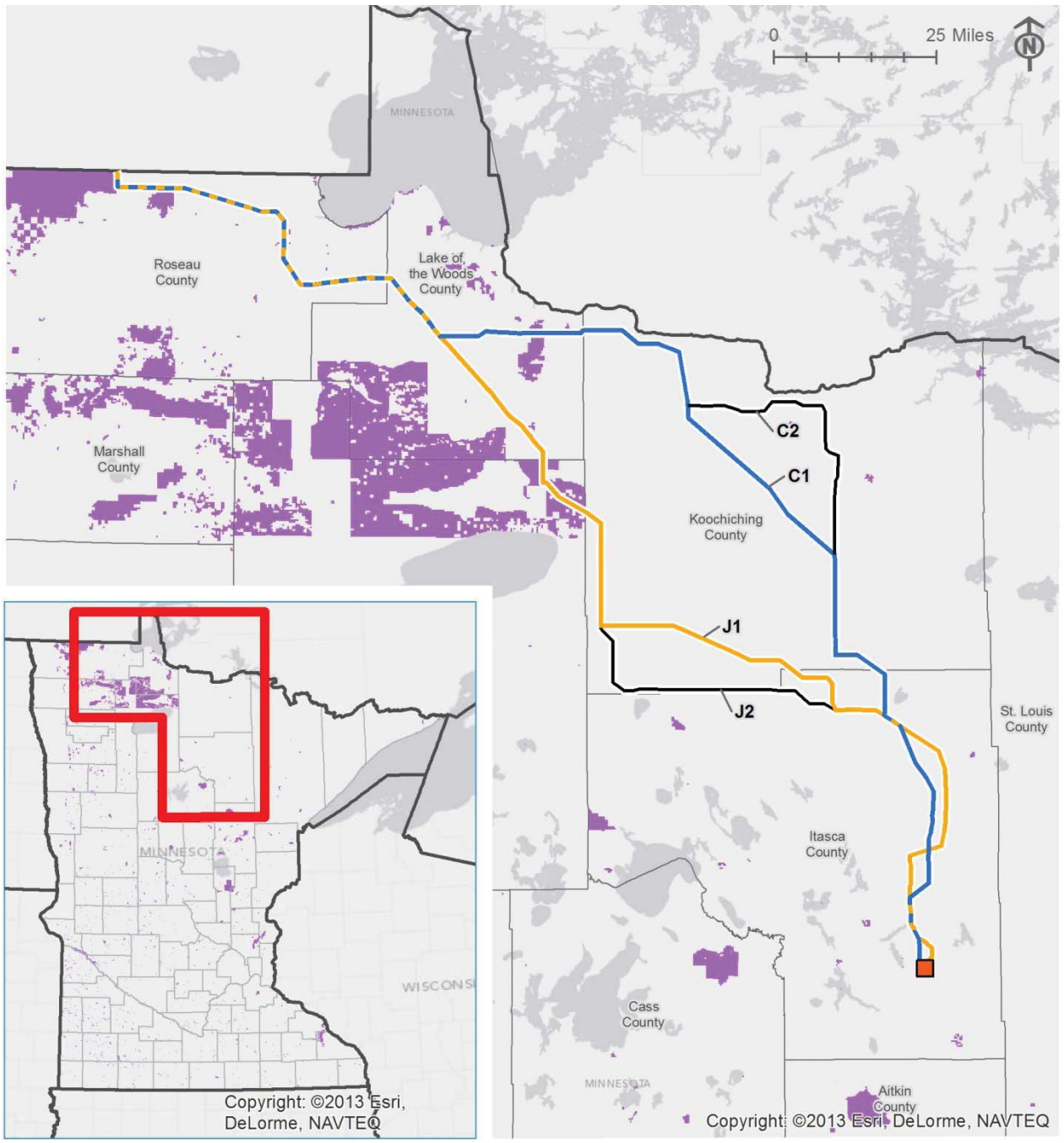


FIGURE 9 WILDLIFE MANAGEMENT AREAS



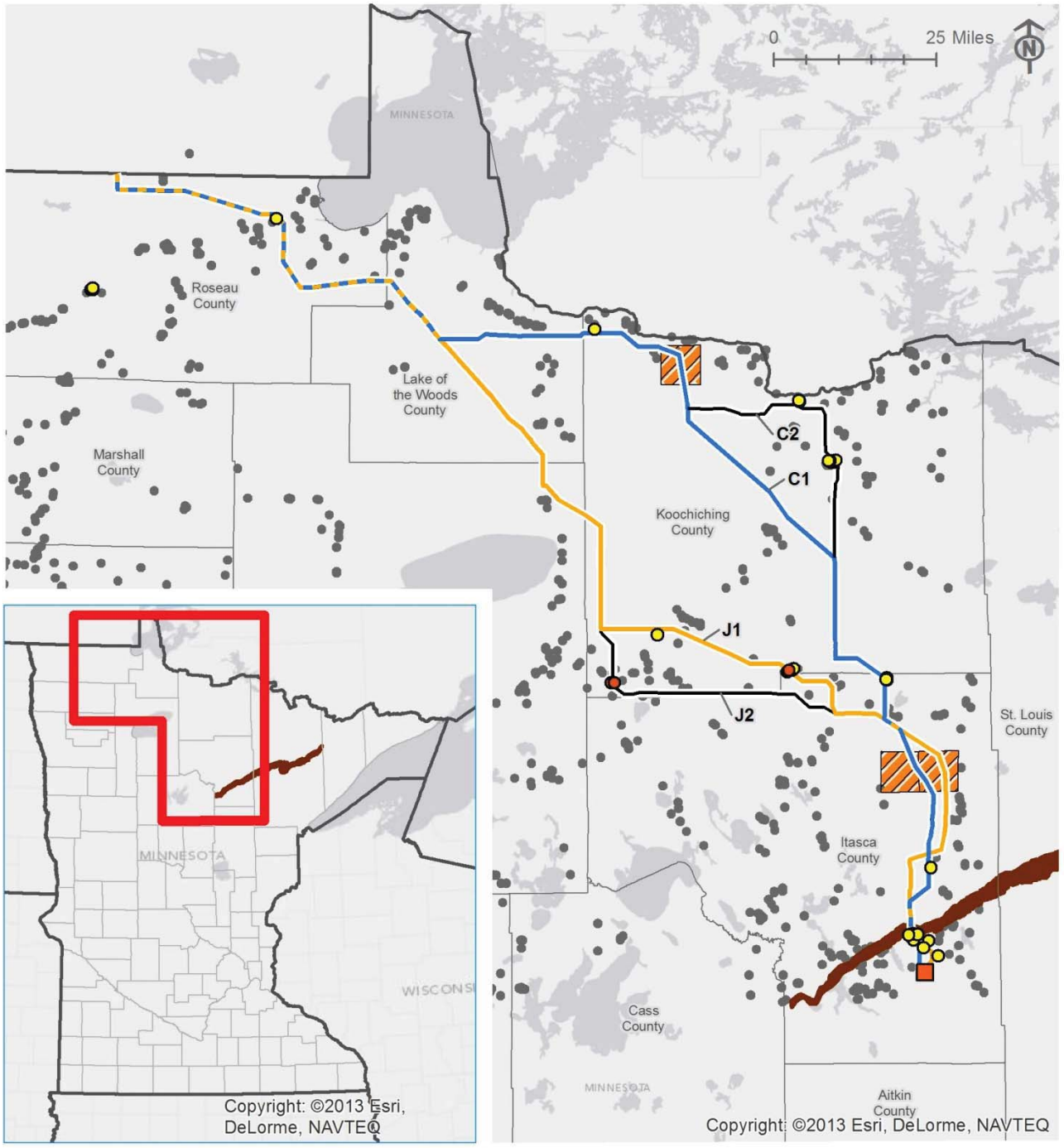
Legend

- 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

FIGURE 10 AGGREGATE & IRON ORE MINING RESOURCES



Legend

- Blue Route
- Orange Route
- Segment Option
- Blackberry Substation
- Aggregate Source within 1-mile of ROW
- Aggregate Source within 200 ft. ROW
- Aggregate Source
- Mesabi Iron Range
- Active Mineral Lease
- State Boundary
- County Boundary

Sources: ESRI,DNR, MnDOT

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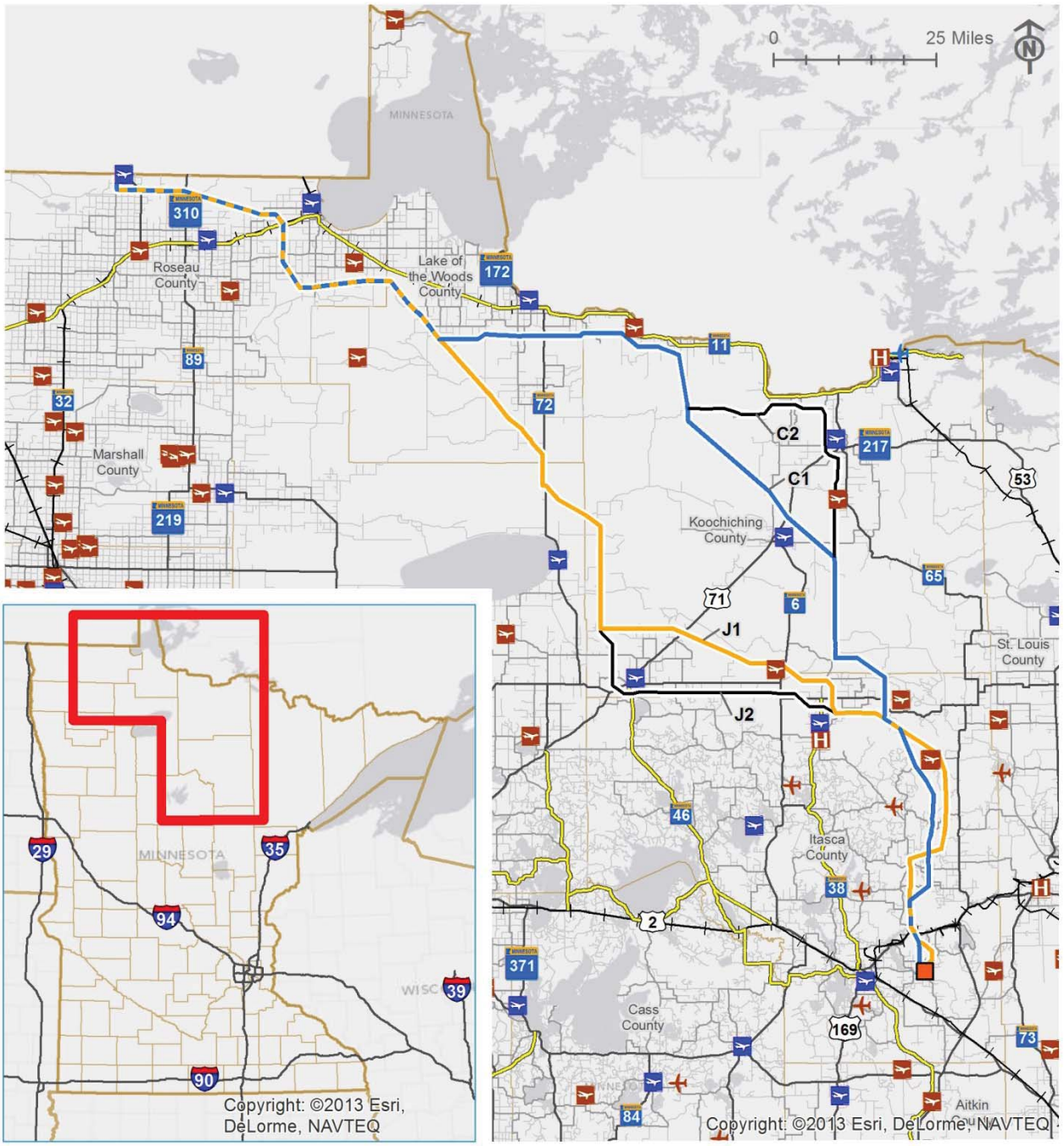
FIGURE 11. EXISTING TRANSPORTATION INFRASTRUCTURE



Legend

- Blue Route
- Orange Route
- Segment Option
- Blackberry Substation
- Private-use Airport
- Private-use Heliport
- Private-use Seaplane Base
- Public-use Airport
- Public-use Heliport
- Public-use Seaplane Base
- Scenic Byway
- Interstate / US / State Highway
- County Highway
- Other Road
- Railroad
- State Boundary
- County Boundary

Sources: ESRI,MnDOT, US Census, FAA

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FIGURE 12. PUBLIC WATER INVENTORY (PWI) WATERCOURSE and BASINS

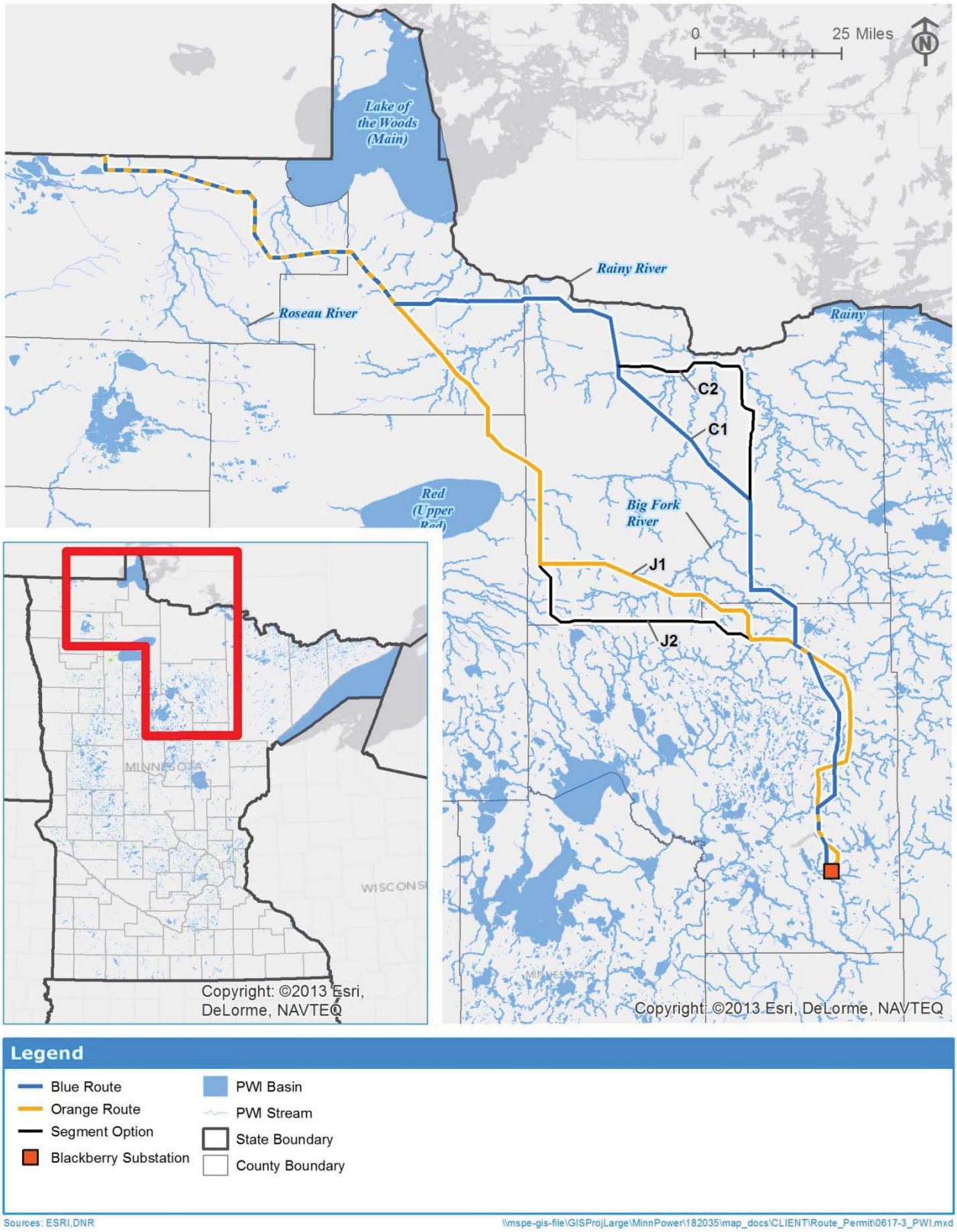


FIGURE 13. FEMA FLOODPLAINS

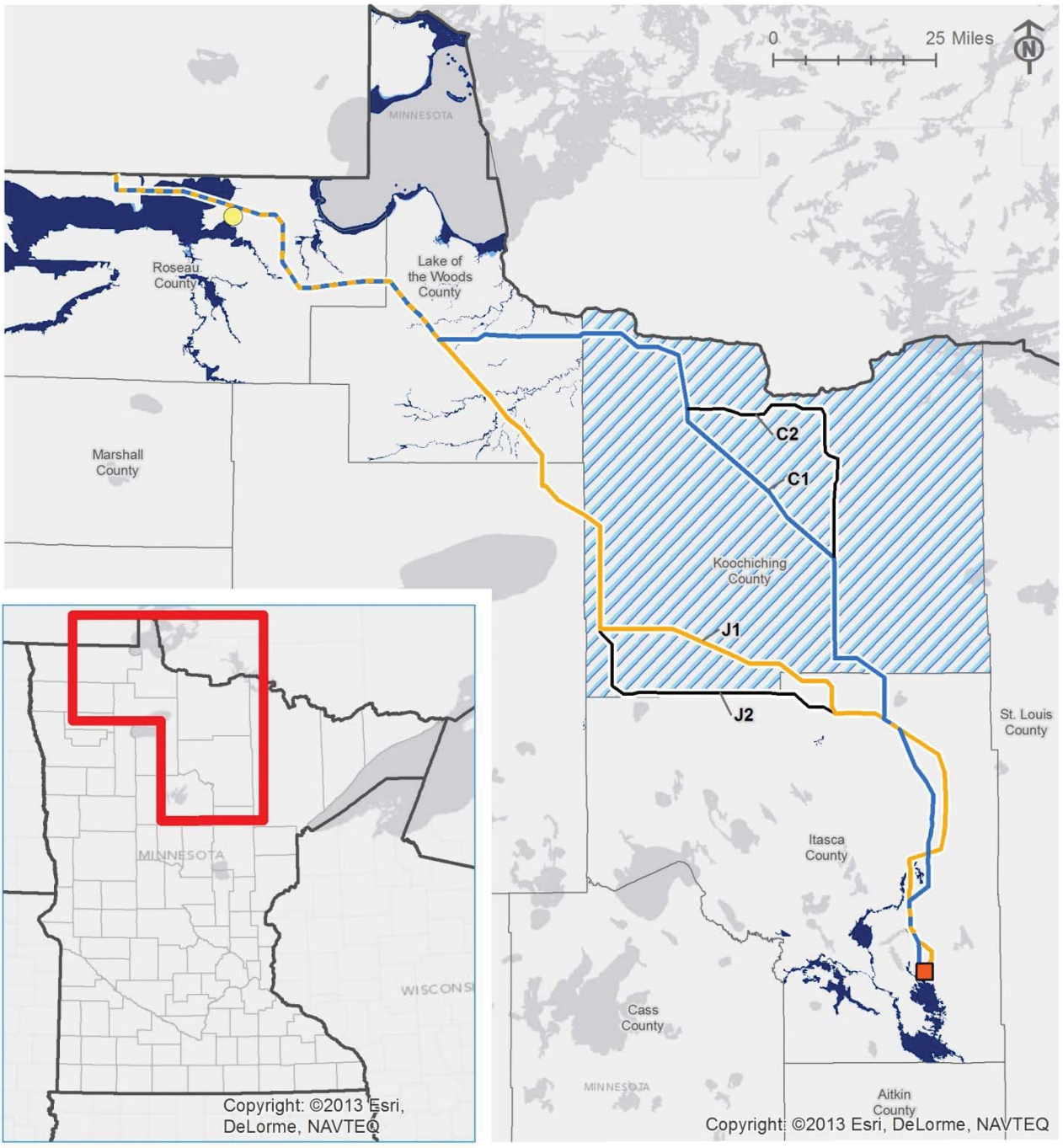
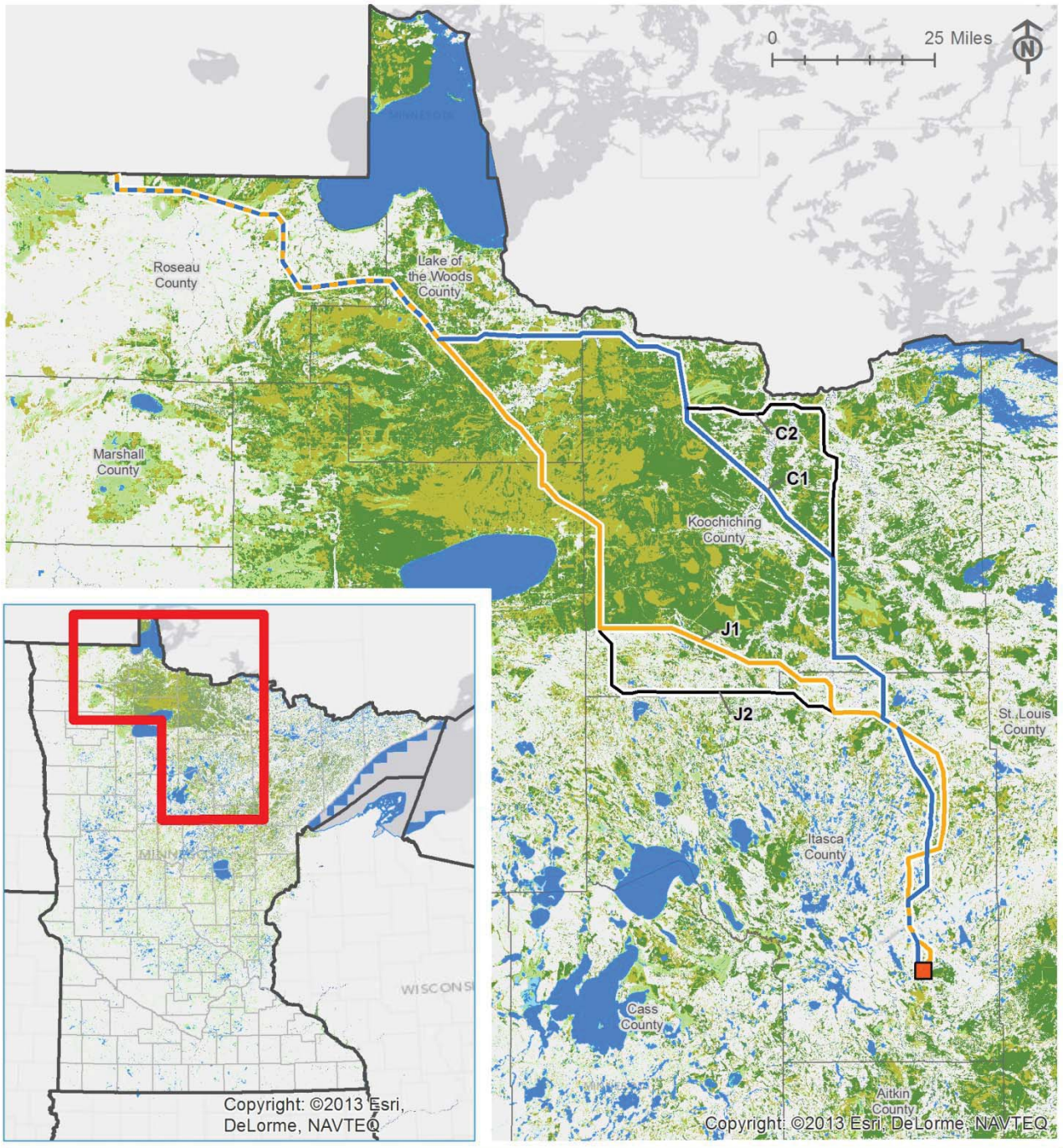


FIGURE 14. NATIONAL WETLAND INVENTORY (NWI) WETLANDS



MINNESOTA DEPARTMENT OF COMMERCE

In the Matter of Minnesota Power's Application for a Certificate of Need for the proposed Great Northern Transmission Line Project.

ER SCOPING DECISION
PUC Docket No. E0015/CN-12-1163

The above matter came before the Deputy Commissioner, Department of Commerce (Department) for a decision on the scope of the Environmental Report (ER) to be prepared for the Minnesota Power application for a Certificate of Need determination for the proposed MP Great Northern Transmission Line (GNTL) project.

Project Description

Minnesota Power, in partnership with Manitoba Hydro, proposes to construct a 500 kV transmission line from the International border that would terminate at the Blackberry Substation in Itasca County (spanning an estimated 235 to 270 miles).

At this time, Minnesota Power is considering three potential international border crossing areas: near US Highway 59 in Kittson County, County State Aid Highway 24 along the Kittson/Roseau County border, and Minnesota Trunk Highway 89 in Roseau County. The potential route(s) from those crossing areas to the Blackberry Substation in Itasca County will be developed through the HVTL routing proceedings and should reflect the consideration of a number of factors, including infrastructure sharing opportunities, large water bodies, Scientific and Natural Areas, State Parks, and large areas of open wooded wetland and cities.

Purpose and Need

The Applicant has stated that the project would provide a critical new transmission resource for northern Minnesota and the region by providing an additional high voltage tie-line between Manitoba and the United States. The Applicant stated that an additional consideration is that the current transmission resources are unable to facilitate significant new energy exchanges and that the existing 500 kV tie-line between Manitoba and the United States represents the single largest potential system emergency in the region. As such, new transmission not only enables additional energy exchanges, but also strengthens the regional transmission grid.

The Applicant continues, adding that the project represents the Minnesota portion of major new transmission facilities necessary to deliver the power called for under the Commission-approved 250 MW Agreements (MPUC Docket No. E-015/RP-09-1088, Order Accepting Resource Plan and Requiring Compliance Filings, May 6, 2011).

Regulatory Background

On October 21, 2013, Minnesota Power submitted an Application for a Certificate of Need to construct the Great Northern Transmission Line project to the Public Utilities Commission (Commission). This new large high voltage transmission line will extend from the Manitoba United States border to Minnesota Power's Blackberry Substation in Itasca County, Minnesota. The application was submitted pursuant to the Certificate of Need (CN) provisions found in Minnesota Rules 7849.

The Commission accepted the CN Application as complete on December 18, 2013.

Before any large energy facility, in this case HVTL, can be constructed in Minnesota, the Commission must determine that they are necessary and in the best interest of the state. The certificate of need process includes environmental review and public hearings, and typically takes 12 months. This process is the only proceeding in which a no-build alternative and the size, type, timing, system configuration and voltage of the proposed project will be considered.

If a certificate of need is required, it must be issued prior to the route permit for a project (Minnesota Statute 216B.243).

The Department Energy Environmental Review and Analysis (EERA) staff is responsible for administering the environmental review process. The Commission is responsible for determining if the transmission lines proposed are needed.

The environmental review process under the certificate of need procedures includes public information/scoping meetings and the preparation of an environmental review document, the Environmental Report (ER). The environmental report is a written document that describes the human and environmental impacts of the proposed project, alternatives to the project and methods to mitigate anticipated adverse impacts.

The ER must be prepared before the public hearing and before the Commission can make a decision on the certificate of need application.

Scoping Process Summary
On January 15, 2014, Commission staff sent notice of the places, dates and times of the Public Information and ER Scoping meetings to those persons on the General List maintained by the Department, the agency technical representatives list and the project contact list.

Commission staff and EERA staff jointly held six public information/scoping meetings. The purpose of the meetings was to provide information to the public about the proposed project, to answer questions, and to allow the public an opportunity to suggest CN alternatives and potential impacts that should be considered during preparation of the environmental review document. A variety of topics were discussed during the presentation. Topics included: the certificate of need process, schedule, statutes and rules; Minnesota power's description of the purpose and need, and project components; environmental review procedures; and, the scoping of alternatives and impacts.

Approximately 90 people attended the public information and scoping meetings; 20 individual took the opportunity to speak on the record. A court reporter was present to document oral statements. Written comments were due no later than Friday, March 14, 2014. Twenty-eight written comments were received.

Many of the comments received, both oral and written, were more relevant to the routing process, meaning that they dealt with issues that are route specific. These comments will be reserved for the upcoming HVTL routing docket and evaluated during that docket's environmental review scoping process. Other comments have relevance to both the CN and the routing dockets, and will therefore be covered in the environmental review documents for both proceedings. The remaining relevant comments dealt with issues specific to the size, type, timing, system configuration and/or voltage of the proposal contained in MP's Certificate of Need application. These comments were: upgrading the existing transmission system; alternative voltages (230 kV, 345 kV),

direct current (DC) alternative; demand side management; line losses; and double circuiting along the Dorsey-Forbes 500 kV line.

Scoping comments, along with other relevant documents, can be reviewed at the Department's website: http://mn.gov/commerce/energyfacilities//resource.html?Id=33610 and on eDockets: http://www.edockets.state.mn.us/EFiling/search.jsp (enter 12 for the year and 1163 for the number).

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HAVING REVIEWED THE MATTER, consulted with staff, and in accordance with Minnesota Rule 7849.1400, I hereby make the following Scoping Decision.

MATTERS TO BE ADDRESSED

Selected alternatives and impacts, along with those required in rule (Minn. Rule 7849. 1500, subpart 1 and subpart 3), are incorporated into the Environmental Report Scoping Decision.

The ER on the proposed Great Northern Transmission Line project will address and provide information on the following matters:

1.0 INTRODUCTION
- 1.1 Purpose and Need
- 1.2 Regulatory requirements

2.0 PROJECT DESCRIPTION
- 2.1 General
- 2.2 Design
- 2.3 Right-of-Way Requirements and Acquisition
- 2.4 Construction
- 2.5 Operation and Maintenance
- 2.6 Permits

3.0 ALTERNATIVES TO THE PROPOSED HVTL
- 3.1 No-build Alternative
- 3.2 Demand Side Management
- 3.3 Purchase Power
  - 3.3.1 Long term Purchase Power
  - 3.3.2 Short term Purchase Power
- 3.5 Up-grading Existing Facilities
  - 3.5.1 Double Circuit Existing Lines
- 3.6 Facilities of a Different Size
  - 3.6.1 Alternative Voltages
  - 3.6.2 DC Alternative
- 3.7 Generation Alternatives

4.0 ENVIRONMENTAL AFFECTS
- 4.1 Air Quality
- 4.2 Biological Resources
  - 4.2.1 Forest Fragmentation
  - 4.2.2 Avian
- 4.3 Culture Resources

4.4 Geology and Soils
4.5 Health and Safety
4.5.1 EMF
4.5.2 Stray Voltage
4.5.3 Interference with Communications/GPS
4.6 Land Use
4.6.1 Agricultural (livestock, crops, timber)
4.7 Noise
4.8 Socioeconomics
4.8.1 Property Values
4.9 Transportation
4.10 Visual Impacts and Aesthetics
4.11 Water Resources (surface, groundwater, wetlands)
4.12 Waste Management and Disposal

5.0 REQUIRED PERMITS and APPROVALS
The ER will include a list of permits that will be required for the project.

The above outline is not intended to serve as a "Table of Contents" for the ER document, and as such, the organization (i.e., structure of the document) of the information and the data may not be similar to that appearing in the ER.

ISSUES OUTSIDE THE SCOPE OF THE ER

The following issues will not be considered or evaluated in the ER:

- Route alternatives.
- Any alternatives that do not meet the underlying need for or purpose of the project.
- The impacts and issues associated with components of the project which are within the Canadian jurisdiction.
- The manner in which land owners are paid for transmission rights-of-way easements.
- Contested issues or disputes of fact with respect to the representations made in the CN application.

SCHEDULE

Following is the anticipated schedule: July 2014 – ER Available

Signed this 22nd day of April, 2014

STATE OF MINNESOTA
DEPARTMENT OF COMMERCE
DIVISION OF ENERGY RESOURCES

William Grant, Deputy Commissioner
Division of Energy Resources