GREAT RIVER ENERGY

And

ITASCA-MANTRAP COOPERATIVE ELECTRICAL ASSOCIATION

APPLICATION TO THE
MINNESOTA PUBLIC UTILITIES COMMISSION
FOR A
ROUTE PERMIT

Docket ET2/TL-06-468

ALTERNATIVE PERMITTING PROCESS

RDO PROJECT

SUBSTATION AND
TRANSMISSION LINE UPGRADE

April 6, 2006

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LIST OF ACRONYMS

ACRONYMS	
AC	Alternating current
ACSR	Aluminum conductor steel reinforced
ACSS	Aluminum conductor steel supported
BMPs	Best Management Practices
BPA	Bonneville Power Administration
Commission	Minnesota Public Utilities Commission
Corps	United States Army Corps of Engineers
dB(A)	Decibel
DNR	Minnesota Department of Natural Resources
DOT	Minnesota Department of Transportation
EMF	Electromagnetic fields
EPA	Environmental Protection Agency
EPRI	Electric Power Research Institute
EQB	Minnesota Environmental Quality Board
FWS	United States Fish and Wildlife Service
GRE	Great River Energy
HVTL	High voltage transmission line
Itasca-Mantrap	Itasca-Mantrap Cooperative Electrical Association
kV	Kilovolt
MCM	Thousand circular mil
MHS	Minnesota Historical Society
MP	Minnesota Power
MVA	Megavolt-ampere
MW	Megawatt
NAC	Noise area classifications
NESC	National Electric Safety Code
NRCS	Natural Resources Conservation Service
PCA	Minnesota Pollution Control Agency
ppm	Parts per million
RUS	Rural Utilities Service
TH	Trunk Highway
USDOE	United States Department of Energy

Application for a Route Permit for a High Voltage Transmission Line and Associated Substation Upgrade to Support Increased Load Growth in the Park Rapids Area

Pursuant to Minn. Stat. § 116C.51 to 116C.69 and Minn. Rules pt. 4400.0400 et seq., Great River Energy (GRE) and Itasca-Mantrap Cooperative Electrical Association (Itasca-Mantrap) hereby apply to the Minnesota Public Utilities Commission (Commission) for a Route Permit for a high voltage transmission line (HVTL) and an associated substation upgrade in Hubbard County, Minnesota to meet the electrical needs of Itasca-Mantrap customers located in the Park Rapids area. The application is submitted under the Alternative Permitting Process (Minn. Rules pt. 4400.2000).

The Application is divided into 15 sections as follows:

1. **EXECUTIVE SUMMARY** – provides background information on GRE and Itasca-Mantrap and a brief justification for the project.

2. **NEED FOR THE PROJECT** – provides a detailed discussion of the need for the project.

3. **OWNERSHIP/PERMITTEE** – describes the proposed ownership of the line and associated facilities (Minn. Rules pt. 4400.1150, subp. 2 A, B), the permittees for the project, and contact information.

4. **ALTERNATIVES CONSIDERED AND REJECTED** – identifies alternatives considered by the applicants and the reasons they were rejected (Minn. Rules pt. 4400.2100).

5. **DESCRIPTION OF THE PROPOSED PROJECT** – provides a detailed description of the proposed project (Minn. Rules pt. 4400.1150, subp. 2 D) and line specifications.

6. **ENVIRONMENTAL INFORMATION** – provides a description of the environmental setting, effects on environmental and human resources, and mitigative measures (Minn. Rules pt. 4400.1150, subp. 2E and 2F, and subp. 3), including the identification of land uses and environmental conditions along the proposed route.

7. **IDENTIFICATION OF EXISTING RIGHTS OF WAY** – describes utility and public rights of way along the proposed route (Minn. Rules pt. 4400.1150, subp. 2 I).

8. **ENGINEERING AND OPERATIONAL DESIGN OF PROPOSED HVTL** – describes engineering and operational design concepts for the proposed project, including electric and magnetic fields (Minn. Rules pt. 4400.1150, subp. 2 J).

9. **COST ANALYSIS –** provides cost analysis of the proposed project, including costs of construction, operation, and maintenance (Minn. Rules pt. 4400.1150, subp. 2 K).

10. **DESIGN OPTIONS TO ACCOMMODATE FUTURE EXPANSION** – describes possible design options to accommodate expansion of the project in the future (Minn. Rules pt. 4400.1150, subp. 2 L).

11. **RIGHT OF WAY ACQUISITION AND RESTORATION** – describes procedures and practices proposed for acquisition and restoration of the right of way (Minn. Rules pt. 4400.1150, subp. 2 M).

12. **CONSTRUCTION, OPERATION AND MAINTENANCE** – provides a narrative description of the procedures and practices for construction, operation, and maintenance of the proposed line and substation (Minn. Rules pt. 4400.1150, subp. 2 M).

13. **LIST OF PERMITS NEEDED** – a list and brief description of federal, state, and local permits that may be required for the proposed project (Minn. Rules pt. 4400.1150, subp. 2 N).

14. **SUMMARY** – summarizes the key elements of the Route Permit Application and compares them to the established factors to be considered in evaluating this Application (Minn. Rules pt. 4400.3150).

15. **REFERENCES** – lists documents referenced in the text of the Application and data sources used to generate maps.

Minn. Stat. § 216B.243, Subd. 2, states that no large energy facility shall be sited or constructed in Minnesota without the issuance of a certificate of need by the Commission. Minn. Stat. § 216B.2421, Subd. 2(3) defines a “large energy facility” as any high voltage transmission line with a capacity of 100 kilovolts (kV) or more with more than ten miles of its length in Minnesota or that crosses a state line. The proposed 115 kilovolt transmission line that is the subject of this application is 2.5 miles long, therefore it does not meet the definition of a large energy facility and no certificate of need is required.

The names of each owner whose property is within the proposed route (Minn. Rules pt. 4400.1150, subp. 2G) are provided in Appendix A. A United States Geological Survey topographical map showing the entire length of the proposed route (Minn. Rules pt. 4400.1150, subp. 2H) is provided in Figure 6-1.

GRE held an Open House/Public Meeting on the proposed project on March 30, 2006 at the Straight River Township Hall (see Notice in Appendix B). Nine individuals attended the meeting. Of those nine, one was from GRE, three represented Itasca-Mantrap, three were Township Supervisors, and three were private landowners.

A fact sheet (which had also sent in the invitation letter) was passed out to all in attendance. GRE and Itasca-Mantrap discussed the need for the project as listed on the fact sheet. Itasca-Mantrap explained the area power quality issues and the need for the 115kV upgrade. GRE talked about overall Park Rapids area improvements, including the new Long Lake Bulk Substation, the upgrade at the Hubbard Substation, and the proposed Badoura - Park Rapids 115 kV line. General project details concerning construction, pole heights and type were provided (pictures of a single and double circuit line were shown). A summary of the State Permitting process was passed out and a brief explanation of the permitting steps was offered to the attendees.

Landowner questions concerned the construction schedule and general pole location. GRE and Itasca-Mantrap suggested that the new line would be offset about 5 feet to accommodate construction. There was a general question about the Straight River crossing and DNR notification. It was explained that the DNR as well as other agencies had been notified and that GRE would obtain a License to Cross the Straight River.

GRE indicated that a representative would be sent out to talk to each landowner affected by the project, and that an easement revision would be sought.

One landowner had specific questions/concerns regarding past tree/vegetation control on his property. He was informed that GRE was aware of his concerns and would discuss the remedy with him.

1. EXECUTIVE SUMMARY

1.1 General

Great River Energy (GRE) is a not-for-profit generation and transmission cooperative based in Elk River, Minnesota. GRE was created when Cooperative Power Association and United Power Association formed a joint operating company on January 1, 1999.

GRE provides electrical energy and related services to 28 member distribution cooperatives (Figure 1-1), including Itasca-Mantrap Cooperative Electrical Association (Itasca-Mantrap), the distribution cooperative serving a portion of the area to be supplied by the proposed high voltage transmission line (HVTL). The distribution cooperatives, in turn, supply electricity and related services to more than 560,000 residential, commercial, and industrial customers in Minnesota and Wisconsin.

GRE's 2,500-megawatt (MW) generation system includes a mix of baseload and peaking plants, including coal-fired, refuse-derived fuel, and oil plants as well as new wind generators. GRE owns approximately 4,400 miles of transmission line in Minnesota, North Dakota, South Dakota, and Wisconsin.

Itasca-Mantrap provides electricity and related services to approximately 11,315 residential, commercial and industrial customers in Minnesota. Approximately 400 residential, commercial and industrial Itasca-Mantrap customers in the Park Rapids area would benefit from the proposed project.

GRE and Itasca-Mantrap's mission is to provide safe, reliable, competitively priced energy to those it serves. Voltage deficiencies and reliability concerns require an upgrade of the Itasca-Mantrap's RDO Substation located near Park Rapids, Minnesota. In response to these concerns, Itasca-Mantrap and GRE propose to upgrade the 34.5 kilovolt (kV) system serving this substation.

The project described in this route application will provide an additional 115 kV source into the area, strengthening the capacity of the power grid and allowing the Itasca-Mantrap distribution system to maintain adequate voltage and improve reliability to customers.

1.2 Description of the Proposed Project

Itasca-Mantrap will convert the existing transformer at the RDO Substation from the present voltage of 34.5 kV to 115 kV. GRE will convert and upgrade approximately 2.5 miles of an existing transmission line from 34.5 kV to 115 kV. One mile of the line upgrade will be a double circuit 115/34.5 kV (Figure 1-2). The new line will tap GRE's 115 kV "HP" line. The substation modifications and transmission line construction are scheduled for late fall 2006.

Figure 1-1

Figure 1-2

2. NEED FOR THE PROJECT

The Park Rapids area transmission system is shown in Figure 2-1. There have been many transmission outages in this area in the last couple years that have resulted in voltage deficiencies, especially to the sensitive load of Lamb-Weston/RDO (a large potato manufacturing plant). A transmission upgrade is needed to provide reliability and stability in voltage at the RDO Substation south of Park Rapids.

The Itasca-Mantrap RDO conversion project to 115 kV is critical in assuring that the Park Rapids region maintains appropriate voltage service. The Lamb-Weston/RDO load, which has peaked at 10 MW, is presently served from the 34.5 kV system, which is unusual for a load of this size. It is very difficult to serve this load at 34.5 kV because of the voltage drop across the lines. Also, this large load is on a long radial transmission line that increases its exposure to line faults, resulting in de-energization of the plant due to problems potentially 25 miles away.

GRE standards require voltage levels of 92% or above at substations. Absent the proposed project, if the 115 kV line from Hubbard to Long Lake were out of service due to unplanned or planned outages, the Lamb-Weston/RDO load would drag down the local 34.5 kV system such that brownouts would occur. Load shedding would be necessary to prevent damage to Itasca-Mantrap and Minnesota Power (MP) customer loads.

Voltages for projected 2006 summer and winter peak load days in the region (without the proposed project and with loss of the Long Lake 115 kV source) are shown in Table 2-1.

Table 2-1 Projected 2006 Voltages

Substation	Summer %	Winter %
MP Park Rapids	89.5	90.1
MP RDO	89.5	90.1
MP Long Lake	90.4	90.9
Itasca-Mantrap Pinepoint	86.2	90.0
Itasca-Mantrap Osage	87.0	89.7
Itasca-Mantrap RDO	91.2	92.0

These voltage levels are assuming that the Itasca-Mantrap Park Rapids and Mantrap load has already been shifted to their alternative source of Badoura. Without the proposed project, it will take three switching procedures to

accomplish even these voltage levels, and rotating blackouts will need to be implemented thereafter to raise the voltage on the system.

Figure 2-1 Park Rapids Area Transmission System

In addition, without the proposed transmission upgrade, the transmission system would overload as shown in Table 2-2.

Table 2-2 Projected Transmission Line Overload

Line Segment	Overload %
Hubbard to MP Hubbard	122.2
MP Hubbard to Osage	121.3

If one of these lines were to fail due to overloading, the Park Rapids region would be out of service until the Hubbard-Long Lake 115 kV line or the overloaded line was returned to service. The options to resolve these problems are limited until the Badoura-Long Lake 115 kV line is built. The Badoura 34.5 kV system is too far away to offer much support, as the voltage drop is significant. This was realized in a recent operation that occurred in the area where the Park Rapid's regional load was transferred to Badoura, causing all the voltage correcting devices to turn on or go to full boost with voltages still remaining low. Eventually, the Hubbard source was re-energized resulting in a significant voltage spike.

The proposed project will temporarily resolve the above issues by converting Itasca-Mantrap's Lamb-Weston/RDO load to the nearby, recently completed Hubbard-Long Lake 115 kV line. This will benefit the Park Rapids region and Lamb-Weston/RDO as follows:

- The exposure of this industrial load will be greatly reduced, resulting in a higher probability of continued service resulting in savings to a major employer that has to compete in the national market.
- The 115 kV voltage will be more stable for the industrial load with fewer voltage swings due to motor starting or load shifting.
- The load will be removed from the 34.5 kV system, enhancing voltage support to the remaining 34.5 kV loads. As a result, Pinepoint Substation will have 92% voltage in the summer peak scenario and 95% voltage in the winter peak scenario.
- The line overloads will be under 85% in the summer scenario.

The only remaining transmission issue for Lamb-Weston/RDO would be the possible loss of the Hubbard to RDO line segment. If this occurred, the Lamb-Weston/RDO load would remain out until the line could be returned to service or, if local load is low enough, the load could be re-energized through the Long Lake 115/34.5 kV connection.

MP and GRE are planning for a second 115 kV line at the Long Lake Substation, as proposed in the Certificate of Need Application for the Badoura Project (Minnesota Power and Great River Energy, 2005). In this scenario the Lamb-Weston/RDO will then have a secondary 115 kV source, so that outage time will not be dependent on local load.

3. OWNERSHIP/PERMITTEE

3.1 Proposed Ownership

Itasca-Mantrap owns the existing RDO Substation and will own the upgraded RDO Substation. GRE owns the existing 34.5 kV line and will own the upgraded 115 kV line.

3.2 Permittees

Great River Energy and Itasca-Mantrap Cooperative Electrical Association will be named as permittees for this project. Transfer of the permit to any other person or organization is not anticipated.

Contact information for GRE and Itasca-Mantrap are provided below.

Permittee: Great River Energy
17845 East Highway 10
PO Box 800
Elk River, Minnesota 55330

Contact: Carole L. Schmidt

Phone: (763) 241-2272

Fax: (763) 241-6072

Email: cschmidt@grenergy.com

Permittee: Itasca-Mantrap Cooperative Electrical Association
16930 County Road 6, PO Box 192
Park Rapids, Minnesota 56470

Contact: Mike Monsrud

Phone: (218) 732-3377

Fax: (218) 732-5890

Email: mmonsrud@itasca-mantrap.com

4. ALTERNATIVES CONSIDERED AND REJECTED

This section addresses Minn. Rules pt. 4400.2100 (Alternative Permitting Process), which requires an applicant to identify any sites or routes rejected and the reasons for rejecting them.

4.1 Alternative Routes Considered for the RDO Project

GRE evaluated two other potential routes for the 115 kV transmission line as shown in Figure 4-1. These routes are discussed below.

4.1.1 Alternative 1

Alternative 1 would exit east out of the RDO Substation for approximately one mile, turn north for one mile, then east ½ mile to the tap point with GRE's 115 kV "HP" line. This route was rejected because it would affect more residences, require more tree clearing, require entirely new right of way, be more costly, and would cross the Fish Hook River, which is a designated trout stream.

4.1.2 Alternative 2

Alternative 2 would exit out of the RDO Substation straight east for approximately 1.5 miles to the tap point with GRE's 115 kV "HP" line. Although the length of this alternative is shorter, it was rejected because there would be poor access to the switch structure at the tap point, it would require more tree clearing and entirely new right of way, it would be more costly, and it would cross the Fish Hook River, which is a designated trout stream.

4.2 Alternative Transmission Plans

The only other transmission system that can be considered is the continued use of the 34.5 kV system through a new 34.5 kV source from Hubbard. This would result in a longer transmission line (about four miles) being built in an already congested transmission corridor, while maintaining a large load on the 34.5 kV system. Such an alternative would be impractical in that the nearby 115 kV line has the capacity to serve the large load and the 34.5 kV option is less efficient.

Figure 4-1 Routes Considered for the RDO Project

5. DESCRIPTION OF THE PROJECT

The substation and the associated transmission line would be within Hubbard County, Minnesota.

5.1 RDO Substation Conversion

The proposed project involves the conversion the existing Itasca-Mantrap 34.5 kV RDO Substation to 115 kV. The RDO Substation (Figure 5-1) is located south of Park Rapids about 1/3 mile east of Highway 71 (Figure 5-2). Itasca-Mantrap will replace the existing 34.5 kV transformer at the substation with a 115 kV transformer and modifications will be made to the high-side facilities. The new transformer will be a 15 MVA (megavolt-ampere) GE transformer.

Expansion of the substation site will not be required, as the required modifications to the substation can be accomplished within the existing substation footprint.

5.2 GRE Transmission Line Upgrade

Design voltage of the proposed transmission line is 115 kV. GRE will convert and upgrade two segments (approximately 2.5 miles total) of an existing transmission line from 34.5 kV to 115 kV (Figure 5-2).

Segment 1 is approximately 1.5 miles. It exits the RDO Substation and runs east for 0.5 mile, then turns south for one mile to the intersection of Trunk Highway (TH) 87. This segment will be upgraded to a single circuit 115 kV line using structures as shown in Figure 5-3.

Segment 2 is approximately one mile. It continues from the intersection of TH 87 one mile east to the point where the line taps GRE's 115 kV "HP" line. This segment will be upgraded to a double circuit 115 kV/34.5 kV line using structures as shown in Figure 5-4.

Both transmission line segments would utilize 795 aluminum conductor steel supported (ACSS) conductors. These provide greater load capacity with less sag than other traditional conductors, including 795 aluminum conductor steel reinforced (ACSR). ACSS provides more current carrying capability than ACSR with comparable structures, poles and appearance.

Segment 1 would have three single conductors (not bundled) and one shield wire. Segment 2 would have six single conductors and one shield wire.

Figure 5-1 Photo of Existing Itasca-Mantrap RDO Substation

Figure 5-2 Proposed Project

Figure 5-3 Typical GRE Single Circuit 115 kV Structure

Figure 5-4 Typical GRE 115 kV/34.5 kV Double Circuit Structure

6. ENVIRONMENTAL INFORMATION – PROPOSED PROJECT

Minn. Rules pt. 4400.1150, subps. 2E, 2F, and 3 require environmental information for the proposed project that is intended to meet the needs of the Park Rapids area load center. This portion of the Application provides a description of the land use and environmental setting associated with the project.

The project has been reviewed by a number of state and federal agencies. All environmental review correspondence related to the proposed project is provided in Appendix B.

6.1 Description of Environmental Setting

The proposed route for the two segments of upgraded 115 kV transmission line is shown in Figure 6-1. The first segment exits the RDO Substation and runs east for 0.5 mile, then turns south for one mile to the intersection of TH 87. This segment will be upgraded to a single circuit 115 kV line.

The second segment continues from this intersection one mile east to the point where the line taps GRE's 115 kV "HP" line. This segment will be upgraded to a double circuit 115 kV/34.5 kV line.

The environmental setting along the proposed route includes hydrological features such as rivers, wetlands, and riparian areas. A mix of groundcover is also present along the proposed route. Wildlife habitat exists in pockets throughout the proposed route. There are no threatened or endangered species or state listed species identified along the proposed route or any sites that are classified as rare or unique. Further, the physiographic features (topography, soils, geology, and prime farmland) are typical for this area and do not preclude the use for development of this project.

Land use along the proposed route includes a mix of industrial, rural residential, and agricultural lands. Industrial land uses include the Lamb-Weston/RDO potato processing facility just north of the proposed project. The residential areas along the proposed route are single-family homes. Open space includes river and riparian areas, pastures and cropped fields.

6.2 Effects on Human Settlement

6.2.1 Public Health and Safety

The Minnesota Department of Transportation (DOT), Office of Aeronautics was contacted (GRE letter of November 10, 2005, Appendix B) requesting information on the possible effects of the proposed project on airports or airstrips in the project area. In a letter dated November 15, 2005 (Appendix B), the DOT indicated that the location of the substation and lines would not interfere with

Figure 6-1

operations at the Park Rapids Municipal Airport. The project would also conform to the use restrictions of the land and the proposed structure heights would not penetrate any of the height limitation surfaces as identified in the airport zoning ordinance. The DOT Office of Aeronautics has no objection to the proposed improvements.

The primary public health and safety issues with electrical transmission lines are electric and magnetic fields (EMF), which are discussed in Section 8.3 of this document, and ozone and nitrogen oxide emissions, which are discussed in Sections 6.5 and 8.4.

6.2.2 Displacement

The substation conversion and the upgrade of the transmission line will be done in a manner such that no person will be displaced from their residence or business.

6.2.3 Noise

There will be two sources of audible noise from the project; the conductors and the upgraded RDO Substation.

<u>Conductor Noise</u>

Audible noise from the conductors is due to point source corona (minor breakdown of air insulating a conductor), and is a function of conductor voltage gradient. Noise emission from a transmission line occurs during heavy rain and wet conductor conditions. In foggy, damp, or rainy weather conditions, power lines can create a crackling sound due to the small amount of electricity ionizing the moist air near the wires. During heavy rain the general background noise level is usually greater than the noise from the transmission line and few people are out near the line. As a result, people do not normally notice audible noise from a transmission line during heavy rain. During light rain, dense fog, snow, and other times when there is moisture in the air, transmission lines will produce audible noise at approximately household background levels. During dry weather, audible noise from transmission lines is barely perceptible.

Audible noise is generally measured by the decibel (dB(A)) scale (the “A” suffix refers to the weighting network used for measurement), which is used for general noise ordinances.

The 115 kV line operating at or below 121 kV should not exceed approximately 12 dB(A) at the edge of the right of way during fair weather conditions. When dry, the noise level at the right of way edge will be essentially inaudible. During a heavy rain (1 inch per hour) the noise level may approach 18 dB(A) at the right of way edge. However, background noise levels will also be greatly increased during this type of weather event.

Table 6-1 lists some common noise levels.

Table 6-1 Common Noise Levels

Sound Level db(A)	Environmental Condition
134	Threshold of pain
114	Loud automobile horn
80-90	Inside motor bus
74	Average traffic on street corner
60-70	Conversational speech
54	Typical business office
40-50	Living room, suburban area
34	Library
20-30	Bedroom at night
14	Broadcast studio
0-10	Threshold of hearing

Source: Electric Power Research Institute (EPRI), 1982.
Note: Noise levels for a 115 kV transmission line would be between 0 and 18 dB(A), depending on the weather.

The Noise Control Requirement in Minnesota Pollution Control Agency (PCA) Minn. Rules 7030.0030 (Minnesota Pollution Control Agency, Undated) states that noise contributors shall comply with the Noise Area Classifications (NAC) Rule 7030.0040 criteria shown in Table 6-2.

The noise area classification is based on land use activity at the location of the receiver. For example, household units are defined under NAC (1), bus passenger terminals are defined under NAC (2), and transportation right of way is defined under NAC (3). NAC (1) includes the most noise sensitive areas such as households, hospitals, churches, and campgrounds. The L_{10} is defined as the noise level exceeded 10 percent of the time, or for six minutes in an hour. The L_{50} is the noise level exceeded 50 percent of the time, or for 30 minutes in an hour. The L_5 is the noise level exceeded 5 percent of the time, or for 3 minutes in an hour.

Table 6-2 Rule 7030.0040 Noise Area Classifications

	Day (0700-2200)		Night (2200-0700)	
NAC	L_{50}	L_{10}	L_{50}	L_{10}
1	60	65	50	55
2	65	70	65	70
3	75	80	75	80

The industry standard for utilities is calculated based on L_{50} and L_5 for audible noise emissions. The worst-case scenario is when the transmission line is exposed to heavy rain conditions (one inch per hour). Anticipated levels for heavy rain conditions for the proposed 115 kV line based on the results from the

Bonneville Power Administration Corona and Field Effects Program version 3 (U.S. Department of Energy (USDOE), Bonneville Power Administration (BPA), Undated) are listed in Table 6-3.

Table 6-3 BPA Program Results – Heavy Rain Case

L_5	L_{50}	NAC Category
17.7 dB(A)	14.2 dB(A)	1 (edge of right of way)
18.8 dB(A)	15.3 dB(A)	3 (directly under the line)

BPA has developed a general guideline based upon public response to alternating current (AC) transmission line audible noise. The guideline indicates that numerous complaints can be expected if the line noise exceeds approximately 58.5 dB(A) and that few complaints should be expected if audible noise is limited to 52.5 dB(A). The calculated values for the proposed project are well below the guidelines mentioned above and audible noise will be barely perceptible during fair weather.

Substation Noise

Transformers at substations produce noise under certain conditions. The level of noise or its loudness depends on conductor conditions, voltage level, and weather conditions. Generally, noise levels during operation and maintenance of substations are minimal.

The new transformer at the RDO Substation will comply with the state noise standards. This substation is surrounded by industrial and agricultural uses and should not have significant noise impacts.

The closest residence to the RDO Substation is approximately ¼ mile away and will not be affected by the substation upgrade.

6.2.4 Aesthetics

Two types of poles will be used for the project. The structures along Segment 1 will be single pole wood structures that will be 60-75 feet above ground, with average spans between poles of 350-400 feet. Segment 2 will be double circuit wood poles that will be 70-85 feet above ground, with an average span between poles of 300-350 feet.

Segment 2 of the upgraded transmission line will be visible along TH 87. It will replace an existing 34.5 kV line. The area this section of the line passes through is primarily agricultural and parallels a major road. No significant impacts to the visual character of this area will occur.

The structures proposed for the transmission line upgrade will have a narrow profile that is designed to be less intrusive than other structure designs.

6.2.5 Socioeconomics

Demographics

The population of Hubbard County increased from 14,939 to 18,376 (23% increase) from 1990 to 2000. This is one of the strongest growth rates in the

state, with growth and development in the Park Rapids area particularly strong (Hubbard County Land Use Plan, 2005). Population trends for Hubbard County, Park Rapids, and Straight River and Hubbard townships are shown in Table 6-4.

Table 6-4 Population Characteristics

Location	Population 1990	Population 2000	Change 1990-2000
Minnesota	4,375,099	4,919,479	12.4 %
Hubbard County	14,939	18,376	23.0%
Park Rapids	2,863	3,276	14.4 %
Straight River Township	481	662	24.6 %
Hubbard Township	631	786	37.6 %

Sources: Hubbard County Land Use Plan, 2005.

Projections indicate that the population of Hubbard County will be approximately 23,550 by 2020, an increase of 28% over the 2000 population.

Economy

Business patterns for Hubbard County, based upon the most recent information available (US Bureau of the Census, 2003), indicated a varied work force. Industries identified included: forestry, fishing, hunting, agriculture; utilities; construction; manufacturing; wholesale trade; retail trade; transportation and warehousing; finance and insurance; real estate and rental and leasing a property; professional, scientific and technical services; management of companies and enterprises; administrative support, waste management and remediation services; educational services; health care and social assistance; arts, entertainment and recreation; accommodation and food services; and other services (except public administration).

The 1999 median household income for Hubbard County was $35,321 with 9.7% of people living below the poverty level.

6.2.6 Cultural Values

As part of the development of the Hubbard County Land Use Plan (2005), County residents identified the following values as important:

- **Individual Choice**: Types of work and leisure, where to live and lifestyle
- **Local Influence**: Over policy that affects the lives of county citizens
- **Conservation**: Of county resources, used such that they remain healthy for future generations
- **Balance**: Between individual liberties and the public's welfare, and between competing economic development and environmental protection objectives
- **Equity**: In distribution of resources, improvement of infrastructure, and in decision-making
- **Respect**: For the knowledge, abilities and role of all jurisdictions involved in managing growth in Hubbard County.

Hubbard County (Hubbard County Land Use Plan, 2005) developed the following three overall goals that describe the vision of Hubbard County, and along with the values listed above, provide a guide when implementation strategies are developed:

1. Create and maintain a county community that protects its natural resources and embraces growth and change.
2. Maintain the strong rural character of the County.
3. Provide a broad range of choices for County residents in the areas of housing, economic opportunity, and recreation.

GRE believes that a reliable electrical system is fundamental to the area's growth and that the proposed project is compatible with the identified values and goals. In particular, by using existing right of ways and infrastructure, GRE is minimizing impacts on natural resources.

6.2.7 Public Services

Public services provided by Hubbard County or Straight River or Hubbard townships (i.e., police, fire protection, waste collection, etc.) will not be affected

by the proposed transmission project. There are no anticipated impacts on the public services in the community.

6.2.8 Summary

There will be minimal short-term impacts on the human environment during the physical placement of the transmission line poles. This will be a temporary

impact with no anticipated long-term impacts. There is no anticipated mitigation necessary for the effects on human settlement

This project will utilize existing transmission line right of way and will provide Itasca-Mantrap customers a reliable and efficient future energy supply. The anticipated impacts are therefore positive.

6.3 Effects on Land-Based Economies

6.3.1 Agriculture

The transmission line passes through agricultural land in several portions of the route, in both Straight River and Hubbard townships. Primary crops in the area are corn, soybeans and potatoes.

Impacts to farmland may occur from pole placement in areas currently farmed. The area of impact will be the footprint of the pole itself. Most of the route that runs through farmland will run near existing roads, thus minimizing the impact to agricultural land. GRE will work closely with landowners who have center-pivot irrigation systems near the transmission line.

6.3.2 Forestry

There are no forestry resources of economic importance within the project area. Wooded areas within the project area are associated with the Straight River and its tributaries in addition to woodlots associated with farmsteads.

6.3.3 Tourism

The many lakes, parks, forests, rivers, and trails in the region offer many opportunities to visitors of the Park Rapids area. Fishing, birding, hiking, canoeing, horseback riding and snowmobiling are all popular activities in the area.

Because the proposed project involves upgrade of existing facilities, there are no anticipated impacts to tourism in the area.

6.3.4 Mineable Resources

There is no mining in or near the project area.

6.3.5 Summary

There do not appear to be any unavoidable impacts to the land-based economies due to the proposed 115 kV transmission project. No mitigation measures are needed or proposed.

6.4 Cultural Resources

6.4.1 Archaeological and Historic Resources

The Minnesota Historical Society (MHS) was contacted (GRE letter of November 10, 2005, Appendix B) requesting information on the possible effects of the proposed project on historic properties in the project area. In a letter dated December 12, 2005 (Appendix B), the MHS indicated that there are no properties listed on the National or State Registers of Historic Places that will be affected by this project.

The proposed route was reviewed pursuant to the responsibilities given the State Historic Preservation Officer by the National Historic Preservation Act of 1966 and the Procedures of the Advisory Council on Historic Preservation (36 Code of Federal Regulations 800).

6.4.2 Summary

Neither the substation site nor the proposed transmission line route is in the vicinity of any known historic resource. As such, there are no anticipated impacts to cultural resources sites in the project area. If any archaeological sites are identified during placement of the poles along the proposed route, the particular site will be avoided and the poles placed outside the specified buffer zone.

6.5 Air Quality

The only potential air emissions from a transmission line result from corona, which may produce ozone and oxides of nitrogen. This can occur when the electric field intensity exceeds the breakdown strength of the air. For a 115 kV transmission line, the conductor surface gradient is typically below the air breakdown level. As such, it is unlikely that any measurable emissions would occur from the conductor surface.

Therefore, the 115 kV transmission line project is not expected to impact air quality.

6.6 Water Resources

6.6.1 Surface Water

Surface water resources along the proposed route include wetlands and the Straight River and associated riparian and floodplain areas.

The Minnesota Department of Natural Resources (DNR) was contacted (GRE letter of November 10, 2005, Appendix B) requesting information on the possible effects of the proposed project on waters and wetlands in the project area. The DNR reviewed the project and had no comment (e-mail response of November 16, 2005, Appendix B).

The United States Army Corps of Engineers (Corps) was contacted (GRE letter of November 10, 2005, Appendix B) requesting information on the possible effects of the proposed project on floodplains, waters, and wetlands in the project area. In a letter dated March 1, 2006 (Appendix B), the Corps indicated that a Section 404 permit may be required for projects that involve deposition of dredged or fill material into waters of the United States. However, because this project is a rebuild of an existing line in primarily upland areas, no deposition of fill material into waters of the United States is anticipated. The line crosses the Straight River, but little tree clearing will be necessary and the structures are 100-200 feet from the water, therefore impacts to the river will be minimal.

6.6.2 Summary

Potential impacts to the hydrologic features in the project area would be limited to ground disturbances due to pole placement in the area of the Straight River crossing. Impacts to this area will be avoided and minimized to the extent practicable. The existing transmission line crossing at the Straight River is fairly open and impacts that do occur will be temporary and limited to the specific pole location and the area directly adjacent to the pole. Best management practices (BMPs) will be used to control erosion and avoid water quality impacts to the river. GRE will seek an amendment of its current license to cross the Straight River from the DNR and will adhere to any conditions and recommendations contained in the license.

The wood poles used for this project will be pretreated with pentachlorophenol or creosote to increase the wood durability and life expectancy of the poles. Degradation of these wood preservatives occurs through aerobic soil degradation, aerobic and anaerobic aquatic degradation, and photolysis. However, the respective half-life for these processes range from less than 20 minutes to 63 days, the preservatives are not very mobile in soil or water, and are subject to biodegradation to its elemental state near the pole. Therefore, there will be no long-term impacts from the use of these preservatives.

6.7 Vegetation and Associated Wildlife

Vegetation in Hubbard County consists primarily of forest, forest cut-overs, grassland, shrubby grassland, wetlands, and cultivated lands (Hubbard County Land Use Plan, 2005).

6.7.1 Vegetative Communities Along Proposed Route

Vegetative communities in the proposed project area consist primarily of cultivated cropland, along with some forest/riparian vegetation along the Straight River and woodlots associated with farmsteads.

6.7.2 Wildlife Habitat

The predominant habitats within the project area are agricultural. Agricultural areas usually provide cover in windrows and woodlots, as well as tall grasses along fencerows. Organisms inhabiting these areas would be those that are typically associated with agricultural settings, such as upland game birds, red fox, white-tailed deer, and garter snakes.

Other habitats in the project area include the Straight River and the riparian corridor along the river. Organisms commonly found in such riparian areas include white-tailed deer, raccoon, mink, red fox, and a variety of avian species.

6.7.3 Summary

No impacts to native vegetation are anticipated. Placement of the poles will not occur in areas where native vegetation has been identified.

There is a potential for the temporary displacement of wildlife, loss of habitat, and avian collisions with the new power lines. Wildlife could be impacted within the immediate area of construction. The distance that animals will be displaced will depend on the species. Impacts to wildlife are anticipated to be short-term, as the transmission line will be constructed along existing right of way. Additionally, these animals will be typical of those found in agricultural settings, and will not incur population level effects due to construction. When possible, impacts to wooded areas in the project area will be avoided.

Raptors, waterfowl, and other bird species may also be affected by the construction and placement of the transmission lines. Waterfowl are typically more susceptible to transmission line collision, especially if the line is placed between agricultural fields that serve as resting areas or along major migration flyways.

Avian collisions are a possibility after the completion of the transmission line. However, this project is not located in an area where there is a major flyway or feeding area for waterfowl.

Additionally, large birds such as raptors are sometimes impacted by power lines through electrocution. This is an electric distribution issue, as electrocution occurs when birds with large wingspans come in contact with either two conductors, or a conductor and grounding device. Transmission line designs used by GRE for this project will not create any electrocution hazards.

BMPs will be implemented to prevent erosion of the soils in the areas of impact. The following measures can be used to help avoid or minimize impacts to area vegetation and wildlife resources during and after the completion of the proposed transmission line:

- Implement sound water and soil conservation practices during construction and operation of the project to protect topsoil and adjacent water resources and minimize soil erosion. Practices may include containing excavated material, protecting exposed soil, and stabilizing restored soil.
- Minimize tree felling and shrub removal that are important to area wildlife.
- Implement raptor protection measures, including placement of bird flight diverters on the line at the water crossing if recommended by local wildlife management staff.
- Revegetate disturbed areas with native species and wildlife conservation species where applicable.

6.8 Rare and Unique Natural Resources

Rare and unique natural features include information on federal and state protected and rare species, remnant areas of native vegetation, significant natural resource sites, and significant natural features.

The DNR was contacted (GRE letter of November 10, 2005, Appendix B) requesting information on the possible effects of the proposed project on rare and unique features in the project area. The DNR reviewed the proposed project and had no comment (e-mail response of November 16, 2005, Appendix B).

The United States Fish and Wildlife Service (FWS) was contacted (GRE letter of November 10, 2005, Appendix B) requesting information on the possible effects of the proposed project on threatened and endangered species or critical habitat in the project area. The FWS determined that the project would not affect any federally listed species (e-mail response of March 1, 2006, Appendix B).

The proposed transmission line will follow an existing transmission corridor, with minimal impacts to the natural vegetation and associated wildlife. No significant natural resource sites or significant natural features, or threatened or endangered

species or state listed species were identified by the DNR or the FWS along the proposed route.

Native vegetation that is compatible with the operation and maintenance of the transmission line will be maintained within the proposed route. If necessary, native species will be planted or seeded to revegetate areas disturbed by project construction.

6.9 Physiographic Features

6.9.1 Topography

The proposed project is located in the outwash plain south of Park Rapids. Topography is nearly level to undulating. Slopes are smooth and local relief is typically less than 10 feet, but ranges up to 40 feet along drainage channels (Neuenfeldt, 2003). The topography is typical of a glaciated landscape.

6.9.2 Geology

Most of the landforms and parent materials in Hubbard County are related to the Wadena Lobe of Late Wisconsin glaciation. The proposed project is located in the outwash plain south of Park Rapids, one of four distinct geomorphic areas in the county. The Wadena Drumlin Area is mostly in Straight River Township. The drumlins were formed by the Wadena Lobe and consist of sandy loam till. Outwash deposits carried by meltwaters of the Itasca Moraine have buried most of the drumlins (Neuenfeldt, 2003).

The lowermost bedrock unit in Hubbard County consists of Precambrian metamorphic and igneous rocks. The uppermost geologic unit consists of glacial drift of the Wisconsin Age. Most of the soil materials and landscapes are the result of the advance and retreat of the Wadena Lobe (Neuenfeldt, 2003).

6.9.3 Soils

The General Soil Map for Hubbard County identifies two general soil associations within the project area: Verndale-Dorset and Two Inlets-Sugarbush-Graycalm (Neuenfeldt, 2003). The Verndale-Dorset Association soils are sandy loams formed from sandy outwash that are commonly used for cultivated crops, hayland and pasture. The Two Inlets-Sugarbush-Graycalm Association soils are loamy sands formed from outwash that are commonly used for pasture and forest land.

Soils mapped within the project area are shown in Table 6-5. The soils along the route are generally very well drained sandy loams.

Table 6-5 Soils Mapped Within Project Area

Map Unit	Soil Name	Drainage	Farmland of Statewide Importance
567A	Verndale Sandy Loam, 0-2% Slopes	Somewhat excessively drained	Yes
1126 B	Verndale-Nymore complex, 1-6% Slopes	Somewhat excessively drained	Yes
1127 B	Bootlake-Graycalm complex, 2-8% Slopes	Well drained	Yes
1248 C	Nymore-Verndale complex,6-12% slopes	Excessively drained	No
1249 C	Graycalm-Bootlake complex, 8-15% slopes	Somewhat excessively drained	No
1969	Evart-Isan complex, 0-1% slopes, channeled	Very poorly drained	No
207B	Nymore loamy sand, 2-6% slopes	Excessively drained	No
207C	Nymore loamy sand, 6-12%slopes	Excessively drained	No

Source: Neuenfeldt, 2003.

6.9.4 Prime Farmland and Additional Lands of Statewide Importance

In general, prime farmland soils have an adequate and dependable water supply from precipitation or irrigation. They have a favorable temperature and growing season with acceptable levels of acidity or alkalinity, content of salt or sodium, and few or no rocks. They are permeable to water and air, are not excessively erodible and are not saturated with water for long periods of time. They do not flood frequently or they are protected from flooding.

The Natural Resources Conservation Service (NRCS) was contacted (GRE letter of November 10, 2005, Appendix B) requesting information on the possible effects of the proposed project on important or prime farmlands in the project area. In a letter of March 8, 2006, the NRCS indicated that although there are Farmlands of Statewide Importance in the project area, GRE's construction plans

and methods would have little or no effect on these soils along the proposed route.

6.9.5 Summary

Potential impacts of construction are compacting the soil and exposing the soils to wind and water erosion. Impacts to physiographic features should be minimal during and after installation of the transmission line structures, and these impacts will be short term. GRE will use BMPs to minimize soil erosion during construction and will revegetate the soils as soon as possible. There should be no long-term impacts resulting from this project.

6.10 Land Use

6.10.1 Land Use

Approximately 60% of Hubbard County is forested. Land use in Hubbard County is summarized in Table 6-6. The majority of the land along the proposed transmission line is cultivated.

Table 6-6 Cover Types in Hubbard County

Cover Type	Acreage
Forest	325,386
Grassland	104,186
Wetlands	67,549
Forest Cut-overs	57,100
Open Water	51,882
Cultivated Land	25,576
Development	6,563
Gravel Pits/Open Mines	747
Shrubby Grassland	441
Total	639,430

Source: Hubbard County Land Use Plan, 2005.

6.10.2 Zoning

Hubbard County only has zoning within the shoreland ordinance jurisdictional area, which includes the Straight River. Although the County Shoreland Management Ordinance requires a 500' buffer on either side of rivers, the ordinance does not address transmission lines. There is no zoning or any zoning districts outside of shoreland. The land surrounding the substation site and along the transmission line route is agricultural.

6.10.3 Public Lands and Recreational Areas

Park and Recreational Areas

There are many State Forests near the Park Rapids area, but none are near the proposed project. The substation and transmission line are not located near any parks or open spaces.

Trails

The State Heartland Trail passes through Park Rapids, but is north of the proposed project.

6.10.4 Summary

Potential land use impacts along the proposed route due to the 115 kV transmission line will be very limited. The proposed route for the 115 kV transmission line will be approximately 2.5 miles long and will entirely utilize existing transmission line right of way. The new 115 kV transmission line does not represent an incompatible land use with those that exist in the corridor. The substation is located in an agricultural/ light industrial area, and is not near any parks or trails. Therefore, anticipated impacts of the proposed project on land use are minimal and mitigation measures will not be needed.

7. IDENTIFICATION OF EXISTING RIGHTS OF WAY ALONG THE PROPOSED ROUTE

7.1 Utility Rights of Way

Both segments of the proposed 115 kV transmission line follow GRE's existing 34.5 kV transmission line.

7.2 Public Rights of Way

Segment 2 of the proposed transmission line parallels the TH 87 right of way.

8. ENGINEERING AND OPERATIONAL DESIGN OF THE PROPOSED HVTL AND RDO SUBSTATION

8.1 Engineering and Operational Design of the HVTL

Structure types to be used for the project are shown in Figure 8-1. Structures, pole heights and spans will vary depending upon topography and environmental constraints (such as highway crossings, stream crossings, and required angle structures). Horizontal post insulators will be used unless design requires longer spans beyond the capability of the insulators, in which case a braced post design will be utilized to accommodate the increased loadings. Angles in the line will require guying (the use of anchors and support cables) or specialty structures. Where guying is not practicable, laminated or other self-supporting steel poles will be used with drilled pier foundations.

8.1.1 Segment 1 – RDO Substation to TH 87

Single pole wood structures with horizontal post insulators will be used for the single circuit segment of the project. The structures will have three single conductor phase wires and one shield wire. The phase wires will be 795 thousand circular mil (MCM) ACSS with seven steel core strands and 26 outer aluminum strands. The average span will be 350-400 feet and heights will range from 60 to 75 feet.

8.1.2 Segment 2 – TH 87 to Tap Point

GRE's double circuit segment will be constructed using horizontal post structures similar to those shown in Figure 8-1. The average span between structures will be 300-350 feet and the poles will be approximately 70 -85 feet in height.

8.1.3 Construction Considerations

<u>Clearances</u>

The transmission lines will be designed to meet the National Electrical Safety Code (NESC) (Institute of Electrical and Electronics Engineers, 2002) standards. The NESC recommends minimum safety standards for clearances over roadways, buildings, signs, light standards, and other facilities.

GRE has company standards that meet or exceed the NESC requirements, and also follows the Rural Utilities Service (RUS) Design Manual for High Voltage Transmission Lines (US Department of Agriculture, 1992), which recommends clearances above the minimum NESC values to account for construction tolerances, such as a pole that is set deeper than originally specified.

Figure 8-1 Schematic Diagrams of Typical GRE Structures

Clearances over highways and roadways will exceed the 23 feet recommended by the NESC and RUS standards and may be limited by the DOT or local county highway permitting. Although the existing standards give recommended clearances over buildings, GRE generally does not locate transmission lines directly over a building unless it cannot be avoided. Horizontal clearances to buildings, signs, light standards, and other installations will be determined by calculating the blowout (movement of the wire due to wind), structure deflection, and safe electrical clearance from the line.

Right of Way Requirements

Right of way widths for the transmission line will range from 70 feet to 100 feet (35-50 feet on either side of the transmission centerline).

Additional right of way may be required for longer spans or special design requirements based on final survey. Right of way width depends on conductor blowout and the recommended clearances to obstructions along the route.

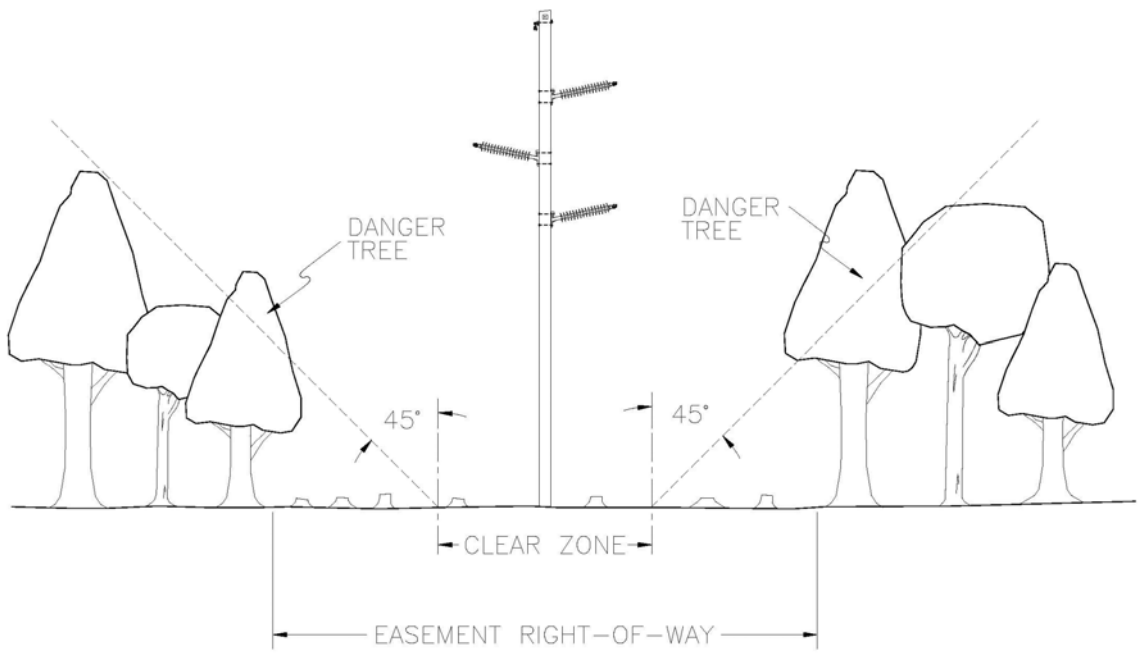
Tree Clearing

The NESC states that “trees that may interfere with ungrounded supply conductors should be trimmed or removed.” Standard practices per specifications from the RUS indicate total removal of trees within the easement area, with additional trees and danger trees removed or trimmed beyond the easement area if they could fall into the energized transmission line as shown in Figure 8-2. Special tree trimming agreements are possible to minimize tree removal based on negotiations with individual landowners.

Material Requirements

The construction of the transmission line will require the use of both renewable and non-renewable resources. The renewable resources consist of the wooden poles and the non-renewable resources consist of insulators, conductors, shield wires, and related hardware

Figure 8-2 Standard Tree Removal Practices



8.2 Engineering and Operational Design of the RDO Substation

The RDO substation is an existing low profile substation. The only changes to be made will be replacement of the existing 34.5kV transformer with a new 115 kV transformer that will utilize the existing concrete foundation. The framing will be altered to accommodate for added clearance on the high side switch structure. The proposed layout of the RDO Substation is provided in Figure 8-3.

8.3 Electric and Magnetic Fields

Questions often arise about electric and magnetic fields (EMF), which are invisible lines of force that surround any electrical device. The term EMF refers to electric and magnetic fields that are coupled together such as in high frequency radiating fields. For lower frequencies such as for power lines, EMF should be separated into electric fields and magnetic fields. Transmission lines operate at a frequency of 60 hertz (cycles per second), which is in the non-ionizing portion of the electromagnetic frequency spectrum. Fields are considered ionizing when they cause electrons to eject from their orbits around a normal atom. This will typically occur with frequencies in the range of 10^{16} to 10^{22} hertz.

Figure 8-3

Magnetic fields result from the flow of electricity (current) in the transmission line. The intensity of the magnetic field is related to the current flow through the conductors. The magnetic field associated with the transmission line surrounds the conductor and rapidly decreases with the distance from the conductor. The value of the magnetic field density is expressed in the unit of gauss or milligauss.

The most recent and exhaustive studies of the health effects from power frequency fields conclude that the evidence of health risk is weak. Some of these studies are listed below:

- National Institute of Environmental Health Sciences. 2002. *EMF. Electric and Magnetic Fields Associated with the Use of Electric Power.* National Institutes of Health.

- National Research Council. 1997. *Possible Health Effects of Exposure to Residential Electric and Magnetic Fields.*

- Minnesota Department of Health. 2002. *EMF White Paper on Electric and Magnetic Field (EMF) Policy and Mitigation Options.*

- Electric and Magnetic Fields (EMF): Environmental Health in Minnesota. http://www.health.state.mn.us/divs/eh/radiation/emf

For this project, the overall EMF impact of the single circuit segment of line will be minimized by the compact design, and the impact of the double circuit segment will be minimized by the phase arrangement along with the compact design.

The voltage in a transmission line generates an electric field, but the magnitude of the electric field rapidly decreases with distance from the conductor. The electric field is expressed in a unit of volts per meter. Although there is no state or federal standard for transmission line electric field exposures, the Minnesota Environmental Quality Board (EQB) has imposed a maximum electric field limit of 8 kV per meter at one meter above ground. That standard was implemented to mitigate serious hazard from shocks when touching large objects parked under transmission lines with voltage of 500 kV or greater. The proposed 115 kV line will have a maximum magnitude of electric field density of approximately 1.6 kV per meter underneath the conductors one meter above ground level. Research on the biological effects from electric fields on animals and humans has shown no significant association with disease in humans.

8.4 Ozone and Nitrogen Oxide Emissions

Corona, which may produce ozone and oxides of nitrogen, consists of an ionic or electrical discharge from the surface of a transmission line conductor. It occurs when the electric field intensity or surface gradient on the conductor exceeds the breakdown strength of air. For a 115 kV transmission line, the conductor surface

gradient is usually below the air breakdown level. Some imperfection, such as loose conductor support hardware or water droplets, is necessary to cause corona. When corona occurs, it will be within a few centimeters or less immediately surrounding a conductor. Ozone also forms naturally in the lower atmosphere from lightning discharges and from reactions between solar ultraviolet radiation and air pollutants such as hydrocarbons from auto emissions.

The natural production rate of ozone is directly proportional to temperature and sunlight and inversely proportional to humidity. Therefore, humidity (or moisture), the same factor that increases corona discharges from transmission lines, inhibits the production of ozone. Ozone is a very reactive form of oxygen and combines readily with other elements and compounds in the atmosphere. Because of its reactivity, ozone is relatively short-lived.

On July 18, 1997 the Environmental Protection Agency (EPA) promulgated a regulation (62 Federal Register 38856) replacing the 1-hour ozone 0.12 parts per million (ppm) standard with an 8-hour standard at a level of 0.08 ppm. The form of the 8-hour standard is based on the 3-year average of the annual fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area. Calculations using the Bonneville Power Administration *Corona and Field Effects Program Ver. 3* (USDOE, BPA, Undated) for a standard single circuit 115 kV project predicted the maximum concentration of 0.008 ppm near the conductor and 0.003 ppm at one meter above ground during foul weather or worst case conditions with rain at 4 inches per hour. During a mist (rain at 0.01 inch per hour) the maximum concentrations decreased to 0.0003 ppm near the conductor and 0.0001 ppm at one meter above ground level. For both cases, the ozone levels are below EPA standards.

Most calculations for the production and concentration of ozone assume high humidity or rain with no reduction in the amount of ozone due to oxidation or air movement. These calculations would therefore overestimate the amount of ozone that is produced and concentrated at ground level. Studies designed to monitor the production of ozone under transmission lines have generally been unable to detect any increase due to the transmission line facility.

8.5 Radio/TV Interference

The most significant factor with respect to radio and television interference is not the level of the transmission line induced noise, but how it compares with the strength of the broadcast signal. Very few problems have arisen with existing 115 kV transmission line radio noise, as radio stations have adequate signal to noise ratios such that interference is usually not a problem.

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), 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. Because no lattice steel towers are anticipated for the proposed 115 kV line, this will not be a problem.

Corona generated radio frequency noise is quite small in the very high frequency range used for television transmission. As a result, television interference from corona generated by the proposed 115 kV line will generally be negligible. Noise in the frequency range of cellular type phones is almost non-existent and the technologies used by these devices is superior to that used in two way mobile radio.

Loose and/or damaged hardware may also cause television interference. If television or radio interference is caused by or from the operation of the proposed 115 kV line in those areas where good reception is presently obtained, GRE will inspect and repair any loose or damaged hardware in the transmission line, or take other necessary action to restore reception to the present level, including the appropriate modification of receiving antenna systems if deemed necessary.

9. COST ANALYSIS OF THE PROPOSED PROJECT

9.1 Project Costs

The cost estimate for construction of the RDO project is shown below.

RDO Substation Modifications (Itasca-Mantrap)	$ 500,000
Segment 1- RDO Substation to TH 87 1.5 miles single circuit 115 kV (GRE)	$ 450,000
Segment 2 – TH 87 to Tap Point 1.0 mile double circuit 115/34.5 kV (GRE)	$ 400,000
Total Estimated Cost of the Project	**$1,350,000**

9.2 Operation and Maintenance Costs

Once converted to 115 kV, operation and maintenance costs associated with the RDO Substation will be minimal, other than weed control inside the substation.

Annual operation and maintenance costs associated with 115 kV transmission lines in GRE's system have averaged approximately $1000 per mile of line over the last several years. Costs of operation account for approximately 43% of those costs, and include such items as switching actions, air patrol, and surveying. The remaining 57% of those costs is maintenance and includes tree clearing, right of way spraying, and structure inspections.

10. DESCRIPTION OF DESIGN OPTIONS TO ACCOMMODATE FUTURE EXPANSION OF THE HVTL

The GRE transmission planning timeframe presently extends out to 2026. During this timeframe, GRE does not have any plans to expand the proposed Lamb-Weston/RDO 115 kV line, nor is GRE aware of any other utility plans to expand the 115 kV line. The design plans are therefore based on the current project and do not include any future expansion of the HVTL.

If load continues to grow to the west of the Lamb-Weston/RDO plant, it is likely that the 115 kV line will be extended further along the 34.5 kV route as there is a large region that is HVTL deficient. This may occur within the next 50 years unless technology has offered some other possibilities in serving this region.

11. PROPERTY/RIGHT OF WAY ACQUISITION AND RESTORATION

11.1 Right of Way Requirements

11.1.1 Segment 1 – RDO Substation to TH 87

The proposed route for this section of line will use an existing 34.5 kV line between the RDO Substation and TH 87. The right of way for this line is 70 feet in width and the single circuit line will be designed to be placed within this existing right of way.

11.1.2 Segment 2 – TH 87 to Tap Point

The double circuit 115/34.5 kV portion of the line from TH 87 to the tap point will be built on the existing GRE 70-foot right of way. Additional right of way may be required in some areas.

11.2 Property/Right of Way Acquisition Procedures

Once approvals from various state, federal and local agencies, and governmental units are secured, land rights acquisition will commence. Land rights include easement acquisition in the case of a transmission line, or acquisition of a fee interest in the case of a substation or breaker station. As a general practice, landowners will be contacted to review project details and to discuss the initial phase of the transmission project, including survey and soil investigation. Upon completion of the survey and preliminary design, landowners will be contacted and easement/fee acquisition negotiations will commence.

During the acquisition phase of the project, landowners are given a copy of the conveyance documents generally including easements, deeds, structure design or photos, offer sheets, and a plan showing the proposed transmission line or facility relative to the landowner's property. Additional information may also be given to each landowner explaining powerline safety, easement acquisition procedures, and damage settlement. In addition to permanent easements necessary for the construction of the line, temporary easements may be obtained from certain landowners for temporary construction, access, or staging areas for temporary storage of poles, vehicles, or other related items. Landowners will be notified in the event site access for soil boring is required to determine soil suitability in areas where certain soil characteristics may require special transmission structure design.

11.2.1 RDO Substation Conversion

During the substation conversion phase, any nearby property owners will be advised as to the construction schedules or needed access to the site. Vegetation on the property outside of the substation footprint, driveway, and

buffer will be left undisturbed, except where it must be impacted to allow for transmission line access to the substation.

11.2.2 Transmission Line Upgrade

GRE will amend existing easement rights for the transmission line upgrade. In cases where additional rights are determined to be necessary, customary acquisition procedures will be followed for these rights. In cases where the existing rights are determined to be adequate, the affected property owners will be contacted and provided an explanation of the use of the easements. GRE Right of Way representatives will be available to discuss easement issues with all property owners.

11.3 Tree Clearing and Staking

After land rights have been secured, landowners will be contacted to discuss the initial construction phase of the project including schedules, ingress and egress to and from the planned facility, tree and vegetation removal, damage mitigation, and other related construction activities.

The first phase of construction activities will involve surveying the centerline of the new transmission line, followed by removal of trees and other vegetation from the right of way. As a general practice, low-growing brush or tree species are allowable at the outer limits of the easement area. Taller tree species that endanger the safe and reliable operation of the transmission facility are removed. In developed areas and to the extent practical, existing low growing vegetation that will not pose a threat to the transmission facility or impede construction will remain in the easement area.

The second phase of construction will involve staking the location of structures, followed by structure installation and stringing of conductor wire.

11.4 Right of Way Restoration

Upon completion of construction activities, landowners will be contacted to determine whether or not construction damages have occurred. Areas that sustain construction damage will be restored to their pre-construction condition to the extent possible. Landowners will be notified of the completion of the project, and asked to report any outstanding construction damage that has not been remedied or any other issue related to the construction of the transmission line. Once construction cleanup is complete and construction damages have been successfully mitigated, landowners will be sent a final contact letter signaling the close of the project and requesting notification of any outstanding issues related to the project.

12. CONSTRUCTION PRACTICES AND OPERATION AND MAINTENANCE OF THE HVTL AND ASSOCIATED SUBSTATIONS

12.1 Construction Practices

12.1.1 General

The proposed 115 kV transmission line would be constructed at existing grade elevations. Therefore, no pole locations would require grading unless it is necessary to provide a level area for construction access and activities.

GRE designs and constructs transmission lines using the most cost-effective methods based on past experiences and practices and in compliance with the latest industry standards.

Typical tangent structures will be wood, laminated wood, or steel direct-embedded poles. The structures will require a hole dug 10 to 15 feet deep with 3 to 4 feet diameter for each pole. Any excess soil will be distributed evenly near the site or removed, unless requested by landowners or others. The poles may be backfilled with native soils, crushed rock, or concrete depending on design conditions. In lowland areas, a galvanized steel culvert may also be inserted for pole stability due to poor soil capacity. Large angle structures will typically be self-supporting steel poles that will require a drilled pier foundation. The piers will typically have diameters of 4 to 8 feet. The hole may require a typical depth of 15 to 30 feet deep depending on design requirements. The piers will be filled with concrete delivered to the site by concrete trucks from a local batch plant.

Poles may be delivered to the staked location or to a designated marshalling yard depending on delivery and contractor availability. If the poles are delivered to a staked site, they are placed on the right of way out of the clear zone of any adjacent highways or designed pathways. The poles are typically framed with insulators and hardware on the ground, and then lifted and placed in the hole by a bucket truck or a crane, depending on the weight of the structure.

Once the structures have been erected, conductors are installed by establishing stringing setup areas within the right of way. These stringing setup areas are typically located every two miles along the project route. The conductors are pulled with a rope lead that connects to every structure through a dolly attached at the insulator location. Temporary guard or clearance poles are installed at crossings to provide adequate clearance over other utilities, streets, roads, highways, railroads, or other obstructions after any necessary notifications are made or permit requirements met to mitigate any concerns with traffic flow or operations of other utilities.

In lowland areas, construction activities may occur during the winter season to mitigate any damage to wetland areas or to comply with required crossing

permits. A pre-construction conference will outline any special requirements for the contractor prior to the start of any construction activities.

During construction, when temporary removal or relocation of fences may occur, installation of temporary or permanent gates may be required. GRE right of way agents will coordinate with the landowners on replacement of fences and gates. As part of the easement restriction lists, the GRE contractor will work around cultivated areas until harvest has occurred.

12.1.2 RDO Substation Conversion

There is sufficient space at the existing substation to accommodate the transmission upgrade and no new land will be purchased. No expansion of the existing fenced area is anticipated. New fencing, if necessary, would match the existing fence and the existing grade would be maintained.

Itasca-Mantrap plans to perform all design, engineering and construction activities using internal resources.

No upgrades or modifications are planned on the distribution portion of the RDO Substation.

Itasca-Mantrap will utilize erosion control methods to minimize runoff during substation modifications and will comply with local, state, NESC and RUS standards regarding clearance to ground, clearance to crossing utilities, clearance to buildings, right of way widths, erection of power poles, and stringing of transmission line conductors.

Upon completion of the substation modifications, Itasca-Mantrap will restore the site. Post-construction reclamation activities include the removing and disposing of debris, dismantling all temporary facilities (including staging areas), employing appropriate erosion control measures, and reseeding areas disturbed by construction activities with vegetation similar to that which was removed.

Itasca-Mantrap will perform periodic inspections, maintain equipment, and make repairs over the life of the substation. Itasca-Mantrap will also conduct routine maintenance as required to remove undesired vegetation that may interfere with the safe and reliable operation of the substation.

12.1.3 Transmission Line Upgrade

As an RUS borrower, GRE adheres to RUS standards regarding clearances to ground, clearance to crossing utilities, clearance to buildings, right of way widths, erecting power poles, and stringing of transmission line conductors. RUS requires borrowers to submit an environmental report prior to any construction activities.

GRE typically utilizes outside contractors for construction activities on large transmission line projects. The specifications used are developed by GRE's Engineering Services Department, which utilize the RUS contract documents and standards. A copy of the project's easement restriction list, construction permit conditions, and any required local permits are given to the awarded contractor prior to construction.

Construction of the double circuit transmission line with the existing 34.5 kV transmission line will occur on the same right of way. If the existing line is required to remain available to be in-service during construction for reliability purposes, it will be tilted to one side to allow construction of the new line. If there are no reliability issues, the line can be removed. Otherwise construction procedures will be similar to those discussed above for the proposed project. As stated previously, the right of way width is planned to remain the same, however due to the voltage increase, the right of way width will need to be evaluated for proper clearances. Compact designs can sometimes mitigate the need for additional right of way for voltage upgrades.

12.2 Operation and Maintenance

GRE will periodically use the transmission line right of way to perform inspections, maintain equipment, and repair damage. Regular maintenance and inspections will be performed over the life of the facility to ensure a reliable system. Annual inspections will be done by foot, snowmobile, All-Terrain Vehicles, pickup truck, or by aerial means. These inspections will be limited to the acquired right of way and areas where obstructions or terrain require access off the easement. An aerial inspection of each transmission line is conducted monthly to ensure reliable operation.

The companies will conduct vegetation surveys and remove undesired vegetation that will interfere with the operation of the transmission line. Frequency of vegetation maintenance is on a two to five year cycle. Right of way clearing practices include a combination of mechanical and hand clearing, along with an application of herbicides where allowed.

12.3 Work Force Requirements

During construction, there will be minimal impacts to community services, hotels and restaurants to support the utility personnel and contractors. It is estimated that 8 to 12 workers will be employed for the substation modification work and 8 to 12 workers during construction of the transmission line.

It is not expected that additional permanent jobs would be created by this project. The construction activities would provide seasonal influx of additional revenue into the communities during the construction phase, and materials such as concrete may be purchased locally.

13. LIST OF PERMITS NEEDED

13.1 Local

- **Township and County Road Crossing Permits** are required to cross or occupy city and county road right of way.

13.2 State

- A utility must obtain a **Route Permit** from the Minnesota Public Utilities Commission to construct a high voltage transmission line.
- The Minnesota Department of Natural Resources has identified protected waters and wetlands in the state for which a **License to Cross** must be obtained (for this project, the Straight River).
- **Road Crossing Permits** from the Minnesota Department of Transportation are required to cross or occupy state trunk highway road right of way.
- **State Lands Permits** may be required to occupy state-owned property. None are expected for this project.

13.3 Federal

- **Rural Utilities Service Approval** - A utility that requests financial assistance from the Rural Utilities Service must demonstrate environmental compliance and obtain environmental approval prior to construction of a transmission line.

14. SUMMARY OF FACTORS TO BE CONSIDERED IN EVALUATING THIS APPLICATION

GRE has applied for a Route Permit for a 115 kV HVTL that is needed to meet the energy needs of Itasca-Mantrap customers located in the Park Rapids area. The HVTL's two endpoints will be the existing RDO Substation and the interconnection point with GRE's "HP" transmission line.

The role of the Commission is to determine the best route to follow to accomplish those requirements, and to determine what mitigation efforts GRE and Itasca-Mantrap should employ to reduce any environmental consequences. Minn. Rules pt. 4400.3150 lists 14 factors to consider in determining whether to issue a permit for the proposed route. Those factors are discussed briefly below.

A. Effects on human settlement, including but not limited to, displacement, noise, aesthetics, cultural values, recreation, and public services.

Effects of the proposed project on human settlement are discussed in Section 6.2 of this Application. The project involves modification of an existing substation and upgrade of an existing transmission line, resulting in no displacement of existing residences. The noise from the HVTL and substation will be minimal (Section 6.2.3). The proposed project will have no impact on cultural values, recreation, or public services.

B. Effects on public health and safety.

The proposed project will be constructed to comply with RUS standards as well as the NESC. Questions often arise about electric and magnetic fields (EMF), which are invisible lines of force that surround any electrical device. The term EMF refers to electric and magnetic fields that are coupled together such as in high frequency radiating fields. Electric and magnetic fields are discussed in Section 8.3 of this Application. The HVTL meets the EQB standard imposing a maximum electric field limit of 8 kV per meter at one meter above ground. That standard was implemented to mitigate serious hazard from shocks when touching large objects parked under transmission lines with voltage of 500 kV or greater. The proposed 115 kV line will have a maximum magnitude of electric field density of approximately 1.1 kV per meter underneath the conductors one meter above ground level. Research on the biological effects from electric fields on animals and humans has shown no significant association with disease in humans.

Magnetic fields result from the flow of electricity (current) in the transmission line. Recent studies of the health effects from power frequency fields conclude that the evidence of health risk related to magnetic fields is weak.

C. Effects on land-based economies, including but not limited to, agricultural, forestry, tourism, and mining.

The proposed route for the HVTL does not significantly impact any prime agricultural, forestry or mining property, nor is the route located in an area where tourism would be affected (Section 6.3 of this Application).

D. Effects on archaeological and historic resources.

The Minnesota Historical Society determined that the proposed project will not affect any archaeological or historical resources (Section 6.4; Appendix B).

E. Effects on the natural environment, including effects on air and water quality resources and flora and fauna.

The HVTL and associated substation will not affect air or water quality (Sections 6.5 and 6.6; Appendix B). It will only affect flora within the easement area. There are limited fauna in this route, and they will not be affected by the HVTL or substation.

F. Effects on rare and unique natural resources.

The Minnesota Department of Natural Resources and the United States Fish and Wildlife Service determined that the proposed project will not affect any rare or unique natural resources (Section 6.8; Appendix B).

G. Application of design options that maximize energy efficiencies, mitigate adverse environmental effects, and could accommodate expansion of transmission capacity.

There are no known, or likely plans to add additional transmission capacity along the proposed route. Therefore, the design is appropriate to this project and maximizes energy efficiency.

GRE will work with the affected landowners to use a design that mitigates the impact on the affected landowners and the right of way.

As stated in Section 10, the region to the west is HVTL-deficient, making the proposed project a potential source for this region. GRE has not budgeted for any additional expansion of the 115 kV line and will look at other technologies when the time comes for implementing more electrical delivery options.

H. Use or paralleling of existing rights-of-way, survey lines, natural division lines, and agricultural field boundaries.

The proposed transmission line route uses an existing transmission line right of way.

I. Use of existing large electric power generating plant sites.

This criterion is not applicable.

J. Use of existing transportation, pipeline, and electrical transmission systems or rights-of-way.

The proposed transmission line route uses an existing transmission line right of way.

K. Electrical system reliability.

The proposed project will improve the electrical system reliability for the local distribution systems and in general to the Lamb-Weston/RDO plant. Lamb-Weston/RDO is enhanced by shifting the large load to the 115 kV line, which has less line exposure than its existing 34.5 kV source. This greatly benefits the plant by minimizing momentary outages that can disrupt its operations and cause financial losses. With the Lamb-Weston/RDO load moved off the 34.5 kV system onto the 115 kV system, the Park Rapids distribution system will also benefit, as appropriate voltage levels will be more easily attained on the 34.5 kV system. The Lamb-Weston/RDO load served at 34.5 kV drags down the voltage profile, resulting in brownouts.

L. Costs of constructing, operating, and maintaining the facility which are dependent on design and route.

The cost of constructing, operating, and maintaining the facility along the proposed route is no higher, and is likely to be lower than along alternative routes. The proposed route relies entirely on existing right of way, which reduces the cost of acquiring easements, and right of way preparation.

M. Adverse human and natural environmental effects which cannot be avoided.

The only identified environmental effects that cannot be avoided are primarily short-term during the reconstruction of the line and substation conversion. If any archeological sites are identified during placement of the poles along the proposed route or construction of the substation, the particular site will be avoided. Native vegetation will be maintained within the proposed route that is compatible with the operation and maintenance of the transmission line. If

necessary, native species will be planted or seeded in areas that are devoid of native species. Soils will be revegetated as soon as possible to minimize erosion or some other method will be used during construction to prevent soil erosion. During construction temporary guard or clearance poles are installed at crossings to provide adequate clearance over other utilities, streets, roads, highways, railroads, or other obstructions after any necessary notifications are made or permit requirements met to mitigate any concerns with traffic flow or operations of other utilities.

N. Irreversible and irretrievable commitments of resources.

The proposed project does not require any irreversible or irretrievable commitment of resources. Should the line and/or substation be abandoned and removed at some time in the future, there is nothing related to their earlier placement that would prevent or require a different use of resources in the future.

15. REFERENCES

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APPENDIX A

NAMES OF PROPERTY OWNERS WITHIN PROPOSED ROUTE

Landowners Along Proposed Transmission Line Route

Aukes, Tracey

Becker, Duane and Cindy

Chase, Jeremy

Ernhart, Daniel

Ernhart, Ronald and Marlys

Minnesota Department of Natural Resources

RD Offutt Company

Thompson, Dennis and Linda

Weaver, Roger and Melissa

Wright, Ricky and Joanne

APPENDIX B

NOTICES/AGENCY CORRESPONDENCE