6. ENVIRONMENTAL INFORMATION – PROPOSED PROJECT

This portion of the Application provides a description of the land use and environmental resources in the northern Park Rapids Project area, potential impacts and proposed mitigative measures. The general information in the following sections pertains to both the Proposed and Alternate routes. Information specific to the Proposed and Alternate routes is provided where appropriate.

The Project has been reviewed by a number of state and federal agencies. All environmental review correspondence related to the proposed 115 kV Project is provided in Appendix A.

6.1 Description of Environmental Setting

Great River Energy is proposing to construct a 115 kV transmission line connecting the proposed Potato Lake Substation with the PM Line north of the City of Park Rapids. The total length of the proposed 115 kV transmission line is approximately 7.25 miles, located in Arago, Todd, Henrietta and Lake Emma townships in Hubbard County, Minnesota as shown in Figure 3-1.

The Project area is dominated by lakes, forest, grasslands and wetlands, with a few areas of agricultural land. Some residential areas and a few businesses occur along the road rights of way and are scattered within the area.

The environmental setting within the Project area includes hydrologic features such as rivers, creeks, ditches, wetlands and riparian areas. A mix of groundcover is present along the Proposed and Alternate routes. The physiographic features (topography, soils, geology and farmland) are typical of this area and do not preclude the development of this Project.

Wildlife habitat exists in pockets throughout the Project area. There are three vertebrate animals within the Project area that are listed in the Minnesota Department of Natural Resources (DNR) Natural Heritage Program database.

Land use in the Project area includes a mix of public, residential, business, open space and some agricultural lands. The residential areas within the Project area are primarily single-family homes of varying density. Open space areas include forest, wetlands, grasslands and a few areas of cultivated land.

Information on environmental resources in both the Project area and along the Proposed and Alternate routes is provided in this section.

6.2 Effects on Human Settlement

6.2.1 Public Health and Safety

Proper safeguards would be implemented for construction and operation of the transmission facilities. The Project will be designed in compliance with local, state, National Electrical Safety Code (NESC) and Great River Energy standards regarding clearance to the ground, clearance to crossing utilities, strength of materials and right of way widths. Construction crews and/or contract crews would comply with local, state and NESC standards regarding installation of facilities and standard construction practices. Great River Energy's established safety procedures as well as industry safety procedures would be followed during and after installation of the transmission line and substation, including clear signage during all construction activities.

The Project would be equipped with protective devices to safeguard the public if an accident occurs and a structure or conductor falls to the ground. Great River Energy's existing substations are already equipped with breakers and relays located where existing 115 kV transmission lines connect to the substations. The Potato Lake Substation would include these same protections. The protective equipment is designed to de-energize the transmission line should such an event occur.

The Minnesota Department of Transportation (MnDOT), Office of Aeronautics was contacted[1] requesting information on the possible effects of the proposed Project on airports or airstrips in the Project area. In e-mails[2] dated December 14th and 15th, 2009 (Appendix A), the MnDOT indicated that the nearest public use airport is the Park Rapids Airport and the Project would not be an immediate obstruction to landing at that airport. Once design details are available, Great River Energy will ensure that Federal Aviation Administration (FAA) requirements for the Project are met.

<u>Impacts and Mitigation</u>
No impacts to public health and safety are anticipated as a result of the Project. Great River Energy will ensure that safety requirements are met during the construction and operation of the facility. Additionally, when crossing roads or railroads during stringing operations, guard structures will be utilized to eliminate traffic delays and provide safeguards for the public. With implementation of these safeguards and protective measures, no additional mitigation should be needed.

[1] Letter from Marsha Parlow, Great River Energy to Michael Ferry, MNDO. 12 November 2009. *See* Appendix A.
[2] Emails from Michael Ferry, MNDO to Marsha Parlow, Great River Energy. 14 & 15 December 2009. *See* Appendix A.

6.2.2 Displacement

The transmission line will be designed to avoid displacement of existing residences or businesses.

6.2.3 Noise

There are two potential sources of audible noise from the Project; the conductors on the transmission line and the proposed Potato Lake Substation.

Noise Measurement

Noise levels are measured on a logarithmic scale in units of decibels. Because human hearing is not equally sensitive to all frequencies of sound, it is customary to apply a weighting factor so the overall measured sound pressure level will relate as closely as possible to the ear's perception of the sound. The A-weighting network is typically used and the measured sound level is expressed in units of decibels A-weighted (dB(A)). In general terms, a noise level change of 3 dB(A) is imperceptible to human hearing. A 5 dB(A) change in noise level is clearly noticeable. A 10 dB(A) change in noise level is perceived as a doubling of noise loudness. Estimates of some common noise sources are presented in Table 6-1.[3]

Table 6-1 Common Noise Levels

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

[3] *A Guide to Noise control in Minnesota*, Minnesota Pollution Control Agency (1999). http://www.pca.state.mn.us/waste/pubs/noise.pdf

Noise Regulations

The Noise Control Requirement states that noise contributors shall comply with the Noise Area Classifications (NAC) established in Minnesota Rules part 7030.0040,[4] which are shown in Table 6-2.

The NAC is based on land use activity at the location of the receiver.[5] 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).[6] NAC (1) also includes other noise-sensitive areas such as medical and other health services, religious services, educational services and camping areas.[7]

Table 6-2 Noise Area Classifications[8]

	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

Minnesota Rules part 7030 uses the decibel A-weighting network and applies statistical sound levels (L-Level Descriptors) to account for changes in sound levels over a period time as shown in Table 6-2. The L_{10} is defined as the noise level exceeded 10 percent of the time, or for six minutes in an hour. The L_{50} is the noise level exceeded 50 percent of the time, or for thirty minutes in an hour. The L_5 is the noise level exceeded five percent of the time, or for three minutes in an hour.

Conductor Noise

Audible noise from electrical 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 at these times. As a result, people do not normally notice audible noise from a transmission line during heavy rain. Transmission lines will typically produce audible noise at household background levels during light rain, dense fog, snow and other times when there is moisture in the air. During dry weather, audible noise from transmission lines is barely perceptible.

[4] Minn. R. 7030.0030 (2003).
[5] Minn. R. 7030.0050 (2003).
[6] Minn. R. 7030.0050 (2003).
[7] Minn. R. 7030.0050 (2003).
[8] Minn. R. 7030.0040 (2003).

The proposed 115 kV line should not exceed approximately 12 dB(A) (essentially inaudible) at the edge of the right of way during fair weather conditions. During a heavy rain (one 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.

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 115 kV lines based on the results from the Bonneville Power Administration Corona and Field Effects Program version 3 (U.S. Department of Energy, 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

The proposed Potato Lake Substation will be designed and constructed to comply with the state noise standards (Minnesota Rules part 7030) described above.

Noise associated with substations includes the operation of transformers and switchgear. The transformers produce a constant low-frequency humming noise while the switchgear produces an impulsive or short duration noise during infrequent activation of the circuit breakers. Due to the infrequent operation of the switchgear, the noise generated would be considered temporary in nature and not predicted to exceed the MPCA Noise Limits.

The transformer vendor provided noise levels measured one meter from the equipment of 66 dBA when the transformer cooling fans are not running and 70 dBA when the fans are running. To conservatively predict future noise levels and compliance with the 50-dBA limit, the 70-dBA noise level was treated as a point source at the transformer and modeled to determine the distance where the noise levels would be reduced to 50 dBA.

A simplified, conservative model[9] was created to determine the distance at which the noise would attenuate to 50 dBA. Noise propagation through the outdoor atmosphere typically decreases in level with increasing distance between the source and the receiver. The noise attenuation is the result of several mechanisms, including geometrical spreading of the sound waves, shielding provided by physical structures, atmospheric absorption of the acoustic energy and ground effects on the sound waves. In general, the noise or sound pressure levels emitted from the substation will decrease approximately 6 dB for each doubling of distance from the source to the receiver. The simplified model was prepared based on this 6-dB reduction with a doubling of distance. The model is conservative in that it does not factor in geometric spreading or any attenuation from shielding or ground effects.

Based on the model, substation noise level at the Potato Lake Substation would attenuate to 50 dBA at a distance of approximately 30 feet from the transformer. The nearest residence is approximately 1,100 feet east of the substation and at this distance, the noise level would be approximately 19 dBA.

Impacts and Mitigation

The calculated noise values for the proposed Project are well below the Minnesota regulatory limits. No impacts are anticipated; therefore, no mitigation is necessary or proposed.

6.2.4 Aesthetics

In general, aesthetic impacts are dependent on the response of the viewer. Viewer response is based on the sensitivity and exposure of the viewer to a particular viewshed. Sensitivity relates to the magnitude of the viewer's concern for the viewshed, while exposure is a function of the type, distance, perspective and duration of the view. Sensitivity can be described in terms of "levels of sensitivity." Three levels of sensitivity can be used to identify potential impact areas:

- Low Visual Sensitivity – motorists viewing transmission lines from the perspective of the roads they traverse.
- Moderate Visual Sensitivity – recreationalists, such as bird watchers, hikers, hunters and other individuals whose activity is specific to and who are sensitive to a finite geographic location, and who are sensitive to man-made structures and their impact on the natural environment.

[9] The simplified model is based off the following formula: S2 = S1 - 20 * Log(d2/d1). S2 = Noise level at distance d2 (dBA), S1 = Measured sound level at d1 (dBA), D1 = Distance from noise source to S1 noise measurement (ft), and D2 = Distance from noise source at which S2 is calculated (ft).

- High Visual Sensitivity – residential viewers who own property within 500 feet of the Proposed Route alignment and are concerned about the structures and how they impact the view of the natural environment.

The Great River Energy 115 kV single circuit line will be constructed using single pole wood structures with horizontal post insulators. The average height will be between 60 and 85 feet, with an average span of 300 to 400 feet.

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

The Proposed and Alternate routes cross or parallel CSAHs and local roads. None of these roadways are designated as Scenic Byways.

The transmission line will be visible along the roads that it parallels. In some areas it will replace an existing distribution line, which will be attached to the new poles. Homes within 500 feet of the Proposed Route alignment will be the most likely to have their viewshed affected by the construction of a transmission line, and are therefore considered potentially high visual sensitivity resources.

The residences and businesses within varying distances of the road centerlines along the Proposed and Alternate routes are summarized in Table 6-4 and shown on Figure 6-1. The buildings were counted on both sides of the road.

Table 6-4 Residences and Businesses within 100, 300 and 500 feet either side of Road Centerline

Route	100 Feet from Road Centerline	300 Feet from Road Centerline	500 feet from Road Centerline	Length of Line (miles)
Proposed Route	2	29	51	7.25
Alternate Route	2	20	39	7.25

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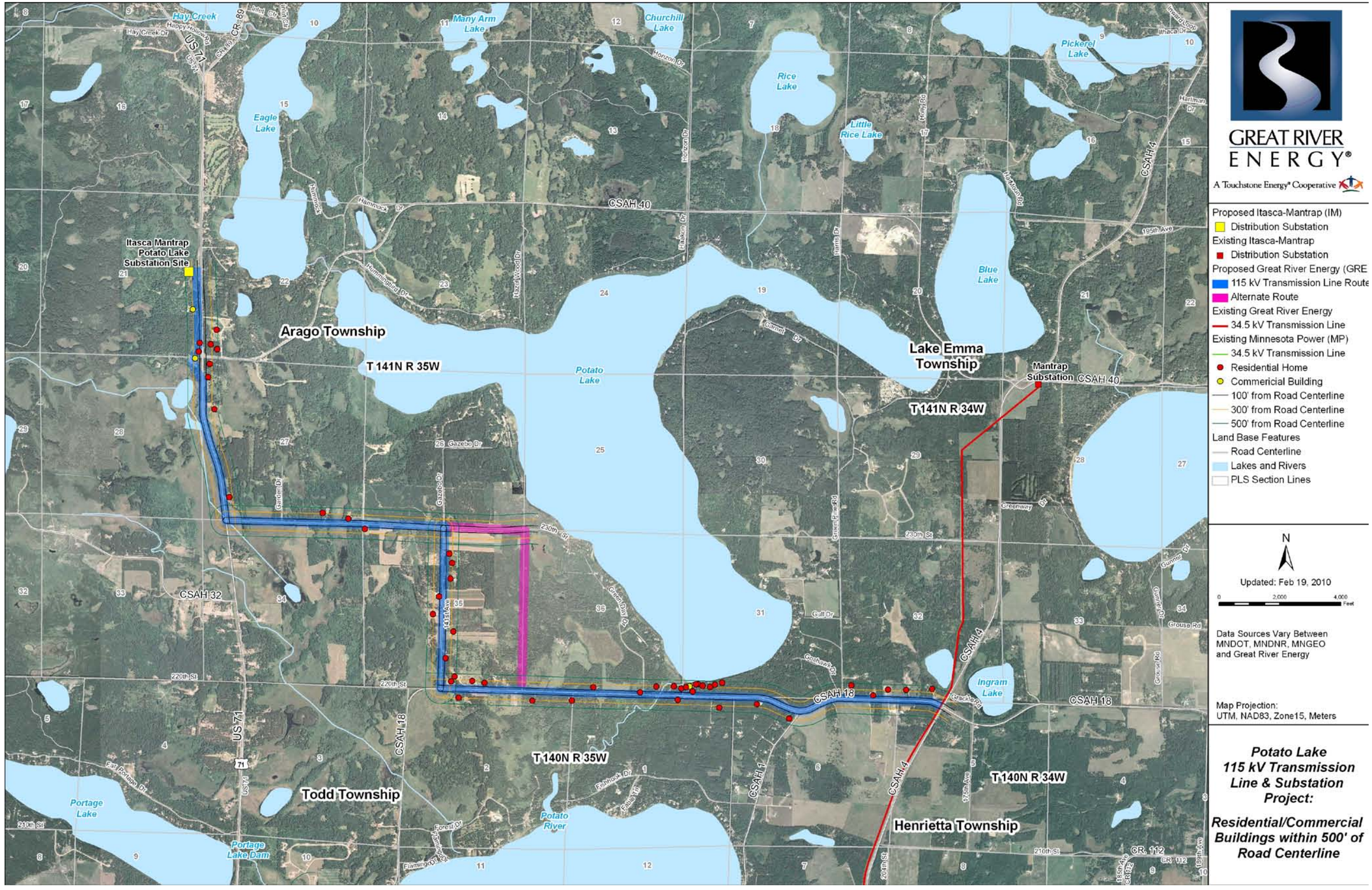
Figure 6-1 Residential/Commercial Buildings within 500 ft of Road Centerline



Impacts and Mitigation

Although the new transmission line will be a contrast to surrounding land uses, Great River Energy will work with landowners to indentify concerns related to the proposed transmission line and substation. In general, mitigation includes enhancing positive effects as well as minimizing or eliminating negative effects.

- Location of structures, right of way and other disturbed areas will be determined by considering input from landowners or land management agencies to minimize visual impacts.

- Care will be used to preserve the natural landscape; construction and operation will be conducted to prevent any unnecessary destruction of the natural surroundings in the vicinity of the work.

- To the extent practicable, new transmission lines will parallel existing transmission lines and other rights of way, to the extent that such actions do not violate sound engineering principles or system reliability criteria.

- Structures will be placed at the maximum feasible distance from highway, trail and water crossings, within limits of structure design.

- Landowners will be compensated for removal of mature yard trees, either through easement negotiations or on a separate basis

6.2.5 Socioeconomics

Demographics

The estimated population of Hubbard County in 2008 was 18,810 (Table 6-5) with a 2.4% increase in population from 2000 through 2008. The number of persons per square mile (density) in 2008 was 19.9. The total number of housing units in 2007 was 13,021. The home ownership rate in 2000 was 83.3% and housing units in multi-unit structures 6%.

The minority population includes individuals who are members of the following population groups: Black, American Indian or Alaskan Native; Asian; Native Hawaiian or other Pacific Islander; or Hispanic or Latino.

Based on the 2008 Census estimate, population in Hubbard County was 96% White, 0.3% Black, 2.3% American Indian, 0.3% Asian, 0 % Native Hawaiian or other Pacific Islander, 1.4% Hispanic or Latino, and 1.1% multiracial. The estimated 2008 population was almost evenly split between males and females (49.9% and 50.1%, respectively). The age group composition was 20.9% for persons under 18 years old, 20.8% for persons 65 years and older, and 58.3% for 18-64 year olds.

Table 6-5 Population Characteristics[1]

Location	Population 2000	Population 2008 (est.)	Percent Change 2000-2008
Minnesota	4,919,479	5,220,393	6.1
Hubbard County	18,376	18,810	2.4

Hubbard County is generally less racially and ethnically diverse than the state of Minnesota as a whole (Table 6-6). Neither racial nor ethnic minorities would be disproportionately affected by the Project.

Table 6-6 Race/Ethnicity Characteristics[2]

Place	Population	Percentage of Population						
		White	Black/ African-American	American Indian	Asian/ Pacific Islander	Other Race	More than One Race	Hispanic /Latino
Minnesota	5,220,393	89	4.6	1.2	3.6	--	1.5	4.1
Hubbard County	18,810	96	0.3	2.3	0.3	--	1.1	1.4

Z – Value greater than zero but less than 0.1% Source: U.S. Census Bureau, 2009
X – Value greater than 0.01%

The 2009 median household income for Hubbard County was $42,231 with 11.4% of people living below the poverty level (Table 6-7).

Table 6-7 Household Economic Characteristics, 2009[3]

Place	Median Household Income	Home Ownership Rate	Median Value of Owner Occupied Housing	Persons per household	Percentage Below Poverty Level Individuals
Minnesota	$55,664	74.6	122,400	2.52	9.5
Hubbard County	$42,231	83.3	97,300	2.45	11.4

Impacts and Mitigation

Any adverse impacts to socioeconomic conditions or factors for project or transmission line construction would be short-term; therefore, no mitigation is necessary or proposed.

Construction of the Project should result in short-term positive economic impacts in the form of increased spending for lodging, meals and other consumer goods and services. It is not anticipated that the Project will create new permanent jobs,

[1] US Census Bureau, 2009 Website, http://quickfacts.census.gov/qfd/states/27/27057.html
[2] US Census Bureau, 2009 Website, http://quickfacts.census.gov/qfd/states/27/27057.html
[3] US Census Bureau, 2009 Website, http://quickfacts.census.gov/qfd/states/27/27057.html

but it will create temporary construction jobs that will provide one-time influx of income to the area.

Expenditures for equipment, energy, fuel, operating supplies and other products and services benefit businesses in the county where the Project is located. Indirect impacts may occur through the increased capability of the electric system to supply energy to commercial and industrial users, which will contribute to the economic growth of the region.

There will also be some long-term beneficial impacts from the new transmission lines, including an increase to the county's tax base resulting with incremental increase in revenue from utility property taxes. The availability of reliable power in the area will have a positive effect on local businesses and residents.

6.2.6 Cultural Values

Cultural values include those perceived community beliefs or attitudes in a given area that provide a framework for that community's unity. The communities in the vicinity of the project (Arago Township, Todd Township, Henrietta Township and Lake Emma Township) appear to have cultural values corresponding with the economic activities of the region (agriculture, industry and tourism). The major values within the region include individualism and appreciation of natural resources.

Traditional attitudes and uses of local resources have been changing as the area plays a larger role in recreational tourism. The area is a popular area for snowmobile recreation and lakes draw residents in the southern part of the county.[4]

Park Rapids is an area that has a history of French fur traders and explorers seeking the source of the Mississippi River, the development of trading posts, the proliferation of logging camps and the long awaited railroad. The railroad would prove to be important in bringing tourists to the Park Rapids area as a vacation destination. The main attraction for tourists coming on the rail was Itasca State Park, Minnesota's first state park.[5] Tourism remains central to the regional economy. The residents in the Project area likely value the natural environment and the opportunities natural resource-based industries bring to the region.

<u>Impacts and Mitigation</u>
No negative impacts to cultural values are anticipated; therefore, no mitigation is necessary or proposed.

[4] http://www.parkrapids.com/neighborhoods/hubbardcounty.htm
[5] http://www.parkrapids.com/history.htm

6.2.7 Public Services

Public services provided in the Potato Lake area (i.e., police, fire protection, waste collection, etc.) will not be affected by the proposed transmission project.

Impacts and Mitigation
No negative impacts to public services in the community are anticipated; therefore, no mitigation is necessary or proposed.

6.3 Effects on Land-Based Economies

6.3.1 Agriculture

There is pasture, hay and grassland and a small percentage of cultivated agricultural land along the Proposed and Alternate routes (Figure 6-2). Approximately 35.18 percent of the length of the Proposed Route and 27.58 percent of the Alternate Route are in hay, pasture or grassland. Approximately 1.11 percent of the Proposed Route and 0.04 percent of the Alternate Route are in cultivated agricultural land.

Impacts and Mitigation
The Project will result in permanent and temporary impacts to cultivated agricultural land. Permanent impacts will occur as a result of structure placement along the route centerline. The area of impact will be the footprint of the pole itself and the area immediately surrounding the pole (approximately 30 square feet), although the majority of the right of way easement will be available for agricultural cultivation. It is estimated that approximately 150 square feet would be impacted in the Proposed Route and approximately 120 square feet would be impacted in the Alternate Route.

During construction, temporary impacts, such as soil compaction and crop damage within the right of way, are likely to occur. Great River Energy will work with landowners to minimize impacts to all farming operations along the route. By aligning the transmission line along existing distribution line and road rights of ways, impacts can be minimized. Great River Energy will compensate landowners for any crop damage and soil compaction that may occur during construction. Areas disturbed during construction will be repaired and restored to pre-construction contours as required so that all surfaces drain naturally, blend with the natural terrain and are left in a condition that will facilitate natural revegetation, provide for proper drainage and prevent erosion.

Specific mitigation measures to be implemented include:

- The movement of crews and equipment will be limited to the right of way to the greatest extent possible, including access to routes. Contractors employed by the Great River Energy will limit movement on the right of

Figure 6-2 Land Use Map

way to minimize damage to grazing land, crops, or property. If movement outside of the right of way is necessary during construction, permission will be obtained and any crop damage will be paid to the landowner.

- When weather and ground conditions permit, deep ruts that are hazardous to farming operations will be repaired or compensation will be provided as an alternative if the landowner desires. Such ruts will be leveled, filled and graded or otherwise eliminated in an approved manner. In hay meadows, alfalfa fields, pastures and cultivated productive lands, compacted soils will be loosened and ruts will be leveled by scarifying, harrowing, disking, or by other approved methods. Damage to ditches, tile drains, terraces, roads and other features of the land will be corrected using approved methods and indigenous plants where necessary. The land and facilities will be restored as nearly as practicable to their original conditions.

- Right of way easements will be purchased through negotiations with each landowner affected by the Project and payment will be made for full value of crop damages or other property damage that occurs during construction or maintenance as negotiated.

- Construction will be scheduled during periods when agricultural activities will be minimally affected or the landowner will be compensated accordingly.

- Fences, gates and similar improvements that are removed or damaged will be promptly repaired or replaced.

Some temporary construction space will be needed for the Project. For temporary marshalling yards, which will provide space to store material and equipment, Great River Energy will lease the space by agreement with the respective landowner(s), remove and properly dispose of all material and debris, and repair all damages and perform restoration, as necessary. It is not anticipated that temporary construction space outside of the right of way and on private property will be needed, with the exception of limited equipment access.

6.3.2 Forestry

Approximately 60% of Hubbard County is forested. Public agencies manage half of the forested lands in the county. Both the Proposed and Alternate Routes cross wooded areas, some of which is privately-owned woodlots and shelterbelts. Approximately 45.12 percent of the Proposed Route would cross forested land and approximately 54.28 percent of the Alternate Route would cross forested land.

Impacts and Mitigation

The entire width of the transmission line right of way (50 feet along roads, 100 feet cross country) would need to be cleared of vegetation that could potentially grow into the conductors. Based on a rough estimate off the Land Use Map (Figure 6-2), the Proposed Route will affect between 21 and 25 acres of forested land and the Alternate Route will affect between 30 and 34 acres of forested land. This is only an estimate because it is not known on which side of the road the transmission line will be located.

Great River Energy will replace or compensate for windbreaks as determined through negotiations with individual landowners.

6.3.3 Tourism

Tourism in the Project area consists primarily of fishing and cabin rentals surrounding the lakes during the summer months, and ice-fishing and snowmobiling in the winter months.

One tourist site, Summerhill Farm, is located south of the proposed Potato Lake Substation on Highway 71(Figure 6-2).[1]

There is a bike path that runs along Highway 71, a snowmobile trail along CSAH 4, and a ski trail north of the proposed substation.

Impacts and Mitigation

Although the transmission line will run through the Summerhill Farm tourist site, it will follow the existing distribution line (which will be attached to the new poles) and it should not adversely affect this tourist area. There is a homestead with trees between the substation and Summerhill Farm, which provides a buffer between them.

The bike path, snowmobile trail and ski trail will be unaffected by the proposed Project.

6.3.4 Mineable Resources

There are no mining resources in the vicinity of the Proposed and Alternate routes.

[1] http://www.summerhill-farm.com (2009)

6.4 Cultural Resources

The Minnesota Historical Society (MHS) was contacted[2] requesting information on the possible effects of the proposed Project on historic properties in the Project area. MHS indicated[3] that the proposed Project 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).

6.4.1 Archaeological and Historic Resources

MHS indicated that "there are no properties listed on the National or State Registers of Historical Places, and no known or suspected archaeological properties in the area that will be affected by this project".

After receiving notice of the Project, the Leech Lake Band of Ojibwe[4] stated that they "have determined that the Leech Lake Band of Ojibwe does not have any concerns regarding sites of religious or cultural importance in this area".

Impacts and Mitigation
No known historical resources were identified within the Proposed and Alternate routes or near the proposed substation site. Therefore, no impacts are anticipated during the installation of the transmission line. If any archaeological sites are identified during placement of the poles along the permitted route, construction work will be stopped and MHS staff consulted as to how to proceed.

6.5 Natural Environment

6.5.1 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.

Impacts and Mitigation
No impacts to air quality are anticipated due to the operation of the transmission line.

[2] Letter from Marsha Parlow, Great River Energy to Dennis A. Gimmestad, MHS. 12 November 2009. *See* Appendix A.
[3] Letter from Britta L. Bloomberg, MHS to Marsha Parlow, Great River Energy. 16 November 2009. *See* Appendix A.
[4] Letter from Gina M. Lemon, Leech Lake Band of Ojibwe, to Michelle Lommel, Great River Energy, 23 October 2009. *See* Appendix A.

Temporary air quality impacts caused by construction vehicle emissions and fugitive dust from right of way clearing and construction are expected to occur. Exhaust emissions from diesel equipment will vary during construction, but will be minimal and temporary. The magnitude of emissions is influenced heavily by weather conditions and the specific construction activity taking place. Appropriate dust control measures will be implemented.

6.5.2 Water Resources

Hydrologic features in the Project area and along the Proposed and Alternate routes are shown in Figure 6-3.

Ground Water

The DNR divides Minnesota into six groundwater provinces. Hubbard County falls into the Central Province, which is described as sand aquifers in generally thick sandy and clayey glacial drift overlaying Precambrian and Cretaceous bedrock. Fractured and weathered Precambrian bedrock is used locally as a water source.[5]

Surface Water

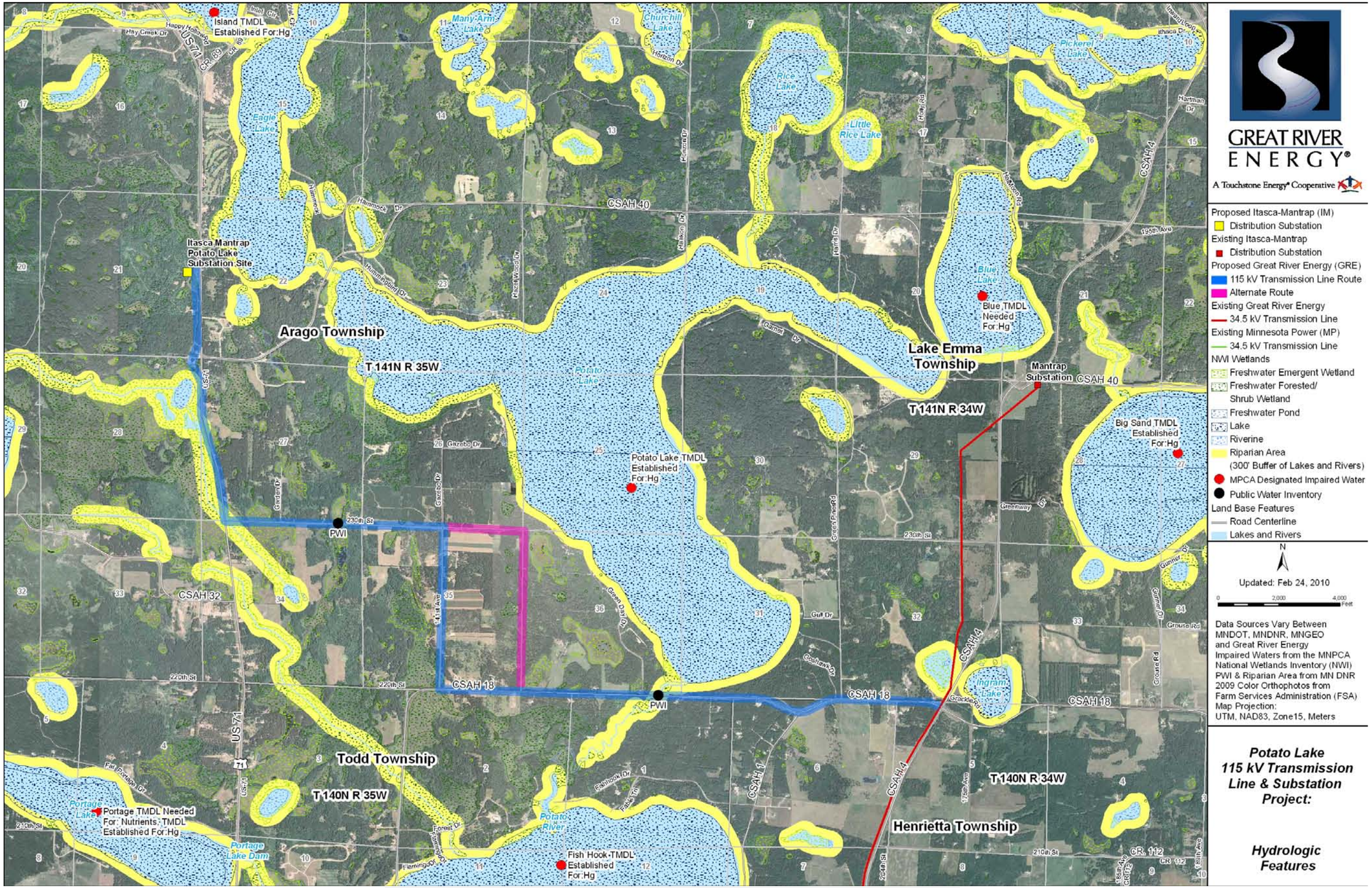
The Project area lies within the Crow Wing River watershed of the Upper Mississippi River Basin. Water generally flows toward the Crow Wing River within the Project area.[6]

The Project would require a United States Army Corps of Engineers (Corps) permit under Section 10 of the Rivers and Harbors Act if the work involves a navigable water of the United States; however, no navigable water will be affected by the proposed Project.

The Corps was contacted[7] requesting information on the possible effects of the proposed Project on floodplains, waters, and wetlands in the Project area and along the Proposed and Alternate routes. The Corps typically only provides a general response on a project until it receives a jurisdictional determination request and/or a permit application. The Corps response[8] did address its' regulatory jurisdiction and permitting requirements.

[5] http://files.dnr.state.mn.us/natural_resources/water/groundwater/provinces/gwprov.pdf (2009)
[6] http://www.pca.state.mn.us/water/basins/uppermiss/index.html (2009)
[7] Letter from Marsha Parlow, Great River Energy, to Bill Baer, USACE. 13 November 2009. *See* Appendix A.
[8] Letter from Tamara E. Cameron, USACE to Marsha Parlow, Great River Energy, 17 December 2009. *See* Appendix A.

Figure 6-3 Hydrologic Features in the Potato Lake Area



Lakes

The lakes in the Project area include Eagle Lake, Potato Lake and Fish Hook Lake[1] (Figure 6-3).

Eagle Lake is located north of the Project and has a surface area of 411 acres. The transmission line would be over 0.25 mile away from the lake near the substation.

Potato Lake is located northeast of the Project and has a surface area of 2,100 acres. The Proposed Route comes within 0.08 mile of the lake and the Alternate Route comes within 0.16 mile of the lake.

Fish Hook Lake is located south of the Project and has a surface area of 1,632 acres. Both the Proposed and Alternate routes are approximately ¾ mile from the lake.

Rivers, Streams and Ditches

There are a number of rivers, streams and ditches in the Project area. The transmission line would cross a manmade ditch on the west side of Highway 71 and the Potato River, which flows between Potato Lake and Fish Hook Lake along CSAH 18 (Figure 6-3).[2]

Riparian Areas

Riparian areas are ecosystems that occur along watercourses or at the fringe of water bodies. For purposes of this Application, the riparian areas are defined as the land within 300 feet of streams and within 1,000 feet of lakes. These distances were selected because they are consistent with the definition of shoreland in the DNR Statewide Standards. These statewide standards set guidelines for the use and development of shoreland (riparian) property around all lakes greater than 25 acres (10 acres in municipalities) and rivers with a drainage area of two miles or greater.

The Proposed and Alternate routes cross a total of approximately 0.38 miles of riparian areas in five locations (Figure 6-3). These areas include the riparian areas of lakes (named and unnamed) as well as stream and ditch crossings.

Public Waters

Public Waters are wetlands, water basins and watercourses of significant recreational or natural resource value in Minnesota as defined in Minnesota

[1] http://www.dnr.state.mn.us/lakefind/index.html http://www.dnr.state.mn.us/maps/compass.html (2009)
[2] MNDNR: *Public Waters Inventory Maps.* http://files.dnr.state.mn.us/waters/watermgmt_section/pwi/HUBB1OF1.pdf (2009)

Statutes Section 103G.005. The DNR has regulatory jurisdiction over these waters.

The Proposed Route and Alternate routes would cross two Public Waters (Figure 6-3): one Public Water Inventory (PWI) wetland (514P, T141N R35W, Sections 27 and 34), and one PWI river (Potato River, T141N R34W Section 36, T140N R34W Section 1).

Impaired Waters

Section 303(D) of the Federal Clean Water Act requires states to publish, every two years, a list of streams and lakes that are not meeting their designated uses because of excess pollutants (impaired waters). The list, known as the 303(d) list, is based on violations of water quality standards. In Minnesota, the MPCA has jurisdiction over determining 303(d) waters. These waters are described as "impaired". There are several lakes in the Project area classified with mercury impairment, including Potato Lake and Fish Hook Lake (Figure 6-3).

Floodplains

The transmission line would cross the floodplain of the Potato River, which flows between Potato Lake and Fish Hook Lake on the south end of the Project.

Wetlands

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 (WCA).

The United States Fish and Wildlife Service (USFWS) produced maps of wetlands based on aerial photographs and NRCS soil surveys starting in the 1970s. These wetlands are known as the National Wetland Inventory (NWI). Wetlands listed on the NWI may be inconsistent with current wetland conditions; however, NWIs are the most accurate and readily available database of wetland resources within the Project area and were therefore used to identify wetlands along the Proposed Route and Alternate routes. The wetland types and percentage within the Proposed and Alternate routes are provided in Table 6-8.

There are approximately 23.15 acres of wetlands within the Proposed Route, which represents 10.70 % of the land that could potentially be disturbed between the proposed Potato Lake Substation and the proposed switch on the PM Line.

Table 6-8 Wetland Types along the Proposed and Alternate Routes (NWI)

Cowardin Type[1]	Proposed Route Acreage	Percent of Wetland Type within Proposed Route	Alternate Route Acreage	Percent of Wetland Type within Alternate Route
PEMC	6.08	26.24	6.51	26.11
PEMCd	7.90	34.11	7.90	31.70
PEM/SS1C	4.57	19.74	4.57	18.34
PEM/SS1Cd	1.06	4.59	1.85	7.43
PF01A	0.06	0.25	0.06	0.24
PF01C	0.46	2.00	0.46	1.86
PF06/SS1Bg	1.83	7.91	0.00	0.00
PSS1/EMCd	0.00	0.00	0.00	0/00
PSS1/EMC	0.00	0.00	0.69	2.75
PSS1C	1.20	5.16	2.88	11.57
Total	**23.15**	**100.00**	**24.93**	**100.00**

Cowardin et. al. 1979. *Classification of Wetlands and Deepwater Habitats of the United States*. US Department of the Interior, USFWS, Washington D.C. The wetland type was classified using the Cowardin system that defines the habitat system, vegetative and sediment class and water regime. The wetland classification system is hierarchical, with wetlands and deepwater habitats divided among five major systems at the broadest level. The five systems include Marine (open ocean and associated coastline), Estuarine (salt marshes and brackish tidal water), Riverine (rivers, creeks, and streams), Lacustrine (lakes and deep ponds), and Palustrine (shallow ponds, marshes, swamps, sloughs). Systems are further subdivided into subsystems that reflect hydrologic conditions. Below the subsystem is the class that describes the appearance of the wetland in terms of vegetation or substrate. Each class is further subdivided into subclasses; vegetated subclasses are described in terms of life form, and substrate subclasses in terms of composition. The classification system also includes modifiers to describe hydrology (water regime), soils, water chemistry (pH, salinity), and special modifiers relating to man's activities (e.g., impounded, partly drained).

Some common symbols used in the wetland classification system include:

SYSTEM:	P - Palustrine	L - Lacustrine
CLASS:	RB - Rock Bottom EM - Emergent FO - Forested	UB - Unconsolidated Bottom SS - Scrub-Shrub OW - Open Water
MODIFIERS:	A - Temporarily flooded C - Seasonally flooded E - Seasonally saturated G - Intermittently flooded	B - Saturated D - Seasonally well drained F - Semipermanently flooded H - Permanently flooded
SPECIAL MODIFIERS:	b -beaver f - farmed x - excavated	d- partially drained/ditched s - spoil

Wetlands classified as Palustrine Emergent (PEM) make up approximately 84.71% of the wetland types. Those classified as Palustrine Scrub-Shrub (PSS) make up approximately 5.14% and Palustrine Forested (PFO) wetlands make up approximately 10.15%.

There are approximately 24.93 acres of wetlands within the Alternate Route, which represents 11.09 % of the land that could potentially be disturbed between the proposed Potato Lake Substation and the proposed switch on the PM Line. Wetlands classified as Palustrine Emergent (PEM) make up approximately 83.59% of the wetland types. Those classified as Palustrine Scrub-Shrub (PSS) make up approximately 1.59% and Palustrine Forested (PFO) wetlands make up approximately 0.23%.

For both the Proposed and Alternate routes, there are more wetlands located in the western half of the routes than the eastern half of the routes (Figure 6-3).

Impacts and Mitigation

No impacts to groundwater in the Project area are anticipated.

The Proposed and Alternate routes do not cross any of the lakes in the area, and no navigable waters will be affected by the Project.

Because all rivers, streams, and ditches will be spanned by transmission structures, no structures will be located within these features and no direct impacts to rivers, streams, or ditches are anticipated. Indirect impacts could include sedimentation reaching surface waters during construction due to ground disturbance by excavation, grading, construction traffic, and dewatering of holes drilled for transmission structures. This could temporarily degrade water quality due to turbidity. These impacts will be avoided and minimized using appropriate sediment control practices and Best Management Practices (BMPs).

Once the Project is completed, there would be no significant impact on surface water quality because wetland impacts will be minimized and mitigated, disturbed soil will be restored to previous conditions or better, and the amount of land area converted to an impervious surface will be small.

Sound water and soil conservation practices will be maintained during construction and operation of the Project to protect topsoil and adjacent water resources and minimize soil erosion. These practices may include:

- Containment of stockpiled material away from stream banks and lake shorelines.
- Stockpiling and respreading topsoil.
- Reseeding and revegetating disturbed areas.
- Implementing erosion and sediment controls.
- Structures and disturbed areas will be located as far away from rivers and streams as practicable.

The transmission line will cross two DNR Public Waters: 514P and the Potato River (between Potato Lake and Fish Hook Lake).[3] Great River Energy would apply for a license to cross these waters once design details are available and would follow any recommendations to minimize erosion and other impacts.

The Project should have no impact on the impairment status of the waters in the Project area. There is potential to increase turbidity due to increase sedimentation from construction activities; however, appropriate erosion and sediment control measures will be implemented to avoid or minimize such impacts.

Potential impacts to floodplain and riparian areas along the Proposed and Alternate routes would be limited to ground disturbances due to pole placement. Due to the flexibility to avoid placing poles in sensitive areas, the anticipated impacts to the riparian areas along the Proposed and Alternate routes are minimal.

Construction of the transmission line is not expected to alter existing water drainage patterns or floodplain elevations due to the small cross section per pole and their relatively wide spacing. Although construction of the proposed Potato Lake Substation will involve a small increase in impermeable surfaces (from the control buildings and structure footings), the change to local surface drainage patterns from this and any necessary grading is expected to be negligible. The small area of impermeable surfaces created by the pole structures and breaker station outbuildings or foundations will not cause an increase in susceptibility of flooding in the region.

Temporary impacts to wetlands may occur if they need to be crossed during construction of the transmission line. No staging or stringing set up areas will be placed within or adjacent to water resources, as practicable. Wetland impact avoidance measures that will be implemented during design and construction of the transmission line include spacing and placing the power poles at variable distances to span and avoid wetlands, where possible. When it is not possible to

[3] MNDNR: Public Waters Inventory Maps.
http://files.dnr.state.mn.us/waters/watermgmt_section/pwi/HUBB1OF1.pdf

span the wetland, several measures will be utilized to minimize impacts during construction:

- When possible, construction will be scheduled during frozen ground conditions.
- Construction crews will attempt to access the wetland with the least amount of physical impact to the wetland (*i.e.,* shortest route) and will access poles near/in wetlands from roadways whenever possible to minimize travel through wetland areas.
- The structures will be assembled on upland areas before they are brought to the site for installation, when practicable.
- When construction during winter is not possible, construction mats (wooden mats or the Dura-Base Composite Mat System) will be used to protect wetland vegetation. Additionally, all-terrain construction vehicles may be used, which are designed to minimize soil impact in damp areas.

Permanent impacts to wetlands occur where structures must be located within wetland boundaries. For this Project it is estimated that approximately 25 structures would be placed within wetlands. Wetland impacts due to permanent structure placement would result in approximately 20 square feet of permanent impacts per structure, or approximately 500 square feet (0.01 acre). Wetland vegetation would be restored following construction.

Once design details are available, Great River Energy will apply for a Regional General Permit under Section 404 of the Clean Water Act from the Corps, restore the wetlands as required by the Corps, and comply with the requirements of the Wetland Conservation Act.

Vegetation maintenance procedures under transmission lines prohibit trees from establishing. Existing trees must be removed throughout the entire right of way, including forested wetlands. These wetlands would undergo permanent vegetative changes within the right of way, and mitigation for the conversion of forested wetlands to emergent and shrub/scrub wetlands will likely be required by the Corps.

6.5.3 Natural Vegetation

The Project is located in the Northern Lakes and Forests Ecoregion, which is dominated by mature conifer and northern hardwood forests and interspersed with lake and wetland plant communities. Vegetative communities found along the Proposed and Alternate routes include upland deciduous forests, coniferous forests, shrubby grasslands, grasslands, and various types of wetlands.

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

See Section 6.3.2 for impacts due to tree clearing along the transmission line right of way.

6.5.4 Wildlife/Rare and Unique Natural Resources

Wildlife
The USFWS website indicated that the gray wolf is present in Hubbard County.[4] The USFWS was contacted by letter[5] and their response letter[6] indicated that there are no federally listed or proposed species and/or designated or proposed critical habitat within the action area of the proposed Project.

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

The DNR was also contacted[7] requesting information on the possible effects of the proposed Project on rare and unique features in the Project area. Their response[8] letter identified five occurrences of rare species (mussels, and Blanding's turtles, trumpeter swans, bald eagles, and Colonial waterbirds) known to occur within an approximate one-mile radius of the Proposed and Alternate routes. These occurrences are listed in Table 6-9 and shown on Figure 6-4.

The DNR also identified a preliminary Site of Moderate Biodiversity Significance immediately west of Highway 71 and made the following recommendations for this area:

- Place the overhead line on the opposite side of the road
- Operate within already disturbed areas as much as possible
- Minimize vehicular disturbance in the area
- Do not park equipment or stockpile supplies in the area
- Construct during the fall or winter if possible to avoid damaging plants during the growing season

[4] US Fish and Wildlife Webpage Endangered Species. http://www.fws.gov/Midwest/Endangered/LISTS/minnesot-cty.html
[5] Letter from Marsha Parlow, Great River Energy to Phil Delthey, US Fish and Wildlife Service. 12 November 2009. *See* Appendix A.
[6] Email from Nick Rowse, US Fish and Wildlife Service to Marsha Parlow, Great River Energy. 13 November 2009. *See* Appendix A.
[7] Letter from Marsha Parlow, Great River Energy to Lisa Joyal, Minnesota Department of Natural Resources. 13 November 2009. *See* Appendix A.
[8] Letter from Lisa Joyal, Minnesota Department of Natural Resources to Marsha Parlow, Great River Energy. 16 December 2009. See Appendix A.

- Reduce runoff by completing the work as rapidly as possible and use erosion control measures such as straw bales or silt fences
- Revegetate disturbed soil with species suitable to the local habitat as soon as possible after construction
- Use only invasive-free mulches, topsoils, and seed mixes

Table 6-9 Rare Animal Species within the Project Area

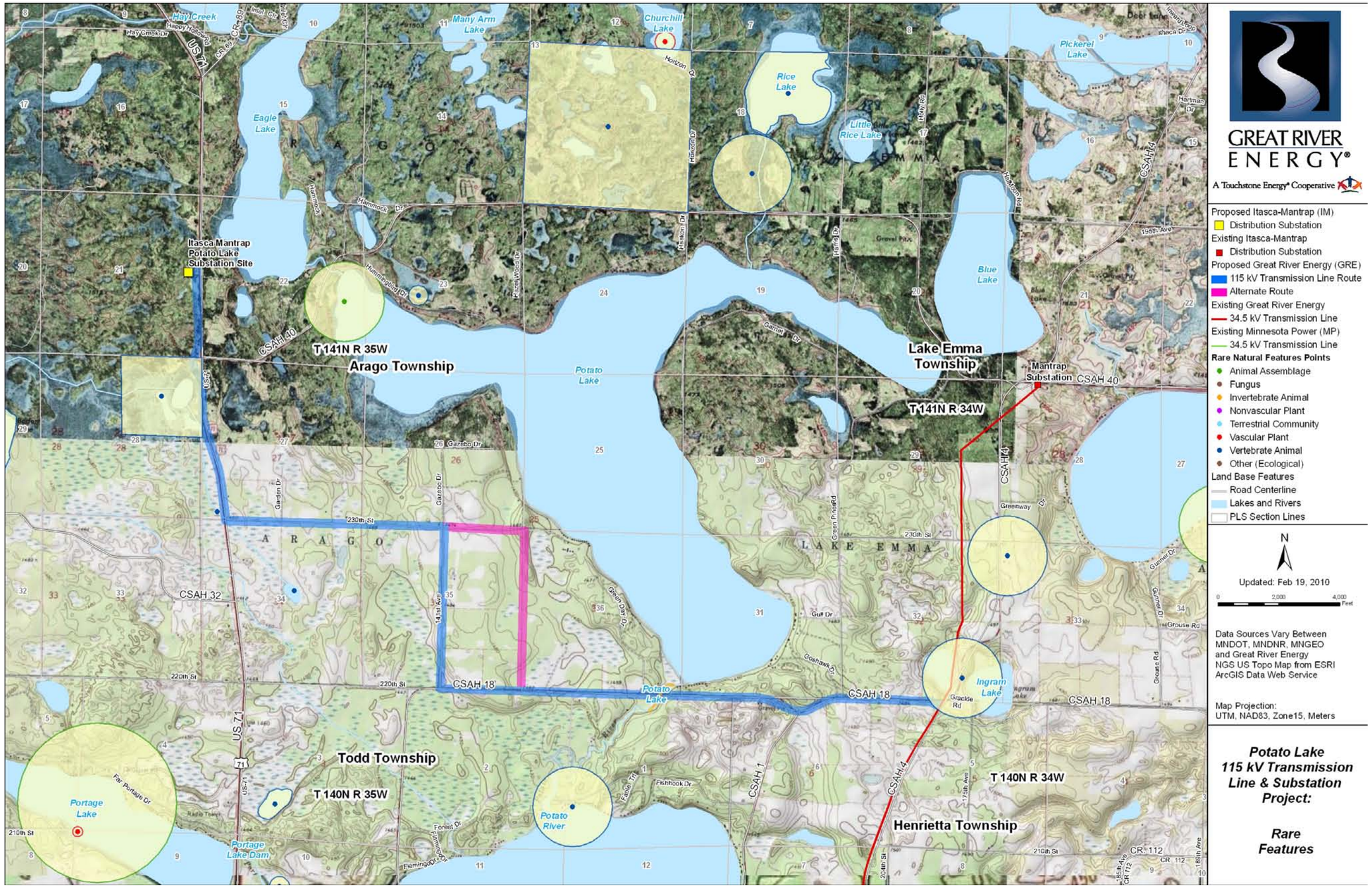
Common Name	Scientific Name	Number of Occurrences	Subnational Rank[1]	Minnesota Protection Status[2]
Creek Heelsplitter (mussel)	Lasmigona compressa	1	S3	SPC
Blanding's Turtle	Emydoidea blandingii	2	S2B	THR
Trumpeter Swan	Cygnus buccinator	6	S2B	THR
Colonial Waterbird Nesting area		2		SNR
Bald Eagle	Haliaeetus Leucocephalus	4	S3B; S3N	SPC

1 Subnational Rank: Rank that best characterizes the relative rarity or endangerment of the taxon or community in Minnesota. S2 - Imperiled in Minnesota because of rarity of because of some factor(s) making it vulnerable to extirpation. S3 – Vulnerable in Minnesota either because rare or uncommon, or found in a restricted range, or because of other factors making it vulnerable to extirpation. S4 – Apparently secure in Minnesota, usually widespread. SNR – Rank not assessed yet. The "B" and "N" is used for migratory birds and refers to the "B" - breeding population of the species or the "N" - nonbreeding population.

2 Minnesota Protection Status: The official endangerment status or level of legal protection Minnesota assigned to this element. END - Endangered. THR - Threatened. SPC – Special concern. NON – A species with no legal status, but about which the Natural Heritage and Nongame Research Program is gathering data because the species falls into one of the following categories: the species is being considered for addition to the state list; the species was removed from the state list; the species was removed from the state list but records for the species are still entered and maintained as a precautionary measure or the species has been recently discovered in the state; the species is presumed to be extirpated from the state.

There are other significant natural resource sites, significant natural features, threatened or endangered species, or state listed species identified by the DNR or the USFWS within the general Project area, but none along the Proposed and Alternate routes.

Figure 6-4 Rare Features in the Project Area



Impacts and Mitigation

There is a potential for the temporary displacement of wildlife and loss of habitat with the new transmission line. 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 parallel to existing rights of way. Additionally, these animals will be typical of those found in forested and agricultural settings, and will not incur population level effects due to construction. When possible, impacts to wooded areas along the Proposed and Alternate routes will be avoided.

The mussel species of special concern (Creek Heelsplitter) occurs in the Potato River; however, because the line will span the river, there should be no impacts the riverbed or this species. Effective erosion prevention and sediment control practices will be implemented at the river crossing to avoid water quality impacts in this area.

The Blanding's Turtle habitat is located in wetlands and adjacent grasslands. To avoid impacting Blanding's Turtles in the vicinity of the Project, Great River Energy will use silt fencing or other erosion control measures to prevent sedimentation when working near waterways. Also, construction crews and contractors will rarely deviate from the Project right of way in an effort to minimize disturbance of surrounding areas. Contractors and crews will be given information on the Blandings's turtle and the list of recommendations for avoiding and minimizing impacts to this species.

Raptors, waterfowl, and other bird species may also be affected by the construction and placement of the transmission lines. Avian collisions are a possibility after the completion of the transmission line and could potentially increase as a result of the proposed line. 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.

Additionally, large birds, such as raptors are sometimes impacted by power lines through electrocution. This is generally an electric distribution issue, as electrocution may occur when birds with large wingspans come in contact with either two conductors, or a conductor and grounding device. Great River Energy's 115 kV transmission line designs for this Project will create greater separation between conductors and grounding devices to minimize electrocution hazards.

Great River Energy will address other avian issues by working with the DNR to identify any areas that may require marking transmission line shield wires to reduce the likelihood of collisions.

Great River Energy will follow the recommendations for the preliminary Site of Moderate Biodiversity Significance, although the intent is for the new line to

follow the existing distribution line south of the new substation, so the line would not be on the opposite side of the road from the Site of Moderate Biodiversity Significance in this area.

The following measures will be used to help avoid or minimize impacts to area wildlife and rare natural resources during and after the completion of the proposed transmission line:

- Minimize tree felling and shrub removal that are important to area wildlife.
- Utilize BMPs to prevent erosion of the soils in the areas of impact.
- 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.
- Revegetate disturbed areas with native species and wildlife conservation species where applicable.
- Implement raptor protection measures, including placement of bird flight diverters on the line at water crossings after consultation with local wildlife management staff.

6.6 Physiographic Features

6.6.1 Topography

The topography of Hubbard County is the result of glacial deposition. The area is characterized by nearly level to moderate topography. The elevation ranges from approximately 1,460 to 1,484 feet mean sea level. The topography of the Proposed and Alternate routes are nearly level with a few steep slopes in the Section 35 of Arago Township, Section 1 of Todd Township and Section 6 in Henrietta Township.[1]

<u>Impacts and Mitigation</u>
Construction of the Project will not alter the topography along the route; therefore, no mitigation is necessary or proposed.

6.6.2 Geology

The Pine Moraines and Outwash Plains Subsection is named for its mix of end moraines and outwash till plains. This area is heavily forested.[2] Sands and sandy

[1] Park Rapids, MN Map. http://terraserver-usa.com
[2] Pine Moraines and Outwash Plains Subsection Profile. http://www.dnr.state.mn.us/ecs/212Nc/index.html

loam soils overlay bedrock and vary in depth between 200 and 600 feet below ground surface. Precambrian bedrock is generally granite, gneiss and slate.[3]

Impacts and Mitigation

Construction of the Project will not alter the geology along the route; therefore, no mitigation is necessary or proposed.

6.6.3 Soils

This region is made up of excessively drained sand and sandy loam soils on landforms that include end moraines, outwash plains, till plains, and drumlin field topography. Soils in the Project area (Figure 6-5) tend to be silty clay loams or clays.[4]

Impacts and Mitigation

Potential impacts of construction are compaction of 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 substation, and these impacts will be short term. There should be no long-term impacts resulting from this Project.

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

Over an acre of soil will be disturbed during the construction of the Potato Lake Substation, therefore a National Pollutant Discharge Elimination System (NPDES) construction stormwater permit from the MPCA will be required. Itasca-Mantrap will obtain a NPDES permit and will prepare a Stormwater Pollution Prevention Plan (SWPPP). Erosion control methods and BMPs will be utilized to minimize runoff during substation construction.

If over an acre of soil will be disturbed during the construction of the transmission line, Great River Energy will obtain a NPDES construction stormwater permit from the MPCA and will prepare a SWPPP. Erosion control methods and BMPs will be utilized to minimize runoff during line construction.

[3] http://www.mn.nrcs.usda.gov/technical/rwa/Assessments/reports/crow_wing.pdf
[4] http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx

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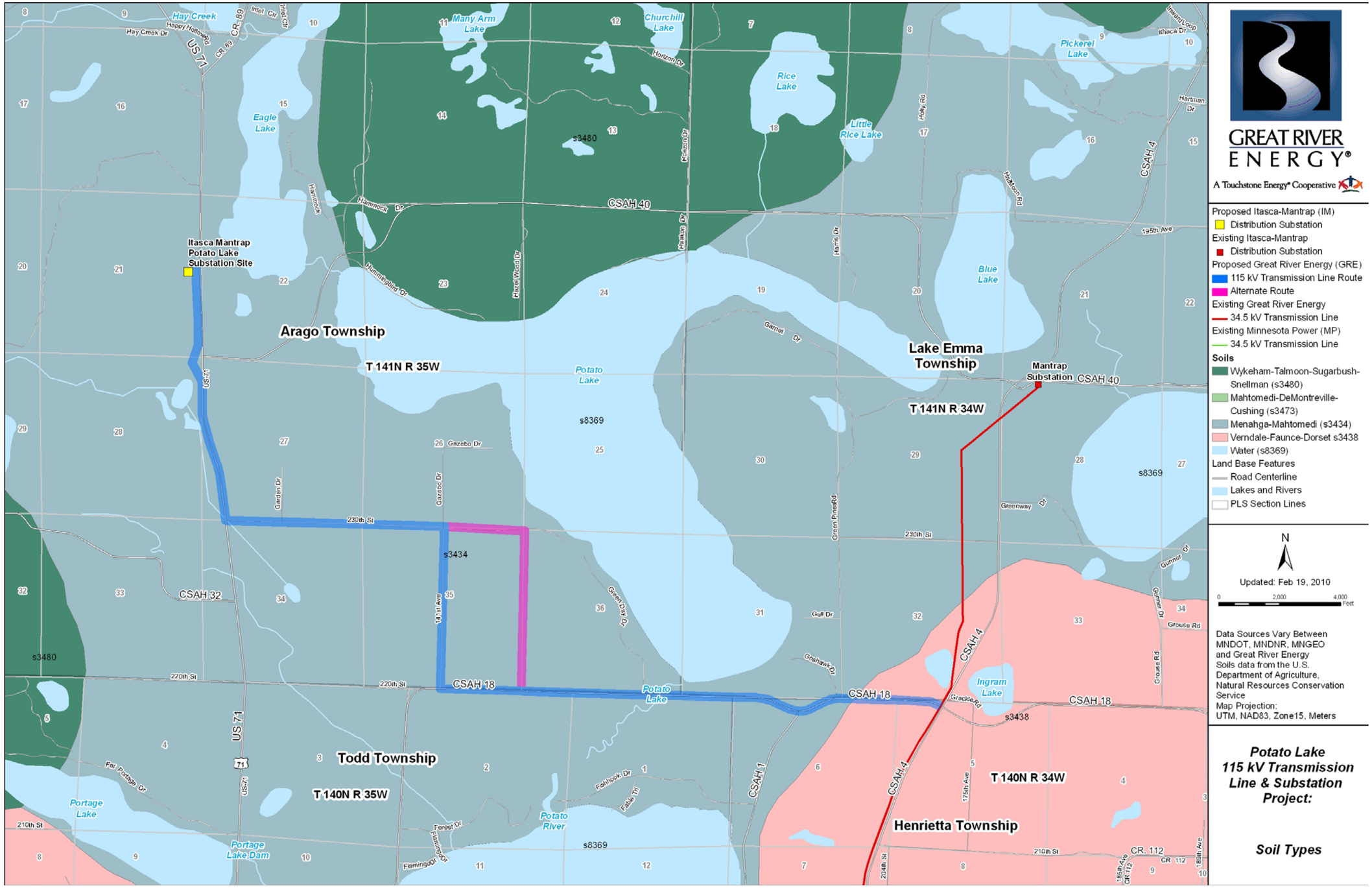
Figure 6-5 Soil Types in the Project Area



6.7 Land Use

Land use along the Proposed and Alternate routes consists mainly of forest, grassland, rural residential uses, wetlands, water, agricultural-related uses, and recreational areas (Figure 6-2). Cultivated land and forested land are discussed in Sections 6.3.1 and 6.3.2, respectively. Wetlands are discussed in Section 6.5.2.

6.7.1 Undeveloped Land

Undeveloped land, such as grassland and pastureland, occurs along the Proposed and Alternate routes (Figure 6-2).

Impacts and Mitigation

Impacts to undeveloped land will be limited to the area of the footprint of the poles. After construction of the Project is complete, disturbed soils in these areas will be stabilized with native vegetation as soon as possible and use of these lands will be minimally impacted.

6.7.2 Public Lands and Recreational Areas

There are no regional parks, recreational areas or State Wildlife Management Areas within the Proposed and Alternate routes.

There is a state snowmobile trail (276) that runs along CSAH 4 (where the switch will be located on the existing PM Line), a bike trail along US Highway 71, and the Soar Eagle Ski Trail (a Minnesota Grant In Aid Trail) is located a quarter mile north of the proposed substation (Figure 6-2).

There are numerous ATV trails in the region; however, there are no ATV trails in the Project area. The Paul Bunyan and Heartland State Trails are not located in the Project area.

There is one small state-owned parcel within the Proposed and Alternate routes.

Impacts and Mitigation

The proposed transmission line will not interfere with the bike trail on Highway 71 because the new line will follow the existing distribution line in this area, which is located well out of the road right of way. The substation and transmission line will not interfere with the snowmobile or ski trails.

No impacts to recreational land uses are anticipated; therefore no mitigation is necessary or proposed.

6.7.3 Zoning

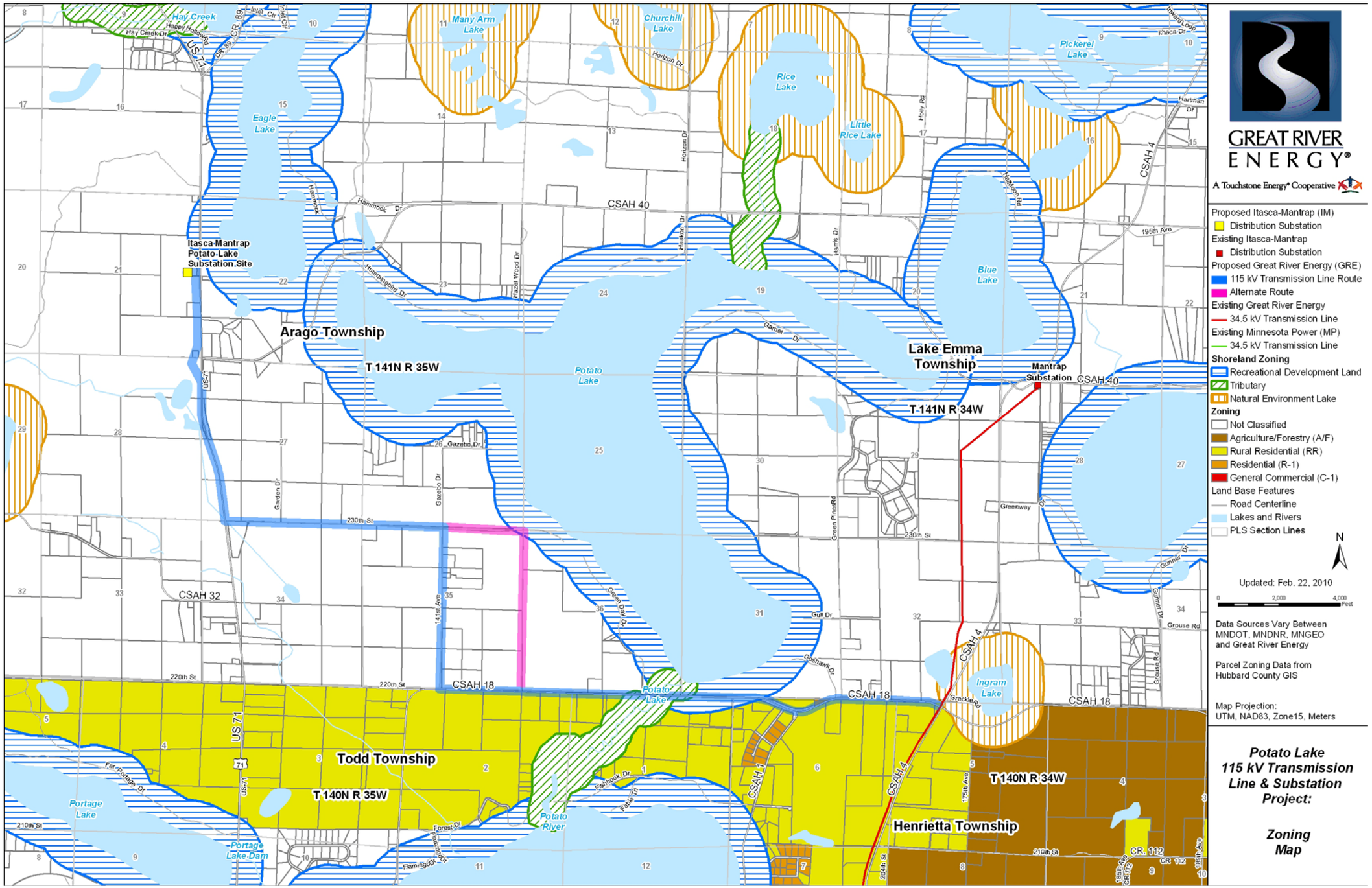
A zoning map of the Project area is provided in Figure 6-6. The Proposed and Alternate routes cross areas designated under Hubbard County Shoreland Ordinance No. 17, Henrietta Township Zoning Ordinance and Todd Township Zoning Ordinance 2007 – No. 02.01.[1] However, a Route Permit issued by the Commission supersedes any local zoning, building and land use regulations.[2]

Impacts and Mitigation

Potential land use impacts along the Proposed and Alternate routes due to the 115 kV transmission line will be limited. Both the Proposed and Alternate routes for the 115 kV transmission line will be approximately 7.25 miles long and will overtake existing distribution line right of way and parallel road right of way as much as possible. The new 115 kV transmission line does not represent an incompatible land use with those that exist in the area. Therefore, anticipated impacts of the proposed Project on land use are minimal and no mitigation measures are necessary or proposed.

[1] Zoning information obtained from offices of Hubbard County, Henrietta Township and Todd Township.
[2] Minn. Stat. §216E.10, subdiv. 1.

Figure 6-6 Zoning Map



7. ENGINEERING AND OPERATIONAL DESIGN OF THE PROPOSED HVTL AND SUBSTATION

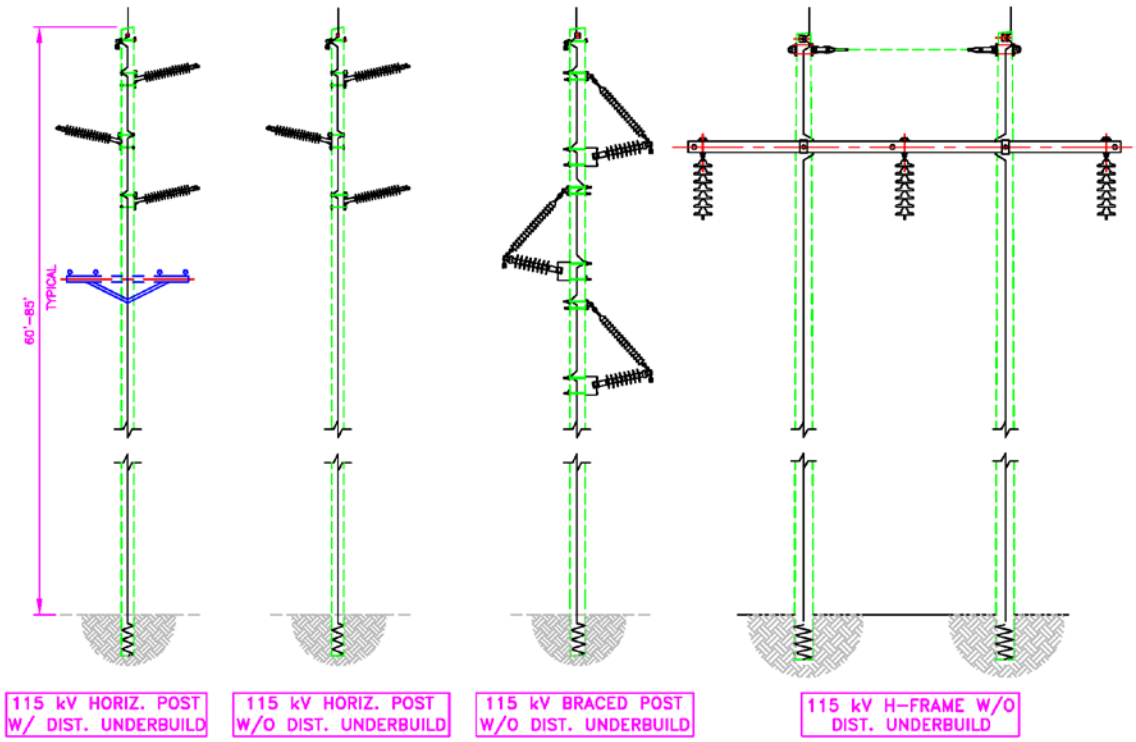
7.1 Transmission Structures

Design voltage of the proposed transmission line is 115 kV. The Project will have a total length of approximately 7.25 miles, with slight variations depending on the exact route chosen. The entire line and associated facilities would be within Hubbard County, Minnesota.

The transmission line would be constructed with 477 aluminum conductor steel reinforced (ACSR). The line would use three single conductors (not bundled).

Typical structure types to be used for this Project are shown in Figure 7-1.

Figure 7-1 Schematic Diagrams of Typical Great River Energy Structures



Single pole wood structures with horizontal post insulators will be the primary structure used for the Project. 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, direct embedded

laminated wood poles or steel poles on drilled pier concrete foundations will be utilized.

The single circuit structures will have three single conductor phase wires and one shield wire. The phase wires will be 477 thousand circular mil ACSR with seven steel core strands and 26 outer aluminum strands. The shield wire will be 0.465 optical ground wire. The average span will be 300-400 feet and heights will range from 60 to 85 feet. Structures, pole heights and spans will vary depending upon topography and environmental constraints (such as highway crossings, stream crossings, and required angle structures).

Single pole with underbuild design will be used in areas where the new transmission line will overtake Itasca-Mantrap distribution lines along Highway 71 and 230th Street. The advantage of this design (over two separate parallel lines) is that less right of way is required. However, these structures will be taller because the higher voltage circuit is “stacked” on top of the lower voltage circuit, resulting in a pole that averages 75 to 85 feet in height. Span lengths would average 250 to 300 feet.

H-Frame design structures may be used in areas with rugged topography and where longer spans are required to avoid or minimize impacts to wetlands or waterways. Span lengths average 600 to 700 feet, with 1,000-foot spans possible with certain topography. Structure heights range from 60 to 80 feet with taller structures required for exceptionally long spans and in circumstances requiring additional vertical clearance exceeding NESC and other agency requirements.

The average diameter of the wood structures at ground level is 20 inches.

7.1.1 Construction Considerations

Clearances

The transmission line will be designed to meet the NESC and the Institute of Electrical and Electronics Engineers standards. The NESC recommends minimum safety standards for clearances over roadways, buildings, signs, light standards, and other facilities.

Great River Energy has company standards that meet or exceed the NESC requirements. Clearances over highways and roadways will exceed the 24.1 feet recommended by the NESC and may be limited by the MnDOT or local county highway permitting. Although the existing standards give recommended clearances over buildings, Great River Energy 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 of the wire, structure deflection, and safe electrical clearance from the line.

7.1.2 Material Requirements

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

7.2 Potato Lake Substation

The proposed Project involves construction of the Potato Lake 115 kV Substation as discussed in Section 5.1. Itasca-Mantrap will own all common substation facilities (land, fence, etc.) and will operate the low voltage distribution facilities.

The proposed Potato Lake 115 kV transmission substation will be built using a “low-profile” or “lattice box structure” design. It will be a conventional outdoor open-type air-insulated bus-and-switch arrangement.

The primary components of the new substation will initially include:

- One 34.5/12.47 kV transformer (would be replaced by a 115/12.47 kV transformer when the surrounding transmission system is converted to 115 kV).
- One 115 kV switch with associated bus work and one 115 kV transrupter to accommodate the 115 kV transmission line termination.
- Grading, fencing, installation of a control building, and steel structure installation.

The new 115 kV transmission line will enter the Potato Lake Substation from the south. Great River Energy will have a permanent easement for its facilities on the south portion of the proposed substation, and will own and operate all the high voltage (115 kV) facilities and control building.

7.3 Electric and Magnetic Fields

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. HVTLs operate at a frequency of 60 hertz (Hz) (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, which typically occurs in frequency ranges of 10^{16} to 10^{22} Hz.

7.3.1 Electric Fields

The transmission line voltage 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) developed a standard of a maximum electric field limit of 8 kV/m at one meter above ground. That standard, which has been used by the Commission in routing assessments, was implemented to mitigate serious hazard from shocks when touching large objects parked under transmission lines with voltage of 500 kV or greater.

Table 7-1 summarizes the electric fields calculated for the Project during the initial 34.5 kV operation and the eventual 115 kV operation of the transmission line. The table includes scenarios with and without distribution underbuild.

The electric field calculations are also shown graphically in Figures 7-2 through 7-9.

7.3.2 Magnetic Fields

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 (G) or milligauss (mG). Recent studies of the health effects from power frequency fields conclude that the evidence of health risk is weak.[54]

Table 7-2 summarizes the magnetic fields calculated for the Project during the initial 34.5 kV operation and the eventual 115 kV operation of the transmission line. The table includes scenarios with and without distribution underbuild.

The magnetic field calculations are also shown graphically in Figures 7-2 through 7-9.

[54] Minnesota Department of Health. *EMF White Paper on Electric and Magnetic Field* (EMF) Policy and Mitigation Options. 2002; National Research Council. *Possible Health Effects of Exposure to Residential Electric and Magnetic Fields*. 1997; www.niehs.nih.gov/health/topics/agents/emf/.

Table 7-1 Calculated Electric Fields (kV/m) for Proposed 115 kV Transmission Line Designs (3.28 feet above ground)

Scenario	Maximum Operating Voltage (kV)	Distance to Proposed Centerline										
		-300'	-200'	-100'	-50'	-25'	0'	25'	50'	100'	200'	300'
Initial Operation No Distribution Underbuild Average Load (Figure 7-2)	36.25	0.00	0.00	0.01	0.05	0.12	0.27	0.14	0.04	0.01	0.00	0.00
Initial Operation No Distribution Underbuild Emergency Load (Figure 7-3)	36.25	0.00	0.00	0.01	0.05	0.12	0.27	0.14	0.04	0.01	0.00	0.00
Initial Operation with Distribution Underbuild Average Load (Figure 7-6)	36.25	0.00	0.01	0.02	0.08	0.18	0.13	0.25	0.07	0.01	0.00	0.00
Initial Operation with Distribution Underbuild Emergency Load (Figure 7-7)	36.25	0.00	0.01	0.02	0.08	0.18	0.13	0.25	0.07	0.01	0.00	0.00
Final Operation No Distribution Underbuild Average Load (Figure7-4)	121	0.00	0.01	0.04	0.16	0.37	0.89	0.46	0.15	0.04	0.01	0.01
Final Operation No Distribution Underbuild Emergency Load (Figure 7-5)	121	0.00	0.01	0.04	0.16	0.37	0.89	0.46	0.15	0.04	0.01	0.01

Final Operation with Distribution Underbuild Average Load (Figure 7-8)	121	0.01	0.01	0.05	0.17	0.28	0.22	0.40	0.15	0.05	0.01	0.01
Final Operation with Distribution Underbuild Emergency Load (Figure 7-9)	121	0.01	0.01	0.05	0.17	0.28	0.22	0.40	0.15	0.05	0.01	0.01

Note: The maximum electric field in the applicants' proposal is 0.973 kV/m, which is well under the maximum limit of 8 kV/m that has been a permit condition imposed by EQB in other transmission line routing proceedings.

Table 7-2 Calculated Magnetic Fields (mG) for Proposed 115 kV Transmission Line Designs (3.28 feet above ground)

Scenario	Maximum Operating Voltage (kV)	Distance to Proposed Centerline										
		-300'	-200'	-100'	-50'	-25'	0'	25'	50'	100'	200'	300'
Initial Operation No Distribution Underbuild Average Load (Figure 7-2)	36.25	0.05	0.10	0.40	1.32	3.13	6.32	3.50	1.44	0.43	0.11	0.05
Initial Operation No Distribution Underbuild Emergency Load (Figure 7-3)	36.25	0.10	0.22	0.84	2.75	6.52	13.17	7.28	3.00	0.89	0.23	0.10
Initial Operation with Distribution Underbuild Average Load (Figure 7-6)	36.25	0.07	0.15	0.53	1.62	4.04	11.02	5.84	2.30	0.66	0.17	0.07

Initial Operation with Distribution Underbuild Emergency Load (Figure 7-7)	36.25	0.14	0.31	1.09	3.37	8.41	22.96	12.16	4.79	1.37	0.35	0.15
Final Operation No Distribution Underbuild Average Load (Figure 7-4)	121	0.00	0.01	0.02	0.06	0.14	0.28	0.16	0.07	0.02	0.01	0.00
Final Operation No Distribution Underbuild Emergency Load (Figure 7-5)	121	0.11	0.25	0.95	3.62	7.33	14.81	8.19	3.38	0.10	0.26	0.12
Final Operation with Distribution Underbuild Average Load (Figure 7-8)	121	0.04	0.10	0.37	1.34	3.79	9.41	4.00	1.40	0.39	0.10	0.04
Final Operation with Distribution Underbuild Emergency Load (Figure 7-9)	121	0.15	0.33	1.17	3.54	8.65	23.60	12.71	5.07	1.46	0.37	0.16

Note: The maximum magnetic field for the Potato Lake Project is 23.60 mG.

Figures 7-2 to 7-9 illustrate electric and magnetic field exposure along the line with and without underbuild distribution during normal (average loading) and single contingency (maximum) conditions with the system intact.

These figures represent the conductors at their respective elevations from the ground. The negative and positive distances on the x-axis represent the feet from the centerline (0 feet) of the proposed 115 kV transmission line.

The figures show the magnetic field strength measured in mG on the left y-axis. These figures show that the strength of the field increases as it measured closer to the center of the transmission line. The left and right distance bounds are 300 feet because the field strength from the line is essentially equivalent to other magnetic field background sources at that distance.

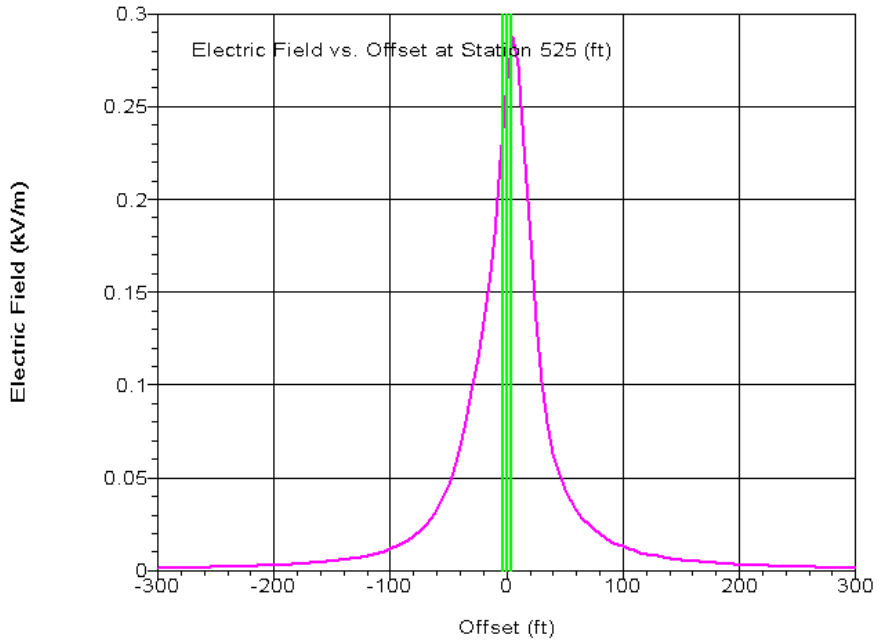
The magnetic fields for the proposed 34.5 kV transmission line with no distribution underbuild at average (Figure 7-2) and maximum (Figure 7-3) loads are estimated to be 6.32 mG and 13.17 mG respectively. At 35 feet from the center of the transmission line, the average load magnetic field is estimated to be 2.2 mG and the maximum load magnetic field is estimated to be 5.0 mG.

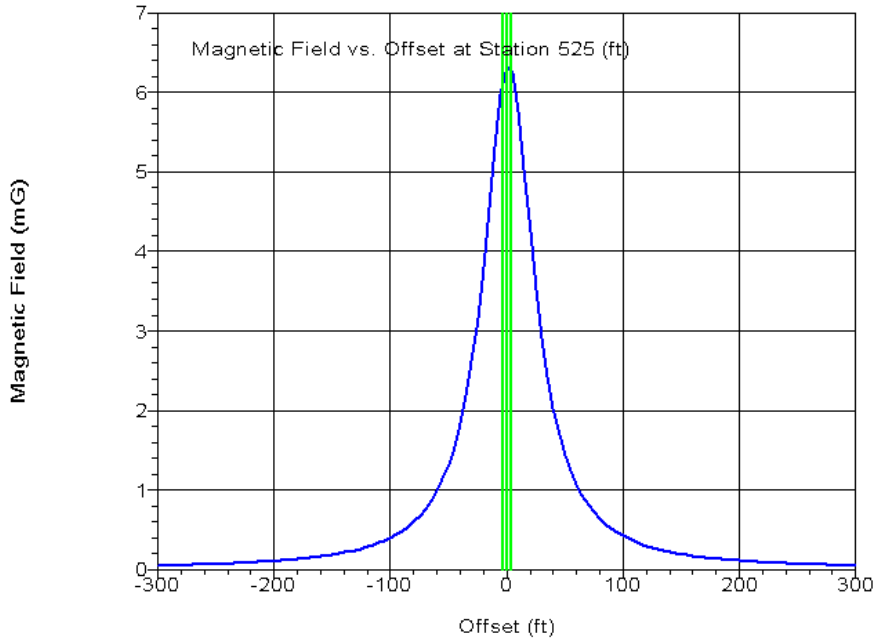
The magnetic fields for the proposed 115 kV transmission line with no distribution underbuild at average (Figure 7-4) and maximum (Figure 7-5) loads are estimated to be 0.28 mG and 14.81 mG respectively. At 35 feet from the center of the transmission line, the average load magnetic field is estimated to be 0.1 mG and the contingency load magnetic field is estimated to be 6.0 mG.

The magnetic fields for the proposed 34.5 kV transmission line with distribution underbuild at average (Figure 7-6) and maximum (Figure 7-7) loads are estimated to be 11.02 mG and 22.96 mG respectively. At 35 feet from the center of the transmission line, the average load magnetic field is estimated to be 4.0 mG and the contingency load magnetic field is estimated to be 6.0 mG.

The magnetic fields for the proposed 115 kV transmission line with distribution underbuild at average (Figure 7-8) and contingency (Figure 7-9) loads are estimated to be 9.41 mG and 23.60 mG respectively. At 35 feet from the center of the transmission line, the average load magnetic field is estimated to be 2.5 mG and the contingency load magnetic field is estimated to be 9.0 mG.

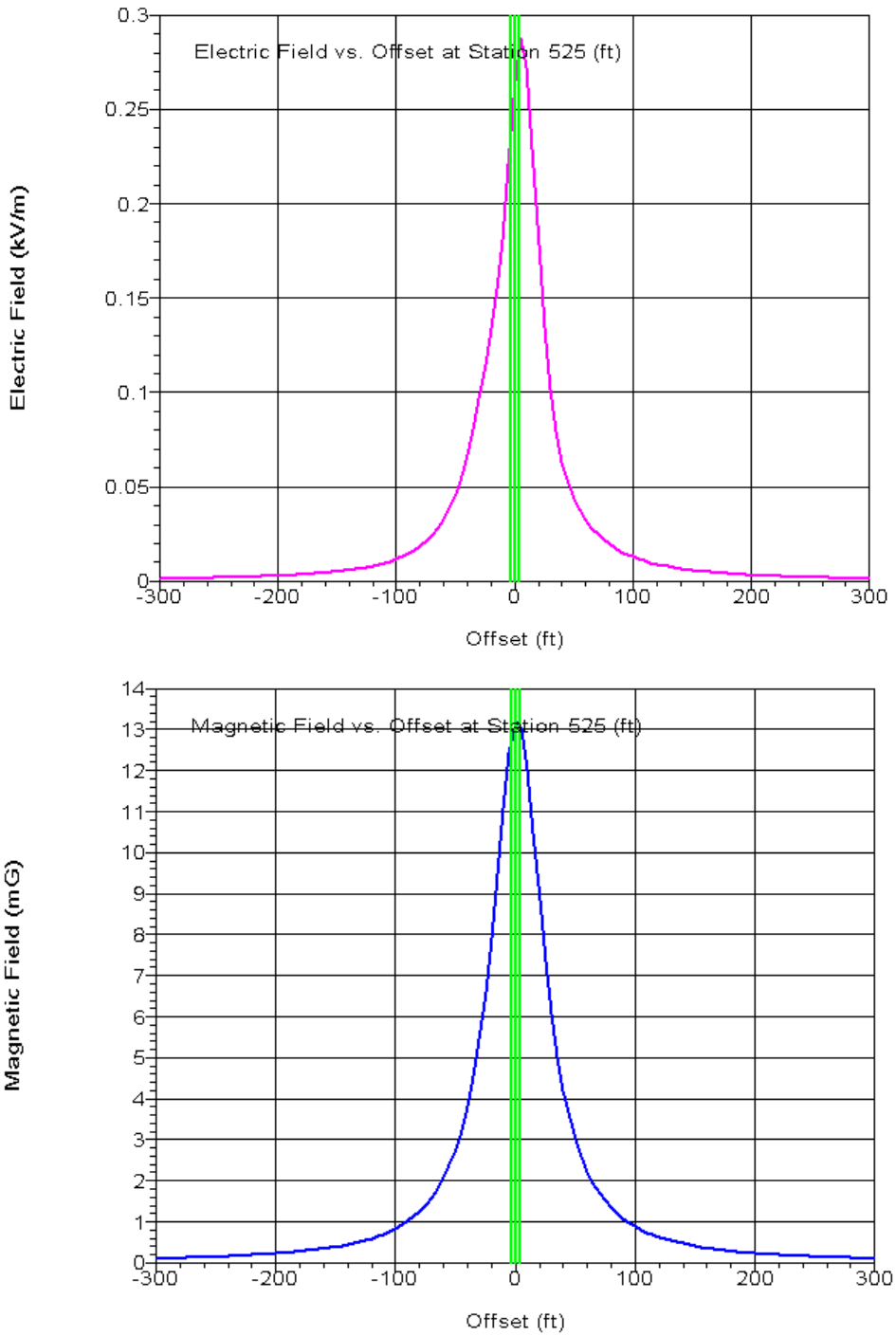
Figure 7-2 34.5 kV Electric and Magnetic Field Profiles – No Distribution Average Loading





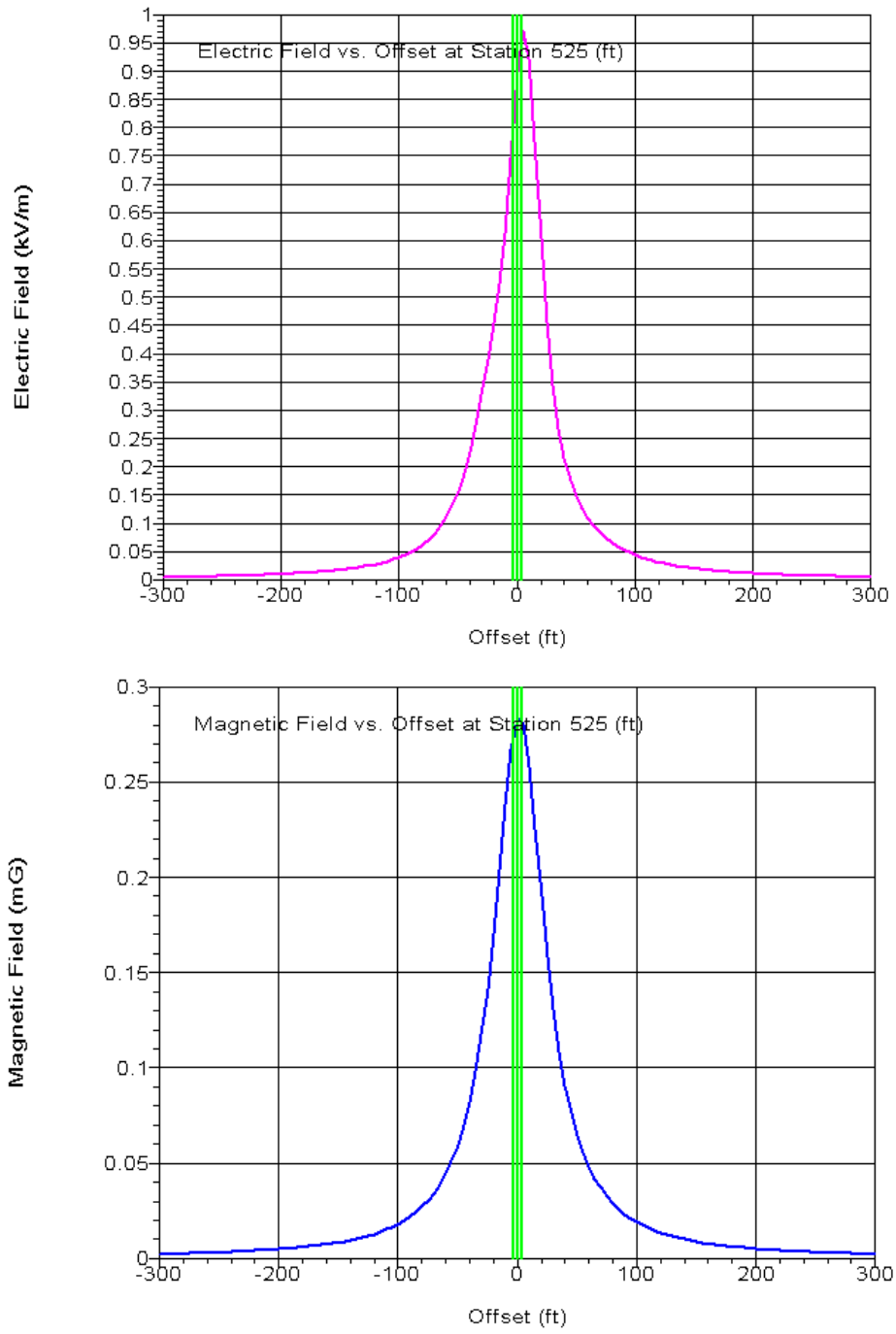
34.5 kV System Average Loading – 60.25 amps
No Distribution Underbuild
Maximum Electric Field: 0.288 kilovolts per meter (kV/m) at 5 feet offset of centerline
Maximum Magnetic Field: 6.32 mG at 0 feet offset of centerline

Figure 7-3 34.5 kV Electric and Magnetic Field Profiles – No Distribution Maximum Loading



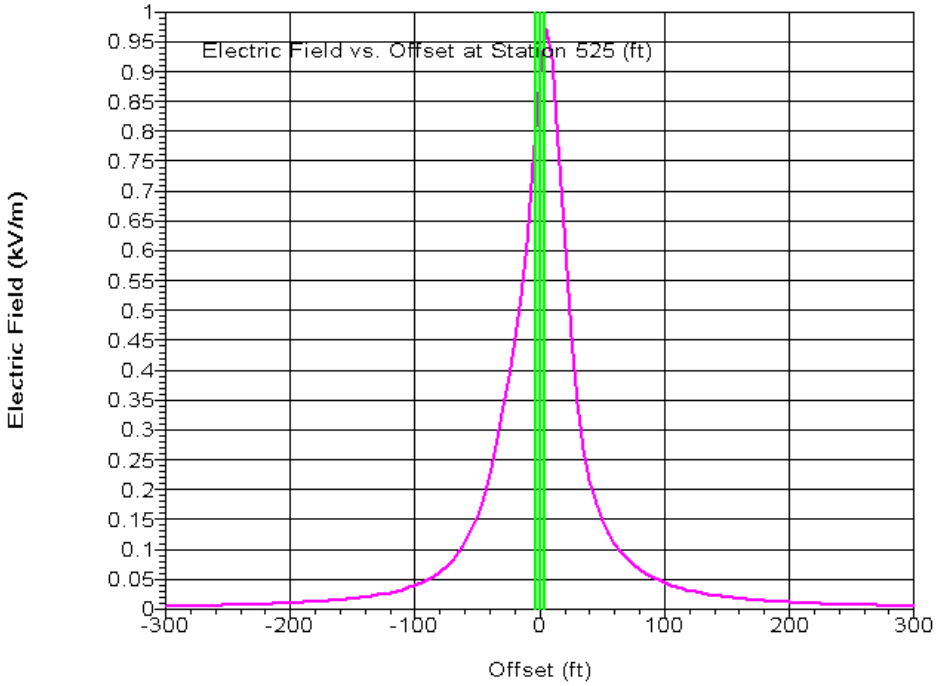
34.5 kV System Maximum Loading – 125.5 amps
No Distribution Underbuild
Maximum Electric Field: 0.288 kV/m at 5 feet offset of centerline
Maximum Magnetic Field: 13.17 mG at 0 feet offset of centerline

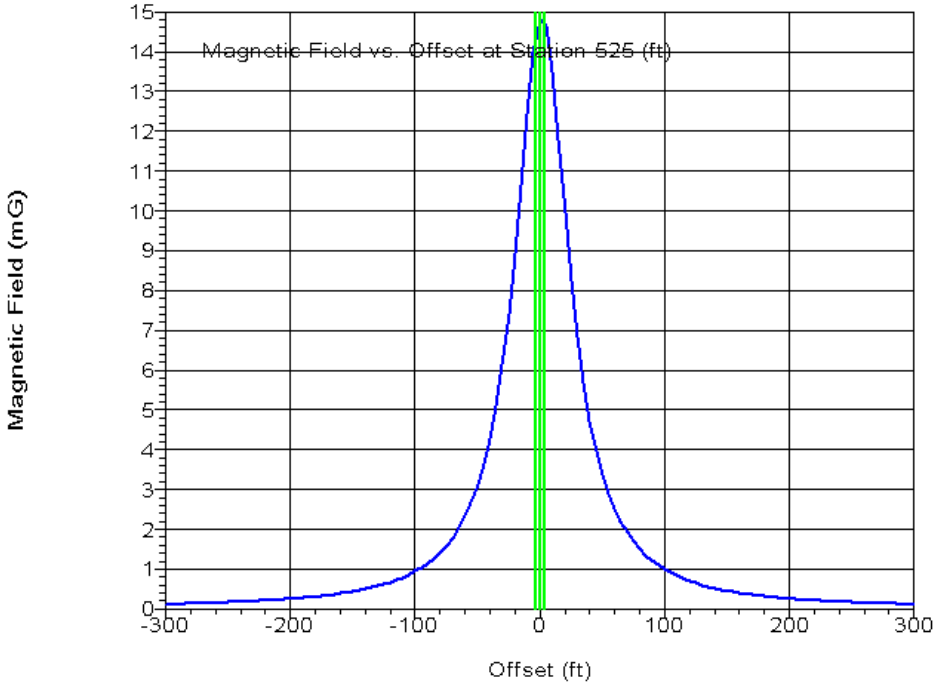
Figure 7-4 115 kV Electric and Magnetic Field Profiles – No Distribution Average Loading



115 kV System Average Loading – 2.7 amps
No Distribution Underbuild
Maximum Electric Field: 0.973 (kV/m) at 5 feet offset of centerline
Maximum Magnetic Field: 0.28 mG at 0 feet offset of centerline

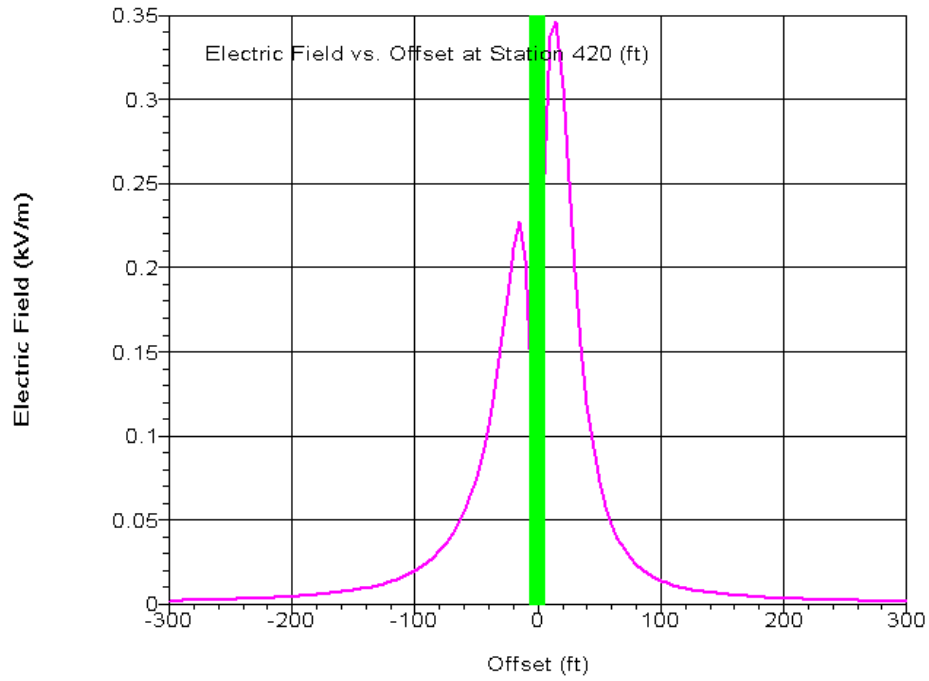
Figure 7-5 115 kV Electric and Magnetic Field Profiles – No Distribution Maximum Loading

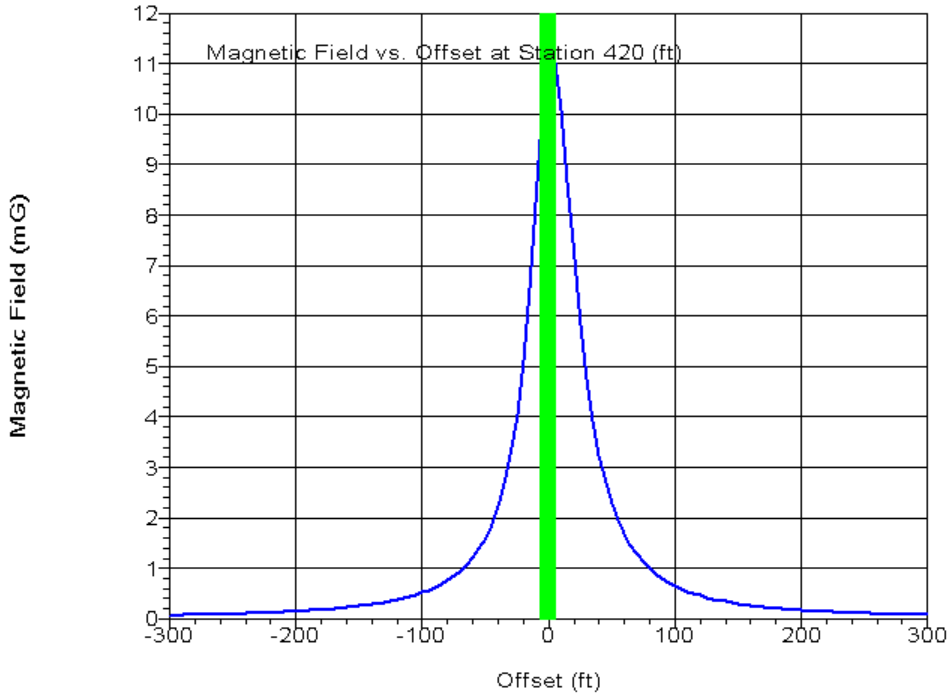




115 kV System Maximum Loading – 141.1 amps
No Distribution Underbuild
Maximum Electric Field: 0.973 kV/m at 5 feet offset of centerline
Maximum Magnetic Field: 14.81 mG at 0 feet offset of centerline

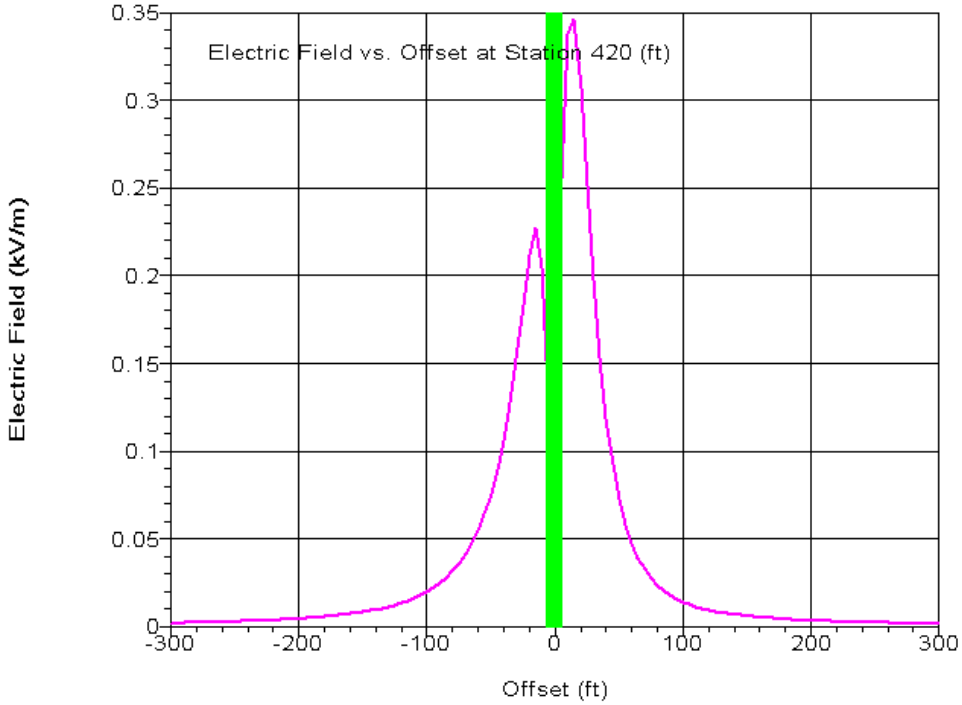
Figure 7-6 34.5 kV Electric and Magnetic Field Profiles – with Distribution Average Loading

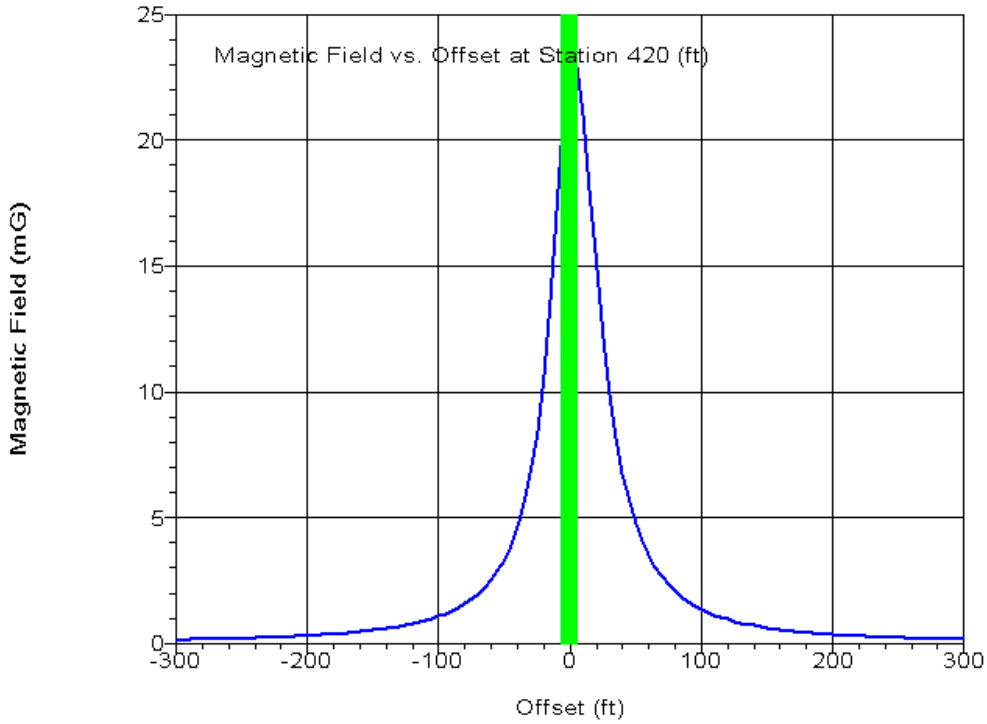




34.5 kV System Average Loading – 60.25 amps
34.5 kV Distribution – 60.25amps
Maximum Electric Field: 0.346 kV/m at 5 feet offset of centerline
Maximum Magnetic Field: 11.02 mG at 0 feet offset of centerline

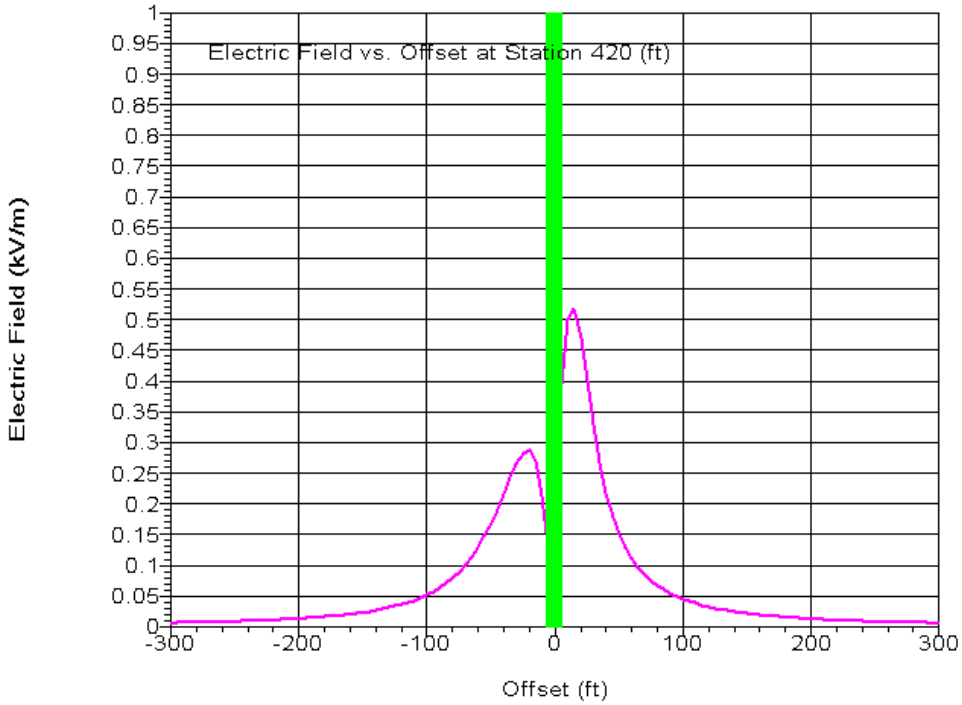
Figure 7-7 34.5 kV Electric and Magnetic Field Profiles – with Distribution Maximum Loading

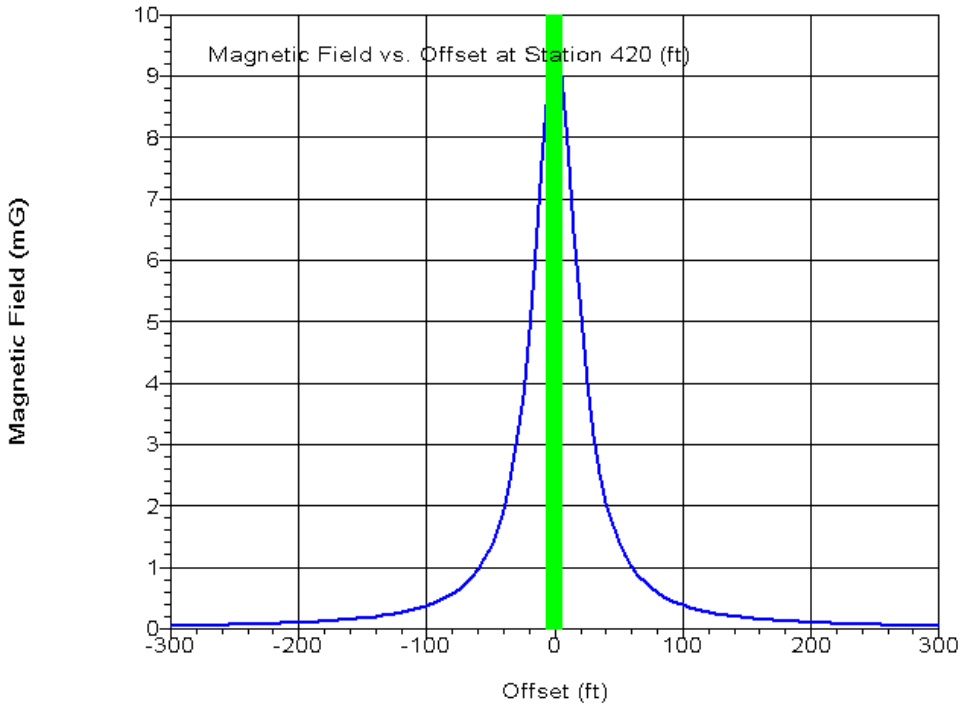




34.5 kV System Maximum Loading – 125.5 amps
34.5 kV Distribution – 125.5 amps
Maximum Electric Field: 0.346 kV/m at 5 feet offset of centerline
Maximum Magnetic Field: 22.96 mG at 0 feet offset of centerline

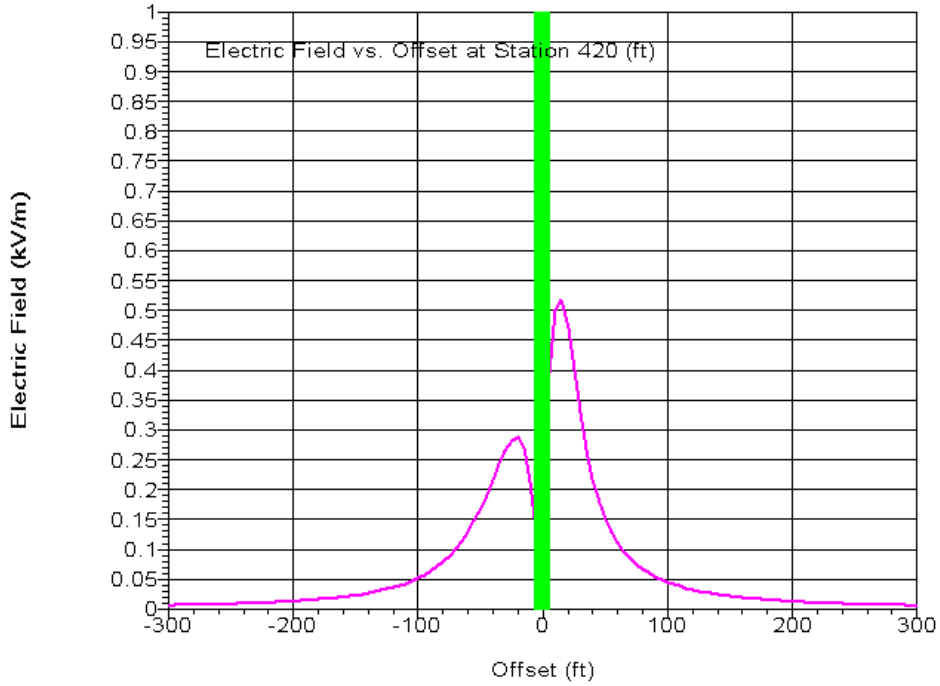
Figure 7-8 115 kV Electric and Magnetic Field Profiles – with Distribution Average Loading

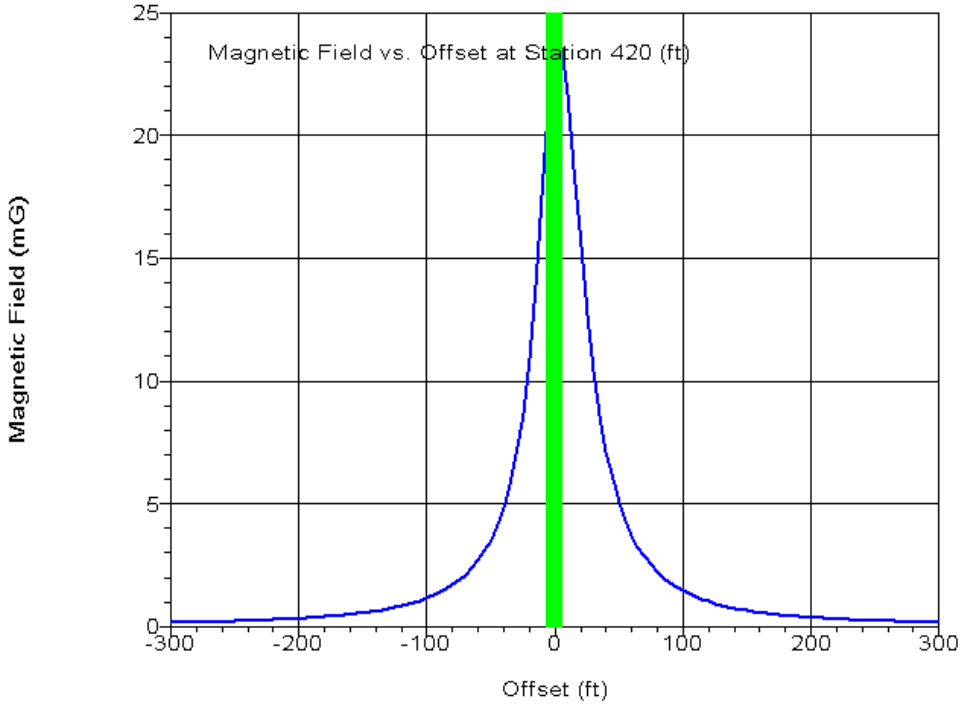




115 kV System Average Loading – 2.7 amps
34.5 kV Distribution – 60.25 amps
Maximum Electric Field: 0.518 kV/m at 5 feet offset of centerline
Maximum Magnetic Field: 9.41 mG at 0 feet offset of centerline

Figure 7-9 115 kV Electric and Magnetic Field Profiles – with Distribution Maximum Loading





115 kV System Maximum Loading – 141.1 amps
34.5 kV Distribution – 125.5 amps
Maximum Electric Field: 0.518 kV/m at 5 feet offset of centerline
Maximum Magnetic Field: 23.60 mG at 0 feet offset of centerline

7.3.3 Summary

The proposed 115 kV line will have a maximum magnitude of electric field density of approximately 0.98 kV/m underneath the conductors, one meter above grade (Table 7-1), which is well below the maximum limit of 8 kV/m that has been a permit condition imposed by EQB in other transmission line routing proceedings. Research on the biological effects from electric fields on animals and humans has shown no significant association with disease in humans.

The maximum magnetic field for the Potato Lake Project is 23.60 mG, for the 115 kV with distribution, maximum loading scenario (Table 7-2).

7.4 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 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 BPA *Corona and Field Effects Program Ver. 3*[55] for a standard single circuit 115 kV project predicted a maximum concentration of 0.006 ppm near the conductor and 0.002 ppm at one meter above ground during foul weather or worst case conditions with rain at one inch per hour. During a mist (rain at 0.01 inch per hour) the maximum concentrations decreased to 0.0002 ppm near the conductor and 0.0001 ppm at one meter above ground level. For both cases, the ozone levels are below EPA standards.

[55] United States Department of Energy, Bonneville Power Administration. Corona and Field Effects Program Version 3.0 Computer Program. Vancouver, WA.

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.

7.5 Radio/TV Interference

Corona discharges from the conductors of a transmission line can occur when the voltage gradient in the vicinity of the conductors exceeds the breakdown strength of air and can result in audible noise. In addition, the discharges can also result in radio frequency (RF) noise. Corona becomes more of an issue as the line operating voltage increases; the most significant factor with respect to radio and television interference is not the magnitude of the transmission line – induced RF noise, but how the transmission line-induced RF noise compares with the strength of the broadcast signal. Very few radio noise problems have resulted from existing 115 kV transmission lines, as broadcast signal strength within a radio station's primary coverage area is great enough that adequate signal to noise ratios are maintained.

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 RF noise currents decrease in magnitude with increasing frequency and are quite small in the FM broadcast band (88-108 megahertz), and

- 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 nonexistent 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 typically not impacted by transmission line RF noise).

Due to the higher frequencies of the TV broadcast signal (54 MHz and above), 115 kV 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 coverage area where good reception is presently obtained, the Applicants will work with the affected party to correct the problem. Usually any reception problem can be corrected with the addition of an outside antenna.

TV picture reception interference can also be the result of a transmission structure blocking the signal to homes in close proximity to a structure. Because the structures proposed for this project will primarily be wood, this is unlikely to occur. However measurements can be made to verify whether a structure is the cause of reception problems. Reception problems can usually be corrected with the addition of an outside antenna, an amplifier, or both.

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 within a broadcast station's primary coverage area where good reception is presently obtained, Great River Energy 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.

Because the conversion to digital television is very recent, no data are available at this time to assess the effects of transmission lines on digital service.

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8. PROPERTY/RIGHT OF WAY ACQUISITION AND RESTORATION

8.1. Identification of Existing Utility and Public Rights of Way

8.1.1 Utility Rights of Way

For the first 1.5 miles from the proposed Potato Lake Substation south along Highway 71 to 230th Street and for approximately 0.75 mile along 230th Street, the new transmission line will overtake existing Itasca-Mantrap distribution lines.

These Itasca-Mantrap distribution lines will be removed, upgraded and attached to the new transmission line. Along roads, the centerline will be approximately two to five feet outside the road right of way.

8.1.2 Public Rights of Way

Proposed Route
The Proposed Route would parallel public rights of way for the majority of the 7.25 miles (approximately 1.5 miles along Highway 71, 1.5 miles along 230th Street; one mile along 141st Avenue, and 3.25 miles along CSAH 18).

Alternate Route
The Alternate Route would parallel public rights of way for 6.25 miles (approximately 1.5 miles along Highway 71, two miles along 230th Street; and 2.75 miles along CSAH 18).

8.2 Right of Way Requirements

Approximately 100 feet of right of way will be required for construction of the transmission line, 50 feet on either side of the transmission centerline. Along roads, the transmission line structures will be placed approximately two to five feet outside of the road right of way.

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.

8.3 Property/Right of Way Acquisition Procedures

Should a route permit be issued by the Commission, land rights acquisition will commence subsequent to survey and preliminary determination of the transmission centerline. 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, an offer of compensation 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 power line 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.

8.3.1 Substation Property Acquisition

Itasca-Mantrap owns 3.2 acres of land that will accommodate the construction of the new 115 kV substation. During the substation construction phase, any nearby property owners will be advised of the construction schedules. To construct, operate and maintain the proposed substation, all vegetation will be cleared from the substation footprint area, from the substation driveway area, and from a buffer area of 15 feet outside the substation fence. 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.

8.3.2 Transmission Line Easement Acquisition

Great River Energy will acquire easement rights for the new 115 kV transmission line. Great River Energy Land Rights Field Representatives will be available to discuss easement issues with all property owners.

8.4 Tree Clearing and Staking

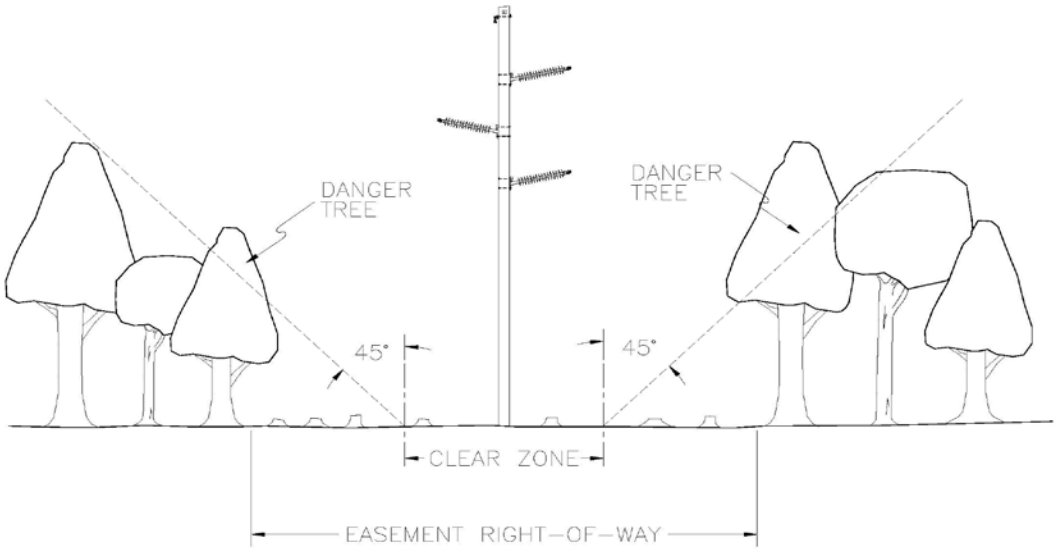
After land rights have been secured, landowners will be notified of the initial construction phase of the Project including schedules, ingress and egress to and from the planned facility, tree and vegetation removal, damage mitigation, and other related construction activities.

The first phase of construction activities will involve survey staking 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 may remain in the easement area, as agreed to during easement acquisitions.
The NESC states that “trees that may interfere with ungrounded supply conductors should be trimmed or removed.” Trees beyond the easement area that are in danger of falling into the energized transmission line should be removed or trimmed to eliminate the hazard as shown in Figure 8-1. In special circumstances, tree trimming agreements may be possible to minimize tree removal based on negotiations with individual landowners.

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

Figure 8-1 Standard Tree Removal Practices



8.5 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.

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9. CONSTRUCTION PRACTICES AND OPERATION AND MAINTENANCE OF THE HVTL AND ASSOCIATED SUBSTATION

9.1 Construction Practices

9.1.1 Transmission Line

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.

Great River Energy 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, as well as environmental and other permit conditions. Great River Energy adheres to NESC 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.

Great River Energy typically utilizes outside contractors for construction activities on large transmission line projects. The specifications used are developed by Great River Energy's Engineering and Project Management Department. A copy of Great River Energy's easement restriction list, environmental restriction lists, and any required local permits are given to the awarded contractor prior to construction.

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 thin spread or removed from the site as required. The poles may be backfilled with native soils, crushed rock or concrete depending on design conditions. In lowland areas, a galvanized steel culvert may be also inserted for pole stability due to poor soil capacity.

Angle structures will typically be guyed. In some instances, an angle structure may consist of a self-supporting steel pole that will require a drilled pier concrete foundation. The pier will typically have a diameter of 4 to 8 feet. The hole may require a typical depth of 15 to 30 feet deep depending on design requirements. The pier will be filled with concrete delivered to the site via 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 via 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 other sensitive 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. Great River Energy right of way agents will coordinate with the landowners on replacement of fences and gates. As part of easement restriction lists, the contractor will work around cultivated areas until harvest has occurred.

9.1.2 Potato Lake Substation

Construction of the proposed Potato Lake 115 kV Substation will begin once permits are received and the final design is complete. A detailed construction schedule will be developed based upon availability of crews, outage restrictions for any transmission lines that may be affected, weather conditions, spring load restrictions on roads, and any restrictions placed on certain areas for minimizing impacts from construction.

Approximately one to two acres of the land acquired will be graded to construct the substation. The concrete foundation will be poured to support the substation equipment and control house.

All construction will be completed in accordance with state, NESC, and Great River Energy construction standards regarding clearance to ground, clearance to crossing utilities, clearance to buildings, right of way widths, erection of power poles (to connect the line to the substation), and stringing of transmission line conductors.

Itasca-Mantrap will obtain a National Pollutant Discharge Elimination System (NPDES) construction stormwater permit from the Minnesota Pollution Control Agency (MPCA) and will prepare the required Stormwater Pollution Prevention Plan. Erosion control methods will be utilized to minimize runoff during substation construction.

Upon completion of construction activities, 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 and/or Great River Energy 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.

Itasca-Mantrap will be responsible for all design, engineering and construction activities.

9.2 Operation and Maintenance

Great River Energy will periodically use its 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.

Great River Energy's Transmission Construction & Maintenance Department 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 three to seven year cycle. Right of way clearing practices include a combination of mechanical and hand clearing, along with an application of herbicides where allowed.

9.3 Work Force Requirements

During construction, there will be minimal positive impacts to community services, hotels and restaurants to support the utility personnel and contractors. It is estimated that 15 to 20 workers will be employed during construction of the Project.

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 may be purchased locally.

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10. AGENCY INVOLVEMENT, PUBLIC PARTICIPATION, PERMITS AND APPROVALS REQUIRED

10.1 Agency Contacts/Public Participation

Great River Energy contacted the following agencies for input on the proposed project:

Minnesota Department of Transportation – Office of Aeronautics

Minnesota Department of Transportation – Transportation Department (Highway Issues)

Minnesota Historical Society

US Army Corps of Engineers

Minnesota Department of Natural Resources

United States Fish and Wildlife Service

Hubbard County (phone conversations and e-mail)

Leech Lake Band of Ojibwe

Correspondence to and from these agencies is provided in Appendix A.

Great River Energy attended township board meetings in the Project area to describe the proposed Project to township board members. All of the township boards understand the need for additional electrical capacity in the Potato Lake area. Great River Energy also held a public information meeting on October 22, 2009 to solicit public input on the Project. Approximately 26 people from the public attended the meeting.

10.2 Identification of Landowners

The names of each owner whose property is within the Proposed and Alternate Routes (Minnesota Rules part 7850.1900, subp. 2G) are provided in Appendix B.

10.3 Required Permits and Approvals

A list of permits and other approvals that may be required for the Project in addition to a Minnesota Route Permit is presented in Table 10-1.

Table 10-1 Potential Permits Required

Permit	Jurisdiction
Federal Approvals	
Section 404 Permit, Clean Water Act (Local/State/Federal Application for Water/Wetland Projects, for discharge of fill due to placement of poles in wetlands) Section 106 Review	Corps of Engineers
Part 7460 review (to ensure compliance with 7460)	FAA
Spill Prevention, Control and Countermeasure (SPCC) Plan (Itasca-Mantrap, for Potato Lake Substation)	EPA
Minnesota State Approvals	
License to Cross Public Waters or State Lands	DNR – Lands and Minerals
Utility Permit (Road Crossing Permits to cross or occupy state trunk highway road right of way)	MnDOT
NPDES Permit (Itasca-Mantrap, for construction of Potato Lake Substation) **NPDES Permit** (Great River Energy, for line construction)	MPCA
Section 401, Clean Water Act	MPCA
Minnesota Local Approvals	
Land Permits, including road crossing/right of way permits (may be required to occupy lands such as parklands, watershed districts, and other publicly-owned land)	County, Township
Minnesota Wetland Conservation Act Exemption	County
Road Crossing Permits	County, Township
Overwidth Loads Permits	County, Township
Driveway/Access Permits	County, Township

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

Great River Energy has applied for a Route Permit for a 115 kV HVTL that will be operated initially at 34.5 kV and will operate at 115 kV when the surrounding system is upgraded to 115 kV. The Project will allow both Great River Energy and Itasca-Mantrap to maintain necessary voltage and reliability requirements in the Potato Lake Project area. The HVTL's two endpoints will be the proposed Potato Lake Substation on the west and the proposed switch on the existing Great River Energy PM Line on the east.

The role of the Commission is to determine the best route to follow to accomplish those requirements, and to determine what mitigation efforts Great River Energy should employ to reduce any human settlement or environmental consequences. Minnesota Rules part 7850.4100 lists 14 factors to consider in determining whether to issue a permit for the Proposed Route or Alternate 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 will not result in displacement of existing residences. The noise from the HVTL and substation will be minimal (Section 6.2.3).

The majority of the Proposed Route and Alternate Route are along existing distribution lines and roadway corridors and will have minimal aesthetic effects. The proposed HVTL and associated substation will have no impact on cultural values, recreation, or public services. Impacts to socioeconomics would be primarily of a short-term, beneficial nature.

The existing Itasca-Mantrap overhead distribution lines along the route will be removed and placed on the same poles as the new transmission line. Along roads, the centerline will be approximately two to five feet outside of the road right of way.

B. Effects on public health and safety.

The proposed Project will be constructed to comply with NESC standards. 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 and includes natural sources such as earth's magnetic field or fields produced during thunder storms, as well as manmade fields produced by electric transmission lines, radio/TV stations, etc. The electric and magnetic fields associated with the proposed Project are discussed in

Section 7.3 of this Application, summarized in Tables 7-1 and 7-2, and shown graphically on Figures 7-2 to 7-9.

Electric field intensity is proportional to the voltage of the line and is measured in kilovolts per meter (kV/m). Electrical fields are blocked by physical barriers, such as trees, buildings, etc.

The proposed 115 kV line will have a maximum magnitude of electric field density of approximately 0.98 kV/m underneath the conductors at one meter above ground level, which is well below the EQB standard of a maximum electric field limit of 8 kV/m 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.

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. Currently the maximum flow will be limited to the size of the transformer at the proposed Potato Lake Substation.

Because the magnetic field strength is dependent on current flow, it will continually change as electric demand increases or decreases. Typically the magnetic field will increase over time because the current flowing on the line increases as load growth occurs. The maximum magnetic field for the Project as proposed will be limited by the conductors.

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

The Proposed Route and Alternate Route for the HVTL do not significantly impact any prime agricultural, forestry or mining property. The existing distribution line alignment will be used near the Summerhill Farm tourist attraction[56], therefore impacts on tourism should be minimal (Section 6.3).

D. Effects on archaeological and historic resources.

The MHS indicated that “there are no properties listed on the National or State Registers of Historical Places, and no known or suspected archaeological properties in the area that will be affected by this project” (Section 6.4).

The Leech Lake Band of Ojibwe[57] stated that they “have determined that the Leech Lake Band of Ojibwe does not have any concerns regarding sites of religious or cultural importance in this area”.

[56] http://www.summerhill-farm.com (2009)
[57] Letter from Gina M. Lemon, Leech Lake Band of Ojibwe, to Michelle Lommel, Great River Energy, 23 October 2009. *See* Appendix A.

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

Effects of the proposed Project on the natural environment are discussed in Sections 6.5 to 6.7 of this Application.

No significant impacts to air quality will result from the proposed Project.

Short-term impacts to water quality resources could occur due to soil disturbance during construction. There is the possibility of sediment reaching surface waters during construction, as the ground is disturbed by grading (primarily at the substation site) and construction traffic. Great River Energy will implement BMPs such as silt fences to prevent sediment from entering surface waters.

Impacts to native, undisturbed flora will be avoided and/or minimized. Only trees and shrubs that would interfere with the safe operation of the line will be removed.

There is minimal potential for the displacement of fauna and loss of habitat from construction of the proposed or alternate route. Wildlife that inhabits natural areas could be impacted in the short-term within the immediate area of construction. This impact will be temporary because there is similar habitat adjacent to the sites.

F. Effects on rare and unique natural resources.

The DNR determined that there are five rare features in the Project area. Because the Proposed Route and Alternate Route will utilize existing electric distribution alignments and parallel existing roads, impacts to habitat will be minimized. Great River Energy will adhere to DNR recommendations to minimize impacts (Section 6.5.4; Appendix A).

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 or Alternate Route. Therefore, the design is appropriate to this Project and maximizes energy efficiency.

Great River Energy will work with affected landowners to use a design that mitigates the impact on their property and the right of way.

The Potato Lake Substation will be laid out to accommodate required equipment such as transmission line terminations, capacitor banks, transformers, and distribution related feeders should significant load growth occur in the area.

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

The Proposed Route and Alternate Route follow existing roads (Highway 71, 230th Street, 141st Avenue and CSAH 18), existing distribution line rights of way, and natural division lines for the entire lengths.

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.

See the comments under part H above.

K. Electrical system reliability.

Itasca-Mantrap, along with generation and transmission provider Great River Energy, serves the electric needs of the Potato Lake area. The existing Itasca-Mantrap distribution system serving the area has reached its capacity limit based on anticipated 2010 winter loading levels (approximately 23 MW). The area's electric load has shown a growth on average of over six percent per year over the last six years with additional growth expected to continue. This growth would further reduce the existing system's reliability and could lead to potential brownouts, rotating blackouts, and safety concerns due to overloaded equipment. The purpose of the proposed Project is to improve the capacity and reliability of the distribution system in the area to meet new expected loads within the next several years.

Great River Energy anticipates that the 34.5 kV system that serves the region will eventually be unable to handle the increased loading. Great River Energy is therefore seeking to construct the proposed Potato Lake transmission facilities to 115 kV specifications to ensure that this line could be easily integrated into a 115 kV system in approximately 4-5 years, and the 115 kV loop development in about 10-15 years. Historically, 115 kV transmission line has been inherently more reliable than other lower voltage lines due to increased ground clearance and insulation levels.

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 or Alternate Route are no higher, and are likely to be lower than along rejected alternative routes. The Proposed Route and Alternate Route parallel existing rights of way to the extent technically and economically feasible. This 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 construction of the line and substation. If any archaeological sites are identified during placement of the poles along the Proposed or Alternate route or construction of the substation, work will be stopped and the MHS will be consulted. Native vegetation will be maintained within the Proposed or Alternate 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 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.

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