GREAT RIVER ENERGY
and
XCEL ENERGY

APPLICATION TO THE
MINNESOTA ENVIRONMENTAL QUALITY BOARD
FOR A
ROUTE PERMIT

ALTERNATIVE PERMITTING PROCESS

AIR LAKE-EMPIRE
115 kV TRANSMISSION LINE
VERMILLION RIVER SUBSTATION

GREAT RIVER ENERGY℠
A Touchstone Energy® Cooperative

Xcel Energy
NORTHERN STATES POWER

April 30, 2004

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

APPENDICES

LIST OF ACRONYMS

ACRONYMS	
AC	Alternating current
ACSR	Aluminum conductor steel reinforced
ACSS	Aluminum conductor steel supported
amsl	Above mean sea level
ATV	All-terrain vehicle
BPA	Bonneville Power Administration
CFR	Code of Federal Regulations
Corps	United States Army Corps of Engineers
CP	Cooperative Power Association
CR	County Road
dB(A)	Decibel
DEA	Dakota Electric Association
DNR	Minnesota Department of Natural Resources
DOT	Minnesota Department of Transportation
EMF	Electromagnetic fields
EPA	Environmental Protection Agency
EPRI	Electric Power Research Institute
EQB	Minnesota Environmental Quality Board
FWS	United States Fish and Wildlife Service
G	Gauss
GRE	Great River Energy
HVTL	High voltage transmission line
kV	Kilovolt
MCM	Thousand circular mil
mG	Milligauss
MHS	Minnesota Historical Society
MHz	Megahertz
MN	Minnesota
MVA	Megavolt-ampere
MW	Megawatt
NAC	Noise area classifications
NESC	National Electric Safety Code
NRCS	Natural Resources Conservation Service
NWI	National Wetlands Inventory
PCA	Minnesota Pollution Control Agency
ppm	Parts per million
RUS	Rural Utilities Service
UPA	United Power Association
USDOE	United States Department of Energy
USGS	United States Geological Survey
V/m	Volts per meter
VHF	Very high frequency

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

Pursuant to Minn. Stat. § 116C.51 to 116C.69 and Minn. Rules pt. 4400.0400 et seq., Great River Energy (GRE) and Northern States Power d/b/a Xcel Energy (Xcel Energy) hereby apply to the Minnesota Environmental Quality Board (EQB) for a Route Permit for a high voltage transmission line (HVTL) and an associated substation in Dakota County, Minnesota to meet the electrical needs of Dakota Electric Association (DEA) and Xcel Energy customers located in the Farmington area. The application is submitted under the Alternative Permitting Process (Minn. Rules pt. 4400.2000).

The Application is divided into 15 sections as follows:

1. **EXECUTIVE SUMMARY** – provides background information on GRE, DEA and Xcel Energy and a brief justification for the project.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Minn. Stat. § 216B.243, Subd. 2, states that no large energy facility shall be sited or constructed in Minnesota without the issuance of a certificate of need by the Public Utilities Commission. Minn. Stat. § 216B.2421, Subd. 2(3) defines a "large energy facility" as any high voltage transmission line with a capacity of 100 kilovolts or more with more than ten miles of its length in Minnesota or that crosses a state line. The proposed 115 kV transmission line that is the subject of this application is

9.25 miles long, therefore it does not meet the definition of a large energy facility and no certificate of need is required.

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

1. EXECUTIVE SUMMARY

1.1 General

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

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

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

DEA provides electricity and related services to approximately 93,000 residential, commercial and industrial customers in Minnesota. Approximately 10,000 residential, commercial and industrial DEA customers in the Farmington/Lakeville area would benefit from the proposed project.

Xcel Energy is a subsidiary of Xcel Energy, Inc. Xcel Energy, Inc. is headquartered in Minneapolis, Minnesota, and is the fourth-largest combination electricity and natural gas energy company in the United States. Xcel Energy provides a comprehensive portfolio of energy-related products and services to 3.2 million electricity customers and 1.7 million natural gas customers through its regulated operating companies in Colorado, Kansas, Michigan, Minnesota, New Mexico, North Dakota, Oklahoma, South Dakota, Texas, Wisconsin, and Wyoming (Figure 1-2). Xcel Energy owns over 240,000 circuit miles of electric transmission and distribution lines, and more than 32,700 miles of natural gas pipelines; and operates regulated power plants that generate about 15,246 megawatts of electric power.

In Minnesota, Xcel Energy provides electricity to approximately 1.2 million customers and natural gas to approximately 400,000 customers. Approximately 4,500 residential, commercial and industrial Xcel Energy customers in the Farmington/Lakeville area would benefit from the proposed HVTL.

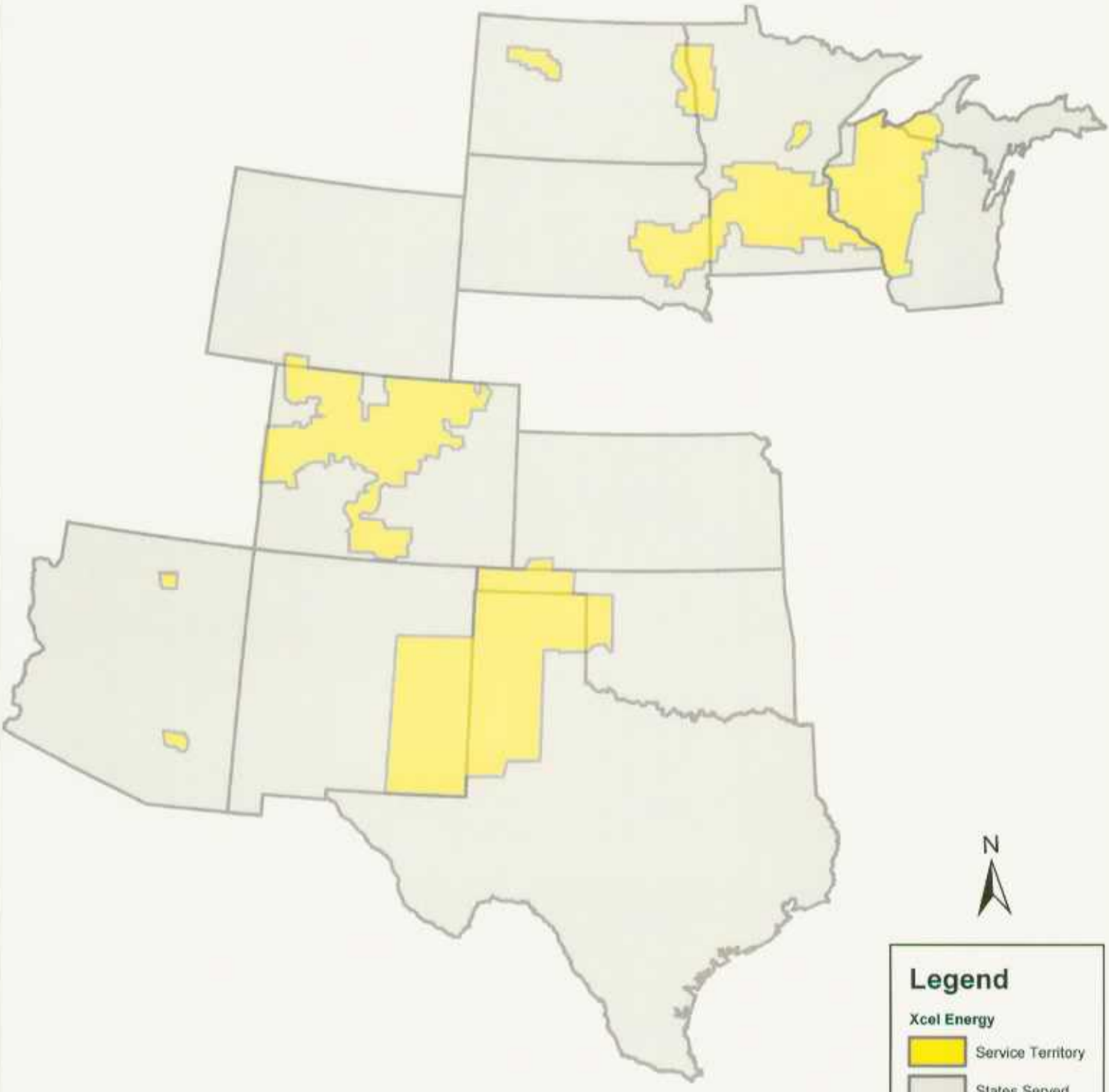
GRE, DEA and Xcel Energy's mission is to provide safe, reliable, competitively priced energy to those it serves. The electrical load in the southeast portion of the Twin Cities has grown beyond the capability of the existing 69 kilovolt (kV)

Figure 1-1

GRE Service Territory

Figure 1-2

Xcel Energy Service Territory



Xcel Energy
NORTHERN STATES POWER

Updated: 03/10/04

and 115 kV sources. Specifically, the 69 kV system from the Pilot Knob Substation in Eagan to the Farmington Substation is at capacity during normal system conditions. Any line failures that may occur in the Farmington, Castle Rock, or Lake Marion areas place a further strain on reliability. The project described in this route application will provide an additional 115 kV source into the area, strengthening the capacity of the power grid and allowing the DEA and Xcel Energy distribution systems to maintain adequate voltage and improve reliability to customers.

1.2 Description of the Proposed Project

GRE and Xcel Energy propose to construct approximately 9.25 miles of 115 kV transmission line and a new distribution substation to meet the growing electrical load in the Farmington area. The proposed route is located within the cities of Lakeville and Farmington and in Empire Township as shown on Figure 1-3.

The proposed 115 kV transmission line will connect the existing Xcel Energy Air Lake Substation, the proposed new Xcel Energy/DEA Vermillion River Substation, and the existing GRE/DEA/Xcel Energy Empire Substation (Figure 1-3). The first 0.5 mile of transmission line between Xcel Energy's Air Lake Substation and Cedar Avenue is already a triple circuit 115 kV line (with one circuit operated at 69 kV) and is not part of this Application.

The proposed line will be double-circuited with Xcel Energy's existing 69 kV transmission line from the intersection of County Road (CR) 50 and Cedar Avenue to the Vermillion River Substation, and then follow a new right of way between the Vermillion River and Empire substations. Specific components of the project are discussed below. Figure 1-3 identifies the location of each of these components.

- Build the new Xcel Energy/DEA Vermillion River Substation, which will be owned by Xcel Energy. DEA will have easement rights for its distribution facilities in the substation.

- Add approximately 2.75 miles of 115 kV line to the existing Xcel Energy single circuit 69 kV line along CR 50 from Cedar Avenue to just east of Eaton Avenue, then north into the proposed Vermillion River Substation. The existing single circuit Xcel Energy line would be rebuilt to a double circuit configuration for this 2.75-mile distance. Both circuits would be designed and insulated to 115 kV, with one circuit operated at 69 kV. This section of line will be owned by Xcel Energy.

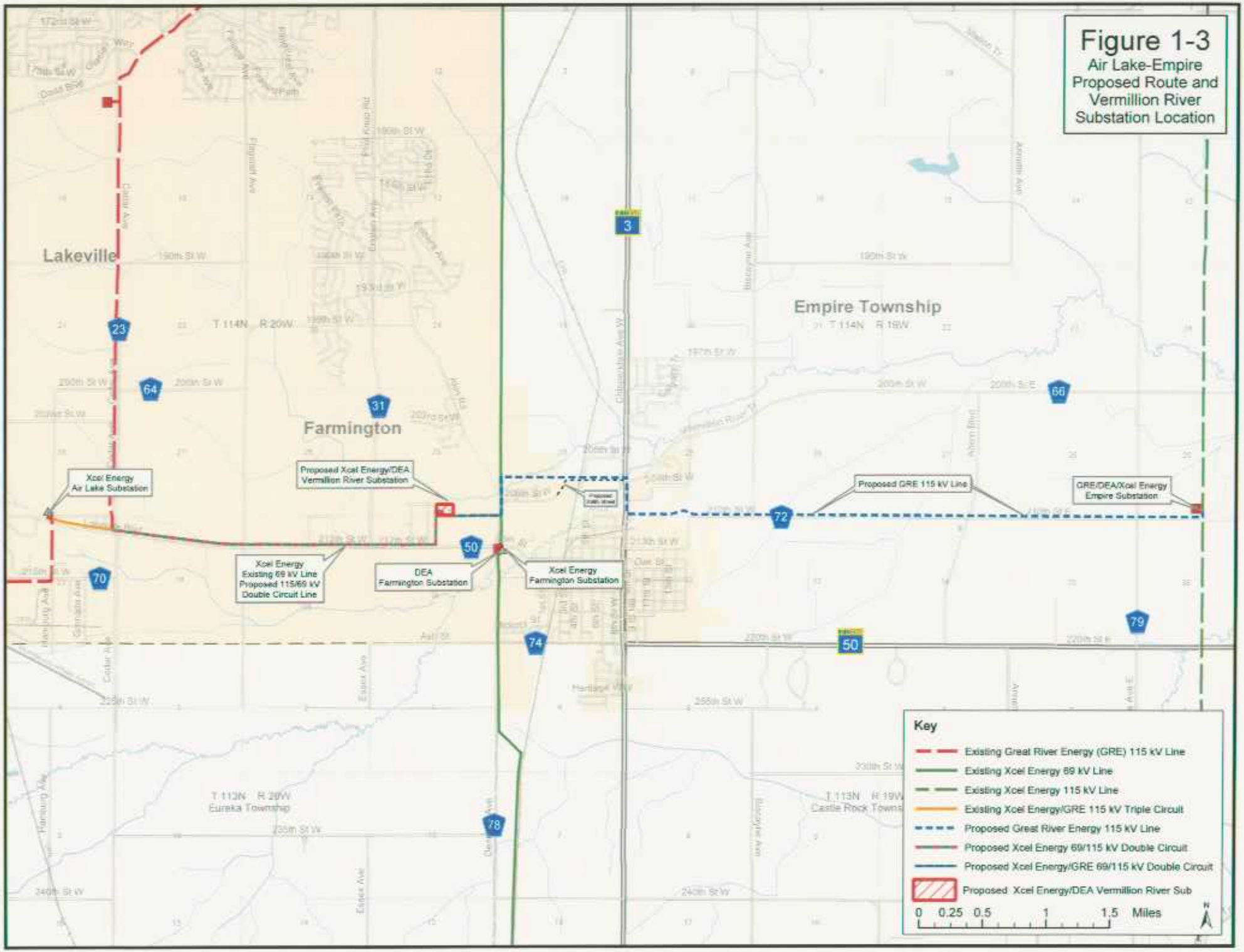


Figure 1-3
Air Lake-Empire Proposed Route and Vermillion River Substation Location
Lakeville
Farmington
Empire Township
T 114N R 20W
T 114N R 19W
T 113N R 20W
Eureka Township
T 113N R 19W
Castle Rock Township
Xcel Energy Air Lake Substation
Proposed Xcel Energy/DEA Vermillion River Substation
Xcel Energy Existing 69 kV Line Proposed 115/69 kV Double Circuit Line
DEA Farmington Substation
Xcel Energy Farmington Substation
Proposed GRE 115 kV Line
GRE/DEA/Xcel Energy Empire Substation
Key
Existing Great River Energy (GRE) 115 kV Line
Existing Xcel Energy 69 kV Line
Existing Xcel Energy 115 kV Line
Existing Xcel Energy/GRE 115 kV Triple Circuit
Proposed Great River Energy 115 kV Line
Proposed Xcel Energy 69/115 kV Double Circuit
Proposed Xcel Energy/GRE 69/115 kV Double Circuit
Proposed Xcel Energy/DEA Vermillion River Sub
0 0.25 0.5 1 1.5 Miles
N

- Build approximately 6.5 miles of new 115 kV transmission line between the Vermillion River Substation and the Empire Substation. The line will exit the Vermillion River Substation as a 115 kV single circuit line for 150-200 feet, connect with an Xcel Energy 69 kV line, and proceed as a 115/69 kV double circuit line east to Akin Road (approximately 1/3 mile total), then north along the east side of Akin Road for approximately 1/3 mile. The double circuit line will be built to 115 kV specifications, with one circuit operated at 69 kV.

  At this point, the 115 kV single circuit will split off from the double circuit and head east one mile along the extension of the north side of proposed 208th Street, crossing the Vermillion River, to the northeast corner of CR 66 and Minnesota (MN) Hwy 3. The line then turns south approximately 1/3 mile along the east side of MN Hwy 3 to the south property line of the American Legion, turns easterly for about ½ mile, then proceeds east along the north side of 210th Street for 4 miles to the Empire Substation. Approximately 3.5 miles of the 4 miles along 210th Street will follow existing DEA and Xcel Energy distribution lines.

  This 6.5 mile section of transmission line will be owned by GRE.

Construction timing for the project is shown in Table 1-1.

Table 1-1 Construction Schedule for Air Lake-Empire HVTL

Year	Project	Miles
2005-2006	Build Vermillion River Substation	
2006	Build double circuit 69/115 kV line between Cedar Ave/CR 50 and Vermillion River Sub.	2.75
	Build 115 kV line between Vermillion River Substation and Empire Substation	6.50

2. NEED FOR THE PROJECT

The southeastern part of the Twin Cities is one of the fastest growing areas of the metropolitan area. It is experiencing rapid housing and commercial development, much of it near Lakeville and Farmington. The primary source of electrical service to this region is from the north via the Twin Cities transmission grid. Both 115 kV and 69 kV transmission lines are used to deliver power south to this area from the Twin Cities system, with the primary transmission substations of Black Dog 115 kV, Pilot Knob 115/69 kV and the Inver Hills 345/115 kV.

There are several factors contributing to the need for the Air Lake to Empire 115 kV transmission line. Each factor can be linked back to the growing electrical load in the area. The need is summarized as follows:

- Low contingency voltage on the Dakota County 115 kV system
- Overload of the 69 kV system to Farmington
- Need for additional distribution substation capacity

Recent transmission studies of this area have identified low voltages on the Dakota County area 115 kV system during contingency situations and overloading of the 69 kV system in the Farmington area. The area was studied in 1999 by Xcel Energy as part of the southeast metro portion of its system studies (Northern States Power, 2000). It was also studied by GRE for the *GRE Long Range Transmission Plan–2003* (GRE, 2003). The distribution needs of Xcel Energy and DEA were studied in individual studies by the respective companies.

A significant amount of inter-utility communication has taken place over the last few years resulting in the combined distribution and transmission plan to provide electric service in the Dakota County area. The planning processes have included public communication of the issues in the Minnesota Biennial Transmission Plan process. The needs and options for this area were presented in the public planning meeting for the Twin Cities zone held on August 19, 2003 to provide information about the existing transmission system, describe the future needs for improvements, and solicit input from the public. This project is included in the 2003 Minnesota Biennial Transmission Projects Report as the recommended plan for the Southeast Twin Cities area.

Xcel Energy and DEA each supply a substantial service territory and electrical load in Dakota County. Table 2-1 shows load data by substation for the Lakeville-Farmington-Empire area directly benefited by this project. The table shows a significant increase of load, driving the need for additional transmission and distribution facilities.

Table 2-1 Expected Electrical Demand (MW) by Substation

Substation	2001	2006	2011	2026
DEA Farmington/ Vermillion River	7.9	11.9	16.1	31.0
Xcel Energy Farmington	14.5	18.8	22.1	30.9
DEA Dodd Park	23.2	17.7	25.6	48.1
DEA Lakeville (1)	—	17.4	22.8	37.1
Xcel Energy Air Lake	35.8	46.6	57.3	80.2
DEA Empire (2)	—	5.2	6.3	15.7
Xcel Energy Rosemount	11.4	14.5	16.6	23.1
Totals	92.8	132.1	166.8	266.1
% Yearly Growth	—	7.3%	4.8%	3.2%

Notes:
(1) The DEA Lakeville Substation will be energized May, 2004.
(2) The DEA Empire Substation was energized May, 2002.

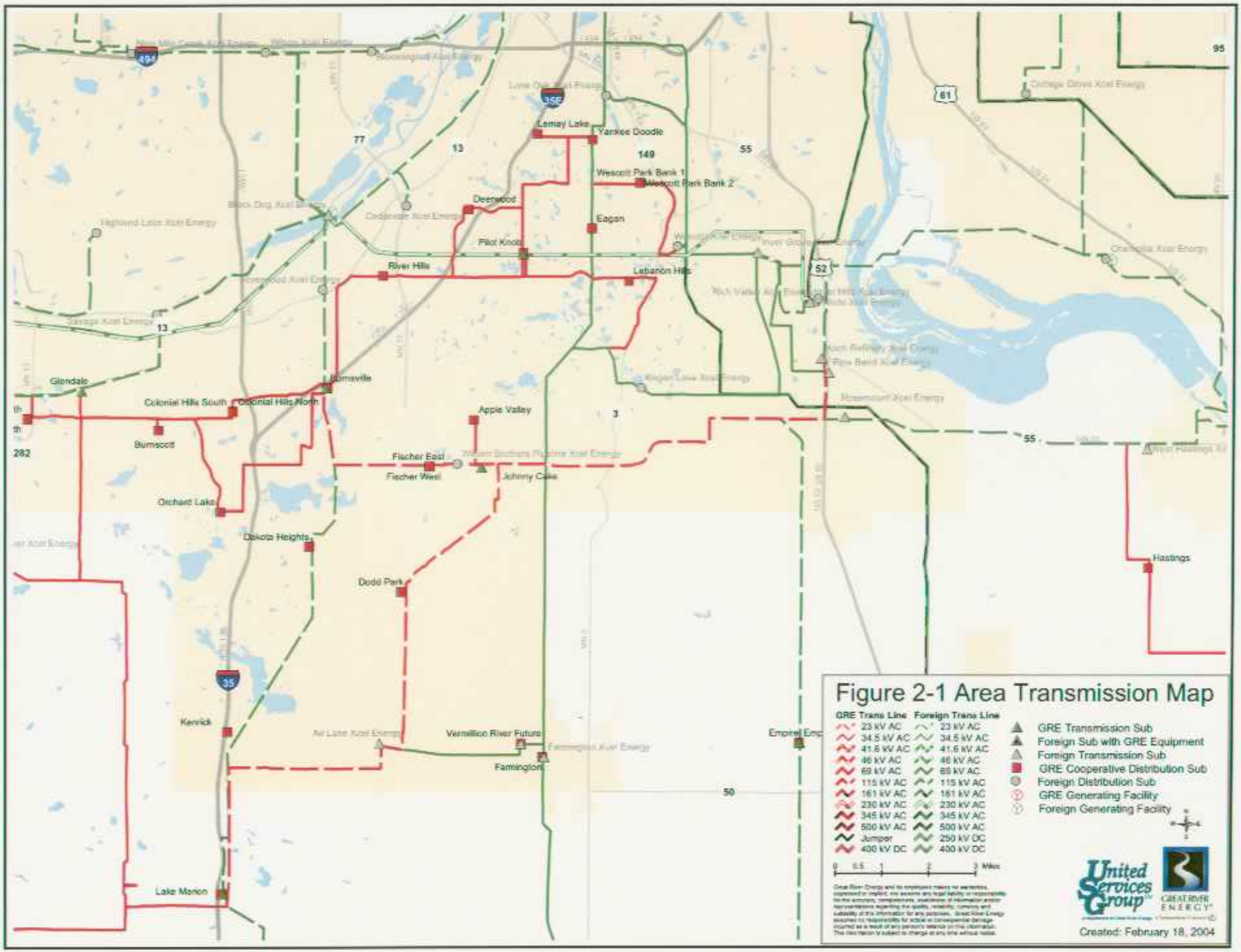
Population growth data shown below in Table 2-2 confirm the development trends and ongoing increase in demand. The Farmington population doubled from 1990 to 2000 based on census data and the high growth is projected to continue over the next 30 years. Lakeville is also experiencing very high growth with an increase of 73.5 percent from 1990 to 2000.

Table 2-2 Population Growth in Farmington, Empire Township, and Lakeville

Year	Farmington	Empire Township	Lakeville
1990	5,940	1,340	24,854
2000	12,365	1,638	43,128
2010	20,500	2,050	58,000
2020	27,100	4,400	77,000
2030	32,000	4,900	86,000
% Ann. Growth 2000 to 2010	5.0%	2.5%	3.4%

Source: Metropolitan Council, 2004

The electrical power flow for the Dakota County 115 kV system (see Figure 2-1) is normally from the Twin Cities transmission grid through the Black Dog 115 kV Substation and the Inver Hills 345/115 kV Substation. The 115 kV system consists of north-south lines from Black Dog to Burnsville to Lake Marion and Inver Hills to Koch to Rosemount to Cannon Falls. The 115 kV system also has an east-west line from Burnsville to Johnny Cake to Koch, and another line from Johnny Cake to Air Lake to Lake Marion. The Air Lake to Empire 115 kV line will complete another east-west line to increase transmission reliability with a stronger tie to the Inver Hills source.


Lemay Lake
Yankee Doodle
Wescott Park Bank 1
Wescott Park Bank 2
Deerwood
Eagan
Pilot Knob
River Hills
Lebanon Hills
Glendale
Burnsville
Colonial Hills South
Colonial Hills North
Apple Valley
Burnscott
Fischer East
Fischer West
Johnny Cake
Orchard Lake
Dakota Heights
Dodd Park
Kenrick
Vermillion River Future
Farmington
Lake Marion
Hastings
Figure 2-1 Area Transmission Map
GRE Trans Line
23 kV AC
34.5 kV AC
41.6 kV AC
46 kV AC
69 kV AC
115 kV AC
161 kV AC
230 kV AC
345 kV AC
500 kV AC
Jumper
400 kV DC
Foreign Trans Line
23 kV AC
34.5 kV AC
41.6 kV AC
46 kV AC
69 kV AC
115 kV AC
161 kV AC
230 kV AC
345 kV AC
500 kV AC
250 kV DC
400 kV DC
GRE Transmission Sub
Foreign Sub with GRE Equipment
Foreign Transmission Sub
GRE Cooperative Distribution Sub
Foreign Distribution Sub
GRE Generating Facility
Foreign Generating Facility
Miles
United Services Group
GREAT RIVER ENERGY
Created: February 18, 2004

The existing 115 kV system will experience low voltage conditions for the projected loads for an outage of the Black Dog to Riverwood 115 kV line (the Riverwood Substation is located between Black Dog and Burnsville on the Black Dog to Burnsville line).

The 69 kV system to the Farmington area is supplied by 115/69 kV sources at the Lake Marion and Pilot Knob substations (Pilot Knob is located between Black Dog and Inver Hills on another 115 kV transmission line in northern Dakota County). The 69 kV system also continues south from Farmington providing one of the sources to the Northfield area. The capability of the 69 kV system to supply additional load is limited. An outage of the 115 kV Black Dog to Riverwood line will cause the Pilot Knob to Farmington 69 kV line to overload. An outage of the Lake Marion to Farmington 69 kV line or the Lake Marion 115/69 kV transformer will also overload the Pilot Knob-Farmington line at projected loads.

Continued expansion of the 69 kV system is not recommended. The facility additions necessary would, in the long term, be significantly more extensive than those needed to supply the load directly from the 115 kV system. Other benefits of supplying distribution substations at 115 kV include higher reliability and lower system losses. The primary source of higher losses with serving distribution from the 69 kV system is the extra transformer step required to move power from the 115 kV system to the 69 kV voltage level. This project takes advantage of a strategic opportunity to move load to the 115 kV system and allow future growth to be served from 115 kV substations.

The distribution needs for the Air Lake-Vermillion River-Empire project are also driven by the population and development of the area. Distribution substation capacity upgrades are required to supply the increased electrical load. Both the Xcel Energy and DEA Farmington substations require additional capacity. They both also have physical restrictions that limit upgrades or expansion. This, coupled with the limitations of the 69 kV system to supply additional load, requires the development of the new Vermillion River 115 kV source.

At present load levels, the DEA Farmington Substation cannot provide reliable backup capacity for other substations and it will exceed its capacity rating within two or three years. Expansion of the existing substation is not possible due to property limitations. When the Vermillion River Substation is completed, the DEA Farmington Substation will be retired with its entire load transferred to the new substation. The Xcel Energy Farmington Substation will remain.

Xcel Energy will limit the amount of load supplied by its Farmington Substation and add capacity at the Vermillion River Substation when required. The firm capacity (maximum capacity for reliable distribution service) at Air Lake will be fully utilized within the next few years. Air Lake is Xcel Energy's only feasible long range existing site alternative to supply load growth in the Farmington area.

The Xcel Energy service territory between Rosemount and Farmington is presently sparsely developed and could be supplied from the Rosemount Substation, but the area has significant growth potential that cannot be adequately supplied from Rosemount. The amount of projected load could not be reliably served given the distance from the Rosemount Substation.

The development of the new Air Lake-Empire 115 kV transmission line and the new Vermillion River Substation will provide for additional load growth in the area and the necessary transmission expansion to maintain reliable electric service for Dakota County. As a joint effort among the utilities, the project will minimize facility requirements and environmental impacts as compared to each utility developing independent facilities.

3. OWNERSHIP/PERMITTEE

3.1 Proposed Ownership

3.1.1 Segment 1 - Air Lake Substation to Vermillion River Substation (Xcel Energy)

Xcel Energy owns the Air Lake Substation and will own all the equipment additions.

The transmission line between the Air Lake Substation and Cedar Avenue is owned by Xcel Energy. It is already built as a triple circuit 115 kV line (with one circuit operated at 69 kV) and is not part of this Application, as no modifications need to be made.

Xcel Energy is rebuilding the 2.75 mile section of transmission line from Cedar Avenue to the Vermillion River Substation from a single circuit 69 kV transmission line to a double circuit 115 kV transmission line, with one circuit operated at 69 kV. Xcel Energy will own these structures.

3.1.2 Vermillion River Substation (Xcel Energy)

Xcel Energy will own the new Vermillion River Substation and DEA will have a permanent easement for its facilities on the western ¼ portion of the proposed substation. The substation will be located on 11.4 acres in the city of Farmington, Dakota County, Minnesota near the intersection of CR 50 and Akin Road.

Within the new substation, Xcel Energy will own and operate all the high voltage (115 kV) facilities, the control house, and all common facilities (land, fence, etc.). Xcel Energy and DEA will separately own and operate their respective low voltage distribution facilities.

3.1.3 Segment 2 - Vermillion River Substation to Empire Substation (GRE)

GRE Energy will own the short (roughly 0.7 mile) segment of 115 kV transmission line east out of the Vermillion River Substation that will be double circuited with the existing Xcel Energy 69 kV line.

GRE will own the approximately 5.8 miles of single circuit 115 kV transmission line that will proceed from Akin Road east to the Empire Substation.

3.1.4 Empire Substation (GRE/Xcel Energy/DEA)

The Empire Substation and the common facilities (land, fence, etc.) are owned by Great River Energy. Xcel Energy owns and operates all the high side

equipment within this substation. DEA owns and operates all the low voltage distribution facilities. Xcel Energy and DEA have permanent easements for their respective facilities in the substation.

3.2 Permittees

Great River Energy and Northern States Power Company, a Minnesota Corporation, d/b/a Xcel Energy will be named as permittees for this project. Transfer of the permit to any other person or organization is not anticipated.

Contact information for GRE and Xcel Energy are provided below.

Permittee:	Great River Energy 17845 East Highway 10 PO Box 800 Elk River, Minnesota 55330
Contact:	Carole L. Schmidt
Phone:	(763) 241-2272
Fax:	(763) 241-6072
Email:	cschmidt@grenergy.com

Permittee:	Xcel Energy 414 Nicollet Mall Minneapolis, Minnesota 55401
Contact:	Pamela J. Rasmussen
Address:	P.O. Box 8 Eau Claire, WI 54702-0008
Phone:	(715) 839-4661
Fax:	(715) 839-2480
Email:	pamela.jo.rasmussen@xcelenergy.com

4. ALTERNATIVES CONSIDERED AND REJECTED

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

4.1 Alternative Routes Considered for Transmission Segment 1 – Cedar Avenue to Vermillion River Substation

For the portion of the project between Cedar Ave./CR 50 and the Vermillion River Substation, no routing alternatives were available or considered. The existing 69 kV transmission line alignment parallel to 212th Street W. is the optimal location for a transmission line in this area, given the substantial development along this corridor. Any alternative route would open up a new corridor and result in much greater human and environmental resource impacts.

4.2 Alternative Sites Considered for the Vermillion River Substation

Several alternative sites were considered for the Vermillion River Substation (see Figure 4-1), based on their proximity to transmission, land availability and distribution access for a joint Xcel Energy/ DEA substation. None of the alternatives is deemed acceptable. The alternative sites considered and the problems associated with each are:

- **Site 1 Expand existing Xcel Energy and DEA Farmington Substations** - The existing substation properties are insufficient for the proposed 115 kV substation. Parkland adjacent to the existing substations is in a potential floodplain and would need to be acquired from the City of Farmington. This land was partially funded with federal monies and any sale would require federal approval. The City of Farmington was not receptive to this option.

- **Site 2 Knutesen Family Property** - This land is planned for light industrial use. Sufficient land was available to build the proposed substation; however, the site was not favorable to the City of Farmington development plan. The owners were not contacted regarding this site.

- **Site 3 Industrial Park Lot 2, Block 1, Farmington Industrial Park 2nd Addition** - When this site was initially evaluated, there was a gas pipeline dividing the property. Absent relocation of the pipeline, the buildable portion of the property was insufficient in size. The possibility and cost to relocate the pipeline was discussed but made this site undesirable. The site has been recently divided into three lots, none of which would be large enough for the substation site.


Figure 4-1
Alternative Sites Considered for the Vermillion River Substation
Existing Xcel Energy 69 kV Line
Site 4
Site 3
Vermillion River Substation Site
Xcel Energy Existing 69 kV Line
Site 2
Site 1
Key
Proposed Xcel Energy/DEA Vermillion River Sub
Alternative Sites Considered
Existing Xcel Energy 69 kV Line
0 0.125 0.25 0.5 Miles
N

- **Site 4 Church Property** - This is currently church-owned property with new construction nearing completion. The property was vacant land when originally considered as a potential site.

The substation site proposed in this Application fits the best into the overall land use of the area and is in close proximity to the existing 69 kV transmission line.

4.3 Alternative Routes Considered For Transmission Segment 2 – Vermillion River Substation to Empire Substation

For the portion of the project requiring new right of way, GRE put forth considerable effort to find an alignment that would have the least impact on human and natural resources. In that process, GRE evaluated two primary alternate routes, which are shown on Figure 4-2 and described below.

4.3.1 Alternative 1 - County Road 66 (200th Street W)

This alternative route would exit the Vermillion River Substation as a 115 kV single circuit line, connect with the Xcel Energy 69 kV line, and proceed as a 115/69 kV double circuit line east to Akin Road, then north along the east side of Akin Road approximately ¼ mile. At this point the 115 kV circuit would split off and head east along the extension of the north side of proposed 208th Street, crossing the Vermillion River, to the northeast corner of CR 66 and MN Hwy 3. It would continue east along CR 66 for 4.5 miles to the intersection with an Xcel Energy 115 kV line, and proceed south as a double circuit 115 kV line about one mile to the Empire Substation.

This alternative route is more congested than the proposed route, with approximately 52 houses, and 4 townhomes. It is also very close to the Vermillion River in places, which would result in greater impacts to the river than the crossings along the proposed route. Because CR 66 makes many turns to avoid the river, multiple specialty poles would be required to construct along this route. This route would also require more tree clearing than the proposed route.

This corridor is identified as a main east-west road corridor in the Dakota County East-West Corridor Study (Dakota County, 2003). Future road improvements will require expansion of the right of way to state standards and relocation of any transmission lines.

4.3.2 Alternative 2 - Minnesota Highway 50 (220th Street W)

This alternative route would exit the Vermillion River Substation east to Akin Road, turn south on Akin Road for approximately one mile to Ash Street (as a double circuit 115/69 kV line), turn east on Ash Street (as a single circuit line) and proceed one mile to the intersection of Ash Street and MN Highway 3. At this intersection the east-west road becomes MN Highway 50 (220th St. W). The

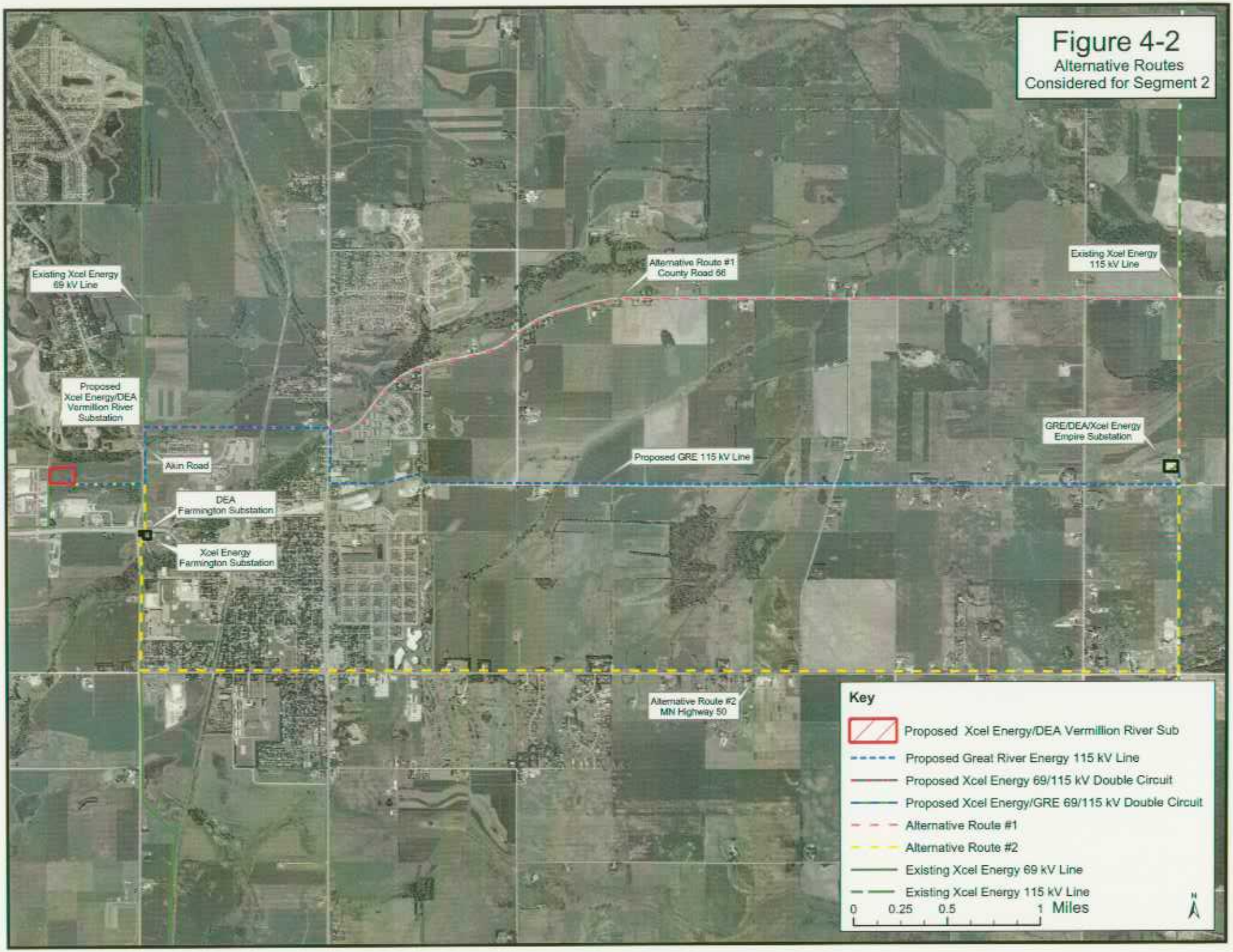


Figure 4-2
Alternative Routes
Considered for Segment 2
Existing Xcel Energy
69 kV Line
Alternative Route #1
County Road 66
Existing Xcel Energy
115 kV Line
Proposed
Xcel Energy/DEA
Vermillion River
Substation
GRE/DEA/Xcel Energy
Empire Substation
Akin Road
Proposed GRE 115 kV Line
DEA
Farmington Substation
Xcel Energy
Farmington Substation
Alternative Route #2
MN Highway 50
Key
Proposed Xcel Energy/DEA Vermillion River Sub
Proposed Great River Energy 115 kV Line
Proposed Xcel Energy 69/115 kV Double Circuit
Proposed Xcel Energy/GRE 69/115 kV Double Circuit
Alternative Route #1
Alternative Route #2
Existing Xcel Energy 69 kV Line
Existing Xcel Energy 115 kV Line
0 0.25 0.5 1 Miles
N

route would follow 220th St. W east for 4.5 miles to the intersection with an Xcel Energy 115 kV line, and proceed north as a double circuit 115 kV line about one mile to the Empire Substation.

This alternative route was rejected because the congested nature of the corridor would result in significantly greater human resource impacts than the proposed route. There are approximately 95 houses, 9 townhomes, 11 businesses, 3 apartment complexes, 3 parks, 2 schools, 2 churches, and the Dakota County Fairgrounds along this route. A significantly greater amount of tree clearing would also be required along this route.

This corridor is also identified as a main east-west road corridor in the Dakota County East-West Corridor Study. Future road improvements will require expansion of the right of way to state standards and relocation of any transmission lines.

4.4 Alternative Transmission Plans

The transmission alternative to the Air Lake-Empire 115 kV transmission line is to continue adding load to the 69 kV system at Farmington. This would require a rebuild of the existing Pilot Knob to Farmington 69 kV line to a higher capacity. The required rebuild includes 11.9 miles of line including a short underground section just south of the Pilot Knob Substation. A large capacitor bank would also be needed at the Air Lake 115 kV Substation for voltage support to the area. By 2009, this alternative would require a second 115 kV transmission line from Black Dog to Burnsville to meet requirements in the event of an outage of the existing Black Dog-Riverwood 115 kV line.

To provide the required distribution substation capacity, DEA would have to expand its existing Farmington Substation by rebuilding it with a larger transformer. Xcel Energy would need to create a new distribution substation in the area.

The physical limitations of the existing 69 kV locations make it impractical to add the necessary equipment needed to meet long-range needs for the area. Both the Pilot Knob and Farmington substations are surrounded by existing roadways, houses, and parks. Expansion needs at these locations would require complete relocation of the substations.

There are no other feasible transmission alternatives to provide the transmission capacity needed for the local load serving issues.

5. DESCRIPTION OF THE PROJECT

The first half mile of transmission line exiting Xcel Energy's Air Lake Substation to the east is currently a triple circuit 115 kV transmission line. Xcel Energy owns two of the circuits (one of which is operated at 69 kV) and GRE owns the remaining 115 kV circuit. Because this section of line is already designed to and capable of operating as a triple circuit 115 kV line, it is not part of this Application.

5.1 Transmission Segment 1 – Cedar Avenue to Vermillion River Substation (Xcel Energy)

The route for which Xcel Energy is requesting a permit from the EQB begins at the intersection of CR 50 and Cedar Ave. and continues to the Vermillion River Substation (Segment 1) as shown in Figure 5-1.

The project route will head east along the north side of CR 50 for approximately 2.5 miles. A new double circuit 115/69 kV transmission line with distribution underbuild will replace the existing 69 kV line with distribution underbuild along this route. At that point the double circuit line will turn north for approximately ¼ mile to the new proposed Vermillion River Substation site. The 69 kV line will continue to the east along its existing alignment and the 115 kV line will extend approximately 300 feet north into the Vermillion River Substation.

5.2 Vermillion River Substation (Xcel Energy and DEA)

The new Vermillion River Substation will be located on 11.4 acres in an Industrial Park in the city of Farmington, Dakota County, Minnesota near the intersection of CR 50 and Akin Road. The area is zoned for light industrial use. Initially the fenced-in area of the substation will be 550 feet by 200 feet and will use approximately 2.5 acres of this site. Figure 5-2 shows photos of the proposed substation site.

Xcel Energy will own the new Vermillion River Substation and DEA will have a permanent easement for its facilities on the western ¼ portion of the proposed substation. Xcel Energy will own and operate all the high voltage (115 kV) facilities, the control house, and all common facilities (land, fence, etc.). Xcel Energy and DEA will own and operate their respective low voltage distribution facilities. Figure 5-3 depicts the proposed initial substation layout.

The Vermillion River Substation will be laid out to accommodate the installation of future feeders and transformers should significant load growth occur in the area. Figure 5-4 shows a possible future layout of the substation.

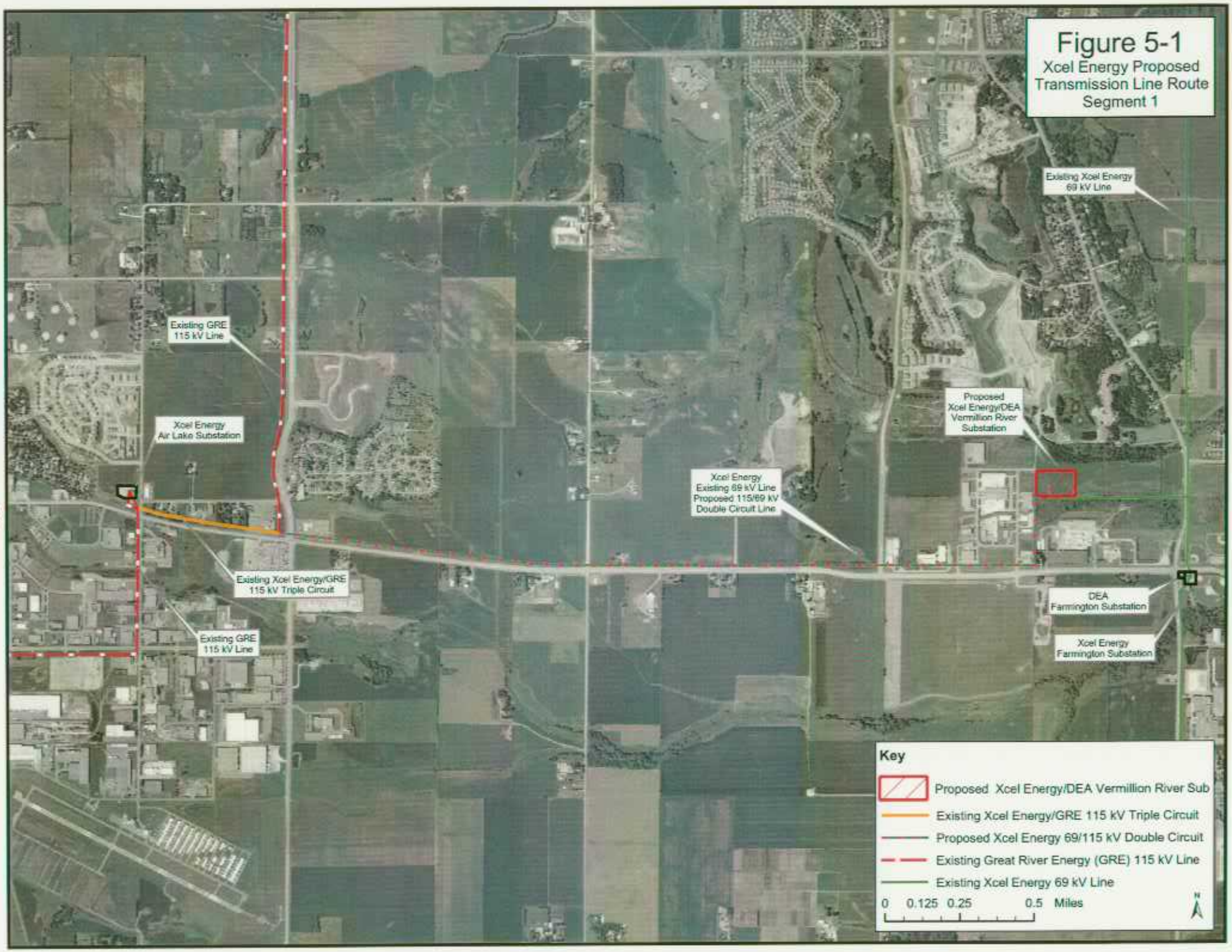


Figure 5-1
Xcel Energy Proposed
Transmission Line Route
Segment 1
Existing Xcel Energy
69 kV Line
Existing GRE
115 kV Line
Xcel Energy
Air Lake Substation
Proposed
Xcel Energy/DEA
Vermillion River
Substation
Xcel Energy
Existing 69 kV Line
Proposed 115/69 kV
Double Circuit Line
Existing Xcel Energy/GRE
115 kV Triple Circuit
Existing GRE
115 kV Line
DEA
Farmington Substation
Xcel Energy
Farmington Substation
Key
Proposed Xcel Energy/DEA Vermillion River Sub
Existing Xcel Energy/GRE 115 kV Triple Circuit
Proposed Xcel Energy 69/115 kV Double Circuit
Existing Great River Energy (GRE) 115 kV Line
Existing Xcel Energy 69 kV Line
0 0.125 0.25 0.5 Miles
N

Figure 5-2 Photos of Proposed Vermillion River Substation Site

Photo 1. Looking east toward proposed Vermillion River Substation Site from Eaton Avenue.

Photo 2. Looking south toward the existing 69 kV transmission line.

Figure 5-3 Initial Vermillion River Substation Layout

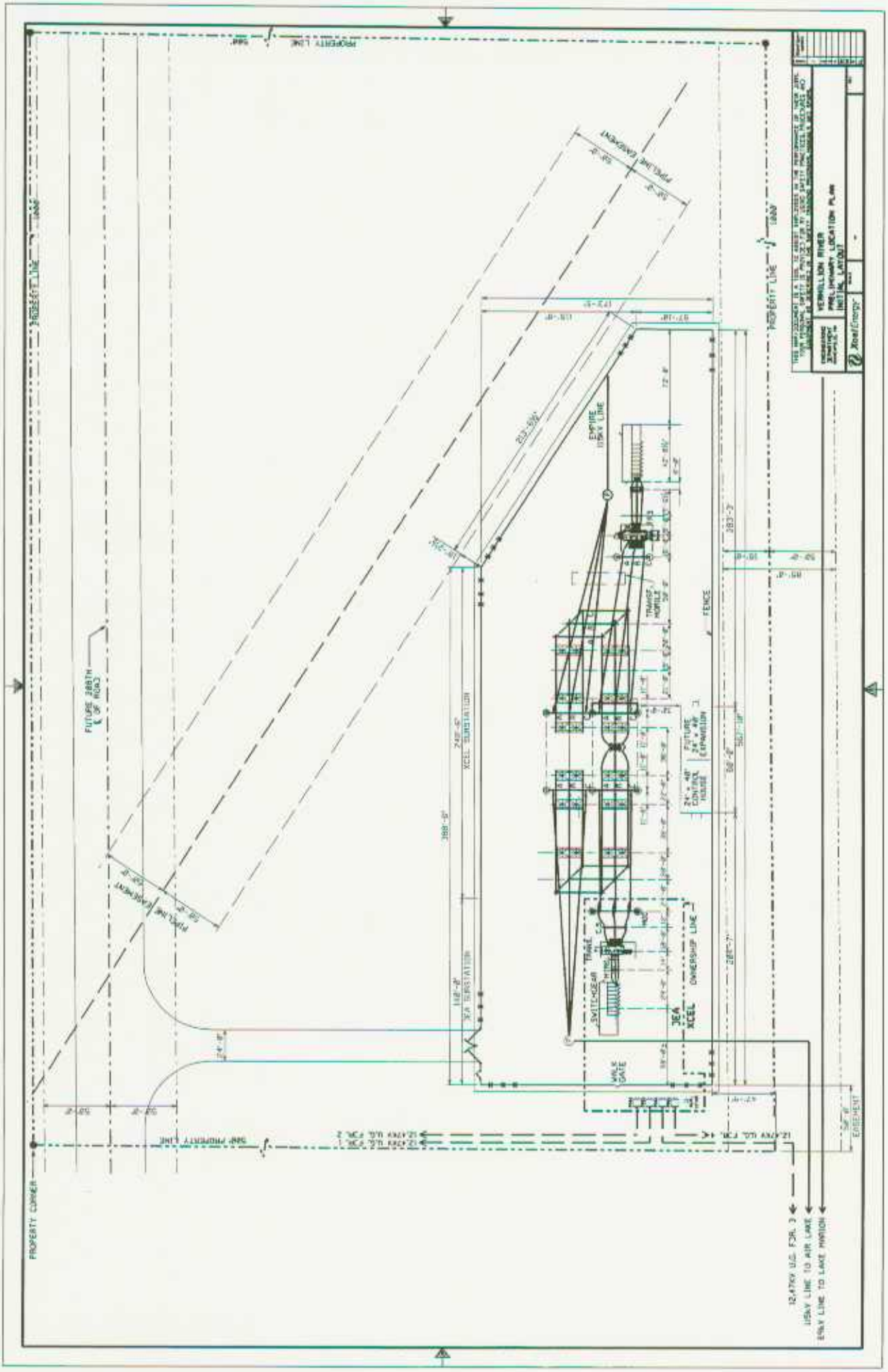
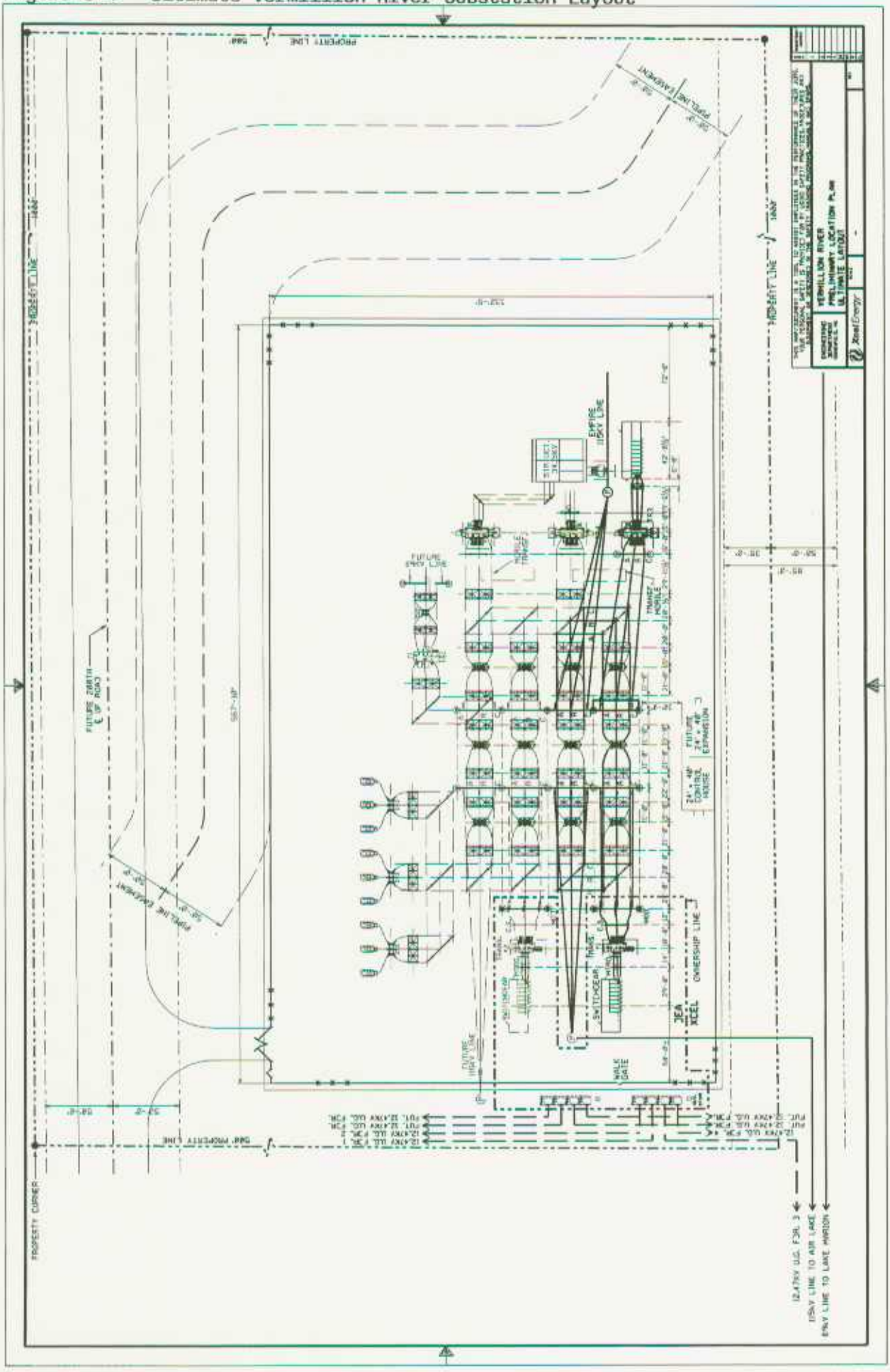


Figure 5-4 Ultimate Vermillion River Substation Layout



5.3 Transmission Segment 2 – Vermillion River Substation to Empire Substation (GRE)

GRE's portion of the project includes construction of approximately 6.5 miles of new 115 kV transmission line connecting the proposed Vermillion River Substation and the existing Empire Substation (Segment 2), as shown in Figure 5-5. The 115 kV line exits the Vermillion River Substation, connects with the Xcel Energy 69 kV line, proceeds east approximately 1/3 mile as a 69/115kV double circuit line to Akin Road, then north along the east side of Akin Road approximately 1/3 mile. At this point, the 115 kV circuit will split off and head east one mile along the westerly extension of the north side of proposed 208th Street, crossing the Vermillion River, to the northeast corner of County Road 66 and MN Hwy 3. The line then turns south about 1/3 mile along the east side of MN Hwy 3 to the south property line of the American Legion, turns easterly for about ½ mile, then proceeds east along the north side of 210th Street for 4 miles to the Empire Substation. Approximately 3.5 of the 4 miles along 210th Street will follow an existing DEA distribution line. Minor route changes may occur for special circumstances.

5.4 Project Specifications

5.4.1 Transmission Line Design Voltage and Conductors

Design voltage of the proposed transmission line is 115 kV. The project would have a total length of approximately 9.25 miles, with slight variations depending on the exact route chosen. If the existing Xcel Energy 69 kV transmission line corridors are utilized as proposed, the project would require only 5.8 miles of new right of way. The entire line and associated facilities would be within Dakota County, Minnesota.

Both transmission line segments would utilize 795 aluminum conductor steel supported (ACSS) conductors. These provide greater load capacity with less sag than other traditional conductors, including 795 aluminum conductor steel reinforced (ACSR). ACSS provides more current carrying capability than ACSR with comparable structures, poles and appearance. The line would use three single conductors (not bundled).

5.4.2 Substations

The proposed project involves the construction of the new Vermillion River Substation (discussed above in Section 5.2) and supports the existing Air Lake and Empire substations as shown on Figure 1-3.

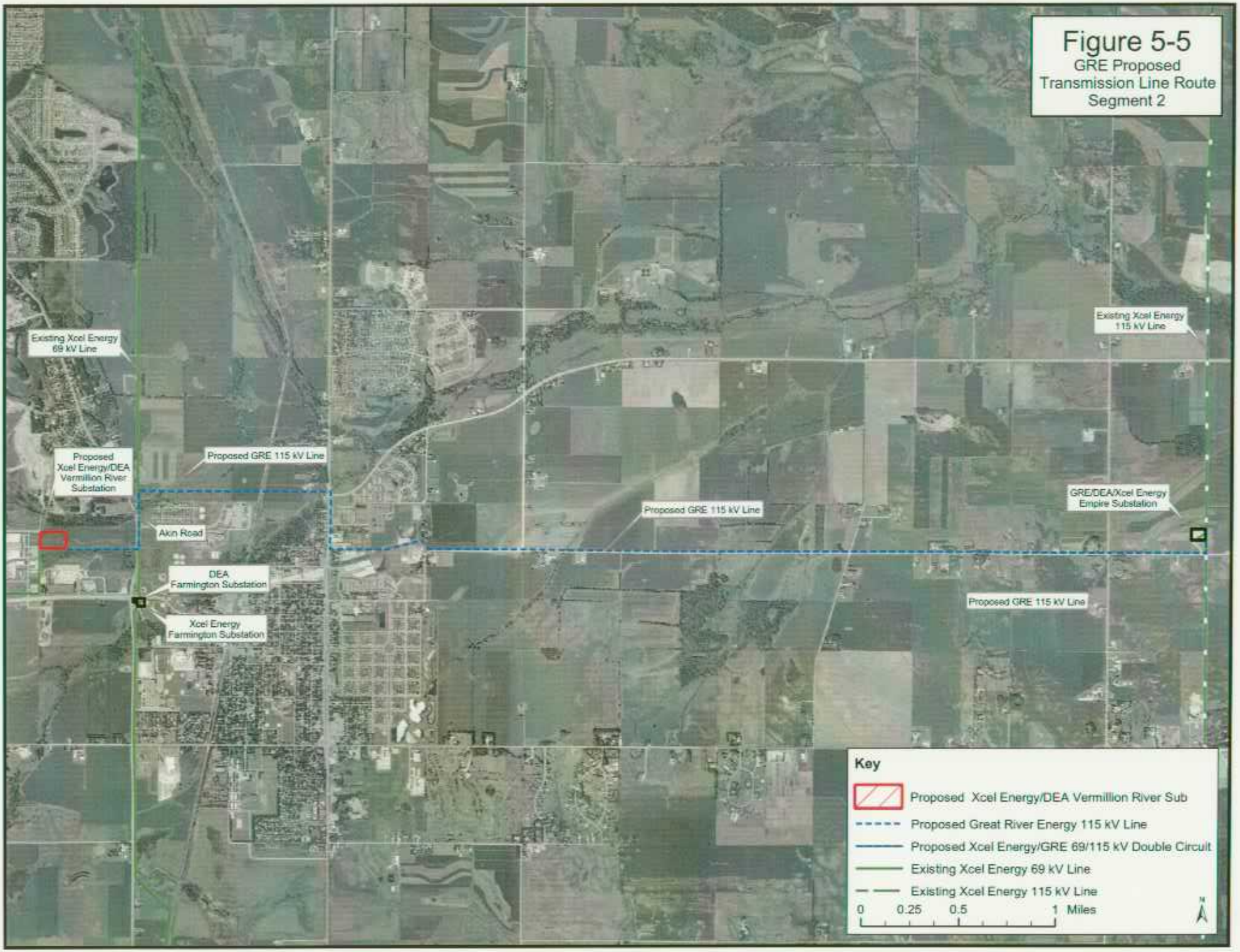


Figure 5-5
GRE Proposed Transmission Line Route Segment 2
Existing Xcel Energy 69 kV Line
Existing Xcel Energy 115 kV Line
Proposed Xcel Energy/DEA Vermillion River Substation
Proposed GRE 115 kV Line
Akin Road
Proposed GRE 115 kV Line
GRE/DEA/Xcel Energy Empire Substation
DEA Farmington Substation
Xcel Energy Farmington Substation
Proposed GRE 115 kV Line
Key
Proposed Xcel Energy/DEA Vermillion River Sub
Proposed Great River Energy 115 kV Line
Proposed Xcel Energy/GRE 69/115 kV Double Circuit
Existing Xcel Energy 69 kV Line
Existing Xcel Energy 115 kV Line
0 0.25 0.5 1 Miles
N

Air Lake Substation

The Air Lake Substation is owned by Xcel Energy. The new 115 kV transmission line from Vermillion River Substation will enter the Air Lake Substation from the south, and a new 115 kV termination will be built there to accommodate the new line. The layout will be developed to accommodate additional substation expansion plans in the future, such as a ring bus or breaker and a half configuration. There is no additional grading, fence expansion, or expansion of the control house planned at this site.

Empire Substation

No major modifications are anticipated at the Empire Substation. The existing substation configuration consists of two rows of breaker and a half that will be able to accommodate the new transmission line from the Vermillion River Substation. The only equipment additions necessary for this substation include the installation of the control and protection equipment within the control house, underground control wires, and the connection of the transmission line to the existing breaker and a half bus.

6. ENVIRONMENTAL INFORMATION – PROPOSED PROJECT

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

The project has been reviewed by a number of state and federal agencies. All environmental review correspondence related to the proposed 115 kV transmission line route is provided in Appendix B.

6.1 Description of Environmental Setting

The proposed route for the 115 kV transmission line is shown in Figure 1-3. The proposed route extends from Cedar Avenue east along CR 50 to just east of Eaton Avenue, where it turns north into the new Vermillion River Substation. From the Vermillion River Substation the line will head east to connect with an Xcel Energy 69 kV line and proceed about 1/3 mile as a 115/69 kV double circuit line east to Akin Road, then north along the east side of Akin Road for approximately 1/3 mile. At this point, the 115 kV circuit will split off and head east one mile along the extension of the north side of the proposed 208th Street extension, crossing the Vermillion River to the northeast corner of CR 66 and MN Highway 3. There the line turns south for about 1/3 mile along the east side of MN Highway 3 to the south property line of the American Legion, turns easterly for about ½ mile, and then proceeds east along the north side of 210th Street for 4 miles to the Empire Substation. Fieldwork along the proposed route needed to prepare this Application was completed in late 2003.

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

Land use along the proposed route includes a mix of industrial, commercial, public, residential, parks and open space, and agricultural lands. Industrial land uses include manufacturing, light industrial, railroad, and warehouses. Commercial uses include retail and service businesses. Public uses include a middle school campus and a church. The residential areas along the proposed route are primarily single-family homes of varying density. Parks and open space include community and school playfields, neighborhood parks, river areas and wetlands, and a greenway. Although the Farmington area is developing rapidly, much of the agricultural land along the proposed route continues to be

farmed, and the Farmington 2020 Comprehensive Plan (City of Farmington, 2000) calls for retention of working farms until at least 2020.

6.2 Effects on Human Settlement

6.2.1 Public Health and Safety

The Minnesota Department of Transportation (DOT), Office of Aeronautics was contacted (GRE letter of November 25, 2003, Appendix B) requesting information on the possible effects of the proposed project on airports or airstrips in the project area. In a letter dated December 29, 2003 (Appendix B), the DOT indicated that the nearest public use airport (Air Lake Airport) is approximately 2.5 miles southeast of the proposed Vermillion River Substation and records do not indicate any private airstrips in the vicinity. The DOT Office of Aeronautics has no objection to the proposed project, as no effects on public airports or private airstrips in the project area are anticipated.

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

6.2.2 Displacement

The siting of the transmission line and new poles will be done in a manner such that no person will be displaced from their residence or business.

6.2.3 Noise

There will be two sources of audible noise from the project; the conductors and the new Vermillion River Substation. Although changes to the equipment at the existing Air Lake and Empire substations will be made, existing noise levels at those substations will not increase.

Conductor Noise

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

audible noise at approximately household background levels. During dry weather, audible noise from transmission lines is barely perceptible.

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

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

Table 6-1 lists some common noise levels.

Table 6-1 Common Noise Levels

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

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

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

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

hour. The L_5 is the noise level exceeded 5 percent of the time, or for 3 minutes in an hour.

Table 6-2 Rule 7030.0040 Noise Area Classifications

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

The industry standard for utilities is calculated based on L_{50} and L_5 for audible noise emissions. The worst-case scenario is when the transmission line is exposed to heavy rain conditions (one inch per hour). Anticipated levels for heavy rain conditions for the proposed 115 kV line based on the results from the Bonneville Power Administration Corona and Field Effects Program version 3 (U.S. Department of Energy (USDOE), Bonneville Power Administration (BPA), Undated) are listed in Table 6-3.

Table 6-3 BPA Program Results – Heavy Rain Case

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

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

Substation Noise

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

The new substation and substation upgrades will be designed and constructed to comply with state noise standards.

None of the proposed changes at the Air Lake Substation will impact current noise levels. This substation is located in a commercial area.

Table 6-4 Population Characteristics

Location	Population 1990	Population 2000	Change 1990-2000	Forecasted Population 2030	Change 2000-2030
Minnesota	4,375,099	4,919,479	12.4 %	6,268,200	27.4 %
7-County Metropolitan Area	2,228,721	2,642,056	18.6 %	3,608,000	36.6 %
Dakota County	275,227	355,904	29.3 %	504,270	41.7 %
Farmington	5,940	12,365	108.2 %	32,000	158.8 %
Empire Township	1,340	1,638	22.2 %	4,900	199.2 %
Lakeville	24,854	43,128	73.5 %	86,000	99.4 %

Source: Minnesota Planning, 2002; Metropolitan Council, 2004

Lakeville and Farmington rank sixth and ninth respectively in the number of new residential units permitted in 2002 (Metropolitan Council, 2003). For single-family units permitted in 2002, Farmington and Lakeville ranked second and fifth respectively (Metropolitan Council, 2003). Farmington anticipates adding an average of 275 new homes per year over the next two decades for a total population of 27,090 by 2020 (City of Farmington, 2000).

The project area is generally less racially and ethnically diverse than both Dakota County and the Metropolitan area as a whole. Neither racial nor ethnic minorities are disproportionately affected by the project (see Table 6-5).

Table 6-5 Race/Ethnicity Characteristics

Place	Population	Percentage of Population						
		White	Black/ African-American	American Indian	Asian/ Pacific Islander	Other Race	More than One Race	Hispanic /Latino
7-County Metropolitan Area	2,642,056	84.7	5.9	0.8	4.6	1.7	2.2	3.6
Dakota County	355,904	91.4	2.3	0.4	2.9	1.3	1.8	2.9
Farmington	12,365	95.6	0.7	0.3	1.5	0.6	1.3	1.9
Empire Township	1,638	96.6	0.2	0.3	1.9	0.6	0.5	0.9
Lakeville	43,128	94.3	1.3	0.4	2.0	0.8	1.3	1.9

Source: U.S. Census Bureau, 2000

The transformers installed at the new Vermillion River Substation will comply with the noise standards. This substation is surrounded by industrial and agricultural uses and should not have significant noise impacts.

No additional equipment is planned for the Empire Substation that would increase existing noise levels. The Empire Substation is screened from the development in the area and there have been no noise issues associated with it.

If necessary, noise monitoring will be conducted in accordance with PCA Rule 7030.0060.

6.2.4 Aesthetics

Two types of poles will be used for the project. The portion of the project double-circuited with an Xcel Energy line will use single pole steel structures with davit arms and distribution lines attached. The average height will be 90 to 95 feet above ground, with an average span of 350 to 400 feet.

The transmission line will be visible along CR 50. It will replace an existing 69 kV line that also has distribution underbuild. The area this section of the line passes through is developed and parallels a major road. No significant impacts to the visual character of this area will occur.

The GRE 115 kV single circuit line will use single pole wood structures with horizontal post insulators. The average height will be approximately 60 to 75 feet, with an average span of 350 to 400 feet (275 to 300 feet in portions where distribution lines are attached).

The structures proposed for this section of the transmission line will have a narrow profile designed to be less intrusive in the area where the line will be located.

6.2.5 Socioeconomics

Demographics

Dakota County experienced rapid population growth, 29.3 percent, during the 1990s (Metropolitan Council, 2004). Population growth in Farmington and Lakeville was particularly rapid during this period, 108.2 percent and 72.6 percent respectively, and much slower in Empire Township, 22.2 percent. The project is located in one of the fastest growing areas within the Minneapolis-St. Paul metropolitan area (see Table 6-4). The population of Dakota County is expected to increase 41.7 percent between 2000 and 2030. The immediate project area will see some of the most explosive growth in the area - forecasts indicate Lakeville will double in size, Farmington will increase its population by nearly two and a half times and population in Empire Township will nearly triple by 2030 (Metropolitan Council, 2004).

Table 6-4 Population Characteristics

Location	Population 1990	Population 2000	Change 1990-2000	Forecasted Population 2030	Change 2000-2030
Minnesota	4,375,099	4,919,479	12.4 %	6,268,200	27.4 %
7-County Metropolitan Area	2,228,721	2,642,056	18.6 %	3,608,000	36.6 %
Dakota County	275,227	355,904	29.3 %	504,270	41.7 %
Farmington	5,940	12,365	108.2 %	32,000	158.8 %
Empire Township	1,340	1,638	22.2 %	4,900	199.2 %
Lakeville	24,854	43,128	73.5 %	86,000	99.4 %

Sources: Minnesota Planning, 2002; Metropolitan Council, 2004

Lakeville and Farmington rank sixth and ninth respectively in the number of new residential units permitted in 2002 (Metropolitan Council, 2003). For single-family units permitted in 2002, Farmington and Lakeville ranked second and fifth respectively (Metropolitan Council, 2003). Farmington anticipates adding an average of 275 new homes per year over the next two decades for a total population of 27,090 by 2020 (City of Farmington, 2000).

The project area is generally less racially and ethnically diverse than both Dakota County and the Minneapolis-St. Paul metropolitan area as a whole (Table 6-5). Neither racial nor ethnic minorities are disproportionately affected by the project.

Table 6-5 Race/Ethnicity Characteristics

Place	Population	Percentage of Population						
		White	Black/ African-American	American Indian	Asian/ Pacific Islander	Other Race	More than One Race	Hispanic /Latino
7-County Metropolitan Area	2,642,056	84.7	5.9	0.8	4.6	1.7	2.2	3.6
Dakota County	355,904	91.4	2.3	0.4	2.9	1.3	1.8	2.9
Farmington	12,365	95.6	0.7	0.3	1.5	0.6	1.3	1.9
Empire Township	1,638	96.6	0.2	0.3	1.9	0.6	0.5	0.9
Lakeville	43,128	94.3	1.3	0.4	2.0	0.8	1.3	1.9

Source: U.S. Census Bureau, 2000

The 2000 population in the project area was almost evenly split between males and females. Residents of the project area tend to be younger than Dakota County or Twin Cities residents as a whole (Table 6-6).

Table 6-6 Gender and Age Characteristics

Place	Median Age	% Male	% Under 18	% 18-64	% 65 & over
7-County Metropolitan Area	34.3	49.3	26.4	63.9	9.7
Dakota County	33.7	49.4	29.2	63.4	7.4
Farmington	30	50.4	34.0	60.4	5.6
Empire Township	31.6	51.1	33.5	60.5	6.0
Lakeville	31.5	50.6	36.1	61.1	2.8

Source: U.S. Census Bureau, 2000

In general, households in the project area have higher incomes, are more likely to own homes and are less likely to be in poverty than households in the Minneapolis-St. Paul metropolitan area as a whole (Table 6-7). The project does not disproportionately impact economically disadvantaged populations.

Table 6-7 Household Economic Characteristics, 1999

Place	Median HH Income	Housing Occupied by		Percentage Below Poverty Level	
		Owner	Renter	Families	Individuals
7-County Metropolitan Area	$54,332	71.4	28.6	4.6	7.4
Dakota County	$61,863	78.2	21.8	2.4	3.7
Farmington	$61,864	87.5	12.5	1.3	2.4
Empire Township	$68,500	93.0	7.0	4.5	6.6
Lakeville	$72,404	91.8	8.2	1.5	2.1

Source: U.S. Census Bureau, 2000

Economy

Business patterns for the City of Farmington, based upon the most recent information available, indicated a work force of approximately 3,166 employees with a total annual payroll in excess of $89 million (United States Census Bureau, 2001). Industries identified included: manufacturing; wholesale trade; retail trade; real estate and rental/leasing; professional, scientific and technical services; administrative, support, waste management and remediation services; educational services; health care and social assistance; arts, entertainment and recreation; accommodation and food service; and other services (except public administration). The primary industries in the Farmington area are manufacturing, followed by education, health and social services, and retail.

6.2.6 Cultural Values

As part of the development of the update to Farmington's Comprehensive Plan adopted in 2000 (City of Farmington, 2000), residents and business people were asked to identify both a vision for the future of the city and the values that should guide development. *A Guide to the Comprehensive Plan* (City of Farmington, no date) states that, "As the City grows to accommodate 5,775 new households by 2020, community leaders want to retain its historic, small town character and protect and preserve its rich natural environment and working farms. Ultimately, the City wants to create a vital community that is in harmony with nature, farming and promotes traditional small town characteristics and qualities."

6.2.7 Public Services

Public services provided by the City of Farmington (i.e., police, fire protection, waste collection, etc.) will not be affected by the proposed transmission project. There are no anticipated impacts on the public services in the community.

6.2.8 Unavoidable Impacts

There will be minimal short-term impacts on the human environment during the physical placement of the transmission line poles. This will be a temporary impact with no anticipated long-term impacts.

This project will utilize existing transmission line right of way for a portion of its distance and will provide DEA and Xcel Energy customers a reliable and efficient future energy supply. The anticipated impacts are therefore positive.

6.2.9 Potential Mitigation

There is no anticipated mitigation necessary for the effects on human settlement.

6.3 Effects on Land-Based Economies

6.3.1 Agriculture

The proposed route passes through agricultural land in several portions of the route, in both the City of Farmington and Empire Township. Approximately 2,395 acres within the City of Farmington was in agricultural use in 2000. Farmington's Comprehensive Plan identifies a policy to retain working farms within the city, at least until 2020.

According to the 1997 Census of Agriculture, the average farm size in Dakota County is 249 acres, of which 89% is used as cropland (United States Department of Agriculture, 1997). Dakota County ranks 30th among Minnesota

counties in crop revenue and 42nd in livestock revenue. The 2003 Minnesota Agricultural Statistics bulletin (United States Department of Agriculture, 2003) lists the primary crops in the county as corn and soybeans, followed by hay. Livestock are also an important source of revenue in the county, with cattle as the principal livestock. Corn was identified as the primary crop along the proposed route during the summer 2003 fieldwork. No large livestock operations were identified at that time.

Impacts to farmland may occur from pole placement in areas currently farmed. The area of impact will be the footprint of the pole itself. Most of the route that runs through farmland will run near existing roads, thus minimizing the impact to agricultural land. The substation site is located in an area zoned "light industrial".

6.3.2 Forestry

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

6.3.3 Tourism

There are many tourist activities available to visitors of the Farmington area. One of the most prominent features is the Vermillion River, which runs through the northern portion of Farmington. This river is a Minnesota Department of Natural Resources (DNR)-designated trout stream and is also a state canoe route (Minnesota Department of Natural Resources, 1995) and the city has tried to strengthen its connection to the river, particularly in the Rambling River Park near downtown Farmington. The proposed transmission line crosses the Vermillion River downstream from the Rambling River Park and the portion designated as a trout stream. The crossing will not interfere with recreational use of the river for canoeing or other uses.

In addition to activities related to the river, Farmington also has many community attractions such as the Dakota County Fair in August, Farmington Dew Days the in June, a Holiday Boutique in November, and a Home/Garden Show in April.

There are no anticipated impacts to tourism in these communities.

6.3.4 Mineable Resources

Although there are aggregate mines in Empire Township, there are currently no mines of economic importance in the immediate area of the project. A consortium of mine operators and landowners plans to develop an aggregate mining operation in Empire Township (Empire Township, 2003). The proposed location of the operation is approximately two miles north of the proposed route. The project will not have any impact on development of the resource.

6.3.5 Unavoidable Impacts

There do not appear to be any unavoidable impacts to the land-based economies due to the proposed 115 kV transmission project.

6.3.6 Potential Mitigation

Mitigation measures are not anticipated for the land-based economies along the proposed transmission line route.

6.4 Cultural Resources

6.4.1 Archaeological and Historic Resources

The Minnesota Historical Society (MHS) was contacted (GRE letter of November 25, 2003, Appendix B) requesting information on the possible effects of the proposed project on historic properties in the project area. In a letter dated December 30, 2003 (Appendix B), the MHS indicated that there are no properties listed on the National or State Registers of Historic Places that will be affected by this project.

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

6.4.2 Unavoidable Impacts

Neither the proposed route nor the substation site are in the vicinity of any known historic resource. As such, there are no anticipated impacts to cultural resources sites in the project area.

6.4.3 Potential Mitigation

No known historical resources were identified within the proposed route. Therefore, no impacts are anticipated during the installation of the transmission line poles. If any archaeological sites are identified during placement of the poles along the proposed route, the particular site will be avoided and the poles placed outside the specified buffer zone.

6.5 Air Quality

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

breakdown level. As such, it is unlikely that any measurable emissions would occur from the conductor surface.

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

6.6 Water Resources

6.6.1 Hydrogeology

The uppermost aquifer is located in the quaternary deposits within the project corridor (Anderson et al., 1974). The aquifer consists of glacial material made up of predominantly mixed outwash and old gray till. The deposits range in thickness from 100 to 150 feet. Sand and gravel deposits produce the highest yields and are utilized for private domestic use and irrigation. Due to susceptibility to contamination, the aquifer is not used for municipal or public water supply. The till material creates an impermeable layer in certain areas, but is not continuous across the region, thus the lower bedrock aquifers are hydraulically connected. The groundwater found in the quaternary drift is considered to be a calcium-magnesium bicarbonate type.

The Prairie du Chien-Jordan Aquifer underlies the quaternary deposits and is the major high-capacity aquifer for Dakota County. The aquifer is composed of two separate geologic units that are hydraulically connected due to the absence of a confining layer. The Prairie du Chien is thin to thickly bedded sandy dolostone where groundwater mainly moves along the joints, fractures, and bedding planes. Vertical fracturing and jointing provided fairly rapid recharge from upper units. The Jordan unit is a medium to thickly bedded quartzose sandstone with shaly layers near the base. The groundwater flow is mainly through the intergranular pore spaces. The potentiometric surface of the Prairie du Chien-Jordan aquifer is similar to that of the water table conditions in certain areas of Dakota County. The average saturated thickness of the unit is approximately 275 feet. The groundwater chemistry is similar to that of the water table aquifer, a hard to very hard, calcium-magnesium bicarbonate type.

6.6.2 Surface Water

Surface water resources along the proposed route include creeks, ditches, riparian areas, floodplains, and wetlands, as shown on Figure 6-1.

Riparian areas are defined as ecosystems that occur along watercourses or at the fringe of water bodies (Natural Resources Conservation Service (NRCS), April 1999). For purposes of this report, the riparian area is 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

Figure 6-1 - Natural Resources Map

Air Lake - Empire 115 kV Transmission Line & Vermillion River Substation
Great River Energy/Xcel Energy
Dakota County, Minnesota

acres (10 acres in municipalities) and rivers with a drainage area of two square miles or greater.

The DNR was contacted (GRE letter of November 25, 2003, Appendix B) requesting information on the possible effects of the proposed project on waters and wetlands in the project area. The DNR reviewed the project and had no comment (e-mail response of January 27, 2004, Appendix B).

The United States Army Corps of Engineers (Corps) was contacted (GRE letter of November 25, 2003, Appendix B) requesting information on the possible effects of the proposed project on floodplains, waters, and wetlands in the project area. In an e-mail dated January 22, 2004 (Appendix B), the Corps indicated that the overhead transmission lines would not require a permit but there might be some wetland issues to address at the proposed Vermillion River Substation site. The applicants are aware that there may be a small wetland near the site and will perform a more thorough evaluation of the site this spring. Results of the evaluation will be communicated to the Corps so that a determination of permitting requirements can be made. EQB staff will be copied on all correspondence.

The various water resources in the project area are discussed below.

Lakes

There are no lakes present along the proposed route.

Creeks and Ditches

The proposed route crosses two public ditches along 210th Street between the Empire Substation and Biscayne Avenue.

Riparian Areas

The proposed route crosses the Vermillion River and a tributary of the Vermillion River three times between the Vermillion River Substation and MN Highway 3. The Vermillion River and its tributary are classified as Public Waters (Minnesota Department of Natural Resources, 1984).

Floodplains

The proposed route passes through floodplain area surrounding the Vermillion River and its tributaries.

Wetlands

A preliminary examination of aerial photos indicates that there is likely to be a wetland immediately south of the proposed Vermillion River Substation.

The DNR has identified an unnamed wetland (19-355) to the east of Akin Road, south of 208th Street (northwest corner of Section 31, Township 114N, Range 20W) as a public water (Minnesota Department of Natural Resources, 1984). The City of Farmington maintains this wetland. A wet meadow and willow swamp were identified 1/8 of a mile south of the proposed transmission line (Minnesota Department of Natural Resources, 1997).

National Wetlands Inventory (NWI) data indicate the route crosses five wetland complexes in the segment between the Vermillion River and Empire substations (see Figure 6-1). The U.S. Fish and Wildlife Service (FWS) used aerial photographs taken in May 1980 as a basis for wetland identification. The NWI map provides guidance in determining areas to be evaluated for wetland characteristics, but should not be used as the sole basis for wetland determinations. For example, the large wetland about two miles west of the Empire Substation has been extensively tiled and drained to a central drainage ditch, and is in agricultural production along the proposed route (see Figure 5-5).

6.6.3 Unavoidable Impacts

Unavoidable impacts to wetland resources and other hydrologic features will be identified and the necessary permits or licenses will be requested. Potential impacts to the hydrologic features identified along the proposed route would be limited to ground disturbances due to pole placement in the riparian, floodplain, and wetland areas. Impacts to these areas will be avoided and minimized to the extent practicable. Any impacts that do occur will be temporary and limited to the specific pole location and the area directly adjacent to the pole. Due to the relatively small areas that would be disturbed and the flexibility to avoid placing poles in sensitive areas, the anticipated impacts to the hydrologic features along the proposed route are minimal.

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

6.6.4 Potential Mitigation

Unavoidable impacts will be mitigated as required by local, state, and federal regulatory permits.

6.7 Natural Vegetation and Associated Wildlife

The vegetation in the area of the proposed route at the time of the Public Land Survey (1847 – 1855) shows the area to be mostly prairie with patches of wet prairies, marshes and sloughs (Minnesota Department of Natural Resources, 1997). A Minnesota County Biological Survey has been conducted for the proposed project. Species typical of the various vegetative communities and wildlife habitat within the project corridor are described below.

6.7.1 Vegetative Communities

The Minnesota County Biological Survey for Dakota County identified two natural communities within the project corridor. A wet meadow and willow swamp were identified approximately 1/8 mile south of the proposed transmission line, straddling Sections 33 and 34 of Township 114N, Range 19W. In addition to the vegetative community identified on the Biological Survey, riparian habitat also exists along the Vermillion River.

A wet meadow is characterized as an open wetland on mineral or shallow organic soil. These areas are typically dominated by lake sedge (*Carex lacustris*), tussock sedge (*Carex stricta*), and blue-joint grass (*Calamagrostis canadensis*). Other types of vegetation commonly found in wet meadows are red-osier dogwood (*Cornus sericea*), slender willow (*Salix gracilis*), American water-horehound (*Lycopus americanus*), tufted loosestrife (*Lysimachia thyrsiflora*), and spotted joe-pye weed (*Eupatorium maculatum*).

Willow swamps are characterized as wet shrub communities on mineral or organic soils that occur in shallow basins. They have greater than 70% shrub cover that is dominated by willows (*Salix* spp.) and red-osier dogwood (*Cornus sericea*).

Riparian habitats are areas adjacent to rivers and streams with a high density, diversity, and productivity of plant and animal species relative to nearby uplands. The Vermillion River historically was bound by prairie and oak savanna, and remnants of these habitats can be found along the river.

6.7.2 Wildlife Habitat

The predominant habitats within the project corridor are urban and agricultural. Animals commonly found in urban settings are songbirds, small mammals, and various types of insects. Agricultural areas usually provide cover in windrows and woodlots, as well as tall grasses along fencerows. Organisms inhabiting these areas would be those that are typically associated with agricultural settings, such as upland game birds, red fox, white-tailed deer, and garter snakes.

Other habitats in the project area include the Vermillion River and the riparian corridor along the river. The Vermillion River is a designated trout stream, and habitat improvement programs have greatly improved the trout resources along the river. Other organisms commonly found along the Vermillion River include white-tailed deer, raccoon, mink, red fox, and a variety of avian species commonly found in riparian habitats.

6.7.3 Unavoidable Impacts

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

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

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. This project is not located in an area where there is a major flyway or feeding area for waterfowl.

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

6.7.4 Potential Mitigation

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

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

6.8 Rare and Unique Natural Resources

The DNR was contacted (GRE letter of November 25, 2003, Appendix B) requesting information on the possible effects of the proposed project on rare and unique features in the project area. The DNR reviewed the proposed project and had no comment (e-mail response of January 27, 2004, Appendix B).

The FWS was contacted (GRE letter of November 25, 2003, Appendix B) requesting information on the possible effects of the proposed project on threatened and endangered species or critical habitat in the project area. The FWS determined that the project would not affect any federally listed species (e-mail response of January 23, 2004, Appendix B).

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

6.8.1 Rare and Unique Features

There are no significant natural resource sites or significant natural features identified by the DNR or the FWS along the proposed route.

6.8.2 Threatened and Endangered Species

There are no threatened or endangered species or state listed species identified by the DNR or the FWS along the proposed route.

6.8.3 Unavoidable Impacts

A portion of the proposed transmission line will follow an existing transmission corridor, with minimal impacts to the natural vegetation and associated wildlife. Potential impacts to rare and unique natural resources in portion of the route requiring new right of way will be primarily limited to impacts associated with transmission pole placement.

6.8.4 Potential Mitigation

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

6.9 Physiographic Features

6.9.1 Topography

The topography of the project area is flat to gently rolling with a small number of localized depressions as shown in Figure 6-2. The elevations range from 940 feet above mean sea level (amsl) in the western portion of the transect to 880 feet amsl along the eastern end (Anderson et al., 1974). The topography is typical of a glaciated landscape.

6.9.2 Geology

The surficial geology of the project area consists of glacial material deposited from advances of the Des Moines Lobe and the Superior Lobe. Along the project corridor, mixed outwash deposits from the Des Moines Lobe are mainly encountered at the surface. A thin covering of mixed outwash from the Des Moines Lobe overlies the Superior Lobe Outwash. The mixed outwash deposits are characterized as sand, loamy sand and gravel. Coarser textures are seen along the edge of the lobe. In some areas, the Des Moines Lobe deposits contain rock assemblages typical of the Superior Lobe Outwash deposits and are only distinguishable due to shale content. The Superior Lobe Outwash deposits consist of sand and gravel. It contains more cobbles and undrained depressions near the ice margin to the north of the site around Apple Valley and Rosemount. The depressions decrease in number and depth to the south and the east, in the outwash areas.

The project area is underlain by Ordovician age bedrock. The Prairie du Chien Group (Lower Ordovician) and St. Peter Sandstone (Middle Ordovician) are encountered anywhere from 50 to 250 feet below ground surface along the length of the project corridor. A shallow bedrock valley curves to the south of the

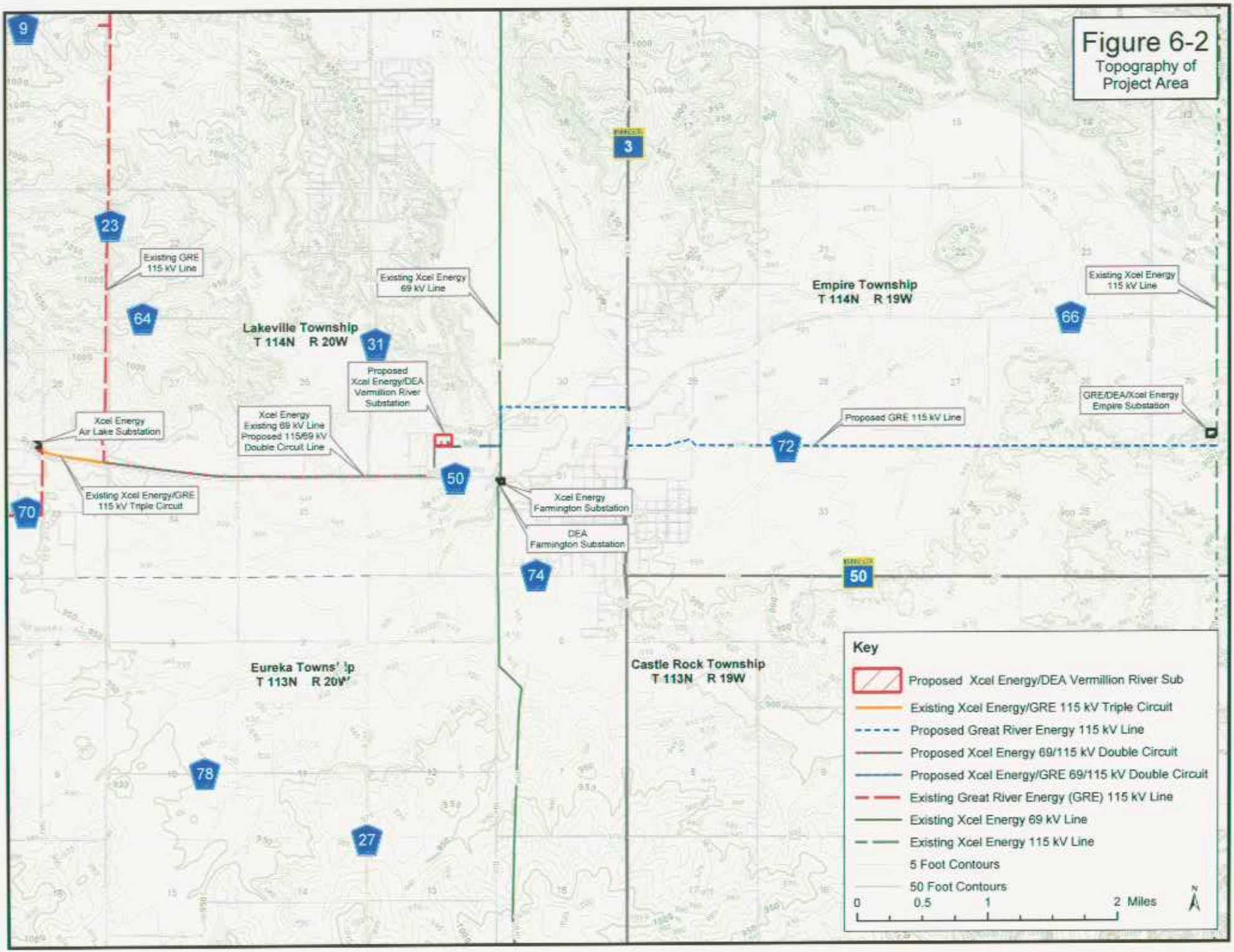


Figure 6-2
Topography of Project Area
Existing GRE 115 kV Line
Existing Xcel Energy 69 kV Line
Existing Xcel Energy 115 kV Line
Lakeville Township
T 114N R 20W
Empire Township
T 114N R 19W
Proposed Xcel Energy/DEA Vermillion River Substation
Xcel Energy Air Lake Substation
Xcel Energy Existing 69 kV Line Proposed 115/69 kV Double Circuit Line
Proposed GRE 115 kV Line
GRE/DEA/Xcel Energy Empire Substation
Existing Xcel Energy/GRE 115 kV Triple Circuit
Xcel Energy Farmington Substation
DEA Farmington Substation
Eureka Township
T 113N R 20W
Castle Rock Township
T 113N R 19W
Key
Proposed Xcel Energy/DEA Vermillion River Sub
Existing Xcel Energy/GRE 115 kV Triple Circuit
Proposed Great River Energy 115 kV Line
Proposed Xcel Energy 69/115 kV Double Circuit
Proposed Xcel Energy/GRE 69/115 kV Double Circuit
Existing Great River Energy (GRE) 115 kV Line
Existing Xcel Energy 69 kV Line
Existing Xcel Energy 115 kV Line
5 Foot Contours
50 Foot Contours
0 0.5 1 2 Miles
N

project. The Prairie du Chien Group consists of dolostone that ranges in thickness from 145 to 308 feet. The group is divided into two formations, the Oneota and the Shakopee, the former being the first encountered. The Prairie du Chien group is highly resistant to erosion. The unit is thick and has a relatively massive nature. The St. Peter unit is a quartzose sandstone that ranges in thickness from 128 to 160 feet. The sandstone is poorly cemented and highly erodible.

6.9.3 Soils

The General Soil Map for Dakota County identifies two groups of general soil associations within the project area: Waukegan-Wadena-Harwick and Marshan-Cylinder (United States Department of Agriculture, 1983). The soils in these units are formed in silty and loamy sediments over sandy outwash on outwash plains and terraces and are commonly used for cultivated crops. The Marshan-Cylinder unit topography is nearly level throughout, whereas a fraction of the Waukegan-Wadena-Harwick complex has slopes ranging between zero and 50 percent.

Table 6-8 represents the soils mapped within the project area. The soils along the route are generally loams with moderate to rapid permeability.

6.9.4 Prime Farmland and Additional Lands of Statewide Importance

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

According to the Minnesota NRCS, approximately 90% of the project corridor is considered prime farmland. Table 6-9 below represents the soil units within the project area that are listed on the Dakota County Prime Farmland list.

Table 6-8 Soils Mapped Within Project Area

Map Unit	Soil Name	Soil Classification	Drainage	Permeability
27B	Dickinson Sandy Loam, 2-6% Slopes	Coarse-loamy, mixed, superactive, mesic Typic Hapludolls	Somewhat excessively drained	Moderately rapid in upper part, rapid in the lower part
39A	Wadena Loam, 0-2% Slopes	Fine-loamy over sandy or sandy-skeletal, mixed, superactive, mesic Typic Hapludolls	Well drained	Moderate in loamy mantle, rapid in sandy underlying material
39B	Wadena Loam, 2-6% Slopes	Fine-loamy over sandy or sandy-skeletal, mixed, superactive, mesic Typic Hapludolls	Well drained	Moderate in loamy mantle, rapid in sandy underlying material
98	Colo Silt Loam, Occasionally Flooded	Fine-silty, mixed, superactive, mesic Cumulic Endoaquolls	Poorly drained	Moderate
129	Cylinder Loam	Fine-loamy over sandy or sandy-skeletal, mixed, superactive, mesic Aquic Hapludolls	Somewhat poorly drained	Moderate in loamy material, very rapid in underlying material
208	Kato Silty Clay Loam	Fine-silty over sandy or sandy-skeletal, mixed, superactive, mesic Typic Endoaquolls	Poorly drained	Moderate in silty mantle, rapid in underlying material
252	Marshan Silty Clay Loam	Fine-loamy over sandy or sandy-skeletal, mixed, superactive, mesic Typic Endoaquolls	Poorly drained	Moderate in upper loamy mantle, rapid in underlying sandy material
255	Mayer Silt Loam	Fine-loamy over sandy or sandy-skeletal, mixed, superactive, calcareous, mesic Typic Endoaquolls	Poorly drained	Moderate in the upper mantle, rapid in the underlying material
301B	Lindstrom Silt Loam 1-4% Slopes	Fine-silty, mixed, superactive, mesic Cumulic Hapludolls	Well drained	Moderate
411A	Waukegan Silt Loam 0-1% Slopes	Fine-silty over sandy or sandy-skeletal, mixed, superactive, mesic Typic Hapludolls	Well drained	Moderate in silty mantle, rapid in sandy underlying material
415A	Kanaranzi Loam, 0-2% Slopes	Fine-loamy over sandy or sandy-skeletal, mixed, superactive, mesic Typic Hapludolls	Well drained or somewhat excessive drained	Moderate in the loamy mantle, rapid in the underlying material
415B	Kanaranzi Loam, 2-6% Slopes	Fine-loamy over sandy or sandy-skeletal, mixed, superactive, mesic Typic Hapludolls	Well drained or somewhat excessive drained	Moderate in the loamy mantle, rapid in the underlying material
611C	Hawick Coarse Sandy Loam, 6-12% Slopes	Sandy, mixed, mesic Entic Hapludolls	Excessively drained	Rapid in upper part, very rapid in lower part
611D	Hawick Coarse Sandy Loam, 12-18% Slopes	Sandy, mixed, mesic Entic Hapludolls	Excessively drained	Rapid in upper part, very rapid in lower part

Source: United States Department of Agriculture, Soil Conservation Service, 1983

Table 6-9 Dakota County Prime Farmland Soil Units

Map Unit	Soil Name
39A	Wadena Loam, 0-2% Slopes
39B	Wadena Loam, 2-6% Slopes
98	Colo Silt Loam, Occasionally Flooded
129	Cylinder Loam
208	Kato Silty Clay Loam
252	Marshan Silty Clay Loam
255	Mayer Silt Loam
301B	Lindstrom Silt Loam 1-4% Slopes
411A	Waukegan Silt Loam 0-1% Slopes

Source: United States Department of Agriculture, Natural Resources Conservation Service, 2004

The NRCS was contacted (GRE letter of November 25, 2003, Appendix B) requesting information on the possible effects of the proposed project on important or prime farmlands in the project area. In a letter dated December 5, 2003 (Appendix B), the NRCS indicated that the proposed transmission line would have minimal effect on soil resources. The applicants are still communicating with the NRCS regarding the proposed Vermillion River Substation site.

6.9.5 Unavoidable Impacts

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

6.9.6 Potential Mitigation

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

6.10 Land Use

6.10.1 Municipal Land Use Categories

Land use along the proposed route consists of roadways and streets, agricultural, residential, commercial, industrial, public and institutional property, and parks and open space (see Figure 6-3).

Although the proposed location of the Vermillion River Substation is currently farmed, the parcel is zoned I-1 (Light Industrial) by the City of Farmington (City of Farmington, 2002). A substation is compatible with this zoning classification.

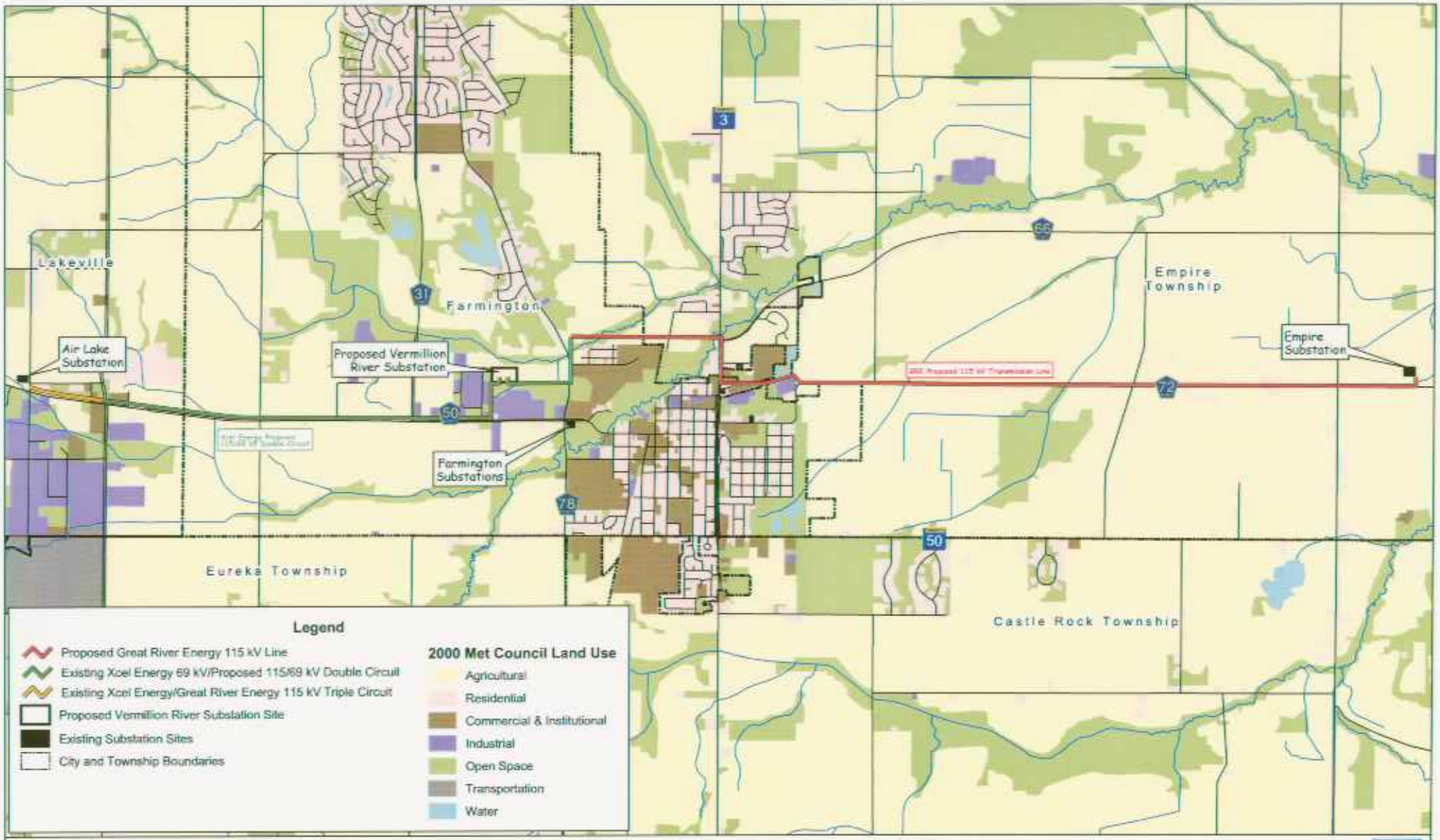


Figure 6-3 - Land Use Map

Air Lake - Empire 115 kV Transmission Line & Vermillion River Substation
Great River Energy/Xcel Energy
Dakota County, Minnesota

6.10.2 Zoning

A conditional use permit is typically required for transmission lines in the City of Farmington and Empire Township. However, GRE, Xcel Energy and DEA are seeking a route permit for this project from the Minnesota Environmental Quality Board. Minn. Stat. § 116C. 61 Subdivision 1 states that "the issuance of a route permit and use of such route locations for high voltage transmission line purposes shall be the sole route approval required to be obtained by the utility. Such permit shall supersede and preempt all zoning, building, or land use rules, regulations, or ordinances promulgated by regional, county, local and special purpose government."

6.10.3 Public Lands and Recreational Areas

Park and Recreational Areas

The proposed route passes near two neighborhood parks and open space areas near Akin Road and crosses through the Prairie Waterway open space area on the eastern edge of Farmington, as the route turns near 210th Street (City of Farmington, 2000). The substation is not located near any parks or open spaces.

Municipal Trails

The proposed route parallels an existing bituminous recreation trail along CR 50 and will cross an existing bituminous bike trail that runs adjacent to the Canadian Pacific Railroad tracks between Akin Road and MN Highway 3. Future bituminous bike trails are planned north of the proposed Vermillion River Substation and along the Prairie Waterway open space area at the western edge of the city (City of Farmington, 2000). The substation is not located near any municipal trails.

6.10.4 Unavoidable Impacts

Potential land use impacts along the proposed route due to the 115 kV transmission line will be very limited. The proposed route for the 115 kV transmission line will be approximately 9.25 miles long and will utilize existing transmission line right of way as much as possible. Of the 9.25 miles, approximately 5.8 miles of new right of way will be required. The new 115 kV transmission line does not represent an incompatible land use with those that exist in the corridor. The substation will be located in an area currently zoned light industrial, and is not near any parks or trails. Therefore, anticipated impacts of the proposed project on land use are minimal.

6.10.5 Potential Mitigation

Mitigation measures are not expected, as land use impacts will be minimal.

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

7.1 Utility Rights of Way

7.1.1 Segment 1 – Cedar Avenue/CR 50 to Vermillion River Substation

Segment 1 of the transmission line, from the intersection of Cedar Avenue and CR 50 to the Vermillion River Substation, parallels an existing Xcel Energy 69 kV transmission line.

7.1.2 Segment 2 – Vermillion River Substation to Empire Substation

GRE's segment of the proposed 115 kV transmission line will follow approximately 3.5 miles of existing DEA and Xcel Energy distribution line along 210th Street. Approximately 0.7 miles will double circuited with the existing Xcel Energy 69 kV line immediately to the east of the proposed Vermillion River Substation site. The remaining 2.3 miles of line will be new utility right of way.

7.2 Public Rights of Way

7.2.1 Segment 1 – Cedar Avenue/CR 50 to Vermillion River Substation

Approximately 2.5 miles of this route parallels the CR 50 public right of way.

7.2.2 Segment 2 – Vermillion River Substation to Empire Substation

In this segment, the route will parallel road right of way along four miles of 210th St, along approximately 1/3 mile of MN State Hwy 3, and along approximately 1/3 mile of Akin Road.

8. ENGINEERING AND OPERATIONAL DESIGN OF THE PROPOSED HVTL AND VERMILLION RIVER SUBSTATION

8.1 Engineering and Operational Design of the HVTL

8.1.1 Segment 1 – Cedar Avenue/CR 50 to Vermillion River Substation

The double circuit construction will use single pole steel structures on concrete foundations with davit arms and distribution lines attached. The average height of the structures will be 90-95 feet (Figure 8-1).

The distance between Xcel Energy's double circuit structures will average 350-400 feet. The 69 kV line will be designed to 115 kV specifications.

There will be six single conductor phase wires and one shield wire on the structures. The phase wires will be 795 MCM (795,000 circular mil) ACSS with seven steel core strands and 26 outer aluminum strands. The industry code word for this conductor is "Drake." The conductor has an overall diameter of 1.108 inches and weighs 1.094 pounds per lineal foot.

8.1.2 Segment 2 – Vermillion River Substation to Empire Substation

Structure types to be used for GRE's portion of the project are shown in Figure 8-2.

Single pole wood structures with horizontal post insulators will be used for the single circuit segment of 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, laminated or other self-supporting steel poles will be used with drilled pier foundations.

GRE single circuit structures will have three single conductor phase wires and one shield wire. The phase wires will be 795 MCM ACSS with seven steel core strands and 26 outer aluminum strands. The average span will be 350-400 feet (275-300 feet with distribution lines attached) and heights will range from 60 to 75 feet. Structures, pole heights and spans will vary depending upon topography and environmental constraints (such as highway crossings, stream crossings, and required angle structures).

GRE's short double circuit segment will be constructed using davit arm structures similar to those shown in Figure 8-2 or horizontal post structures (with six insulators). The average span between structures will be 300-350 feet and the poles will be approximately 75 feet in height.

Figure 8-1 Schematic Diagram of Xcel Energy Double Circuit Structure

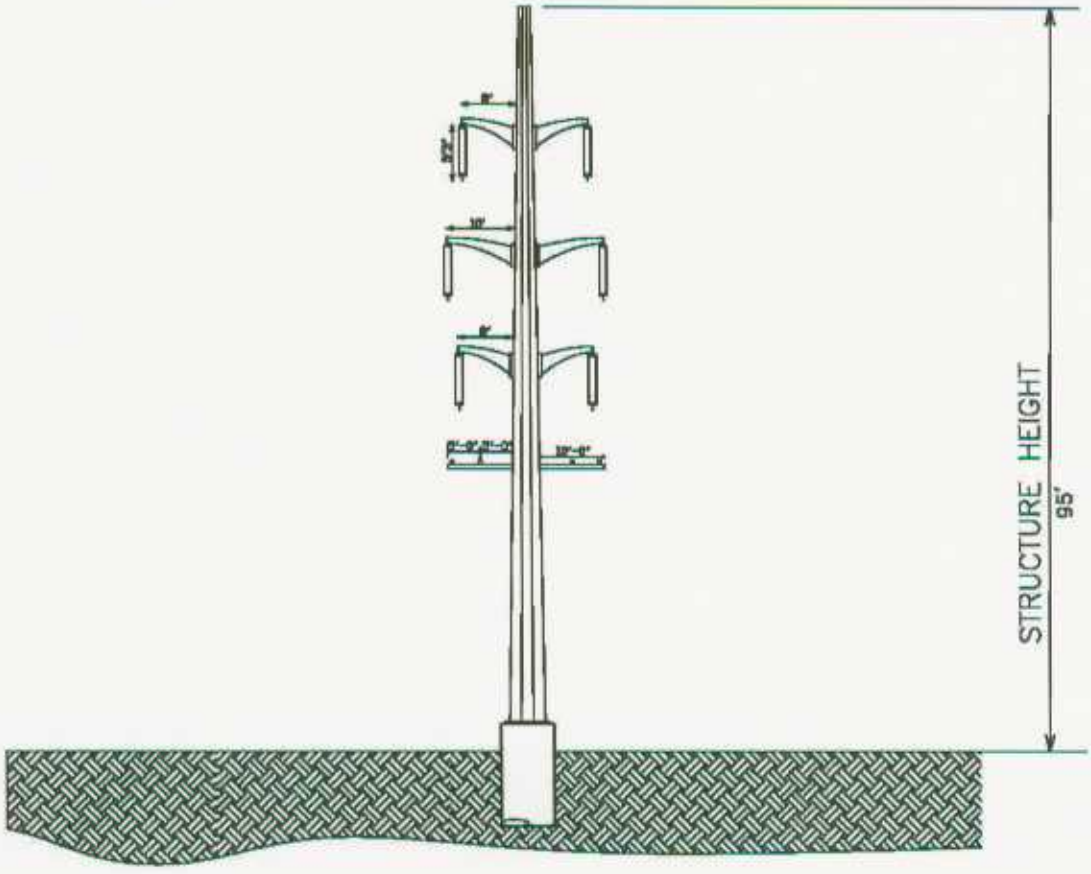
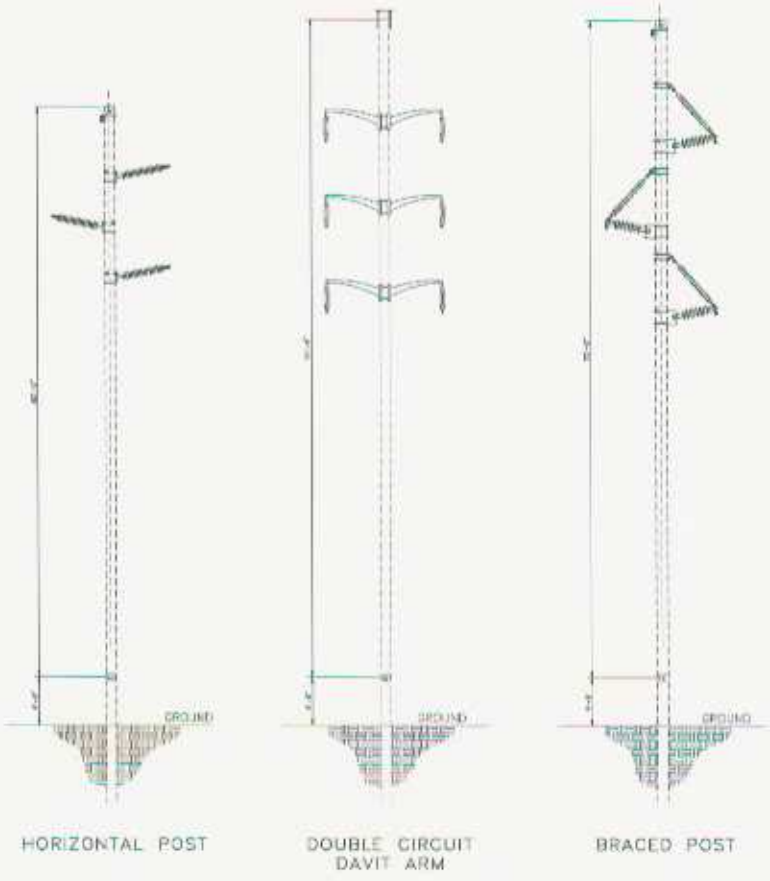


Figure 8-2 Schematic Diagrams of Typical GRE Structures



8.1.3 Construction Considerations

Clearances

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

In addition, the applicants will comply with their respective standards. Xcel Energy has company standards that meet or exceed the NESC requirements.

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

Clearances over highways and roadways will exceed the 23 feet recommended by the NESC and RUS standards and may be limited by the DOT or local county highway permitting. Although the existing standards give recommended clearances over buildings, GRE and Xcel Energy generally do 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.

Right of Way Requirements

For Segment 1 of the project between Cedar Avenue and the Vermillion River Substation, the existing 50-foot right of way will be adequate for the proposed design.

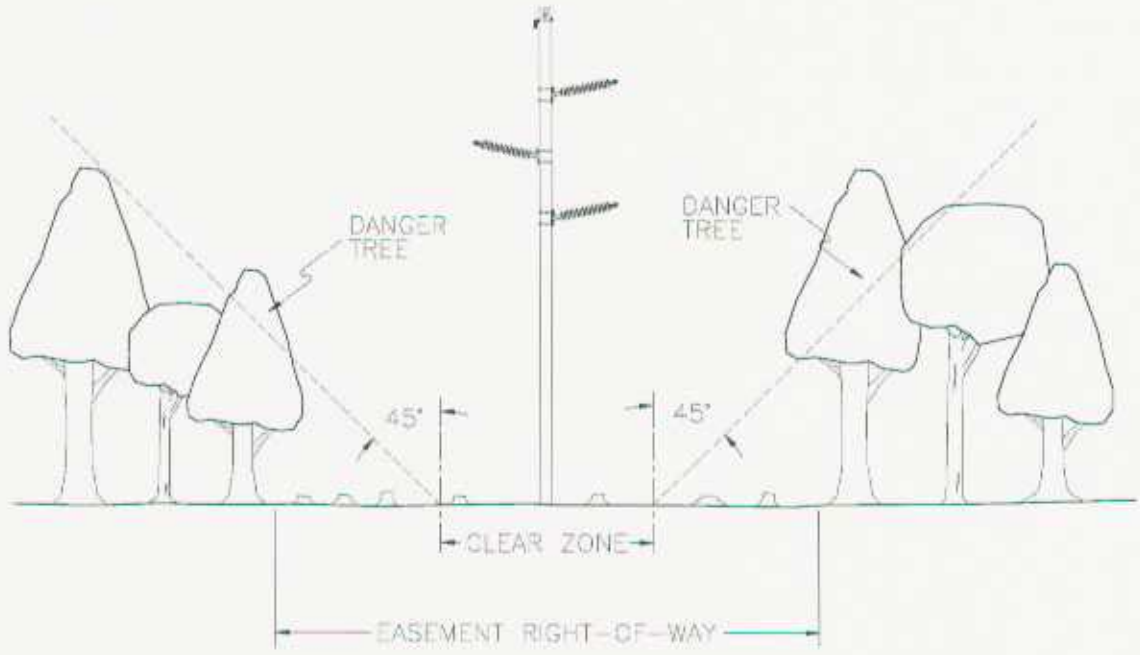
For Segment 2 of the project between the Vermillion River Substation and the Empire Substation, the first approximately 2/3 mile (which is being built as a double circuit) will use the existing 50-foot right of way. The remaining single circuit will be constructed on a 70-foot right of way (35 feet on either side of the transmission centerline).

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

Tree Clearing

The NESC states that "trees that may interfere with ungrounded supply conductors should be trimmed or removed." Standard practices per specifications from the RUS indicate total removal of trees within the easement area, with additional trees and danger trees removed or trimmed beyond the easement area if they could fall into the energized transmission line as shown in Figure 8-3. Special tree trimming agreements are possible to minimize tree removal based on negotiations with individual landowners.

Figure 8-3 Standard Tree Removal Practices



Material Requirements

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

8.2 Engineering and Operational Design of the Vermillion River Substation

The new Vermillion River 115 kV transmission substation will be built using a "low-profile" design, similar to that of the existing Empire Substation. It will be a conventional outdoor open-type air-insulated bus-and-switch arrangement laid out in an easily expandable breaker-and-a-half configuration. A one-line diagram for the initial substation installation is provided in Figure 8-4.

The primary components of the new substation will initially include:

- Two rows of breaker and a half configured to accommodate two 115 kV transmission line terminations.
- One Xcel Energy 115 kV/13.8 kV/28 megavolt-ampere (MVA) transformer with load tap changing equipment and associated switching and protection equipment.
- One 115 kV bus-tie breaker with associated relaying.
- Two Xcel Energy 13.8 kV distribution line feeders.
- One DEA 115 kV/12.47 kV/37 MVA transformer with load tap changing equipment, associated switchgear, and four 12.47 kV distribution line feeders.
- Grading, fencing, installation of a control building, and steel structure installation will be included in the construction.

Xcel Energy will own the new Vermillion River Substation and DEA will have a permanent easement for their facilities on the western ¼ portion of the proposed substation. Xcel Energy will own and operate all the high voltage (115 kV) facilities, the control house, and all common facilities (land, fence, etc.). Xcel Energy and DEA will own and operate their respective low voltage distribution facilities.

The Vermillion River Substation will be laid out to accommodate additional equipment should significant load growth occur in the area. Ultimately, the substation may contain two or three additional rows of breaker and a half equipment to accommodate additional transmission line terminations, capacitor banks, transformers, and related feeders. A preliminary one-line diagram for the ultimate substation installation is provided in Figure 8-5.

8.3 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. Transmission lines operate at a frequency of 60 hertz (cycles per second), which is in the non-ionizing portion of the electromagnetic frequency spectrum. Fields are considered ionizing when they cause electrons to eject from their orbits around a normal atom. This will typically occur with frequencies in the range of 10^{16} to 10^{22} hertz.

Figure 8-4 Vermillion River Substation - Initial Installation

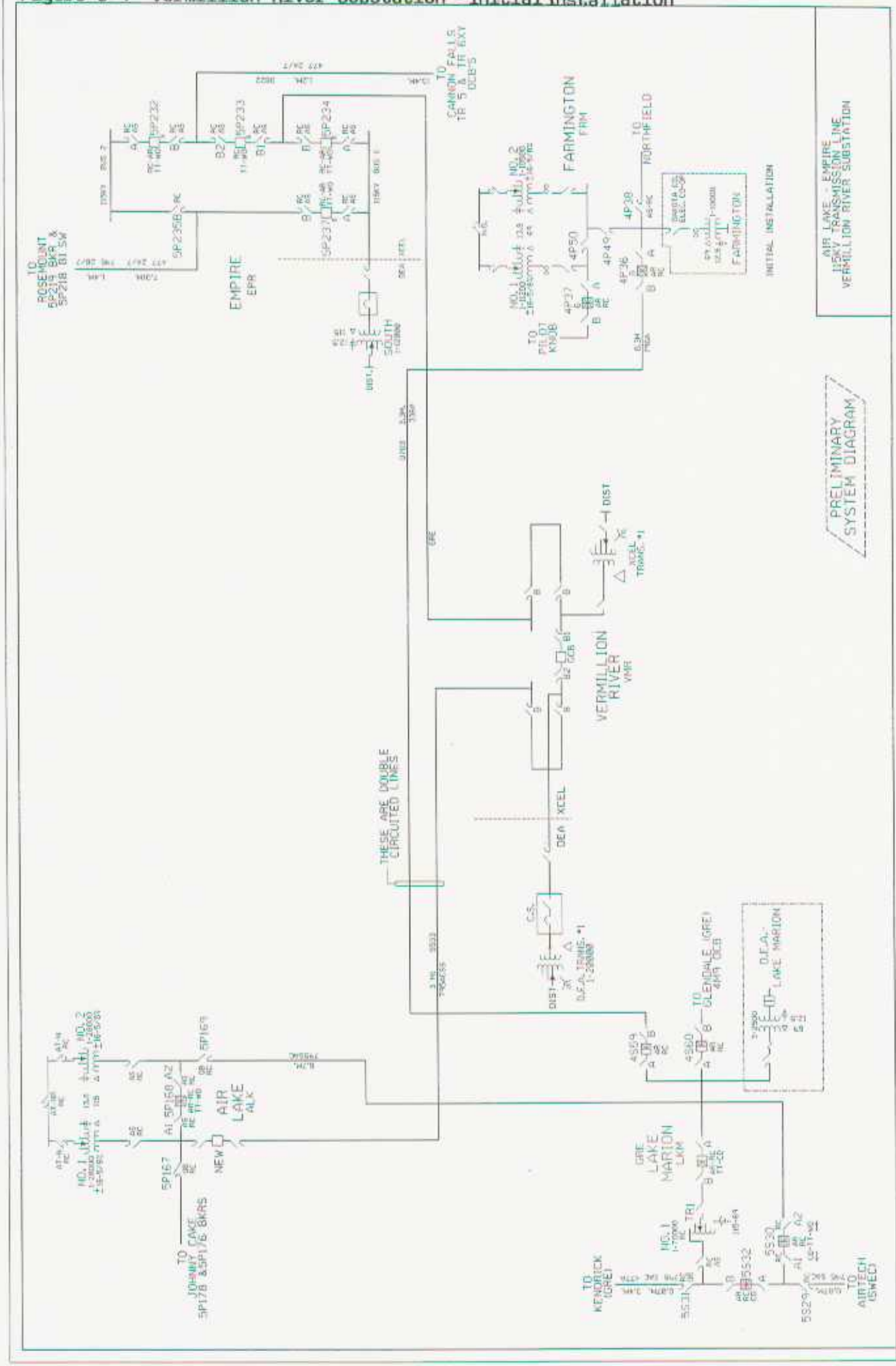
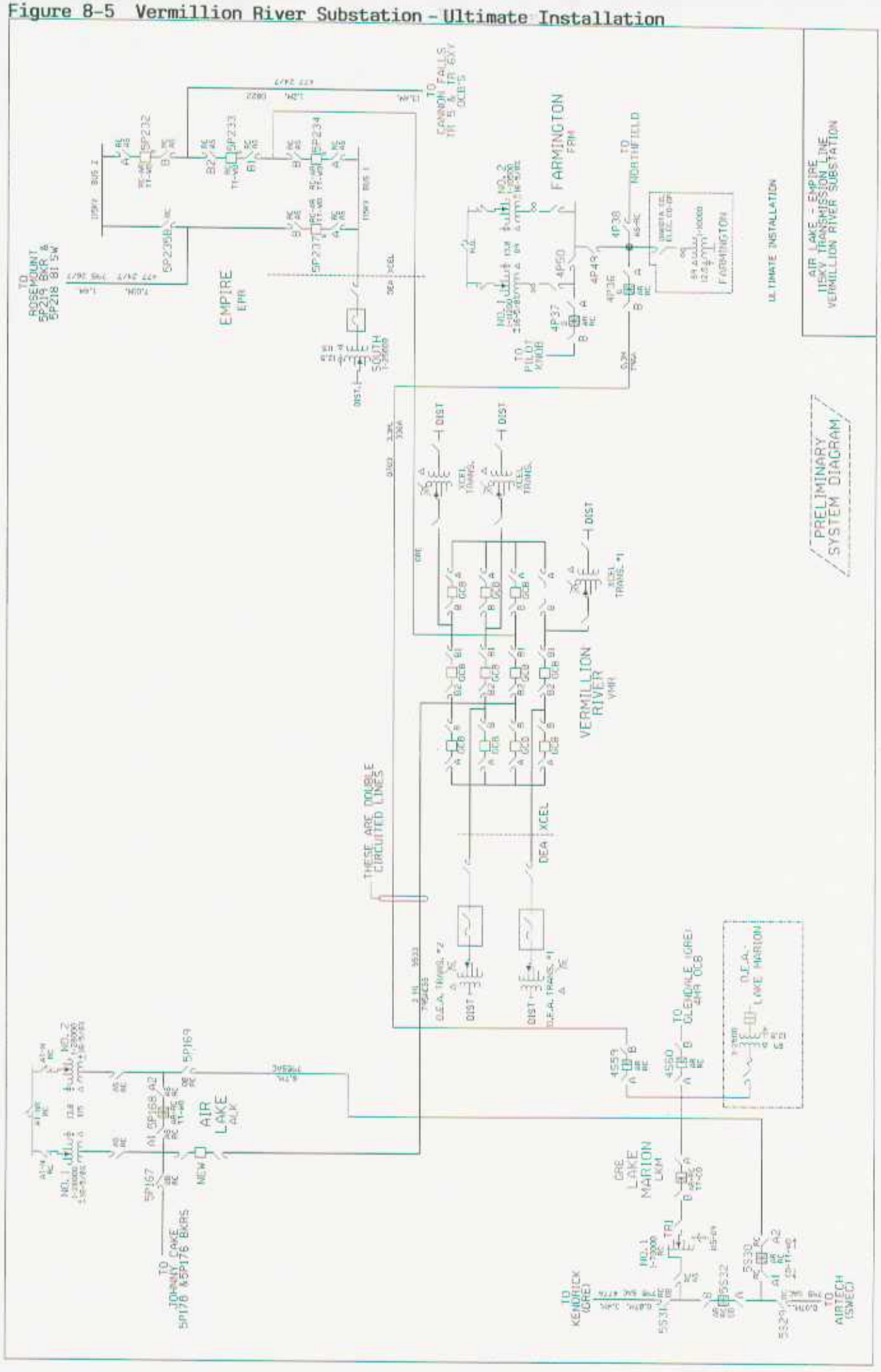


Figure 8-5 Vermillion River Substation - Ultimate Installation



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 (Minnesota Department of Health, 2002; National Institute of Environmental Health, 2002; National Research Council, 1997; http://www.health.state.mn.us/divs/eh/radiation/emf).

8.3.1 Segment 1 – Air Lake Substation to Vermillion River Substation

A sample of magnetic field calculations for the Air Lake Substation to Vermillion River Substation section of the transmission line in year 2006 is provided in Figures 8-6 and 8-7. Figure 8-6 shows a typical magnetic field profile at peak load and Figure 8-7 shows the line operating at peak conditions and providing additional system support during an outage of the Air Lake to Dodd Park 115 kV line.

The segment of 115 kV transmission line will be on double circuit structures with the Farmington to Lake Marion 69 kV line.

On these figures, the conductors are identified as "A", "B", "C", and "GO", and are shown on a two-dimensional graph as if they were attached to a pole. The conductors and magnetic field profile on the left side of the graph are from the Air Lake to Vermillion River line and the conductors and magnetic field on the right side are from the Farmington to Lake Marion line. The dimension up the right side of the graph is distance in feet above grade and only relates to the height of the conductors. The distance left (negative distance) and right (positive distance) of the center (0') of the pole is shown at the bottom of the graph.

The figures also show the magnetic field strength (bell shaped curve) measured in mG (the left side of the graph or "B field"). The magnetic field graph shows that the strength of the field increases the closer you are to the center of the transmission line. In this case, the left and right bounds were selected at 100 feet because the field strength from the line is essentially equivalent to other magnetic field background sources at that distance.

The values of the magnetic field are as follows:

- In 2006, under normal maximum load conditions, the 115 kV transmission line would have a peak value of 26.4 mG directly underneath the transmission line and a value of approximately 18 mG at the edge of the right of way.

Figure 8-6 Magnetic Field Profile – Peak Loads 2006 – System Intact Air Lake Substation to Vermillion River Substation Segment

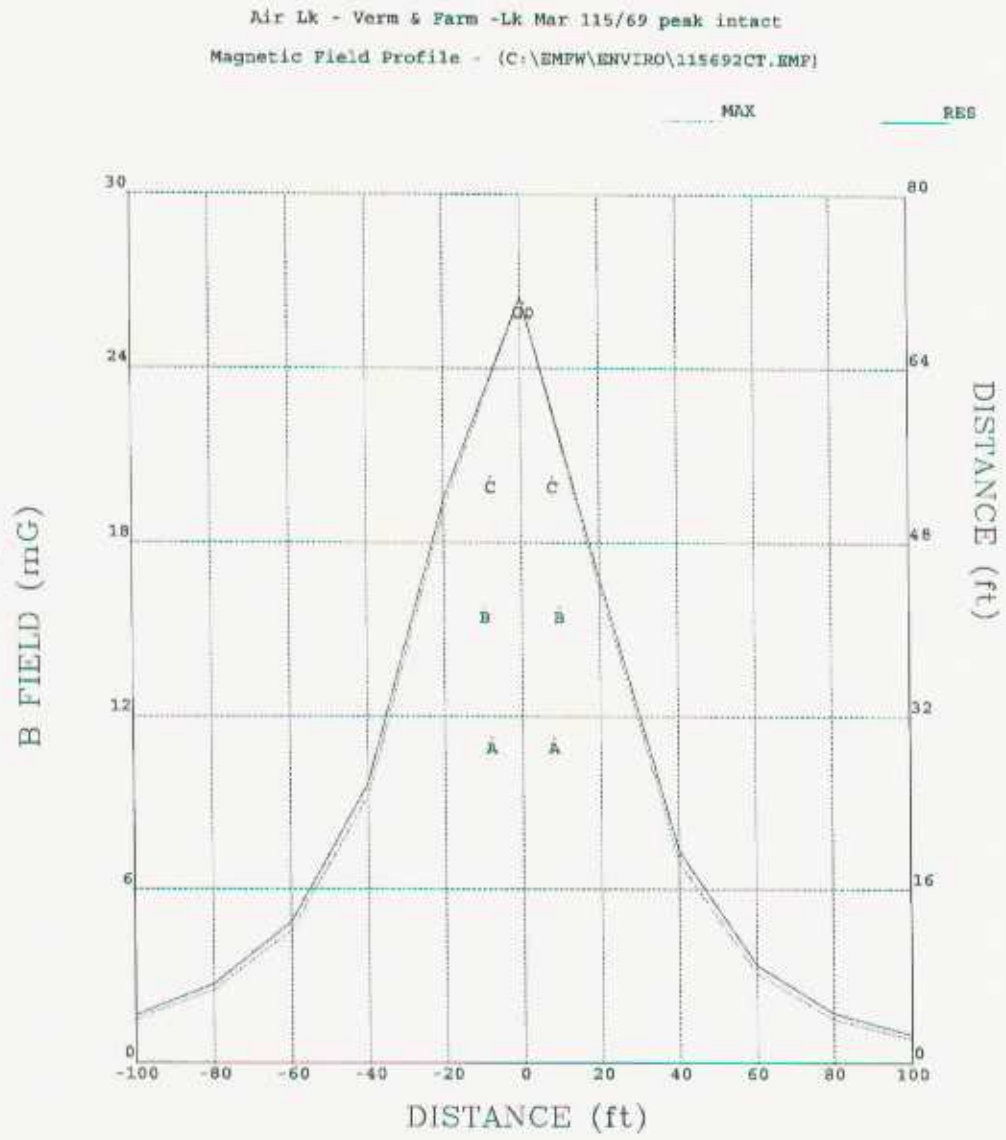
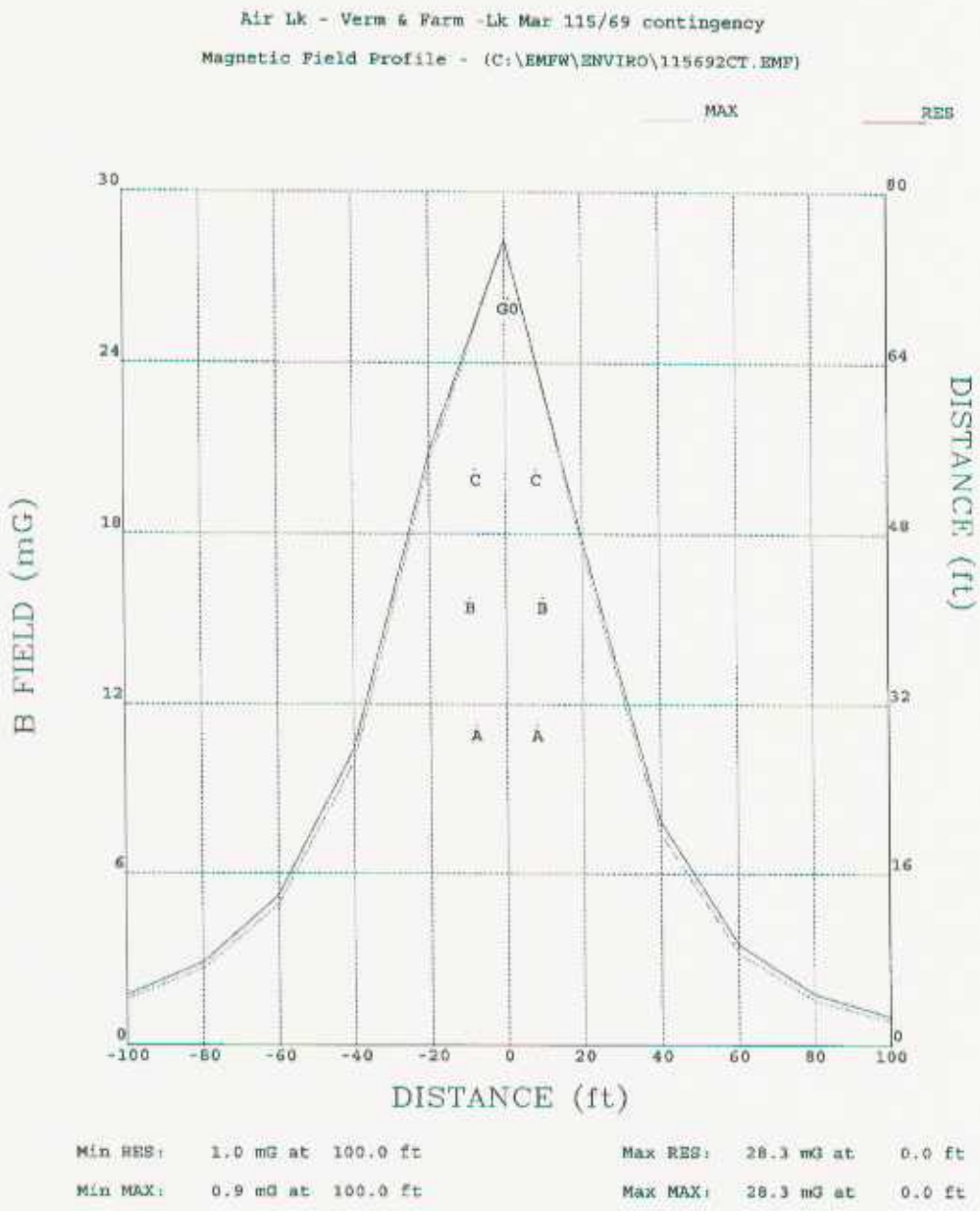


Figure 8-7 Magnetic Field Profile – Peak Loads 2006 – One Contingency Air Lake Substation to Vermillion River Substation Segment



- In 2006, under contingency conditions, the 115 kV transmission line would have a peak value of 28.3 mG directly underneath the transmission line and a value of approximately 20 mG at the edge of the right of way.

8.3.2 Segment 2 – Vermillion River Substation to Empire Substation

A sample of magnetic field calculations for the Vermillion River Substation to Empire Substation transmission line segment in year 2006 is provided in Figures 8-8 and 8-9. Figure 8-8 shows a typical magnetic field profile at peak load and Figure 8-9 shows the line operating at peak conditions and providing additional system support during an outage of the Koch to Apple Valley 115 kV line.

On these figures, the conductors are identified as "A", "B", "C", and "GO", and are shown on a two-dimensional graph as if they were attached to a pole. The dimension up the right side of the graph is distance in feet above grade and only relates to the height of the conductors. The distance left (negative distance) and right (positive distance) of the center (0') of the pole is shown at the bottom of the graph.

The figures also show the magnetic field strength (bell shaped curve) measured in mG (the left side of the graph or "B field"). The magnetic field graph shows that the strength of the field increases the closer you are to the center of the transmission line. In this case, the left and right bounds were selected at 100 feet because the field strength from the line is essentially equivalent to other magnetic field background sources at that distance.

The values of the magnetic field are as follows:

- In 2006, under normal maximum load conditions, the 115 kV transmission line would have a peak value of 30.2 mG directly underneath the transmission line and a value of approximately 10 mG at the edge of the right of way.

- In 2006, under contingency conditions, the 115 kV transmission line would have a peak value of 51 mG directly underneath the transmission line and a value of approximately 17 mG at the edge of the right of way.

The magnetic field strength will typically increase over time because the power flowing on the line increases.

Figure 8-8 Magnetic Field Profile – Peak Loads 2006 – System Intact Vermillion River Substation to Empire Substation Segment

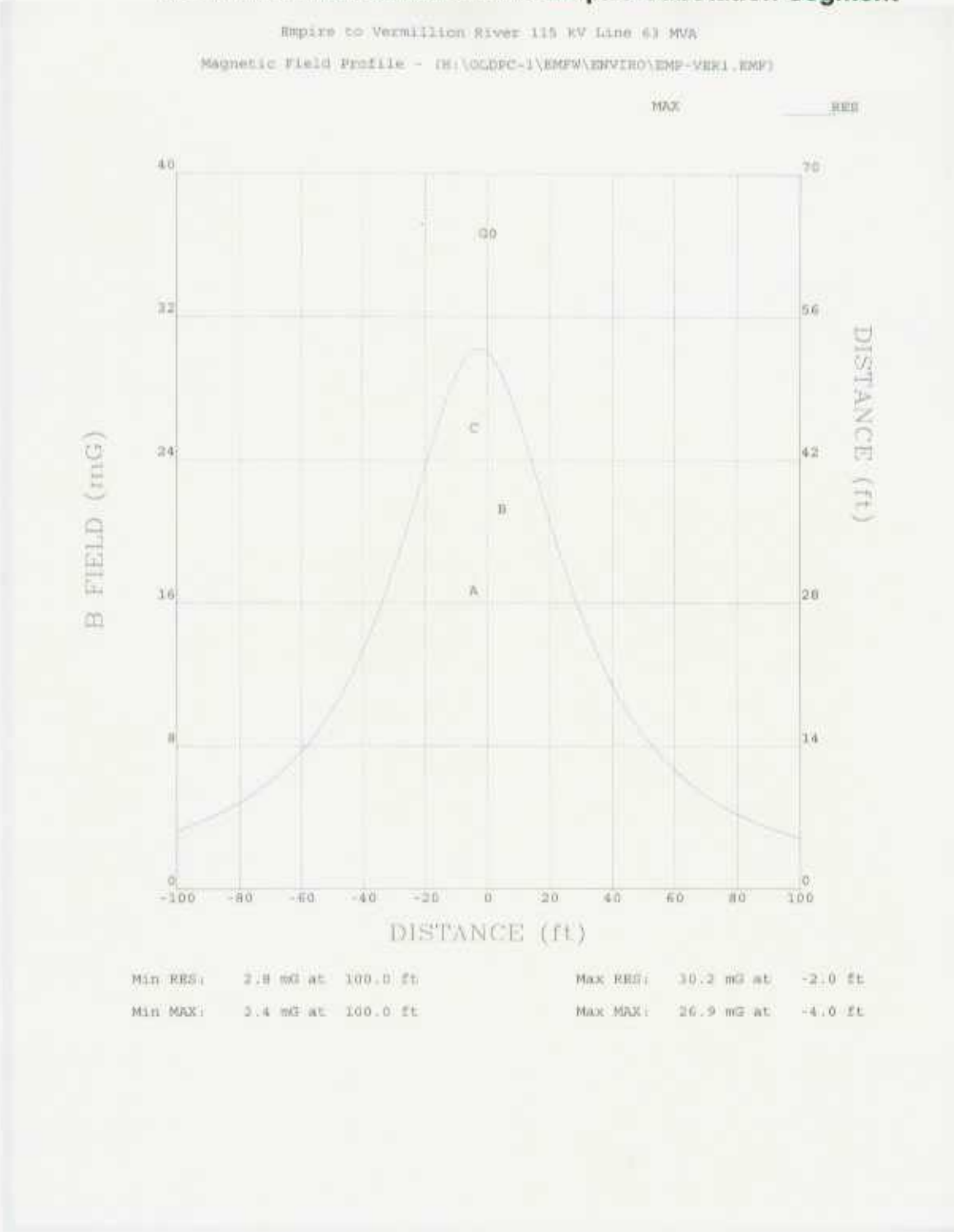
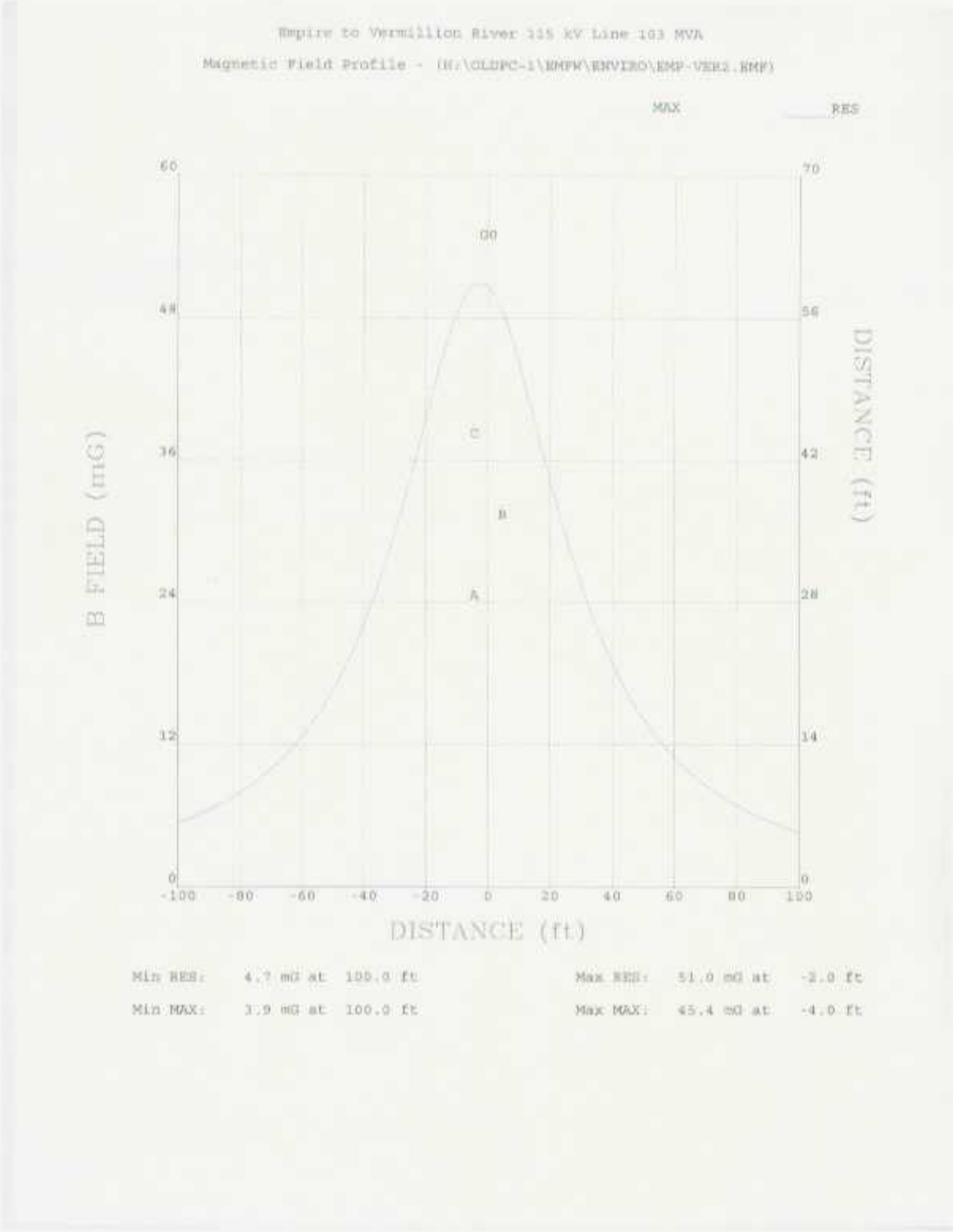


Figure 8-9 Magnetic Field Profile – Peak Loads 2006 – One Contingency Vermillion River Substation to Empire Substation Segment



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

8.4 Ozone and Nitrogen Oxide Emissions

Corona, which may produce ozone and oxides of nitrogen, consists of an ionic or electrical discharge from the surface of a transmission line conductor. It occurs when the electric field intensity or surface gradient on the conductor exceeds the breakdown strength of air. For a 115 kV transmission line, the conductor surface gradient is usually below the air breakdown level. Some imperfection, such as loose conductor support hardware or water droplets, is necessary to cause corona. When corona occurs, it will be within a few centimeters or less immediately surrounding a conductor. Ozone also forms naturally in the lower atmosphere from lightning discharges and from reactions between solar ultraviolet radiation and air pollutants such as hydrocarbons from auto emissions.

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

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

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

8.5 Radio/TV Interference

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

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

Interference with FM broadcast station reception is generally not a problem because:

- corona generated radio frequency noise currents decrease in magnitude with increasing frequency and are quite small in the FM broadcast band (88-108 megahertz (MHz)), and
- the excellent interference rejection properties inherent in FM radio systems make them virtually immune to amplitude type disturbances.

A two-way mobile radio located immediately adjacent to and behind a large metallic structure (such as a steel tower) may experience interference because of signal blocking effects. Movement of either mobile unit so that the metallic structure is not immediately between the two units should restore communications. This would generally require a movement of less than 50 feet by the mobile unit adjacent to a metallic tower. Because no lattice steel towers are anticipated for the proposed 115 kV line, this will not be a problem.

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

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

9. COST ANALYSIS OF THE PROPOSED PROJECT

9.1 Project Costs

The cost estimate for construction of the Air Lake-Empire 115 kV transmission line project is divided into five components as shown below.

Air Lake Substation Modifications	
Xcel Energy	$ 700,000
Vermillion River Substation	
Xcel Energy	$ 5,000,000
DEA	$ 1,200,000
Cedar Ave. to Vermillion River 115/115 kV Line	
Xcel Energy	$ 1,500,000
Vermillion River to Empire Substation 115 kV Line	
GRE	$ 2,800,000
Empire Substation Modifications	
Xcel Energy	$ 100,000
Total Estimated Cost of the Project	**$11,300,000**

9.2 Operation and Maintenance Costs

Annual operation and maintenance costs associated with 115 kV transmission lines in Xcel Energy's system have averaged approximately $1000 per mile of line over the last several years. These costs include tree clearing, inspections, and pole or structure replacements. For this project there will be minimal maintenance costs for at least 15 years, because the line will be constructed with steel poles and there are few trees along the Xcel Energy section of the line.

Once constructed, operation and maintenance costs associated with the Vermillion River Substation will be minimal, other than weed control inside the substation.

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

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

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

Xcel Energy has evaluated transmission system needs for this area out approximately 15 years (with a more detailed evaluation out approximately 10 years). During this timeframe, Xcel Energy does not have any plans to expand the proposed Air Lake-Empire 115 kV line or Vermillion River Substation, nor is Xcel Energy aware of any other utility plans to expand the 115 kV system. The design plans are therefore based on the current project and do not include any future expansion of the HVTL.

For this project Xcel Energy is proposing to rebuild the existing single circuit 69 kV transmission line to a double circuit 69/115 kV with the 69 kV portion built to 115 kV specifications. Although there are no current plans to operate the second circuit at 115 kV, it is possible that the existing 69 kV line may be upgraded to 115 kV in the future.

The Vermillion River Substation will be laid out to accommodate the installation of additional equipment (as described in Section 8.2) should significant load growth occur in the area.

11. PROPERTY/RIGHT OF WAY ACQUISITION AND RESTORATION

11.1 Right of Way Requirements

11.1.1 Segment 1 – Cedar Avenue/CR 50 to Vermillion River Substation

The proposed route for Xcel Energy's section of line will use an existing 69 kV line between Cedar Avenue and the Vermillion River Substation. The right of way for this line is 50 feet in width and the new double circuit line will be designed to be placed within this existing right of way.

11.1.2 Segment 2 – Vermillion River Substation to Empire Substation

The short double circuit 115/69 kV portion of the line (approximately 2/3 mile east of the proposed Vermillion River Substation) will be built on the existing Xcel Energy 50-foot right of way. The single circuit portion of the route will utilize a 70-foot right of way (35 feet on either side of the transmission centerline). Additional right of way may be required in some areas.

11.2 Property/Right of Way Acquisition Procedures

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

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

11.2.1 Segment 1 – Cedar Avenue/CR 50 to Vermillion River Substation

Xcel Energy will build the new 115/69 kV transmission line using its existing easement rights.

In cases where additional rights are determined to be necessary, customary acquisition procedures will be followed for these rights. In cases where the existing rights are determined to be adequate, the affected property owners will be contacted and provided with an explanation of Xcel Energy's intentions regarding use of its easements. Xcel Energy Right of Way representatives will be available to discuss easement issues with all owners regardless of whether or not additional easement rights are necessary.

11.2.2 Substation Property Acquisition

Xcel Energy and DEA have done site evaluations for a joint substation for the proposed substation. Preliminary contact with the landowner of the site has been made along with soil investigations to determine the suitability of the property for a substation. Once the EQB issues a permit, Xcel Energy will work with the landowner and proceed to obtain the necessary land rights for the facility, and will work to obtain the property through voluntary purchase. Condemnation will occur only if Xcel Energy cannot work out an agreeable purchase price with the landowner.

During the substation construction phase, any affected property owners will be advised as to the construction schedules or needed access to the site. 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.

11.2.3 Segment 2 – Vermillion River Substation to Empire Substation

GRE will acquire new easement rights for the entire single circuit portion of the route.

GRE's short double circuit portion will be built on the existing Xcel Energy right of way. In cases where additional rights are determined to be necessary, customary acquisition procedures will be followed for these rights. In cases where the existing rights are determined to be adequate, the affected property owners will be contacted and provided an explanation of the use of the easements. GRE and Xcel Energy Right of Way representatives will be available to discuss easement issues with all property owners.

11.3 Tree Clearing and Staking

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

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

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

11.4 Right of Way Restoration

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

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

12.1 Construction Practices

12.1.1 General

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

Xcel Energy and GRE design and construct transmission lines using the most cost-effective methods based on past experiences and practices and in compliance with the latest industry standards.

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

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

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

In lowland areas, construction activities may occur during the winter season to mitigate any damage to wetland areas or to comply with required crossing permits. A pre-construction conference will outline any special requirements for the contractor prior to the start of any construction activities.

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

12.1.2 Double Circuit Lines

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

Xcel Energy plans to use its own transmission construction crews for this project. A copy of the project's easement restriction list, construction permit conditions, and any required local permits are given to the Xcel Energy crews prior to construction.

12.1.3 Single Circuit Line

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

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

12.1.4 Vermillion River Substation

Construction of the new substation will begin once the final design is complete and the property is acquired. 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 11.4 acres of land will be graded to construct the substation. The concrete foundation will be poured to support the substation equipment and control house. Once the site is graded, a perimeter fence will be installed to secure the site and substation erection will commence.

Xcel Energy provides erosion control methods to be implemented to minimize runoff during substation construction. Xcel Energy construction crews or an Xcel Energy contractor will comply with local, state, NESC and Xcel Energy standards regarding clearance to ground, clearance to crossing utilities, clearance to buildings, right of way widths, erection of power poles, and stringing of transmission line conductors.

Upon completion of construction activities, Xcel Energy 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. Where appropriate, Xcel Energy will incorporate methods to screen the final site.

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

12.1.5 Substation Upgrades

The proposed project will affect two existing substations (Air Lake and Empire). These substations presently transform the voltage from 115 kV on the transmission side down to 15 kV nominal on the distribution side.

No upgrades or modifications are planned on the distribution portions of these two substations.

All construction will be completed in accordance with Xcel Energy and DEA construction standards as well as the NESC. These standards include clearances to ground, clearance to crossing utilities, clearance to buildings, right of way widths, erecting power poles, and stringing of transmission line conductors.

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

Xcel Energy plans to perform all design, engineering and construction activities using internal resources.

12.2 Operation and Maintenance

GRE and Xcel Energy will periodically use their respective 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 (ATV), pickup truck, or by aerial means. These inspections will be limited to the acquired right of way and areas where obstructions or terrain require access off the easement. An aerial inspection of each transmission line is conducted monthly to ensure reliable operation.

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

12.3 Work Force Requirements

During construction, there will be minimal impacts to community services, hotels and restaurants to support the utility personnel and contractors. It is estimated that 15 to 20 workers will be employed during construction of the Xcel Energy portion of the project and 15 to 25 workers during construction of the GRE portion 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 such as concrete may be purchased locally.

13. LIST OF PERMITS NEEDED

13.1 Local

- **City and County Road Crossing Permits** are required to cross or occupy city and county road right of way.
- **City or County Lands Permits** may be required to occupy city or county lands such as parklands, watershed districts, and other city/county-owned property.
- **Building Permits** may be required by the local jurisdictions for substation modifications associated with the proposed transmission line project.

13.2 State

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

13.3 Federal

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

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

GRE and Xcel Energy have applied for a Route Permit for a 115 kV HVTL that is needed to meet the energy needs of DEA and Xcel Energy customers located in the Farmington area. The HVTL's two endpoints will be the intersection of Cedar Avenue/CR 50 and the existing Empire Substation. Between those two endpoints, the HVTL must interconnect with the new proposed Xcel Energy/DEA Vermillion River Substation.

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

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

Effects of the proposed project on human settlement are discussed in Section 6.2 of this Application. The proposed route and associated substation result in no displacement of existing residences. The noise from the HVTL and substation will be minimal (Section 6.2.3). A portion of the proposed line is along an existing 69 kV transmission line corridor. The proposed HVTL and associated substation will have no impact on cultural values, recreation, or public services.

B. Effects on public health and safety.

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

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

The values of the magnetic field for the Xcel Energy 115 kV double circuit transmission line are:

- In 2006, under normal maximum load conditions, the 115 kV transmission line would have a peak value of 26.4 mG directly underneath the transmission line and a value of approximately 18 mG at the edge of the right of way.

- In 2006, under contingency conditions, the 115 kV transmission line would have a peak value of 28.3 mG directly underneath the transmission line and a value of approximately 20 mG at the edge of the right of way.

The values of the magnetic field for the GRE 115 kV transmission line are:

- In 2006, under normal maximum load conditions, the 115 kV transmission line would have a peak value of 30.2 mG directly underneath the transmission line and a value of approximately 10 mG at the edge of the right of way.

- In 2006, under contingency conditions, the 115 kV transmission line would have a peak value of 51 mG directly underneath the transmission line and a value of approximately 17 mG at the edge of the right of way.

The magnetic field strength will typically increase over time because the power flowing on the line increases.

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

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

D. Effects on archaeological and historic resources.

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

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

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

F. Effects on rare and unique natural resources.

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

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

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

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

The Vermillion River Substation will be laid out to accommodate additional equipment (such as additional transmission line terminations, capacitor banks, transformers, and related feeders) should significant load growth occur in the area. Although no specific plans have been made, construction of the site to accommodate future growth will eliminate the need for a new substation site in the future.

In this Application Xcel Energy is proposing to rebuild its existing single circuit 69 kV transmission line to a double circuit 69/115 kV with the 69 kV portion built to 115 kV specifications. Although there are no current plans to operate the second circuit at 115 kV, it is possible that the existing 69 kV line may be upgraded to 115 kV in the future. Constructing the line with both circuits built to 115 kV specifications now will avoid the need to replace the poles in the future, thus minimizing impacts.

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

The proposed transmission line route uses or parallels existing rights of way where possible.

The Xcel Energy portion of the project (Segment 1) uses an existing 69 kV transmission line corridor and its right of way between the Cedar Avenue/CR 50 intersection and the proposed Vermillion River Substation.

The GRE portion of the project (Segment 2) follows existing roads and transmission line right of way as much as possible. It parallels road rights of way along Akin Road, proposed 208th Street, MN Highway 3, and 210th Street. For the short distance that the proposed route traverses undeveloped land, it

incorporates a future roadway designated in the "Dakota County East-West Corridor Study" and minimizes impacts on existing residential development.

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.

The proposed project will improve the electrical system reliability for the local distribution systems as well as for the transmission system. Distribution reliability is enhanced by providing new substation capacity in the vicinity of the load growth. The proposed project will result in shorter distribution feeders and additional capacity to back up other substations when compared to the alternative of serving the new load from substations in the surrounding area.

Transmission reliability is increased by the addition of a new east-west tie for the Dakota County area transmission system. The proposed project gives another source from the Inver Hills 345/115 kV Substation to the Farmington and Lakeville areas. It is critical for the area's reliability, especially during outages of existing transmission lines. The 115 kV line is inherently more reliable than the 69 kV line upgrades identified as the transmission alternative 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 is no higher, and is likely to be lower than along alternative routes. The proposed route relies on 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 archeological sites are identified during placement of the poles along the proposed route or construction of the substation, the particular site will be avoided. Native vegetation will be maintained within the proposed route that is compatible with

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

N. Irreversible and irretrievable commitments of resources.

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

15. REFERENCES

15.1 Text References

Anderson, H.W., Farrell, D.F., Broussard, W.L. *Water Resources of the Lower Minnesota River Watershed*. 1974. South Central Minnesota. Hydrologic Investigations Atlas HA-526. U.S. Geological Survey.

City of Farmington. 2000. *Farmington 2020 Comprehensive Plan*. http://www.ci.farmington.mn.us/CDD/CompPlan2020/CompPlan2020Site.htm (January 7, 2004)

City of Farmington. *A Guide to the Comprehensive Plan*. (no date)

Dakota County. 2003. *East-West Corridor Study*.

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

Electric Power Research Institute. 1982. *Transmission Line Reference Book 345 kV and Above*. 3412 Hillview Avenue, Palo Alto, California.

Empire Township. 2003. *Scoping Environmental Assessment Worksheet for Sand and Gravel Mining and Accessory Use*. http://www.bolton-menk.com/clients/empire/EAWDraft.pdf (January 8, 2004).

Great River Energy. 2003. *Long Range Transmission Plan - 2003.*

Institute of Electrical and Electronics Engineers, Inc. 2002. *National Electrical Safety Code (NESC) C2-2002*. http://standards.ieee.org/nesc/

Metropolitan Council. *2000 Generalized Land Use: Empire County*. http://gis.metc.state.mn.us/maps/landuse2000/map19376.pdf (January 22, 2004).

Metropolitan Council. 2004. *2030 Regional Development Framework*. http://www.metrocouncil.org/planning/framework/Framework.pdf (January 22, 2004).

Metropolitan Council. 2003. *Residential Building Permits Issued in the Twin Cities Area January – December 2002.*

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

Minnesota Department of Natural Resources. 1984. *Protected Waters and Wetlands Map, Dakota County*.

Minnesota Department of Natural Resources. 1997. *Minnesota County Biological Survey Map: Dakota County (Series No. 16).*

Minnesota Department of Natural Resources. 1995. *Public Recreation Information Map, Metro Area – South.*

Minnesota Planning, State Demographic Center. 2002. *Minnesota Population Projections 2000 – 2030.*

Minnesota Pollution Control Agency. Undated. Minnesota Rules Chapter(7030) http://www.revisor.leg.state.mn.us/arule/7030/0040.html

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

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

Natural Resources Conservation Service. 1999. *Conservation Practice Standard, Code 390.* NRCS. St. Paul, Minnesota.

Northern States Power. 2000. *Long-Range Delivery System Study. Southeast Twin Cities Area.*

United States Census Bureau. 2001. *1997 Economic Census.* http://factfinder.census.gov/servlet/GQRTable?_bm=y&-geo_id=E6000US2703720618512099999&-all_geo_types=N&-context=gqr&-ds_name=E9700A1&-tree_id=500&-_lang=en&-format= (January 5, 2004).

United States Census Bureau. *2000 U.S. Census.* http://factfinder.census.gov/home/saff/main.html?_lang=en (January 29, 2004).

United States Department of Agriculture, Minnesota Agricultural Statistics Service. 2003. *2003 Minnesota Agricultural Statistics.* http://www.nass.usda.gov/mn/agstat03/p101104.pdf

United States Department of Agriculture, Minnesota Agricultural Statistics Service. *1997 Census of Agriculture.* http://www.nass.usda.gov/census/census97/profiles/mn/mnpb019.pdf (January 5, 2004).

United States Department of Agriculture, Soil Conservation Service. 1983. *Soil Survey of Dakota County, Minnesota.*

United States Department of Agriculture. Natural Resources Conservation Service. 2004. *Prime and State Wide Important Farmland Soils, Dakota County, MN.* http://efotg.nrcs.usda.gov/treemenuFS.aspx?Fips=27037&MenuName=menuMN.zip (March 9, 2004)

United States Department of Agriculture. 1992. REA Bulletin 1724E-200. *Design Manual for High Voltage Transmission Lines.*

United States Department of Energy, Bonneville Power Administration. Undated. *Corona and Field Effects Program Version 3.0 Computer Program (Public Domain Software).* BPA, P.O. Box 491-ELE, Vancouver, WA 98666.

15.2 Map Data Sources

Metropolitan Council. 2000. *Stream Network Dissolved to Management Streams.* Acquired February 2004 http://www.datafinder.org/metadata/stream_net_dissolve.html

Metropolitan Council. 2000. *Generalized Land Use 2000 for the Twin Cities Metropolitan Area.* Acquired June 2002 http://www.datafinder.org/metadata/landuse_2000.html

Metropolitan Council. 2004. *Counties and Cities & Townships, Twin Cities Metropolitan Area.* Acquired February 2004 http://www.datafinder.org/metadata/county_ctu.html

Minnesota DNR – Division of Waters. 1991-1994. *National Wetlands Inventory Polygons.* Acquired July 2003 http://deli.dnr.state.mn.us/metadata/full/nwixxpy3.html

Minnesota Department of Transportation. 2001. *Mn/DOT BaseMap 2001.* Acquired February 2004 http://www.dot.state.mn.us/tda/basemap/metadata/Roads.html

U.S. Department of Agriculture, Farm Services Agency, Aerial Photography Field Office. 2003. *National Agricultural Imagery Program (NAIP) Digital Ortho-rectified Images (DOQ), Minnesota.* Acquired February 2004 http://www.lmic.state.mn.us/chouse/naip03mrsid.html