

**Environmental Assessment
for the Proposed**

**Yankee Doodle - Pilot Knob 115 kV Transmission
Upgrades**

Dakota County, Minnesota

City of Eagan

July 2009

Table of Contents

1.0	Introduction	1-1
1.1	Proposed Project and Project Need	1-1
1.2	Project Location, Description and Schedule	1-1
1.3	Project Cost Estimate	1-5
2.0	Regulatory Framework	2-1
2.1	Permit Requirement	2-1
2.2	Environmental Assessment Requirement	2-1
2.3	Public Participation/Scoping of Environmental Assessment	2-1
2.4	Plat Approval for Building Permit	2-2
3.0	Engineering Design, Right-of-Way Acquisition, and Construction.....	3-1
3.1	Substations.....	3-1
3.2	Transmission Lines.....	3-3
3.3	Right-of-Way Acquisition	3-5
3.4	Construction and Maintenance Procedures	3-5
4.0	Assessment of Impacts and Mitigation.....	4-1
4.1	Description of Environmental Setting	4-1
4.2	Impacts on Human Settlement	4-1
4.2.1	Socioeconomics	4-1
4.2.2	Displacement.....	4-1
4.2.3	Noise	4-3
4.2.4	Aesthetics.....	4-4
4.2.5	Human Health and Safety	4-4
4.2.6	Public Services	4-8
4.2.7	Transportation	4-8
4.3	Impacts on Land-based Economies	4-8
4.3.1	Recreation/Tourism	4-8
4.3.2	Agriculture	4-8
4.3.3	Mining and Forestry	4-8
4.4	Archaeological and Historic Resources.....	4-8
4.5	Natural Environment.....	4-9
4.5.1	Air Quality	4-9
4.5.2	Water Resources, Wetlands and Soils	4-9
4.5.3	Vegetation and Wildlife/Rare and Unique Natural Resources.....	4-9
5.0	Regulatory Permits and Approvals Required	5-1

Figures

Figure 1-1	General Vicinity Map	1-2
Figure 1-2	Project Map	1-3
Figure 3-1	Eagan Substation Plot Plan.....	3-2
Figure 3-2	Proposed 115 kV Structures.....	3-4
Figure 4-1	City of Eagan Zoning Map.....	4-2
Figure 4-2	DNR Public Waters Map.....	4-11
Figure 4-3	Rare Features Map.....	4-12

Tables

Table 4-1	Common Noise Sources and Levels.....	4-3
Table 4-2	Calculated Electric Fields (kV/m) for Proposed 115 kV Transmission Line Designs.....	4-6
Table 4-3	Calculated Magnetic Fields (Milligauss) for Proposed 115 kV Transmission Line Designs.....	4-7
Table 5-1	Regulatory Permits and Approvals Required.....	5-1

Appendices

Appendix A	Notices
Appendix B	EA Scoping Letter and Public Comments
Appendix C	Agency Correspondence

List of Acronyms Used in this Document

ACRONYMS	
Commission	Minnesota Public Utilities Commission
dB dB(A)	Decibel Decibel, A-weighted
DEA	Dakota Electric Association
DNR	Minnesota Department of Natural Resources
EA	Environmental Assessment
EMF	Electromagnetic fields
EQB	Minnesota Environmental Quality Board
GRE	Great River Energy
kV	Kilovolt
kV/m	Kilovolts per meter
MPCA	Minnesota Pollution Control Agency
NAC	Noise Area Classification
NPDES	National Pollutant Discharge Elimination System
ROW	Right-of-way
SHPO	State Historic Preservation Office
SWPPP	Stormwater Pollution Prevention Plan
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service

1.0 Introduction

1.1 Proposed Project and Project Need

Great River Energy (GRE), Dakota Electric Association (DEA), and Northern States Power Company, doing business as Xcel Energy, propose a number of facility upgrades in the Eagan area to meet the growing electrical demand and improve the service and reliability of electric facilities in the Eagan, Minnesota area (Figure 1-1).

The project will include rebuilding two sections of existing Xcel Energy single circuit 115 kilovolt (kV) lines to double circuit 115/115 kV, upgrading the Eagan Substation from 69 kV to 115 kV, rebuilding a portion of an existing Xcel Energy 69 kV line to 115 kV, and modifications at the Yankee Doodle and Pilot Knob substations. These upgrades are discussed in more detail below and in Section 3.0.

1.2 Project Location, Description and Schedule

The proposed project is located in Sections 11, 14, 23, 26 and 27, T27N, R23W, in the City of Eagan, Dakota County, Minnesota (Figure 1-2). Project permitting will occur in summer 2009 and construction will occur in fall 2009 and into 2010. Each phase of the project is described below.

Great River Energy Transmission Line

Great River Energy will rebuild approximately one mile of Xcel Energy's existing single circuit 115 kV transmission line (currently operated at 69 kV) to a double circuit, 115/115 kV line from the Yankee Doodle Substation south to Wescott Road (Figure 1-2). Xcel Energy will own the poles and one circuit that will operate at 115 kV and Great River Energy will own the other circuit that will operate at 69 kV to restore the 69 kV loop feed to the Wescott Park Distribution Substation.

Although all work will be done within the existing easements, Great River Energy plans to meet with each landowner and acquire an easement for the new circuit that will be owned by Great River Energy. Construction on Great River Energy's portion of the project will begin in fall 2009 and be completed in early 2010.

Figure 1-1



Project Area



 Project Location



**Yankee Doodle To Pilot Knob
115 kV System Upgrades
General Vicinity Map**

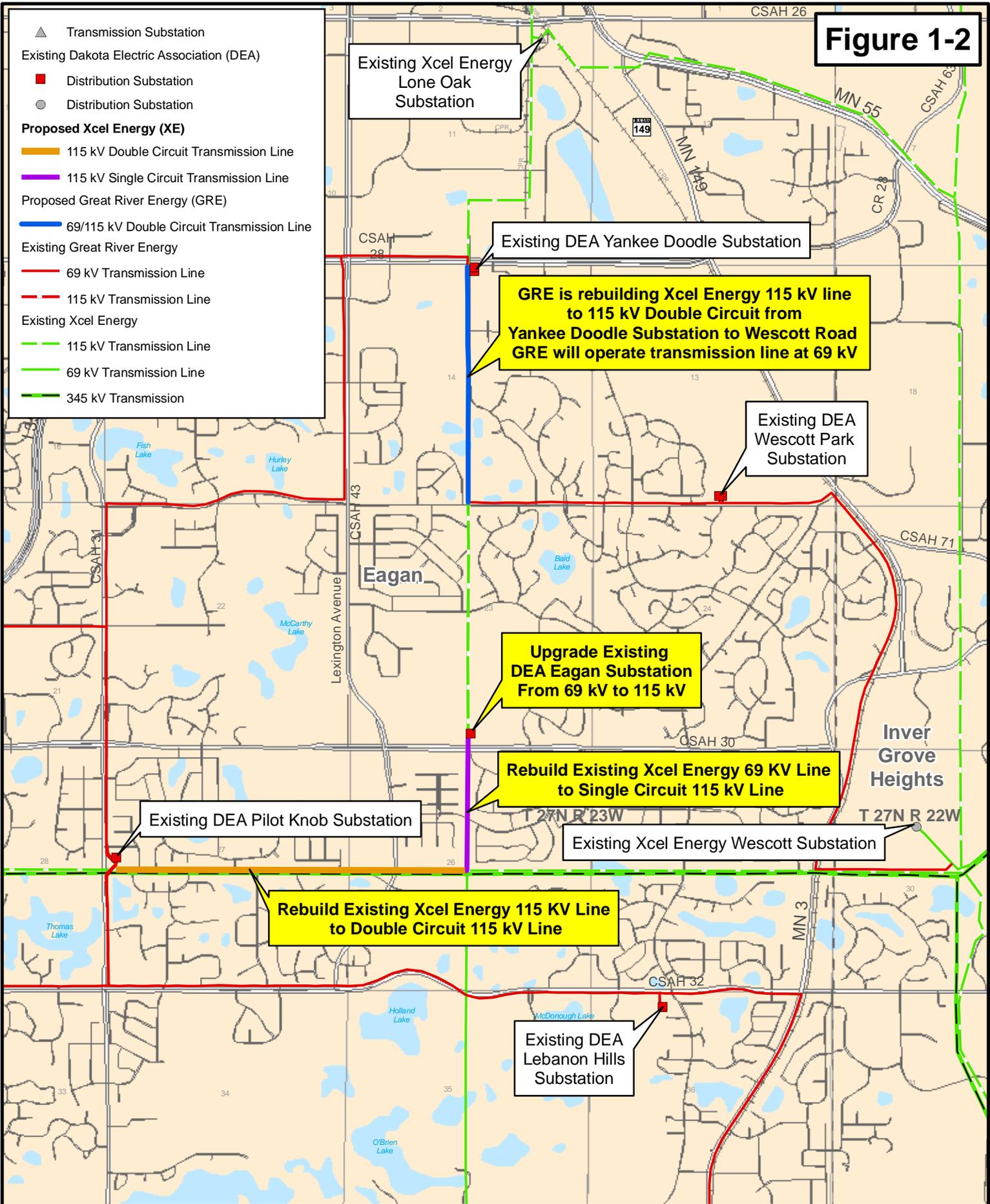
GREAT RIVER ENERGY
A Touchstone Energy Cooperative



GIS Data Sources Vary Between:
MN Department of Transportation, MN Department of Natural Resources,
MN Land Management Information Center, and Great River Energy

Figure 1-2

- ▲ Transmission Substation
- Existing Dakota Electric Association (DEA)
- Distribution Substation
- Distribution Substation
- Proposed Xcel Energy (XE)**
- 115 kV Double Circuit Transmission Line
- 115 kV Single Circuit Transmission Line
- Proposed Great River Energy (GRE)**
- 69/115 kV Double Circuit Transmission Line
- Existing Great River Energy**
- 69 kV Transmission Line
- 115 kV Transmission Line
- Existing Xcel Energy**
- 115 kV Transmission Line
- 69 kV Transmission Line
- 345 kV Transmission



**Yankee Doodle To Pilot Knob
115 kV System Upgrades
Project Map**

GREAT RIVER ENERGY
A Touchstone Energy Cooperative



1 in represents 0.5 miles

Updated: Jun 19, 2009

GIS Data Sources Vary Between:
MN Department of Transportation, MN Department of Natural Resources,
MN Land Management Information Center, and Great River Energy

Xcel Energy Transmission Lines

Xcel Energy will construct a 115 kV line from the Pilot Knob Substation to the Eagan Substation (Figure 1-2) by:

- Upgrading approximately 1.5 miles of existing single circuit 115 kV transmission line (5525 line) to double circuit, 115/115 kV line from the Pilot Knob Substation to the intersection with Xcel Energy's 0703 line approximately ¼ mile east of Lexington Ave.
- Upgrading approximately ½ mile of Xcel Energy's existing single circuit, 69 kV transmission line (0703 line) to single circuit 115 kV line from the previously described intersection north to the Eagan Substation.

All work will be done within the existing easements. Construction on Xcel Energy's portion of the project is planned to start in winter 2010 with a scheduled completion date in summer 2010.

Dakota Electric Association Eagan Substation

The rebuild of the Eagan Substation will involve the demolition of the existing facility and increasing the footprint by approximately 75% without acquisition of additional land. The open box steel structures will be replaced with a more ascetic lower profile substation featuring an enclosed switchgear unit. The existing 8.4 MVA, 69 kV transformer will be replaced with a 36.5 MVA, 115 kV transformer.

Construction on the substation rebuild will begin in late fall 2009 and be completed in late spring 2010. The new substation coupled with the 115 kV transmission line will provide a much stronger, more reliable electrical supply for the existing and future loads.

The transmission tap line into the substation will be constructed by Great River Energy and the 3-way tap switch will be constructed by Xcel Energy.

Other Substation Modifications

A new line exit will be incorporated into DEA's Yankee Doodle Substation, which will complete the in/out configuration. In addition, motors will be added to the switches inside the substation to allow for remote control operation.

A new breaker will be added at Great River Energy's Pilot Knob Substation. This breaker will be connected to Xcel Energy's rebuilt line exiting Pilot Knob Substation.

1.3 Project Cost Estimate

Estimated project costs are listed below.

Great River Energy Transmission Line	\$ 1,070,000
Xcel Energy Transmission Line	\$ 2,500,000
DEA Eagan Substation Rebuild	\$ 1,800,000
Pilot Knob Breaker Addition	\$ 440,000
<u>Yankee Doodle Substation Modifications</u>	<u>\$ 250,000</u>
Total Estimated Project Cost	\$ 6,060,000

2.0 Regulatory Framework

2.1 Permit Requirement

This project falls under the State of Minnesota's Power Plant Siting Act, (Minnesota Statutes § 216E.01-.18 and Minnesota Rules Chapter 7849) for transmission projects over 100 kV and requires a permit from the Minnesota Public Utilities Commission (Commission). However, for eligible projects, a utility may apply to the local unit of government that has jurisdiction over the project for approval instead of applying to the Commission (Minn. Rules 7849.6200). This proposed 115 kV project is eligible for local review.

The City of Eagan has agreed to act as the lead local unit of government with jurisdiction to approve the project. The City was afforded the opportunity to relinquish its jurisdiction by requesting that the Commission assume jurisdiction, but has elected to maintain jurisdiction of the project.

As required by Minn. Rules 7849.6200 Subp.3, a project notice was sent by the utilities to the Commission and to those persons on the Power Plant Siting General Notification list (see Appendix A). A letter from the Office of Energy Security confirming that the Commission received notification that the utilities intend to seek local approval is also included in Appendix A.

2.2 Environmental Assessment Requirement

In accordance with Minn. Rules 7849.6200 Subp.5, an environmental assessment (EA) prepared by the local unit of government with jurisdiction over the project must be completed. The EA contains information on the human and environmental impacts of the proposed project and addresses methods to mitigate such impacts.

When the EA is complete, the City of Eagan must publish a notice in the Environmental Quality Board (EQB) Monitor that the EA is available for review, how a copy of the document may be reviewed, that the public may comment on the document, and the procedure for submitting comments to the City. A final decision on the project cannot be made until at least ten days after the notice appears in the EQB Monitor.

2.3 Public Participation/Scoping of Environmental Assessment

The City of Eagan sent out a Public Comment Notice to property owners on June 12, 2009 to obtain input from the public on the project and the scope of the EA (see Appendix B). One comment was received from the public regarding the project (Appendix B).

In addition, Xcel Energy sent out a project summary notice to all landowners adjacent to the Xcel Energy transmission lines proposed to be rebuilt.

2.4 Plat Approval for Building Permit

The City of Eagan requires a plat approval for a building permit issuance for this project. The City Council must approve the Final Plat of the Eagan Substation Property, and a condition of the final plat is preparation of an Environmental Assessment. Approval of the Final Plat is considered approval of both the substation and related transmission.

An application for a plat approval was submitted to the City on May 27, 2009. The City of Eagan will make a final decision on the plat approval/building permit in August 2009 after notice of the EA has been published in the EQB Monitor and the comment period requirements have been met.

3.0 Engineering Design, Right-of-Way Acquisition, and Construction

3.1 Substations

The project substations are enclosed in fenced areas situated inside the larger parcels. There are 7-foot and 10-foot high chain link fences (with an additional one foot of barbed wire around the top) around the substation and they are designed to deter animals.

Some equipment within the substations is filled with mineral oil for cooling. This equipment sits on concrete pads with three (3) inches of crushed rock covering the entire fenced-in area in the event of an equipment leak. Substations are monitored electronically 24 hours per day for leaks, and inspected monthly for visual leaks.

DEA Eagan Substation

DEA will convert the Eagan Substation from a 69 kV to a 115 kV substation (Figure 3-1). DEA has decided to rebuild the existing Eagan Substation rather than just converting it to the higher voltage because it will allow DEA to make the most use of the existing transmission corridor, off load additional demand from the 69 kV transmission system, extend the useful life of the 69 kV system, provide additional distribution capacity, and provide stronger backup support for adjacent substations.

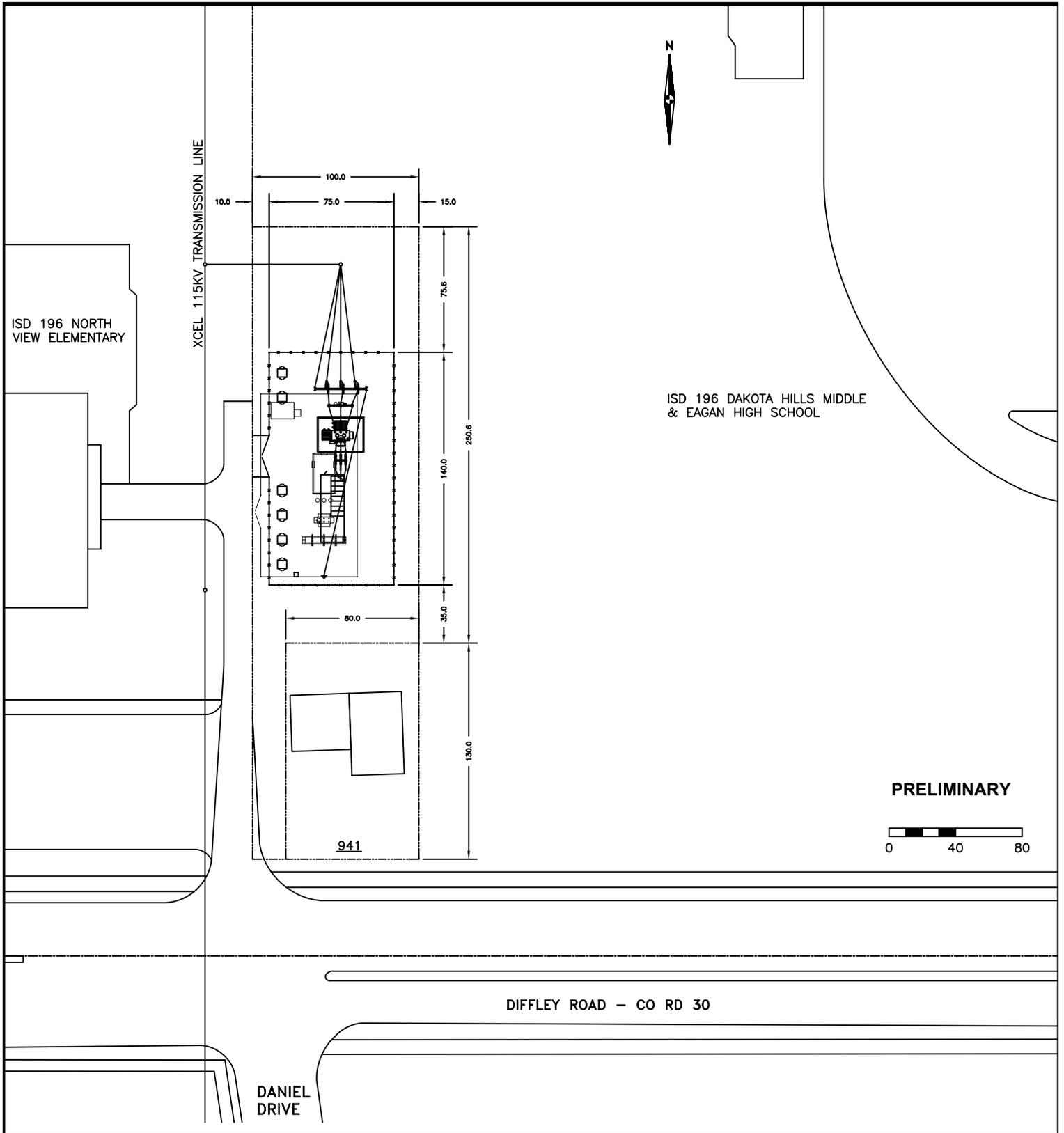
The reconstruction of the Eagan Substation will involve the demolition of the existing facility and increasing the footprint by approximately 75% without acquisition of additional land. This project will replace the open box steel structures with a more aesthetic lower profile substation featuring an enclosed switchgear unit. The existing 8.4 MVA, 69 kV transformer will be replaced with a 36.5 MVA, 115 kV transformer.

Other Substation Modifications

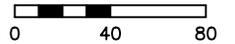
A new line exit will be incorporated into DEA's Yankee Doodle Substation, which will complete the in/out configuration. In addition, motors will be added to the switches inside the substation to allow for remote control operation.

A new breaker will be added at Great River Energy's Pilot Knob Substation. This breaker will be connected to Xcel Energy's rebuilt line exiting Pilot Knob Substation.

Figure 3-1 Eagan Substation Plot Plan



PRELIMINARY



REV.	DATE	DRAWN	APPVD.	DATE	DESCRIPTION

DAKOTA ELECTRIC ASSOCIATION
FARMINGTON MINNESOTA

EAGAN SUBSTATION
PLOT PLAN
(PROPOSED)

CHECKED	_____
DATE	_____
DRAWN	JCG
DATE	06/04/08

SCALE	1" = 80'-0"
W.O. NO.	9447X20
MAP NO.	A2-23DC
DWG. NO.	EA-SK-03

3.2 Transmission Lines

Great River Energy

The existing Xcel Energy 115 kV single circuit transmission line between the Yankee Doodle Substation and Wescott Road will be rebuilt to a double circuit 115/115 kV design (Figure 3-2), consisting of six phase wires and a shield wire for lightning protection.

The new line will be constructed with 795 ACSR conductor supported by steel poles that will be 70-80 feet in height. The spacing between the new poles will be approximately 700-800 feet. Construction will be accomplished within the existing easements.

Xcel Energy will own the poles and one circuit that will be operated at 115 kV. Great River Energy will own the other circuit, which will be operated at 69 kV.

Xcel Energy

Segment 1: Eastward 1.5 miles from Pilot Knob Substation

The existing Xcel Energy 115 kV single H-Frame (5525) transmission line between the Pilot Knob Substation heading east along Wilderness Road for 1.5 miles will be removed and replaced with a 115/115 kV, double circuit davit arm design that will re-establish the removed H-Frame circuit and allow for the addition of the new second circuit that will end at Yankee Doodle Substation. The design will consist of six phase conductors and two shield wires used for protection of the line (Figure 3-2). The new lines will be constructed with 795 ACSR conductor supported by steel poles that will be 70-95 feet in height. The spacing between the new poles will be approximately 600-800 feet. Construction will be accomplished within the existing easements. Xcel Energy will work with the City of Eagan on the restoration of a bike path that is currently routed within the transmission corridor so that the new transmission design complements the path upon completion of the line.

Segment 2: North 0.5 mile to Eagan Substation

Segment 2: At the point where the new double circuit ends (1.5 miles east of the Pilot Knob Substation), the line will continue north for an additional 0.5 mile to Dakota Electric Association's rebuilt Eagan Substation located just off Diffley Road (CSAH 30). In this section the existing 1940s lattice style, 69 kV circuit (Xcel Energy 0703 line) will be rebuilt and replaced with a 115 kV, horizontal post, single circuit design (Figure 3-2). The line will have three 795 ACSR phase wires and a shield wire for lightning protection and spans ranging from 300-400 feet.

Figure 3-2 Proposed 115 kV Structures

Typical Double Circuit 115 kV Structure



Typical Single Circuit 115 kV Structure



3.3 Right-of-Way Acquisition

After project approvals to construct the transmission line are secured, landowners along the Great River Energy portion of the project will be contacted by representatives of Great River Energy to begin direct negotiations to acquire an easement for the circuit that it will own.

Once easements, permits and land rights have been acquired, and immediately prior to construction, individual property owners will be contacted to discuss the construction schedules, access to the site and vegetation clearing required for the project. The right-of-way (ROW) would be cleared of the amount of vegetation necessary to construct, operate and maintain the proposed transmission line. Wood from the clearing operation will be offered to the landowner or removed from the site. Brush will be chipped and disposed of on the ROW. It is standard practice to remove any vegetation species that would be a danger to the line when at a mature height. Also, any vegetation that is in the way of construction equipment may have to be removed.

Some structure locations may require soil analysis to assist with the design of the line. Soil borings would be conducted to determine the soil properties for engineering analysis. An independent geotechnical testing company would take and analyze these borings. Site access would be required and landowners would be contacted for permission.

In addition to the ROW required for adequate clearance of the proposed transmission line, temporary construction easements may be obtained from landowners for the duration of construction. These construction easements would need to be limited to special construction access needs or any additional staging or laydown areas required outside of the proposed transmission line ROW. Where possible, staging and laydown areas would be located within the ROW and limited to previously disturbed or developed areas. Upon completion of construction activities, landowners will be contacted to determine if any additional restoration due to construction damage is necessary.

3.4 Construction and Maintenance Procedures

The proposed 115 kV transmission lines would be constructed at grade elevations; therefore, no pole locations would require grading unless it is necessary to provide a level area for construction access and activities. Construction would comply with the latest industry standards regarding clearance to ground, clearance to crossing utilities, clearance to buildings, ROW widths, erecting power poles, and stringing of transmission line conductors.

Typical pole structures would require a drilled hole 10 to 15 feet deep and 3 to 4 feet in diameter for each pole. Pole structures in wet environments or angle structures may require additional foundation support, typically consisting of a concrete foundation or placement of the pole base inside a vertical galvanized steel culvert. Erosion control methods would be implemented to minimize runoff during construction. The utilities or

approved contractors would perform transmission line construction in compliance with local, state, National Electrical Safety Code, and industry standards.

Poles would be delivered to either the staked location or a project storage yard. If the poles were delivered to a staked site, they would be placed on the ROW out of the clear zone of any adjacent roadways or designated pathways. Insulators and other hardware would typically be attached while the pole was on the ground. The pole would then be lifted, placed and secured on the foundation by a bucket truck or crane.

Once the structures have been erected, conductors would be installed by establishing stringing setup areas within the ROW. The stringing setup areas would usually be established every two miles along the project route. Conductor stringing operations also require brief access to each structure to secure the conductor wire to the insulators or to install shield wire clamps once final sag is established. Temporary guard or clearance poles would be installed, as needed, over existing distribution or communication lines, streets, roads, highways, railways or other obstructions after any necessary notifications were made or permits obtained. This ensures that conductors would not obstruct traffic or contact existing energized conductors or other cables. In addition, the conductors would be protected from damage.

The utilities will periodically use the transmission line ROW to perform inspections, maintain equipment, and repair any damage. They will also conduct regular route maintenance for weed control and removal of undesired vegetation that would interfere with the operation of the proposed transmission line.

During construction, limited ground disturbance at the structure sites may occur. Disturbed areas would be restored to their original condition to the maximum extent practicable as negotiated with the landowner. Post-construction reclamation activities include:

- removing and disposing of debris,
- removing all temporary facilities (including staging and laydown areas),
- employing appropriate erosion control measures,
- reseeding and mulching areas disturbed by construction activities with vegetation similar to that which was removed and,
- restoring the areas to their original condition to the extent possible.

In cases where soil compaction has occurred, the construction crews or a restoration contractor uses various methods to alleviate the compaction as negotiated with landowners.

4.0 Assessment of Environmental Impacts and Mitigation

The proposed project consists of upgrades to existing substation and transmission line facilities, therefore impacts to the environment are expected to be minimal and short-term, with little mitigation required. Great River Energy, DEA and Xcel Energy will minimize environmental impacts during construction of the project.

Correspondence relative to environmental conditions in the project area and responses received from state and federal agencies that reviewed the project are provided in Appendix C.

4.1 Description of Environmental Setting

The proposed transmission line corridors are located in areas that are zoned Planned Development, Residential Single Family, Public Facilities, and Park (see Zoning Map, Figure 4-1).

4.2 Impacts on Human Settlement

Because the project involves only upgrades of existing substation sites and existing transmission lines, impacts on human settlement will be very minimal. There may be impacts to a few residences close to the ROW. Great River Energy, DEA and Xcel Energy will work with the landowners to minimize those impacts. Pole placement will be reviewed and discussed with each landowner to minimize tree loss and visual impacts in those areas close to homes.

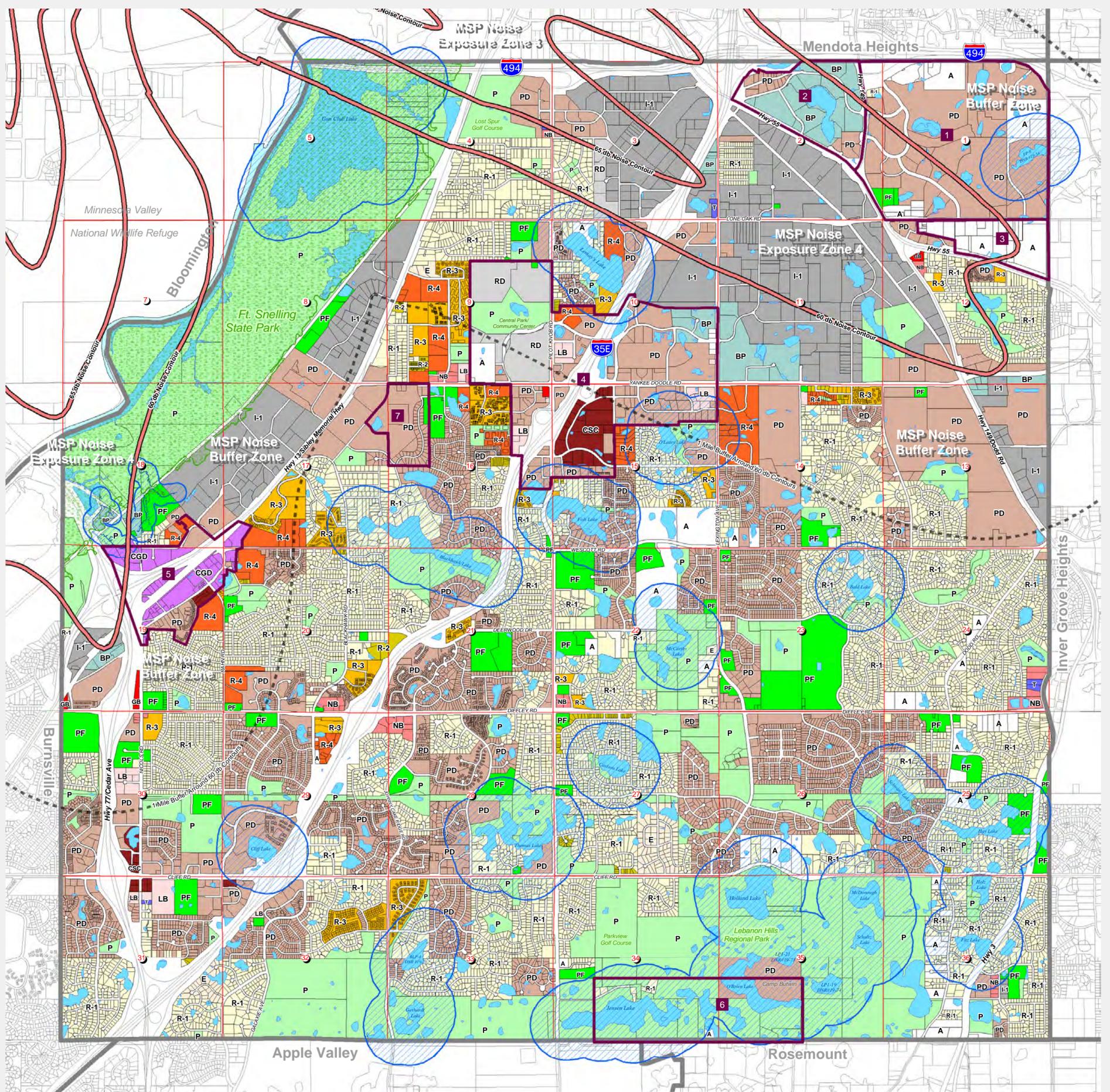
4.2.1 Socioeconomics

The City of Eagan has a very diverse economy including significant commercial, industrial, professional services, retail, hotel and restaurant business, convention amenities, city and county parklands, a water park, and entertainment.

Approximately 25 workers will be required for construction of the project. During construction, there would be a small impact on the local community due to revenue created from expenditures of the construction crew (local community services, hotels, restaurants, construction materials). No permanent jobs will be created by this project.

4.2.2 Displacement

Reconstruction of the substation and transmission lines will not cause the displacement of any residence and will not affect any public services.



Legend

Zoning Designations

- | | | | |
|--|-------------------------------|--|-----------------------------|
| | E-Estate | | RD-Research and Development |
| | R-1-Residential Single Family | | BP-Business Park |
| | R-1S-Small Lot Single Family | | I-1-Limited Industrial |
| | R-2-Residential Double | | P-Park |
| | R-3-Residential Townhouse | | PF-Public Facility |
| | R-4-Residential Multiple | | PD-Planned Development |
| | LB-Limited Business | | A-Agriculture |
| | NB-Neighborhood Business | | Transitional |
| | GB-General Business | | Water |
| | CSC-Community Shopping Center | | Right of Way |
| | CGD-Cedar Grove District | | |

Other

- Parcel Boundary
- Municipal Boundary
- Section Boundary
- Water Body
- Shoreland Tributary Segment (DNR designated)
- Shoreland District Boundary
- Floodplain Overlay District

Special Areas

- Special Area Boundary*
- Special Area #1 - The Waters
- Special Area #2 - Hwy 55/149 Business Triangle
- Special Area #3 - Rural Residential Area
- Special Area #4 - Central Area
- Special Area #5 - Cedar Grove Area
- Special Area #6 - Lebanon Hills Regional Park
- Special Area #7 - Blue Cross/Blue Shield

* Special Area boundaries represent areas surrounding Special Area parcels and sub-land uses as designated in the 2000-2020 City of Eagan Comprehensive Guide Plan and are shown here for reference purposes only. Please refer to Section 3 of the Comprehensive Plan for Special Area details.

MSP Noise Policy Areas

- | | | |
|--|-------------------------------------|--|
| | 75 db Contour (2007 mitigated) | Noise Exposure Zone 1 (75 and above)
Based on 2007 mitigated noise contours resulting from part 150 update process and shown here for consistency with Met Council adopted Land Use Compatibility Guidelines |
| | 70 db Contour (2007 mitigated) | |
| | 65 db Contour (2007 mitigated) | |
| | 60 db Contour (2007 mitigated) | |
| | 1 Mile Buffer Around 60 db Contours | |

Noise policy data acquired from the Metropolitan Council. The Metropolitan Council and the Metropolitan Airports Commission make no representation or warranties, express or implied, with respect to the reuse of the data provided herewith, regardless of its format or the means of its transmission. Determining the appropriate applications for the use of the data set is the responsibility of the user. The user accepts the data "as is," and assumes all risks associated with its use. By acceptance of this data, the user agrees not to transmit this data or provide access to it or any part of it to another party or individual. The Metropolitan Council and the Metropolitan Airports Commission assume no responsibility for actual or consequential damage incurred as a result of any user's reliance on this data.



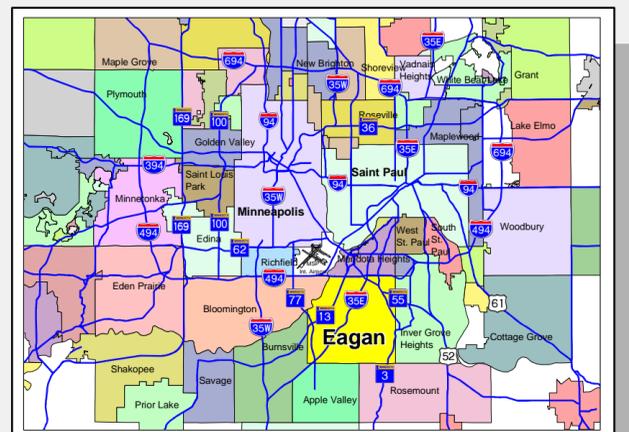
ZONING MAP

of the City of Eagan

Unofficial Map

Map Date: January 5, 2009

The Zoning Designations on this map are a representation of a combination of maps, ordinances, and City Code requirements which make up the complete City of Eagan Zoning Regulations. Information on each Planned Development (PD) is available at City Hall. All zoning requirements and Zoning designations on specific properties are subject to change. The Official Zoning Map is on-file at City Hall in the Community Development Department and available for public viewing.



Data Source: Zoning data and map created and maintained by the City of Eagan Community Development Department. Parcel data acquired from the Dakota County Office of GIS.

Map created using ERSI® ArcMap™ v9.3 L:\users\commdev\projects\ZoningMap08_UnOfficial_export.mxd

4.2.3 Noise

Noise is comprised of a variety of sounds of different intensities, across the entire frequency spectrum. Humans perceive sound when sound pressure waves encounter the auditory components in the ear. These components convert these pressure waves into perceivable sound. Transmission conductors and transformers at substations produce noise under certain conditions. The level of noise or its loudness depends on conductor conditions, voltage level, and weather conditions.

Noise is measured in units of decibels (dB) on a logarithmic scale. Because human hearing is not equally sensitive to all frequencies of sound, certain frequencies are given more "weight". The A-weighted scale (dBA) corresponds to the sensitivity range for human hearing. Noise levels capable of being heard by humans are measured in dBA, the A-weighted sound level recorded in units of decibels. A noise level change of 3 dBA is barely perceptible to human hearing. A 5-dBA change in noise level, however, is clearly noticeable. A 10-dBA change in noise levels is perceived as a doubling of noise loudness, while a 20-dBA change is considered a dramatic change in loudness.

Table 4-1 below shows noise levels associated with common, everyday sources. Noise levels for a 115 kV transmission line would typically be between 0 and 20 dBA, depending on the weather.

Table 4-1

Common Noise Sources and Levels

Sound Pressure Level (dB)	Typical Sources
120	Jet aircraft takeoff at 100 feet
110	Jet aircraft at 400 feet
90	Motorcycle at 25 feet
80	Garbage disposal
70	City street corner
60	Conversational speech
50	Typical office
40	Living room (without TV)
30	Quiet bedroom at night

Source: Environmental Impact Analysis Handbook, ed. By Rau and Wooten, 1980

In Minnesota, state rules have been established to regulate noise levels by land use types. Land uses such as picnic areas, churches or commercial land are assigned to an activity category based on the type of activities occurring in each respective land use. Activity categories are then categorized based on their sensitivity to traffic noise.

The Noise Area Classification (NAC) is listed in the Minnesota Pollution Control Agency (MPCA) noise regulations to distinguish the categories.

Noise emission from a transmission line increases 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 would be out near the transmission line. As a result, people do not normally notice audible noise from a transmission line during heavy rain. This is confirmed by calculated levels during a heavy rain (one inch per hour) that shows noise levels for a 115 kV line at less than 25% of the most sensitive state NAC (NAC 1). 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.

The rebuilt DEA Eagan Substation will be designed and constructed to comply with state noise standards.

4.2.4 Aesthetics

The project will have minimal impact on aesthetics of the area, as it involves only upgrade of existing facilities. The proposed structures will be slightly taller and spaced similar to the existing structures. The finish of the structures will be galvanized or weathering steel. The existing transmission line structures in the area are single pole and H- frame wood structures. The proposed steel poles will give the new transmission line a more modern appearance.

4.2.5 Human Health and Safety

No threats to public health and safety are anticipated for this project. All facilities will be constructed in accordance with all applicable standards, including the National Electric Safety Code and other industry standards. Construction personnel will be required to follow Occupational Safety and Health Administration regulations. Other safety measures such as warning signs, fencing, and gates will be utilized as needed.

Electric and Magnetic Fields (EMF)

The term electromagnetic fields (EMF) refers to electric and magnetic fields that are coupled together, such as in high frequency radiating fields. For the lower frequencies associated with 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. Ionization will typically occur with frequencies in the range of 10^{16} to 10^{22} hertz.

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

- Wisconsin Public Service Commission. January 2008. EMF- Electric & Magnetic Fields. <http://psc.wi.gov/thelibrary/publications/electric/electric12.pdf>
- National Institute of Environmental Health Sciences. 2002. *EMF. Electric and Magnetic Fields Associated with the Use of Electric Power*. National Institutes of Health.
- Minnesota Department of Health. 2002. *EMF White Paper on Electric and Magnetic Field (EMF) Policy and Mitigation Options*.

For any specific line design, the height of the set of phase conductors above ground has a marked influence on the maximum electric and magnetic fields. The phasing arrangement is of particular importance for the maximum fields for a double circuit configuration (two circuits on a single structure).

Electric Fields

The intensity of electric fields is proportional to the voltage of the line and is measured in kilovolts/meter (kV/m). Electric fields of transmission lines above ground are designated by the difference in voltage between two points (usually one meter).

There is no federal standard for transmission line electric fields. However, the EQB has imposed a maximum electric field limit of 8 kV/m measured at one meter above ground.

Table 4-2 provides the calculated electric fields at maximum operating voltage for the proposed transmission line (obtained from 'ENVIRO', a software program licensed by the Electric Power Research Institute, Inc.). Maximum operating voltage is defined as 105 percent of the nominal voltage.

**TABLE 4-2
CALCULATED ELECTRIC FIELDS (KV/M) FOR PROPOSED 115 KV
TRANSMISSION LINE DESIGNS
(3.28 FEET ABOVE GROUND)**

Structure Type	Maximum Operating Voltage (kV)	Distance to Proposed Centerline										
		-300'	-200'	-100'	-50'	-25'	0'	25'	50'	100'	200'	300'
Davit Arm 115/69 kV Steel Pole Double Circuit	121/72.5	0.00	0.00	0.01	0.08	0.54	0.66	1.01	0.11	0.05	0.01	0.01
Laminated Wye 115 kV Steel Pole Single Circuit	121	0.00	0.01	0.07	0.46	1.39	0.42	1.39	0.46	0.07	0.01	0.00
Braced Post 115 kV Steel Pole Single Circuit	121	0.01	0.02	0.12	0.50	0.95	0.97	1.31	0.41	0.11	0.03	0.01
Davit Arm 115 kV Steel Pole Double Circuit	121/121	0.00	0.01	0.03	0.12	0.97	0.56	0.97	0.12	0.03	0.01	0.00

The maximum electric field in the applicants' proposal is 1.39 kV/m, which is well under the maximum limit of 8 kV/m that has been a permit condition imposed by EQB in other transmission line routing proceedings.

Magnetic Fields

Magnetic fields arise 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 as the distance from the conductor increases. Magnetic field density is expressed in the unit of gauss or milligauss.

Table 4-3 provides a summary of the magnetic field calculations associated with each line of the project (obtained from 'ENVIRO', a software program licensed by the Electric Power Research Institute, Inc.).

These calculations are based on the summer peak current and average flow projected for the year 2011 under normal system conditions (system intact). The peak magnetic field values are calculated at a point directly under the transmission line and where the conductor is closest to the ground. The same method is used to calculate the magnetic field at the edge of the right-of-way.

**TABLE 4-3
CALCULATED MAGNETIC FIELDS (MILLIGAUSS) FOR PROPOSED
115 KV TRANSMISSION LINE DESIGNS (3.28 FEET ABOVE GROUND)**

Segment	System Condition	Current (Amps)	Distance to Proposed Centerline										
			-300'	-200'	-100'	-50'	-25'	0'	25'	50'	100'	200'	300'
Pilot Knob to Eagan Tap Double Circuit 115 kV	Peak	301	0.08	0.26	1.86	9.97	29.46	49.48	29.32	9.88	1.83	0.26	0.08
	Average	181	0.05	0.16	1.12	6.00	17.72	29.76	17.63	5.94	1.10	0.16	0.05
Eagan Tap to Eagan Single Circuit 115 kV	Peak	301	0.69	1.50	5.42	16.61	34.35	56.87	43.43	19.27	5.71	1.44	0.62
	Average	181	0.42	0.90	3.26	9.99	20.65	34.20	26.12	11.59	3.44	0.87	0.37
Eagan to Wescott Tap Single Circuit 115 kV	Peak	341	0.58	1.31	5.21	19.08	50.57	84.16	51	19.35	5.35	1.38	0.62
	Average	205	0.35	0.79	3.13	11.47	30.40	50.59	30.66	11.64	3.21	0.83	0.37
Wecott Tap to Yankee Doodle Double Circuit 115/69 kV	Peak	341/82	0.34	0.71	2.15	5.66	15.09	40.89	37.72	16.56	4.50	1.05	0.45
	Average	205/49	0.21	0.43	1.30	3.41	9.07	24.58	22.69	9.96	2.71	0.63	0.27

4.2.6 Public Services

Impacts to other utilities (gas, telephone, electric, water, sewer) will be avoided or minimized. Public services would not be affected by the construction and operation of substation or proposed transmission lines.

4.2.7 Transportation

The proposed transmission upgrades will be built exclusively along existing alignments. The transmission lines cross city roads at a few places. Temporary road closures or lane reductions may be necessary during construction. Operation of the proposed transmission lines will not affect the major roads in the area.

The proposed project is approximately five miles from the Minneapolis - St. Paul International Airport and approximately 5.5 miles from the South St. Paul Municipal Airport. The Minnesota Department of Transportation, Office of Aeronautics was contacted regarding any potential impacts to airports in the vicinity. In a reply letter dated May 20, 2009 (Appendix C), the Office of Aeronautics indicated they did not anticipate any effect on publicly-owned airports; therefore they had no objection to the proposed project.

4.3 Impacts on Land-based Economies

4.3.1 Recreation/Tourism

The project is not expected to affect recreational or tourism opportunities in the area. Xcel Energy plans to restore a bike trail that runs along Wilderness Road for 1.5 miles east of the Pilot Knob Substation. During construction, the path will be unavailable for use, but will be restored upon completion of the project (anticipated to be summer 2010).

4.3.2 Agriculture

The proposed project is in an urban area and will not impact farmland.

4.3.3 Mining and Forestry

There are no mining or forested areas in the vicinity of the project.

4.4 Archaeological and Historic Resources

Because this project involves only upgrades to existing transmission infrastructure, no impacts on cultural resources are anticipated.

4.5 Natural Environment

4.5.1 Air Quality

Because transmission lines do not affect air quality, there will be no long-term environmental impacts on the air from operation of the transmission lines.

During construction of the proposed transmission lines, there would be emissions from vehicles and other construction equipment and fugitive dust from ROW clearing. Temporary air quality impacts caused by the proposed construction-related emissions would be expected to occur during this phase of activity. The magnitude of these emissions is influenced heavily by weather conditions and the specific construction activity taking place. Adverse impacts to the surrounding environment would be minimal because of the short and intermittent nature of the emission and dust-producing construction phases.

4.5.2 Water Resources, Wetlands and Soils

Minimal impacts to water resources are anticipated. The GRE portion of the project crosses one Minnesota Department of Natural Resources (DNR) Public Water (140W, Figure 4-2). GRE will apply to the DNR for a license to cross that water.

The US Army Corps of Engineers (USACE) was contacted regarding this project. In a reply letter dated June 10, 2009 (Appendix C), the USACE indicated that the proposed work is not within the regulatory jurisdiction of the Corps of Engineers and no permit is required.

The General Soil Map Unit in this portion of Dakota County is the Kingsley-Mahtomedi, consisting of gently sloping to very steep, well-drained and excessively drained soils formed in loamy and sandy glacial till and sandy glacial outwash. Soils along the transmission routes include silt loams, loams, sandy loams and loamy sands.

4.5.3 Vegetation and Wildlife/Rare and Unique Natural Resources

The DNR and the United States Department of the Interior Fish and Wildlife Service (USFWS) were contacted regarding vegetation and wildlife resources in the vicinity of the project.

In a reply email dated June 9, 2009 (Appendix C), the DNR concurred with the utilities assessment that the project will not negatively impact any known occurrences of rare features (Figure 4-3) in the project area.

Effects on area wildlife will be minimal. The USFWS website indicated that there are two federally listed threatened or endangered species or other federal trust resources in Dakota County (<http://www.fws.gov/midwest/endangered/LISTS/minnesot-cty.html>). The Higgins eye pearl mussel is an endangered species that occurs in the Mississippi River and

therefore would not be impacted by this project. The Prairie bush-clover is a threatened species that is unlikely to be found along the disturbed transmission corridors because it is considered a Midwestern endemic restricted to a few small areas in the region.

In a reply email dated June 19, 2009 (Appendix C), the USFWS indicated that there are no federally listed or proposed species and/or designated or proposed critical habitat within the action area of the proposed project.

Figure 4-2 DNR Public Waters Map

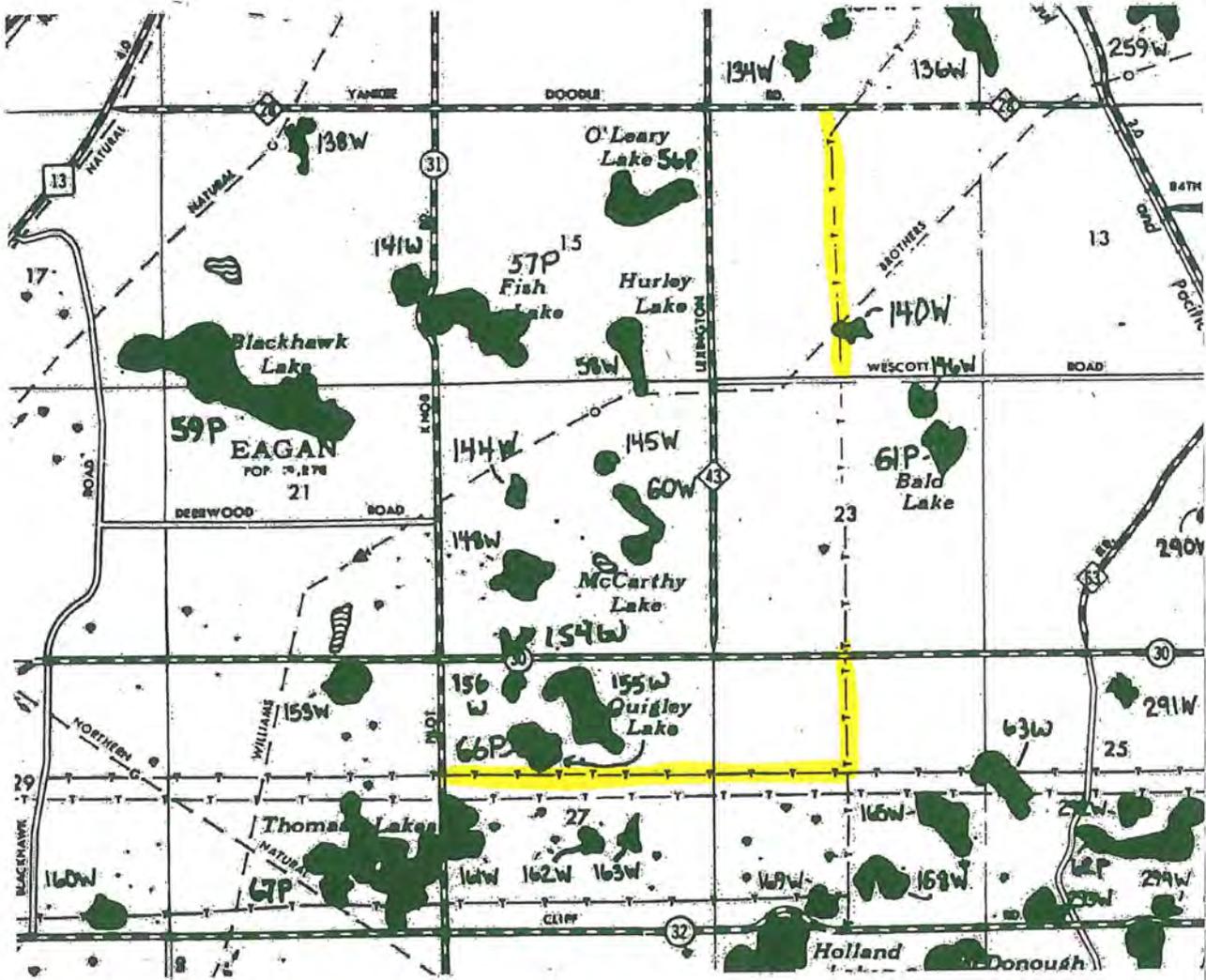
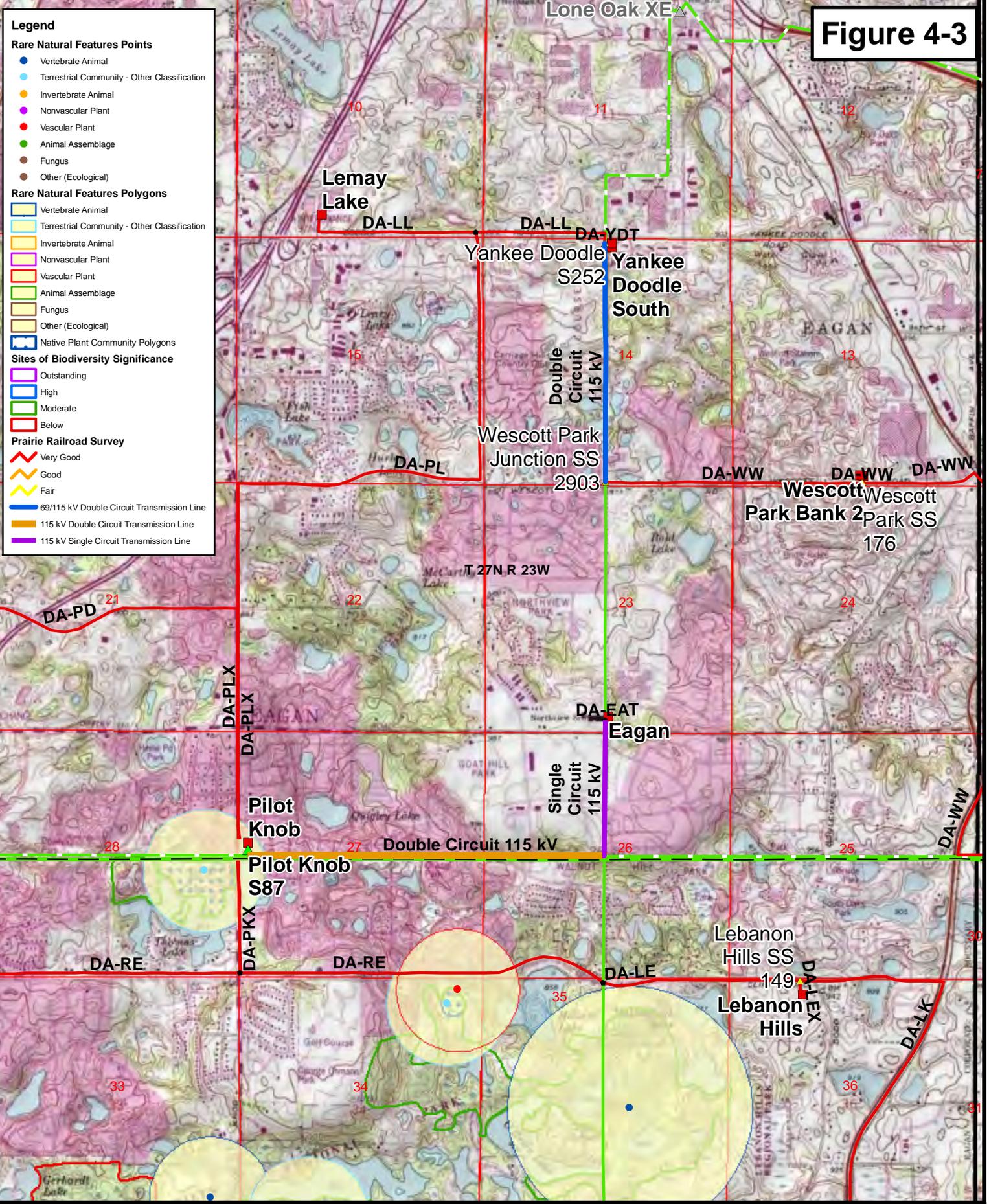


Figure 4-3



Rare Features from the MN DNR Natural Heritage Data Set 12/12/2008
 1:24k Digital Raster Graphic from the MN DNR WMS Image Service
 Other GIS Data Sources Vary Between:
 MN Department of Transportation, MN Department of Natural Resources,
 MN Land Management Information Center, and Great River Energy

**Yankee Doodle To Pilot Knob
 115 kV System Upgrades
 Rare Features Map**

GREAT RIVER ENERGY
 A Touchstone Energy Cooperative

1 in represents 0.5 miles

Updated: Jun 19, 2009

5.0 Regulatory Permits and Approvals Required

Permit requirements or approvals anticipated for this project and the status of each are shown below in Table 5-1.

Table 5-1 Regulatory Permits and Approvals Required

Government Unit	Type of Approval	Regulated Activity	Status
US Dept. of Interior Fish and Wildlife Service (USFWS)	Threatened and Endangered Species Review	Review of records for federally threatened or endangered species that may exist at or near the proposed transmission facilities	No federally listed or proposed species and/or designated or proposed critical habitat within the project area (email of 6/19/09).
US Dept. of the Army Corps of Engineers (USACE)	Wetland and Waterways Review	Review navigable water and the dredging or filling of US waters including wetlands	The proposed work is not within the regulatory jurisdiction of the Corps of Engineers; no permit required (letter of 6/10/09).
MN Dept. of Natural Resources (DNR)	Environmental Review – Wetlands, Water, Trails, Threatened and Endangered Species	Comprehensive review of transmission line impacts	The project will not negatively impact any known occurrence of rare features (email of 6/9/09).
MN Historical Society State Historic Preservation Office (SHPO)	SHPO Review of Nationally Registered Historic Places	Historic preservation	Because this project involves only the upgrade of existing transmission infrastructure, impacts to cultural resources are not anticipated.
Minnesota Department of Transportation- Aeronautics Division	Airspace Concerns	Public and private airports/airstrips	No effects on publicly-owned airports anticipated; no objection to the project (letter of 5/20/09).
Minnesota Pollution Control Agency (MPCA)	National Pollutant Discharge Elimination System (NPDES) Permit	Stormwater Pollution Prevention Plan (SWPPP) and stormwater permit required for disturbance of \geq one acre	If disturbance will be \geq one acre for the Eagan Substation rebuild, DEA will prepare a SWPPP and obtain a stormwater permit.
MnDOT	State Highway Crossing Permit	Permit required prior to construction	None required.
DNR Lands and Minerals	License to Cross Public Water	License required if project crosses DNR Public Waters	GRE will apply to the DNR for a license to cross Public Water 140W.
DNR Lands and Minerals	License to Cross Public Land	License required if project crosses DNR Land	None required.
Dakota County Highway Department	County Highway Crossing Permit	Permit required prior to construction.	All required permits will be acquired for construction.
City of Eagan	Plat Approval/Building Permit Issuance	Construction of new facilities	The application was submitted and is in process.