APPLICATION TO THE MINNESOTA PUBLIC UTILITIES COMMISSION FOR A CERTIFICATE OF NEED FOR 115 KV TRANSMISSION LINE UPGRADES TO THE GLENCOE – WACONIA 69 KV SYSTEM

PUC Docket No. E-002/CN-09-1390

November 30, 2010

Submitted by
Northern States Power Company
and the City of Glencoe, Minnesota

COMPLETENESS CHECKLIST

AUTHORITY	REQUIRED INFORMATION	WHERE
Minn. R. 7849.0200, Subp. 2	Title Page	Title Page
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Minn. R. 7849.0220, Subp. 3	Joint Ownership and Multiparty use	Section 1.4
Minn. R. 7849.240	Need summary and additional considerations	Sections 1.2, 1.6 and 1.7
Subp. 1	Summary of the major factors that justify the need for the proposed facility	Section 1.2
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B	Promotional activities that may have given rise to the demand for the facility	Section 1.7
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1 INTRODUCTION AND SUMMARY

Northern States Power Company, a Minnesota corporation ("Xcel Energy"), and the City of Glencoe, Minnesota ("City") (collectively, "Applicants") submit this Application to the Minnesota Public Utilities Commission ("Commission") for a Certificate of Need to construct approximately 2 miles of new 69 kV transmission line, 6 miles of new 115 kV transmission line, and to upgrade approximately 20 miles of 69 kV transmission line to 115 kV capacity near the cities of Glencoe, Norwood Young America, and Waconia along with certain substation modifications located in the southwest metro area of the Twin Cities (the "Project"). The Project is located within Carver and McLeod Counties. This Application is being submitted pursuant to Minnesota Statute Section 216B.243 and Minnesota Rules 7849.0020 – 7849.0400.

The 115 kV upgrades along with substation modifications, additions and new transmission line were identified in the *Southwest Twin Cities Load Serving Study Review* (also referred to herein as the "Study") prepared by Xcel Energy. The Study was conducted to address pending load serving problems in the rapidly-developing regions of Scott, Carver, McLeod, and Hennepin counties located in the western Twin Cities. The Study revealed that existing facilities in the western portion of this high-growth region will not be able to support projected growth after 2011. The proposal in this Application is one of several transmission projects that will be required to ensure reliable transmission service in this region during the next several years.

1.1 Proposal

Applicants propose to construct the following facilities for which a Certificate of Need is required:

- Construct a new 115 kV Diamond Substation in Glencoe and approximately 5 miles of new 115 kV transmission line between the existing Armstrong Substation and the new Diamond Substation.

- Upgrade approximately 4 miles of 69 kV transmission line to 115/69 kV double circuit from the proposed Diamond Substation to the existing Plato Substation.
- Expand the existing Plato Substation to upgrade the 69 kV distribution load to 115 kV, and to install a capacitor bank on the 69 kV transmission line.
- Upgrade approximately 10 miles of 69 kV transmission line to 115 kV capacity between the Plato Substation, the Young America Substation and the West Waconia Substation.
- Construct approximately 1 mile of new 115 kV transmission line along Highway 5 on the west side of the City of Norwood Young America. This new segment is needed to avoid having to build the 115 kV line into the developed areas of the City of Norwood Young America.
- Upgrade approximately 1 mile of existing 69 kV transmission to 115 kV from the existing West Waconia Substation along Highway 5.
- Construct approximately 2 miles of new 69 kV transmission line from Highway 5 to the existing Augusta 69 kV transmission line. This section would be built to double circuit standard to accommodate a future 115 kV transmission line, along with the proposed 69 kV line.
- Upgrade approximately 7 miles of existing 69 kV transmission line to 115 kV capacity from the Waconia Tap to just short of the Augusta Substation.

Figures 1, 2 and 3 below show the proposed 115 kV upgrades and new segments of 69/115 kV transmission line for the Glencoe to Plato, Plato to Waconia, and Waconia to Augusta segments of the proposed Project respectively.

Figure 1
Glencoe to Plato Segment

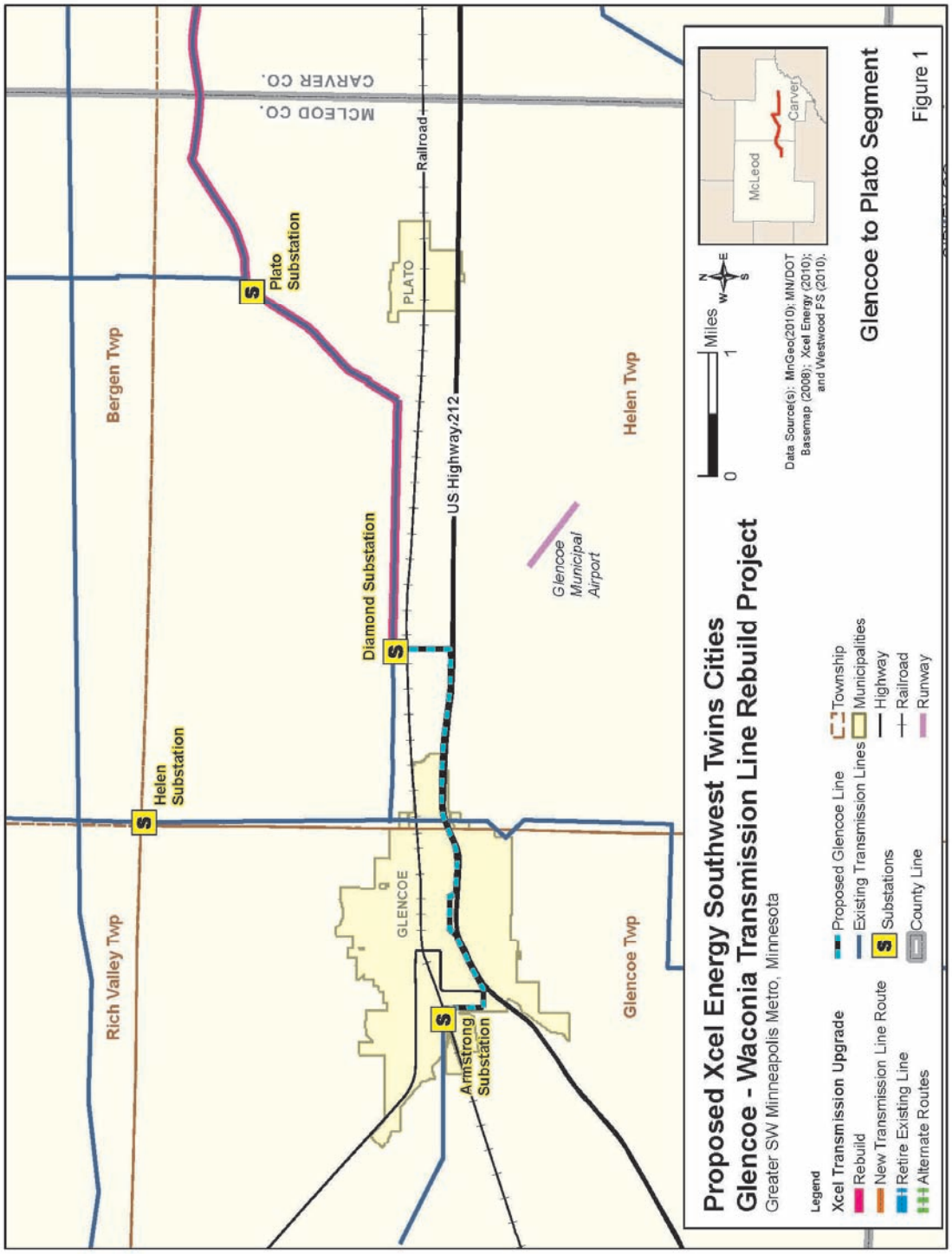


Figure 2
Plato to Waconia Segment

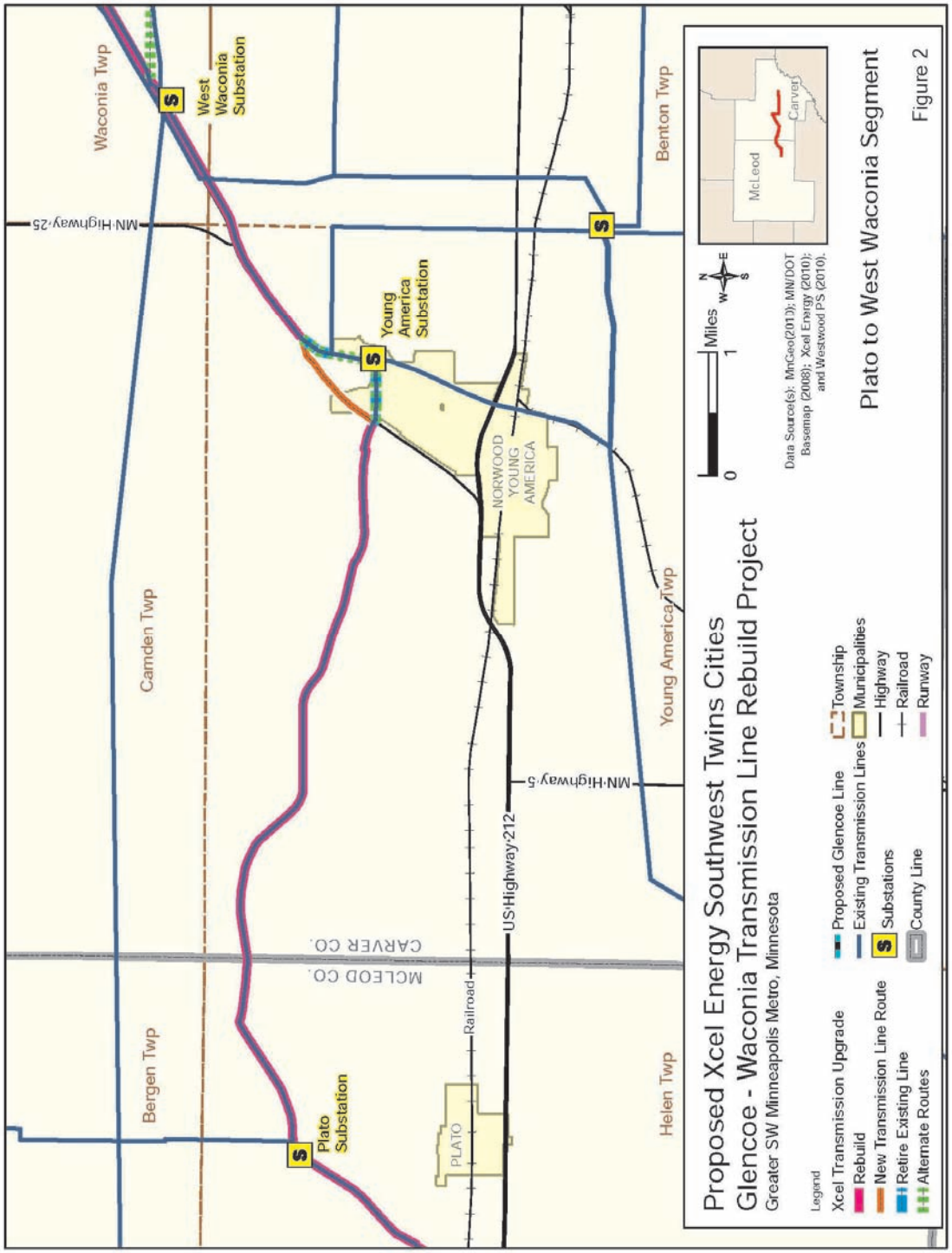
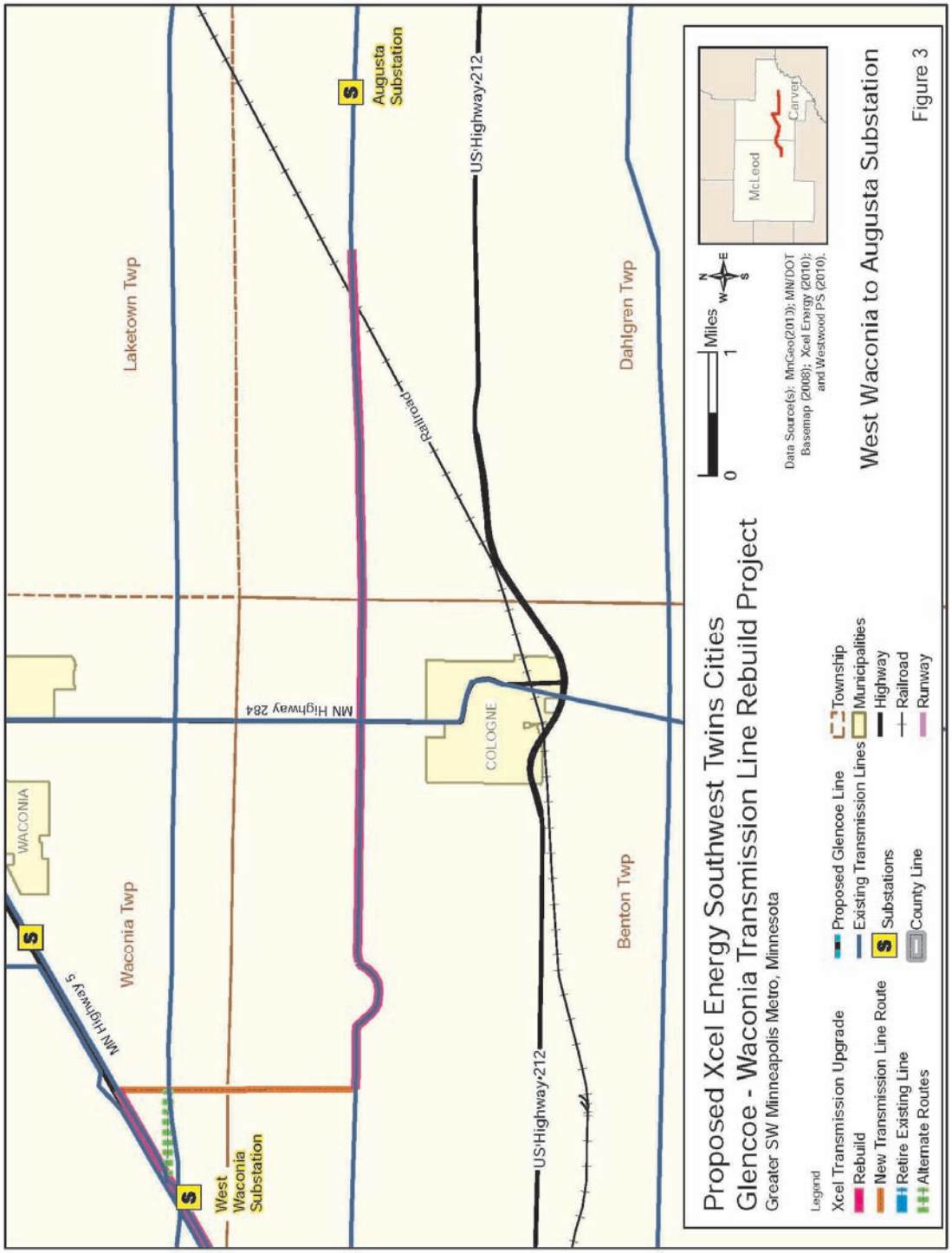


Figure 3
Waconia to Augusta Segment



Applicants propose to construct the Project primarily along existing rights-of-way, which will reduce costs and environmental impacts. The existing 69 kV single wood pole structures will be removed and a new 115 kV or 115/69 kV transmission line will be strung on new steel structures within the existing right-of-way. The proposed segments of new transmission line will require acquisition of approximately 9 miles of new right-of-way (approximately 5 miles of 115 kV right-of-way for the Armstrong Substation to Diamond Substation connection, approximately 1 mile of right-of-way for the 115 kV transmission line along Highway 5 on the west side of the City of Norwood Young America, and approximately 2 miles of new right-of-way for the 69 kV segment from Highway 5 to the Augusta transmission line). These segments will require acquisition of a 75-foot wide right-of-way to accommodate the steel support structures, which are 60 to 105-feet tall that will be placed within the right-of-way at spans of approximately 300 to 400 feet.

Applicants plan to use 795 kcmil Aluminum Core Steel Supported ("ACSS") conductors for the 115 kV segments of the Project and 477 kcmil Aluminum Core Steel Reinforced ("ACSR") conductors for the 69 kV segments of the Project.

The Project is estimated to cost approximately $29 million. Applicants propose to place the reconductored lines and new transmission segments in service by the winter of 2012.

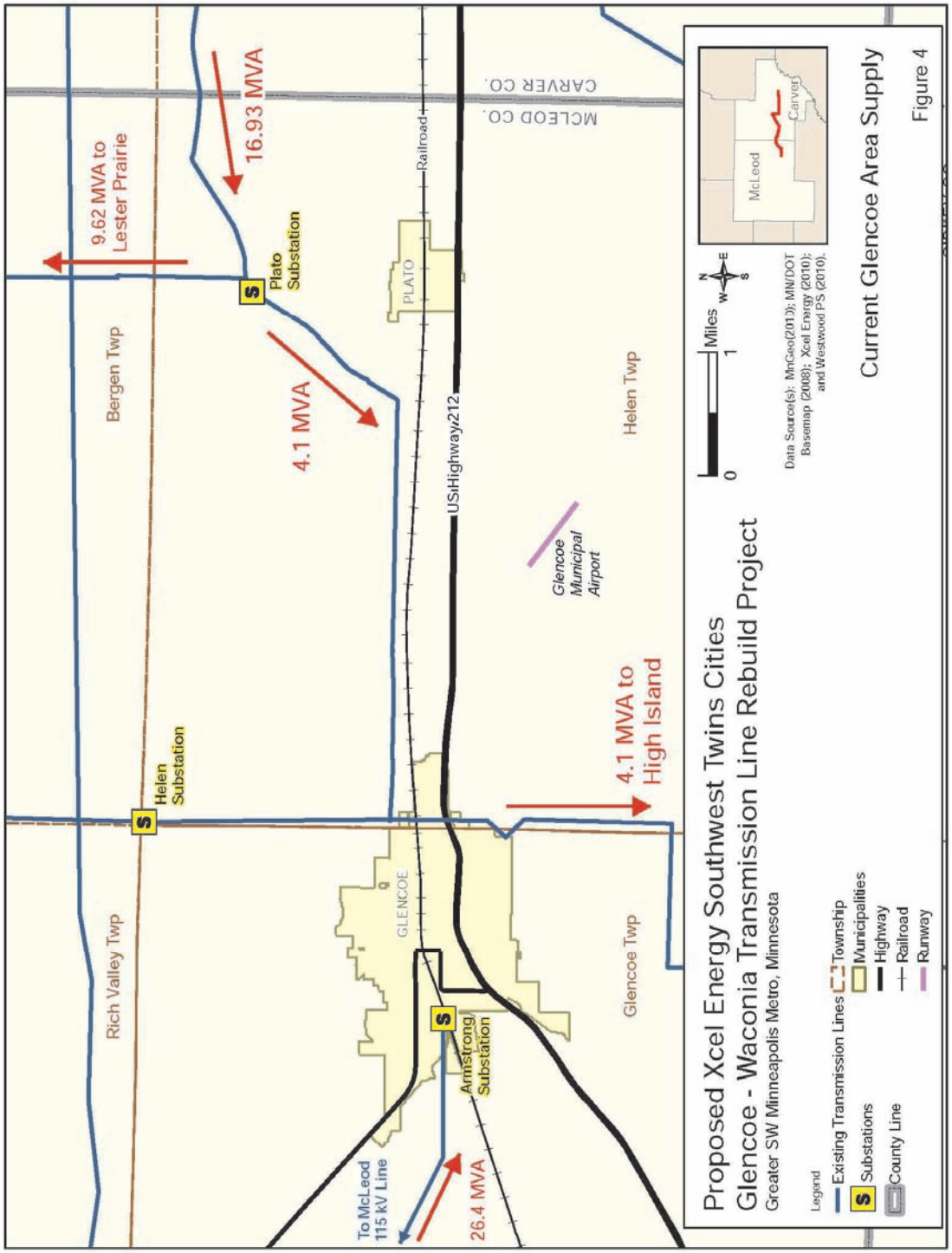
1.2 Need Overview

Glencoe Area

The *Southwest Twin Cities Load Serving Study Review* (the "Study"), attached as Appendix B, was conducted to develop a long range, robust load-serving plan for the western Twin Cities area including Scott, Carver, and Hennepin Counties. As this region continues to expand, additional high voltage transmission facilities will be needed to support area growth and development. The Study identified the need for transmission upgrades in the Glencoe – Waconia area to prevent significant low voltage and line overload conditions when the City of Glencoe is

served from Carver County Substation, during the loss of the McLeod – Glencoe source. Figure 4 displays the current supply sources for the Glencoe load.

Figure 4
Current Glencoe Area Supply

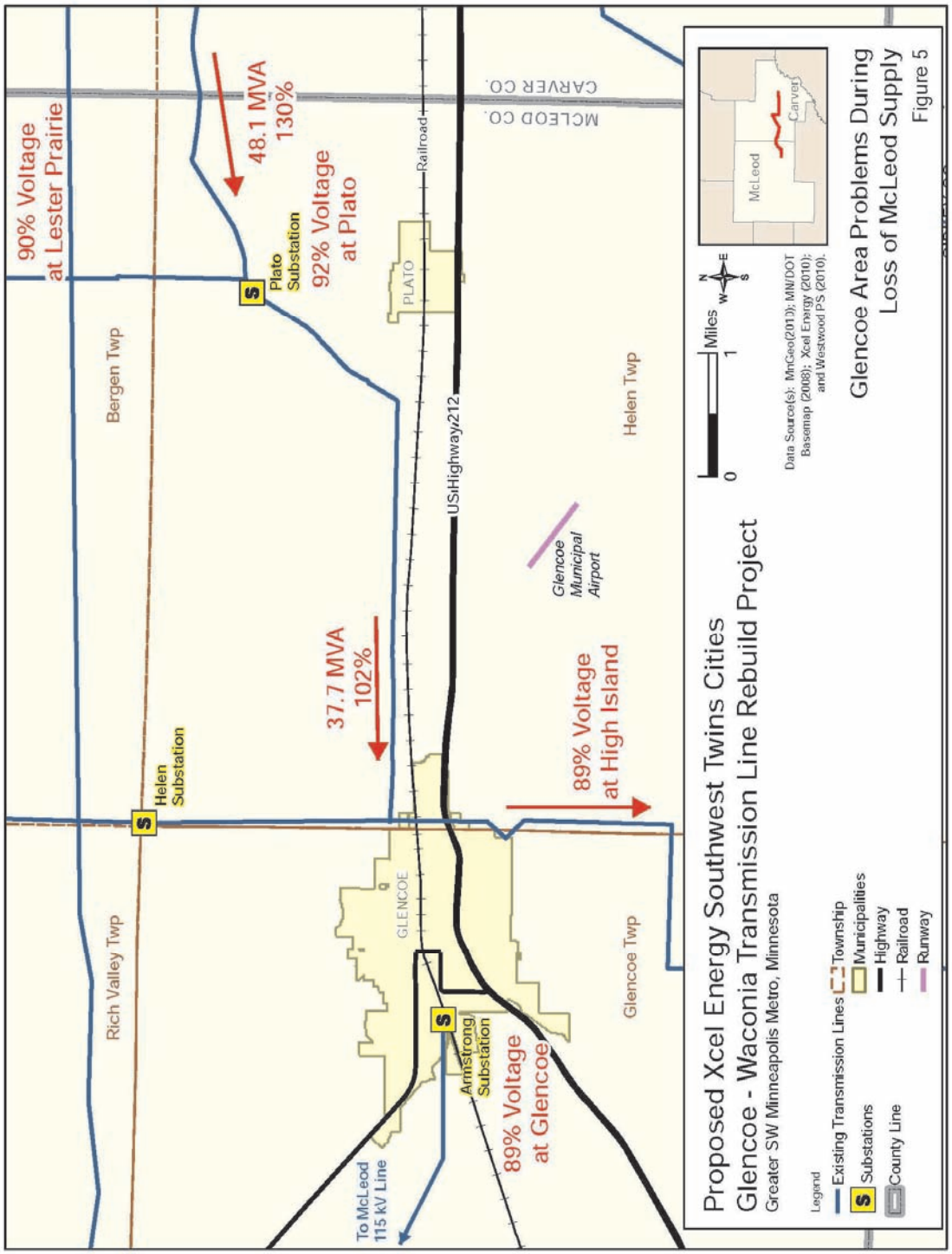


A predecessor study—*Glencoe Area Transmission Study* (the "Glencoe Area Study")—was prepared in 2002 and revealed the need for a 115 kV transmission line from McLeod to Glencoe to West Waconia. The McLeod – Glencoe segment of this line was placed in service in 2006. The proposed second phase of the transmission line, from Glencoe to West Waconia, is the focus of this Application. This second phase is necessary to maintain sufficient voltage levels at the City of Glencoe when the McLeod – Glencoe transmission line is not in-service and to prevent overloading in the region during various other contingencies. The need for this second phase was also identified in the *2007 Minnesota Biennial Transmission Projects Report*.[2]

Forecast data indicates that an outage of the Glencoe – McLeod line will cause significant drops in voltage levels in the greater Glencoe area by 2012. The proposed Project is needed to protect against these significant drops in voltage levels. Figure 5 shows the line loading and low voltage problems that occur for loss of the 115 kV supply to Glencoe from McLeod.

[2] *See 2007 Minnesota Biennial Transmission Projects Report* at section 7.5.4 (Carver County – Waconia Area) *available at* http://www.minnelectrans.com/documents/2007_Biennial_Report/Part_I-Section_7-5.pdf

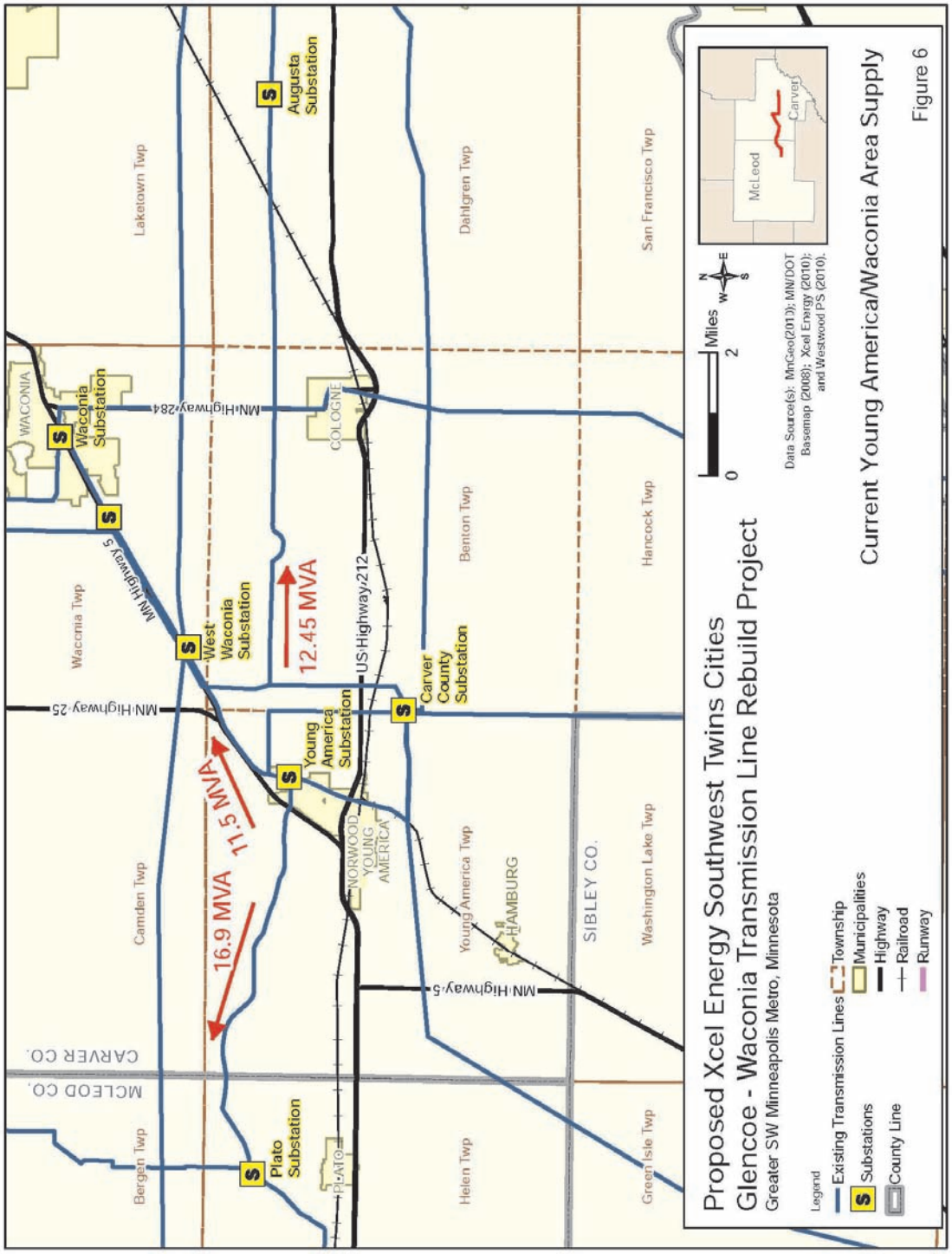
Figure 5
Glencoe Area Problems during Loss of McLeod Supply



Young America/Waconia Area

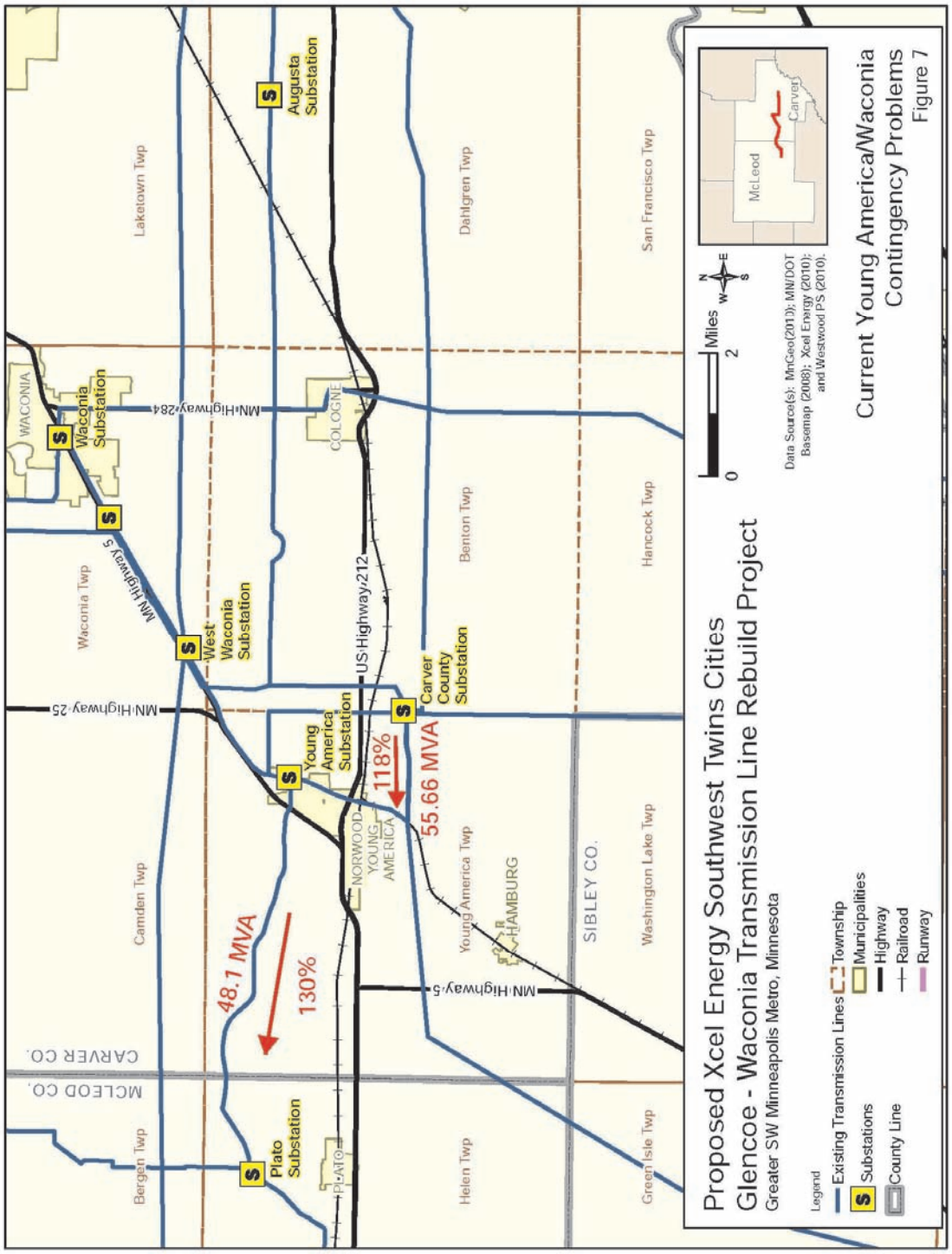
The transmission facilities currently serving the Young America and Waconia load are 69 kV but are supplied from the 115 kV system at the Glencoe, St Bonifacius, Carver County and Scott County Substations. Figure 6 shows the current electricity supply system to this area.

Figure 6
Current Young America/Waconia Area Supply



If supply is lost from one or more of the 115 kV sources to the 69 kV transmission facilities supplying the Young America/Waconia load, low voltages and line overloads will occur. Figure 7 shows the low voltage and line over loads that occur from loss of either the McLeod or St. Bonifacius 115 kV supply.

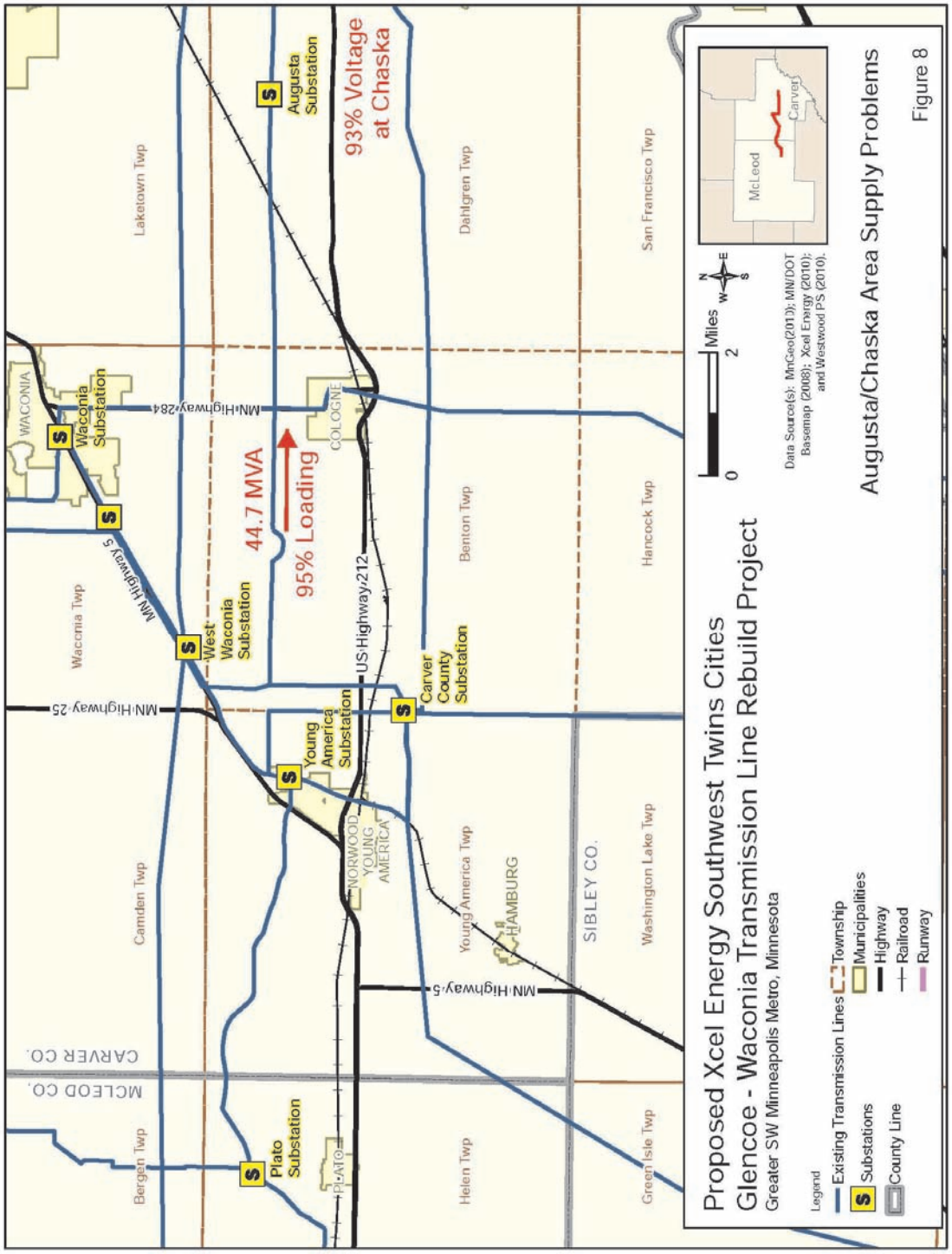
Figure 7
Young America/Waconia Area Problems during 115 kV Supply Outages



Waconia to Augusta

The 69 kV line from Chaska to the Augusta Substation and on to the Carver County Substation currently provides the normal supply to the Augusta load and backup to the Chaska load if the supply to Chaska from the east is lost. Load forecast data indicates that low voltage and overload conditions will develop by 2012 due to increased growth and development in the Chaska area. It is expected that the loss of the Scott County source to Chaska would cause low voltages in the City of Chaska and the loss of one of the two transformers at the Scott County Substation would cause overload on the other Scott County transformer. Figure 8 shows the low voltages and line load problems that occur for disruption of the 115 kV supply to Chaska from the east.

Figure 8
Augusta/Chaska Area Supply Problems



In addition to the expected load growth forecast for the area, there are also plans by the City of Chaska to develop a new biotechnology park that would add approximately 5 to 7 million square feet of new office space. The biotechnology park is expected to add 25 to 40 megawatts of new load to the area system (due to uncertainty as to when this project will develop, the 25 to 40 MW of possible new load was not included in the Study model). The recent expansion of Minnesota Highway 212 is also expected to result in significant commercial, industrial, and residential development in the area. In addition to addressing the low voltage and line load levels for the forecasted load in the area, the proposed Project will also prepare for the possibility for significant load additions in the Chaska area if either of these development possibilities occurs.

1.3 Timing and Cost

Applicants anticipate that construction will begin in 2011 with an anticipated in-service date in the winter of 2012. The overall cost estimate for the proposed improvements is approximately $29 million. Applicants provide this estimate with a ± 30% accuracy. Therefore, the total Project cost could be between $20 and $38 million. Cost estimates for Project segments are provided in Table 1 below.

Table 1 Project Costs

Year In-Service	Facility	Cost
	Xcel Energy Upgrades	
2012	Transmission Line Facilities	$22,200,000
2012	Substation Facilities	$ 3,400,000
	Total Xcel Energy Cost Estimate	**$25,600,000**
	City of Glencoe Upgrades	
2012	Transmission Line Facilities	$1,900,000
2012	Substation Facilities	$1,500,000
	Total City of Glencoe Upgrades	**$3,400,000**
2012	**Grand Total (Xcel Energy & City of Glencoe)**	**$29,000,000**

1.4 Ownership

The approximately 20 miles of 69 kV to 115 kV upgrades and the 2-mile segment of new 69 kV double circuit capable transmission line from Highway 5 to the existing Augusta transmission line will be constructed and owned by Xcel Energy. The 1 mile section of 115 kV transmission line located near Norwood Young America will also be constructed and owned by Xcel Energy. Approximately 5 miles of new 115 kV transmission line from the existing Armstrong Substation to the new 115 kV Diamond Substation as well as the Diamond Substation itself will be built and owned by the City of Glencoe

Minnesota Rules 7849.0220, Subp. 3 requires each owner of a facility to include information provided by parts 7849.0010 to 7849.0400. The Project is a transmission project intended to keep the transmission system reliable and is not designed to meet the long term needs, in excess of 80 MW, of a particular utility that is not an owner.

1.5 Environmental Analysis and Permitting Summary

The Project area contains both urban and rural land uses, as well as natural resource, cultural resource, and recreation areas. Applicants have identified no environmental factors that would preclude construction of the proposed facilities. Impacts can be mitigated by utilizing existing right-of-ways and through best management construction practices. A detailed environmental analysis is provided in Chapter 6.

As part of the Certificate of Need process, the Minnesota Office of Energy Security will also conduct an environmental assessment independent of the information provided in this Application. A Route Permit application will be filed soon after the Certificate of Need. Accordingly, members of the public will have several opportunities to participate in both the Certificate of Need and routing processes.

1.6 Certificate of Need Criteria

Minnesota rules and statutes specify the criteria the Commission should apply in determining whether to grant a Certificate of Need. Minn. Stat. § 216B.243 and Minn. R. 7849.0120.

Minn. R. 7849.0120 provides that a Certificate of Need is to be granted by the Commission to an applicant on a determination that:

(A) The probable result of denial would be an adverse effect upon the future adequacy, reliability, or efficiency of energy supply to the applicant, to the applicant's customers, or to the people of Minnesota and neighboring states;

(B) A more reasonable and prudent alternative to the proposed facility has not been demonstrated by a preponderance of the evidence on the record;

(C) By a preponderance of the evidence of the record, the proposed facility, or a suitable modification of the facility, will provide benefits to society in a manner compatible with protecting the natural and socioeconomic environments, including human health; and

(D) The record does not demonstrate that the design, construction, or operation of the proposed facility, or a suitable modification of the facility, will fail to comply with relevant policies, rules, and regulations of other state and federal agencies and local governments.

The Company's proposal satisfies these four criteria as discussed below.

Denial of the Project would have an adverse effect upon the future adequacy, reliability, or efficiency of energy supply to the Applicants' customers

- Denial of a Certificate of Need for this Project would result in adverse effects upon future adequacy, reliability, and efficiency because low voltage conditions and overloading in the Glencoe – Waconia – Chaska

area would develop by 2012. Low voltage conditions can trigger under voltage relays which can damage customer equipment such as process controls, motor drive controls and automated machines.

- Denial could also hinder future development, including the planned biotechnology facility in the City of Chaska.

A more reasonable and prudent alternative to the proposed facility has not been demonstrated by a preponderance of the evidence

- The Study considered costs, system losses, technical performance, and other factors. The proposed transmission upgrades, including the size, type, and timing, were identified in the Study as the best performing option among alternatives reviewed.

The proposed transmission lines will provide benefits to society in a manner compatible with protecting the natural and socioeconomic environments

- The proposed Project will allow additional load to be added to the area grid, helping to foster economic development in the area and will allow further development along the Highway 212 corridor.
- The portions of the Project that upgrade existing transmission lines will utilize existing rights-of-way to the maximum extent possible, thereby reducing the impact to the natural and socioeconomic environments.

The proposed transmission lines will comply with relevant policies, rules, and regulations of other state and federal agencies and local governments

- Applicants will secure all necessary permits and authorizations prior to commencing construction of the Project.
- The Project will comport with State of Minnesota policies of providing safe and reliable electric service to all customers.

1.7 Socioeconomic Considerations

Minnesota Rules 7849.0240, Subp. 2 requires the applicant for a Certificate of Need to address the socially beneficial uses of the facility output,

promotional activities that may have given rise to the demand, and effects of the facility in inducing future development. Following is a discussion of each consideration:

Socially Beneficial Uses of Facility Output

The purpose of the Project is to ensure system reliability in the Glencoe – Waconia area of the Twin Cities. Low voltage conditions are forecasted to occur beginning in 2012 if the Project is not constructed. Low voltage conditions can damage electronic equipment resulting in significant economic costs to commercial and manufacturing companies. Overloading conditions are also forecast to occur beginning in 2012, which can result in costly outages and inconvenience to area customers.

Promotional Activities

Neither Xcel Energy nor the City has conducted any promotional activities or events that have triggered the need for the Project. The Project is needed due to continued and anticipated growth in this rapidly growing region of the Twin Cities. The Project is required to ensure system reliability and to allow for future growth and development in the area.

Effect in Inducing Future Development

The Project is not necessarily intended to induce future development; however, it may allow future economic development that otherwise would not be possible if the upgrades are not implemented. The upgrades are being proposed based on forecasted demand that shows pending low voltage conditions and overloading in the area by 2012. The upgrades will not only ensure system reliability for Xcel Energy's and the City's customers, but will also accommodate 25 percent additional load growth in the area before further upgrades are required.

1.8 Transmission Lines – Type, Heights, and Spans

The proposed Diamond – West Waconia and the Augusta 115 kV transmission line upgrades and new 115 kV and 69 kV transmission lines are proposed to be constructed using single pole steel support structures. For the portion of the Project that involves upgrading the existing 69 kV transmission line, these structures will replace the existing single pole wooden structures. The change from the current wood structures supporting the existing 69 kV conductor to steel structures is necessary to support the additional weight of the 115 kV transmission line.

In instances where the line has to span over water or wetlands, H-frame steel structures may need to be used. The steel structures will be approximately 60 to 105 feet tall with spans of approximately 300 to 400 feet within the existing 50-foot wide right-of-way.

The new transmission lines in Norwood Young America and along County Highway 51 will require acquisition of a 75 foot wide right-of-way.

The West Waconia to Augusta segment of 69 kV transmission line would be constructed with 477 ACSR conductor. The 115 kV lines would be constructed with 795 ACSS conductor. The average service life of high voltage transmission lines is 50 to 60 years.

Figures 9 and 10 below depict a typical 115 kV single circuit braced post structure and Figures 11 and 12 depict a typical 115/69 kV double circuit, single pole, davit arm structure.

Figure 9
Photo of Typical 115 kV
Single Circuit Braced Post Structure

Figure 10
Typical Dimensions and Right-of-Way Requirements
for Single Circuit Braced Post Structure

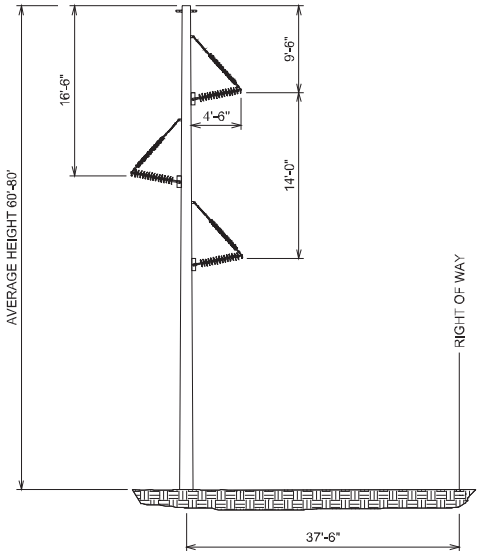


Figure 11
Photo of Typical 115/69 kV
Double Circuit Davit Arm Structure

Figure 12
Typical Dimensions and Right-of-Way requirements for Double Circuit Davit Arm Structure

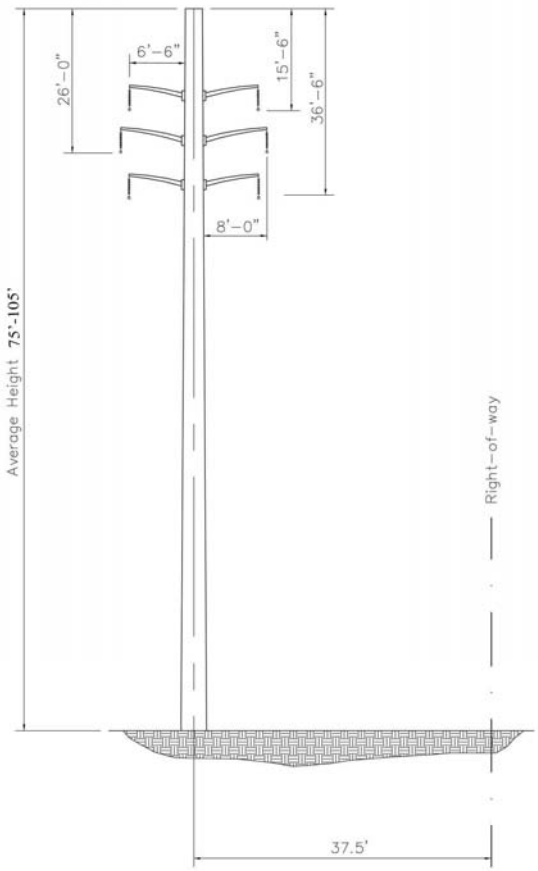


Table 2 summarizes the structure design for the line.

Table 2
Structure Design Summary

Line Type	Structure Type	Structure Material	Right-of-Way Width (feet)	Structure Height (feet)	Foundation	Foundation Diameter (feet)	Span Between Structures (feet)
115 kV Single Circuit	Single pole, horizontal braced post insulator	Weathering steel	75	60-80	Direct embedded for tangents and self-supporting for angle/ dead-end structures	Direct embedded or 4 foot diameter culvert or 5 to 6 foot concrete	300 to 400
115/69 kV Double Circuit	Single pole, davit arm	Weathering steel	75	75-105	Direct embedded for tangents and self-supporting for angle/ dead-end and switch structures	Direct embedded or 4 foot diameter culvert or 6 to 8 foot concrete	300 to 400

1.9 Need for New Right-of-Way

Xcel Energy will require a right-of-way width up to 75 feet for its part of the Project. However, Xcel Energy will rebuild the transmission line within existing 50 foot wide right-of-way whenever reasonably possible. For instance, Xcel Energy proposes to use the existing 50 foot right-of-way for the 115 kV upgrades from the Diamond Substation to the West Waconia Substation and for the upgrades along the 7-mile section of the Augusta transmission line. Blanket easements may be modified to a 75-foot width.

Approximately 2 miles of new 75 foot wide right-of-way will need to be acquired for the new 69 kV transmission line from Highway 5 to the Augusta transmission line that will be built to accommodate a double circuit 115/69 kV transmission line. Approximately 1 mile of new 75 foot right-of-way will need to be acquired for the new 115 kV transmission line north of the City of Norwood Young

America. Applicants will work with landowners to acquire the needed right-of-way for these sections of new transmission line.

The City of Glencoe will use existing rights-of-way for the 5 mile portion of the new 115 kV transmission line connecting Glencoe's existing Armstrong Substation to the new Diamond Substation to be owned by the City.

The new transmission line will be set in existing rights-of-way for the majority of the line route. The existing rights-of-way includes city streets, state trunk highways and county roads. There are some low areas in the route which are subject to flooding and have been avoided by setting poles on top of an existing dike to maintain access for maintenance and storm damage. This location will also minimize the need to remove trees planted by the Minnesota Department of Transportation ("MnDOT") that act as a sound barrier for residents in close proximity to Highway 212. Applicants anticipate a 25 foot easement to be obtained to allow for tree trimming and line blow out.

Figures 10 and 12 above show the pole dimensions and general right-of-way requirements for the line.

1.10 Substations

Applicants propose upgrading the distribution transformer at the Plato Substation from 69/12.5 kV to 115/12.5 kV and installing a 7.5 MVAR capacitor bank in its place. The West Waconia Substation will be expanded to include 115 kV breakers for the termination of new Glencoe 115 kV transmission line.

The City proposes to construct the new Diamond Substation, a 115 kV substation at Diamond Avenue on the east side of the City. The substation would consist of two 115 kV breakers, one on the line to Armstrong Substation and the other breaker on the line to the Plato Substation.

2 NEED

2.1 Low Voltage & Overload Mitigation

The need for the Project was first identified in the Glencoe Area Study that was conducted in 2002. The study identified the need for a 115 kV transmission line from McLeod to Glencoe to West Waconia. The McLeod – Glencoe segment was placed in-service in 2006. This Application addresses the need to complete the second phase of the plan, which is the Glencoe – West Waconia segment. The Glencoe – West Waconia segment will maintain reliable service to the City of Glencoe during loss of the McLeod – Glencoe transmission line. Without the Glencoe – Waconia line, under certain conditions customer equipment such as process controls, motor drive controls and automated machines, could be damaged due to low voltages. Depending on the duration of a low voltage condition, equipment such as electronic power supplies could also malfunction or fail when output voltage drops below certain levels. Without the proposed transmission upgrades, low voltage conditions will worsen as the area experiences continued growth and development.

The *Southwest Twin Cities Load Serving Study Review* (the "Study") included an updated analysis specific to the Glencoe – Waconia area in September 2009, which identified additional system deficiencies in the study area. At times when other transmission lines were out of service, several overloading and low voltage conditions were identified, as illustrated in Tables 3 and 4 below. The Study focused on two regions including Scott County Substation – Carver County Substation and Carver County Substation – Glencoe Substation.

In the Scott County Substation – Carver County Substation area, if either the 1 or 2 transformers at the Scott County Substation is out of service, the remaining transformer will overload. With an outage of the Scott County – Chaska 69 kV transmission line, low voltage conditions arise at the City of Chaska and on the Carver County – Augusta transmission line. In the Carver County Substation– Glencoe Substation area, potential low voltage conditions may occur during the outage of St. Bonifacius – Dickinson 115 kV transmission line and numerous low

voltages occur when City of Glencoe is served from the 69 kV system during the loss of the Glencoe – McLeod 115 kV line.

The criteria used for voltage and loading analysis are listed below. In some of the cases presented, violations have not yet developed; however, Applicants include them because loads and bus voltages indicate that violations will occur in the future and are documented accordingly.

Voltage and Loading Criteria

- Minimum voltage should be at least 92 %
- Maximum acceptable loading on the transmission line is 100% under system intact and 110% under contingency
- Maximum acceptable loading on transformers is 100% under system intact conditions and 115% under contingency.

Table 3
Scott County – Carver County Contingencies

Facility	Contingency	Rating	Loading	% Loading	% Voltage
Scott Co. TR 1 or 2	Scott Co. TR 2 or 1	70	89.6	128%	
Carver Co. – Augusta 69 kV line	Loss of Scott Co. – Chaska 69 kV line	47	44.65	95%	
City of Chaska	Loss of Scott Co. – Chaska 69 kV				93.4 %

Table 4
Carver County – Glencoe Contingencies

Facility	Contingency	Rating	MVA	% Loading	% Voltage
St. Bonifacius	Loss of St. Bonifacius – Dickinson 115 kV line				92.2 %
West Waconia	Loss of St. Bonifacius – Dickinson 115 kV line				93.4 %
Carver Co.	Loss of St. Bonifacius –				93.6 %

Facility	Contingency	Rating	MVA	% Loading	% Voltage
	Dickinson 115 kV line				
Glencoe load	Loss of Glencoe – McLeod tap 115 kV line				89 %
High Island load	Loss of Glencoe – McLeod tap 115 kV line				89 %
Plato load	Loss of Glencoe – McLeod tap 115 kV line				92 %
Lester Prairie load	Loss of Glencoe – McLeod tap 115 kV line				90 %
Plato – Glencoe tap 69 kV	Loss of Glencoe – McLeod tap 115 kV line	37	37.74	102%	
Glencoe tap – Young America 69 kV	Loss of Glencoe – McLeod tap 115 kV line	37	48.1	130%	
Carver Co – Young America tap 69 kV	Loss of Glencoe – McLeod tap 115 kV line	47	55.46	118%	

The most recent forecast provided by Central Minnesota Municipal Power Agency ("CMMPA") for the City of Glencoe indicates that the peak load would be around 20.8 MW in 2015 as opposed to 26.4 MW used in the Study. Historic peaks loads in the City of Glencoe were of 25.8 MW in 2003 and 24 MW in 2006, therefore the loads modeled in the Study are rather conservative. Even with the 20.8 MW of load as forecasted by CMMPA, the voltages at the City of Glencoe and High Island substations would be around 92 percent of the design voltage. Since this is close to being a low voltage violation (and the load for the City of Glencoe has shown the potential to be higher), combined with the age and condition of the existing 69 kV line, the new forecast provided by CMMPA does not impact the need for the Project.

2.2 Growth and Development

The Southwest Twin Cities metro area has realized significant growth during the past 10 years and is projected to continue growing at a significant rate over the next decade. Census data show that: Carver County is forecast to grow from a population base of 70,000 in 2002 to 111,000 by 2010 and 163,000 by 2020;

Hennepin County is forecast to grow from a population base of 1,116,000 in 2002 to 1,217,000 by 2010 and 1,312,000 by 2020; and McLeod County is forecast to grow from a population base of 35,000 in 2002 to 37,000 by 2010 and 40,000 by 2020. Combined, the populations located within these three counties are expected to increase by approximately 290,000 people over the next ten years.

Major commercial and retail development is also anticipated in the area. Growth and development will be facilitated by major new road construction in the area, as well. For example, in 2008, construction of the Highway 212 corridor upgrade was completed. The new Highway 212 included approximately 12 miles of new road that runs southwest between Hennepin County State Aid Highway 4 in Eden Prairie, where it connects to existing Highway 212, to several hundred feet west of Carver County State Aid Highway 147 in Carver, where it reconnects to existing Highway 212. The highway runs through the cities of Eden Prairie, Chanhassen, Chaska, Carver, and Dahlgren.

The City of Chaska has already capitalized on its new access to Highway 212 with plans to construct a new biotechnology center. The City has received a $1 million grant from the State of Minnesota to help create the Chaska Biotech Center, which according to city officials will be a 380-acre business park that is projected to produce as many as 10,000 new jobs within the next 10 years.[3] This development is expected to add approximately 25 to 40 megawatts of new load to the system, which will further the need for the proposed new transmission upgrades as well as future transmission additions in the west-metro region.[4]

2.3 Substation Load Data

Minnesota Rules 7849.0270 requires Applicants to submit "peak demand and annual consumption forecasts for the applicant's service area and system…" That information is presented in Appendix A. Applicants are also submitting peak demand forecasts for the substations within the Study area. Applicants consider

[3] Bioscience Zone Designation May Spur Chaska's Economy, StarTribune.Com, February 14, 2008.

[4] Because of the uncertainty surrounding the development of the proposed Chaska Biotech Center, the projected load was not included in the Study.

this information more informative because it focuses on demand in the region where pending electrical problems were discovered.

Based on the Study, peak loading is forecast to increase by 22 percent in the Study area between 2009 (125.25 MW) and 2015 (152.89 MW) as illustrated in Tables 5 and 6 below.

Table 5
Actual Substation Loads Glencoe – Waconia Study Area

Substation/Year	2004	2005	2006	2007	2008	2009
Chaska City	9.45	9.9	10.4	10.3	9.2	10.5
Xcel Chaska	3.98	2.98	5.41	6.84	5.22	6.97
Victoria	0.0	0.0	0.0	7.5	8.3	7.0
Augusta	11.1	11.4	13.3	14.4	8.0	5.1
West Waconia	29.7	24.2	24.5	25	21.6	26.3
GRE-Waconia	2.1	2.1	2.1	2.2	2.1	2.1
Xcel – Waconia	22	19.9	19.29	15.89	19.89	19.92
Plato	2.58	2.8	2.81	2.13	2.8	2.86
Lester Prairie	6.7	8.8	9.45	7.77	6.07	8.35
Young America	10.19	9.95	10.35	12.8	8.98	13.05
High Island	3.2	4.2	3.1	2.8	3.1	2.6
Glencoe Muni	20.4	20.6	23.3	22	24.8	20.5
TOTALS	**121.4**	**116.83**	**124.01**	**129.63**	**120.06**	**125.25**

Table 6
Forecast Substation Loads Glencoe – Waconia Study Area

Substation/Year	2010	2011	2012	2013	2014	2015
Chaska City	12	12.4	13	13.5	14.1	14.7
Xcel Chaska	7.0	7.2	7.3	7.5	7.6	7.8
Victoria	9.0	9.4	9.8	10.2	10.7	11.2

Substation/Year	2010	2011	2012	2013	2014	2015
Augusta	5.3	5.5	5.7	6.0	7.6	7.9
West Waconia	26.6	27.2	27.7	28.2	28.75	29.3
GRE-Waconia	2.1	2.1	2.2	2.2	2.3	2.3
Xcel – Waconia	20.1	20.5	20.9	21.4	21.8	22.2
Plato	2.9	2.95	3.01	3.07	3.13	3.19
Lester Prairie	8.4	8.6	8.78	8.95	9.14	9.3
Young America	13.2	13.5	13.7	14	14.3	14.5
High Island	3.3	3.5	3.6	3.7	3.9	4.1
Glencoe Muni[5]	25.1	25.3	25.6	25.9	26.1	26.4
TOTALS	**135**	**138.15**	**141.29**	**144.62**	**149.42**	**152.89**

2.4 Condition of Existing Carver County – Lester Prairie – Helena 69 kV Transmission Line

The existing 69 kV transmission line between Carver County, Lester Prairie, and Helena was built in 1949 and has been the source of poor reliability due to the age of the conductors. The line has been out of service 13 times during the past 5 years resulting in 8 momentary and 5 sustained power outages. In some cases, the line was out of service for several days before it could be re-energized. Table 7 below lists the 5 sustained outages.

The total mileage of the Carver County – Lester Prairie – Helena 69 kV transmission line is approximately 22 miles. With 5 sustained outages on 22 miles of line in 5 years, the outage rate of the line, due to failure of conductor, poles or other equipment on the line, is about 0.0455 outages per mile per year. The average sustained outage rate of a 69 kV line in NSP's system, due to all transmission, substation and weather related outages, is approximately 0.0196 outages per mile per year. As the outages on the Carver County – Lester Prairie – Helena 69 kV line, due to transmission line equipment failure alone, are significantly higher than the average sustained outage rate for other 69 kV lines, the line is considered to be in poor condition.

[5] The new load forecast provided by CMMPA for the City of Glencoe is about 20.8 MW in 2015, see section 2.1 for discussion related to the impact of new load forecast.

The Carver County – Lester Prairie – Helena 69 kV transmission line would require a complete re-build in order to improve the reliability of service to the substations served by the transmission line. Although the proposed Project would not result in a rebuild of the entire line between Carver County, Lester Prairie and Helen, the Applicants' proposal would substantially improve reliability for the Plato area by converting it to 115 kV and serving the Plato load from a new line. The Project would also improve the reliability to Young America as it would significantly reduce the exposure of load to line outages by removing the 69 kV lines connecting Young America to Plato and Waconia.

Table 7
Sustained Outages Carver County – Lester Prairie – Helena 69 kV due to line hardware failure

Outage Date	Restored Date	Outage Duration
30th Jul 2003 (09:43)	30th Jul 2003 (20:03)	10Hrs:20min
19th Jun 2005 (03:36)	22 Jun 2005 (18:57)	3days:15Hrs:21min
28th Nov 2005 (10:19)	28th Nov 2005 (15:34)	5Hrs:15min
23rd Feb 2007 (23:06)	24th Feb 2007 (21:24)	22Hrs:18min
19th May 2007 (18:35)	22nd May 2007 (16:15)	2days:21Hrs:40min

3 ALTERNATIVES ANALYSIS

This chapter summarizes Applicants' analysis of alternative transmission options, as analyzed in the Study. The performance of each option was tested to meet the voltage and line loading criteria for North American Electric Reliability Corporation ("NERC") category A, B, and C contingencies. Contingency conditions were analyzed on the Alliant, Great River Energy, and Xcel Energy control areas to monitor for violations. The analysis was performed on the Midwest Reliability Organization ("MRO") 2009 series 2015 summer peak model. The loads in the study region were updated using the non-coincident peak loads for each substation. The generation at Minnesota River, Shakopee, and Glencoe were turned off to evaluate the worst case scenario.

3.1 Transmission Alternatives

Two options were analyzed to address pending low voltage conditions and overloads in the Study area. The two options were selected based on the assumption that replacing the existing 69 kV lines with 115 kV would be the best way to utilize the exiting right of way. Although other possible alternatives might exist, they would involve building more new transmission lines. Therefore they were not studied as part of this study. Applicants' proposed option, Option A-1, is shown in Figure 13 below. Option A-2, the alternative option, is similar to the proposed option and is shown in Figure 14 below.

Figure 13
Preferred Option A-1

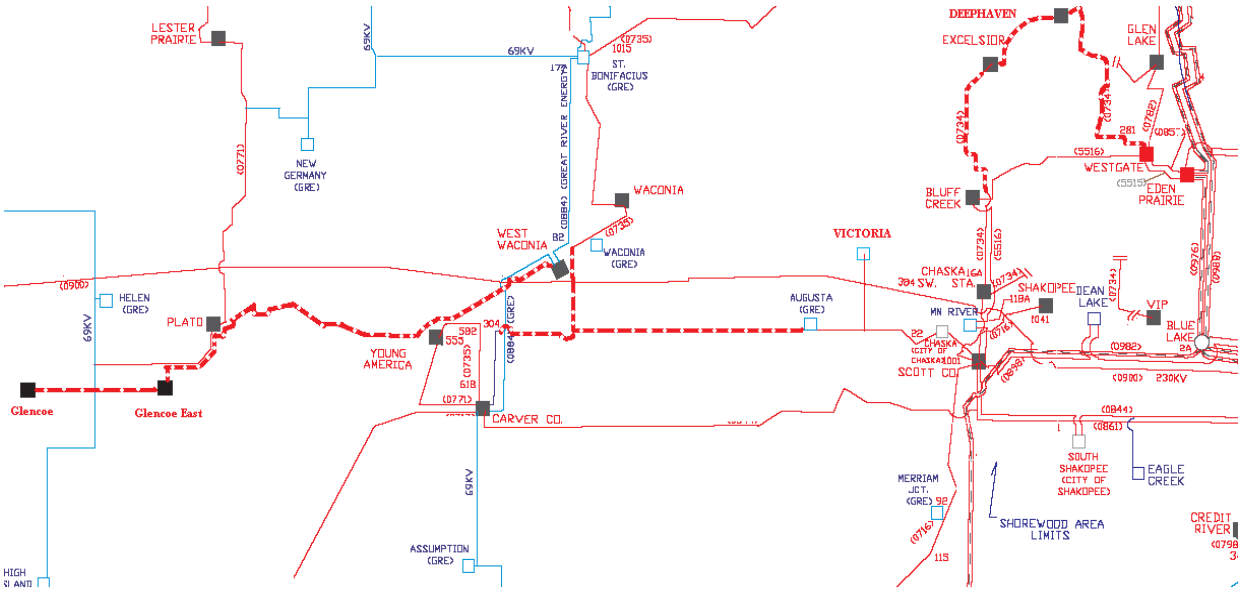
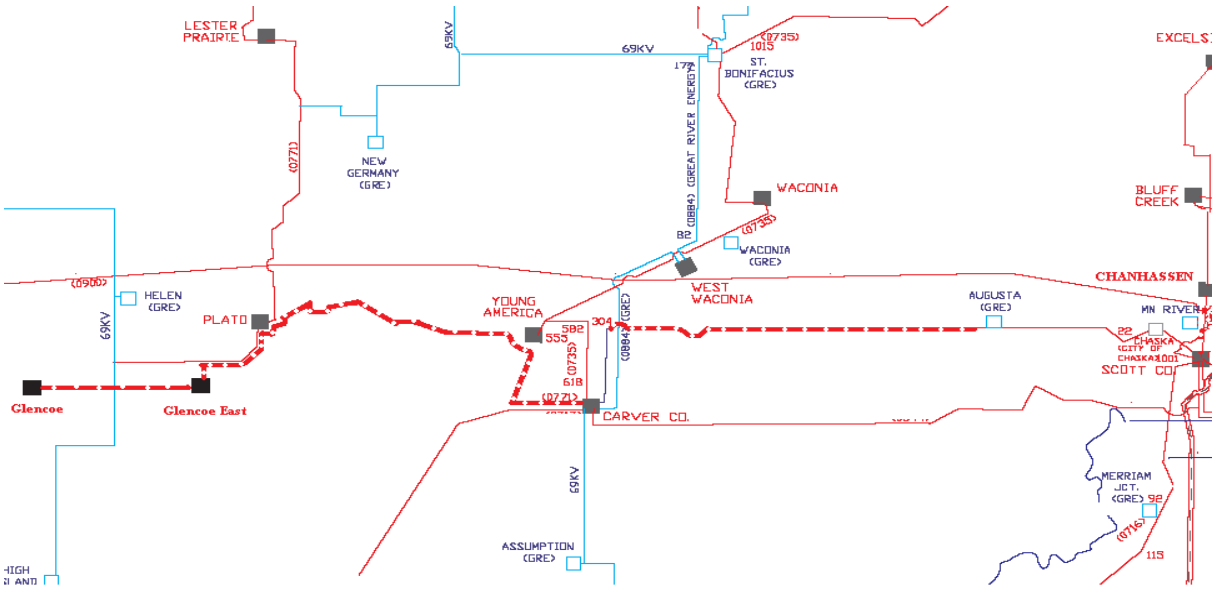


Figure 14
Alternative Option A-2



Both options address the low voltage and overload issues that were discovered in the Study area and both provide for 25 percent incremental load growth before new mitigation measures would be needed in the area (25% load growth equates to approximately 38 MW). There are two key differences between the options. The first is the east terminus. The preferred option would terminate at the West Waconia Substation. Option A-2 would terminate at the Carver County Substation. The other difference is that Option A-2 would not require approximately 3 miles of new 69 kV/115 kV transmission line from West Waconia to the Augusta transmission line because the existing 69 kV line between Carver County and Augusta can be converted to 115 kV only requiring minimal new right-of-way.

Option A-1 is preferred based on the assumption from the 2016 Renewable Energy Standards Study that the 230 kV transmission line from the Minnesota Valley Substation to the Blue Lake Substation will be converted to 345 kV capacity at some point in the future. This 345 kV conversion project currently has a proposed in service date of 2018. A termination at West Waconia instead of Carver County is beneficial because of the proximity of the West Waconia Substation to this potential 345 kV transmission line. A termination at the West Waconia Substation would allow any future need for bulk transmission in the area to be easily be met with minimal additions of new transmission facilities.

Although the West Waconia Substation could be used as a future 345 kV substation in the alternative option, it could also cause overloading of the Carver County – West Waconia transmission line because of a lack of 115 kV transmission lines at the West Waconia Substation. Moreover, the loss of the Carver County – West Waconia transmission line could pose voltage problems because all of the loads at Glencoe, Victoria, and Chaska Substations would be connected to Carver County Substation with this alternative.

Selection of Termination Points

The selection of termination points for each of the options was based on the areas requiring new transmission for load serving benefit, as well as consideration of the

possible location of bulk transmission facilities in the future. As the load serving need is near the Glencoe and West Waconia Substations, those locations were chosen as end points for the new transmission line. Also, the proposed future 345 kV line between Minnesota Valley - McLeod - Blue Lake is expected to use the exiting 230 kV line corridor; since the 230 kV line runs close to West Waconia Substation, future bulk supply needs at West Waconia can be easily met by installing 345/115 kV transformers at this location and building the 345 kV line into the substation.

New Construction Alternative

Applicants did not specifically analyze an alternative that would include all new transmission facilities. The cost and environmental impacts would be significantly greater than the proposed alternatives, which focus on using as much existing right-of-way as possible. Applicants approach comports with Minnesota Rules 7849.0260 B(2), which appears to favor upgrading existing facilities as opposed to constructing all new transmission lines and components.

3.2 Glencoe – Waconia Study Methodology

When evaluating system performance, engineers rely on performance criteria established by the industry to ensure reliable performance. The bulk electric system should be planned to meet the NERC transmission planning standards. Although NERC standards do not apply to transmission system below 100 kV, the local industry practice for 100 kV and below transmission system, when part of a network, is to meet the voltage and line loading criteria for the loss of a single element such as a transformer or transmission line section. This practice helps maintain or restore service to customers during scheduled maintenance and forced outage conditions.

When evaluating the performance of the electric system, engineers use computer simulations of the interconnected system to evaluate performance under a range of scenarios to evaluate the performance of alternative solutions. The computer models consider the capability of each of the transmission elements of the system

and simulate the power flows on the system as the result of the predicted power demand levels at each and every distribution substation in the system under study.

The primary strengths of the methodology employed in the Study are its reliance on the latest modeling software and most recent load forecast data available at the time. The methodology incorporated the use of existing rights-of-way to the maximum extent possible and it considered the likely long-term growth in the region. Lastly, the plans presented in the Study not only address current needs, they also provide the framework for future development of 115 kV and 345 kV transmission infrastructure in the study region between Waconia, Victoria, and Chaska.

3.3 Cost Analysis of Options A-1 and A-2

In conformity with Minnesota Rule 7849.0260(C), the cost of the preferred option is approximately $29 million. The cost for the alternative option is $27 million. Since the estimates are only +/- 30% accurate, it can be assumed that the costs of the two options would be similar. Therefore, the range of costs would be between $20 million and $38 million for the preferred option and $18 million and $36 million for the alternative option. For Xcel Energy's portion of the cost, the 2012 Minnesota jurisdiction revenue requirement for the preferred option is $3 million or a cost/kWh of $0.000095. The 2012 Minnesota revenue requirement for the alternative option is $2.8 million or a cost/kWh of $0.000087. See Appendix D for detailed cost analysis of the Minnesota revenue requirement for Xcel Energy. For the City of Glencoe, the estimated annual revenue requirement is $371,000 or a cost/kWh of $0.0002.

Table 8
Preferred Option A-1

Year	Facility	Study Cost Estimate - 2007	Cost Estimate Escalated to 2010 Equivalent*
	Xcel Energy Upgrades		
2012	Transmission Line Work	$17,100,000	$22,200,000

Year	Facility	Study Cost Estimate - 2007	Cost Estimate Escalated to 2010 Equivalent*
2012	Substation Work	$700,000	$3,400,000
	Total Xcel Energy Upgrades	**$17,800,000**	**$25,600,000**
	City of Glencoe Upgrades		
2012	Transmission Line Work	$0 **	$1,900,000
2012	Substation Work	$0 **	$1,500,000
	Total City of Glencoe Upgrades	**$0 ** **	**$3,400,000**
2012	**Grand Total (Xcel Energy & City of Glencoe)**	**$17,800,000****	**$29,000,000**

***** The cost estimates ($17,800,000) performed in 2007 during the study phase of the project was prorated to the 2010 project estimate since the identified upgrades are similar.

****** At the time the Study estimate was performed in 2007, the cost of City of Glencoe upgrades was not included.

Table 9
Alternative Option A-2

Year	Facility	Study Cost Estimate - 2007	Cost Estimate Escalated to 2010 Equivalent*
	Xcel Energy Upgrades		
2012	Transmission Line Work	$15,700,000	$22,600,000
2012	Substation Work	$700,000	$1,000,000
	Total Xcel Energy Upgrades	**$16,400,000**	**$23,600,000**
	City of Glencoe Upgrades		
2012	Diamond – Armstrong 115 kV line & easement	$0 **	$1,800,000
2012	New Diamond Substation and Armstrong Substation upgrades	$0 **	$1,500,000
	Total City of Glencoe Upgrades	$0 **	**$3,300,000**

Year	Facility	Study Cost Estimate - 2007	Cost Estimate Escalated to 2010 Equivalent*
2012	**Grand Total (Xcel Energy & City of Glencoe)**	**$16,400,000**	**$26,900,000**

***** The cost estimates ($16,400,000) performed in 2007 during the study phase of the project was prorated to the 2010 project estimate since the identified upgrades are similar.

****** At the time the Study estimate was performed in 2007, the cost of City of Glencoe upgrades was not included.

3.4 Line Losses and Total System Losses (MW) by Option

Table 10 below shows the losses for each segment of the Project. Losses under the existing system conditions are 3.1 MW. Under the proposed option, Option A-1, losses are 1.1 MW, for a reduction in losses of 2 MW between the existing system and the proposed upgrades.

Table 10
Existing System Line Losses

Base Case Line	Sending End MW Flows	Losses
Young America - Plato 69 kV	17.2	0.4
Plato - Biscay Jct 69 kV	4.1	0
Young America - Waconia 69 kV	6.3	0.1
Carver Co - Augusta 69 kV	44.3	2.3
Carver Co - Young America #1	24.6	0.2
Carver Co - Young America #2	13.6	0.1
TOTAL	--	3.1
NOTE: The existing system is modified to make it comparable to the planned model by opening the line between Chaska and Scott County		

Table 11
Option A-1 Line Losses

Proposed Line	Sending End MW Flows	Losses
Biscay Jct - Plato 69 kV	9.5	0
Armstrong - Diamond 115 kV	33.3	0
Diamond - West Waconia 115 kV	30.1	0.1
Waconia - Carver Co - tap 69 kV	4.6	0
Carver Co tap - Carver Co 69 kV	47.6	0.6
Carver Co tap - Augusta 69 kV	42.4	0.5
Carver Co - Young America #1	7.3	0
Carver Co - Young America #2	7.3	0
Total	--	1.1 MW

Table 12
Option A-2 Line Losses

Proposed Line	Sending End MW Flows	Losses
Biscay Jct - Plato 69 kV	9.5	0
Armstrong - Diamond 115 kV	36.1	0
Diamond – Carver County 115 kV	32.9	0.2
Carver Co - Augusta 69 kV	42.8	0.9
Carver Co - Young America #1	23.7	0.2
Young America – Waconia 69 kV	9	0.1
Total	--	1.4 MW

Beyond the losses on the affected facilities themselves, there will be loss impacts on the transmission system as a whole as the system improvements being proposed provide a more efficient means of delivering power to load. Table 13 illustrates the total losses for the Great River Energy and Xcel Energy control areas for the existing system conditions case, preferred option, and the alternative

option. No analysis to evaluate savings due to losses was performed because while the difference in losses between the base case and the two options is about 3 MW, the difference in loss performance between the two alternatives is minimal.

Applicants are providing system losses for the control area because it is more informative to analyze system losses in addition to single line losses. A new transmission line will affect losses throughout the control area and will generally reduce losses across the system as a whole, which reduces the amount of power that must be generated. Conversely, focusing on a single line tends to distort its impact because a single, isolated transmission line will always have losses. The amount of power lost on an isolated transmission line is of little value in making a need determination. System losses better inform the determination whether the proposed transmission line has a positive impact on the system.

Table 13
System Losses

Model	Losses
Existing System[6]	350.7
Preferred Option	348
Alternative Option	347.9

3.4.1 Other Transmission Voltages

Other transmission voltages were not considered for this area for the following reasons:

69 kV lines will not meet the future load growth needs in the area, therefore 69 kV options were not considered. 161 kV lines would require new 115/161 kV transformers at Glencoe and West Waconia to be able to connect them to the existing transmission system, a significantly more expensive option when compared to 115 kV. Additionally, 230 kV and 345 kV lines are generally used for

[6] Assuming the line between Chaska and Scott Co is open in order to make the system consistent with the transmission plans.

transferring large amount of power over long distances or providing a back bone for 161 kV or 115 kV transmission systems. Therefore 345 kV and 230 kV transmission options are not appropriate.

3.4.2 Upgrading Existing Transmission Lines

The Project involves upgrading existing 69 kV transmission lines to 115 kV between the Diamond Substation, Plato Substation, Young America Substation, West Waconia Substation and Augusta Substation. About 9 miles of the total Project requires building new transmission lines, the rest of the Project involves rebuilding the existing transmission lines.

3.4.3 Termination Points for Transmission Line

The termination point for the west end of the Project (Structure #142) is based on the fact that existing McLeod - Glencoe (Armstrong) 115 kV line provides the nearest 115 kV termination for the Project, the alternative could involve building the line all the way from the McLeod Substation. This would add an additional 9 miles of new transmission line to the Project. The east end of the Project could be terminated either at the Carver County or West Waconia Substations. The West Waconia Substation is ideal for terminating the new line as a future 345 kV source is expected to be at this location. The cost difference between the two options for the east end of the Project may not be significantly different.

For the area between Waconia and Chaska, the alternative would involve rebuilding the 69 kV line from Carver County substation to 1 mile west of Augusta to 115 kV and operate it at 69 kV. This would be comparable to the proposed plan of building 2.5 miles of 69 kV line between Waconia and exiting Augusta line, and rebuilding 7 miles of 69 kV line to the east to 115 kV and operating it at 69 kV. The cost of the two options would be comparable as the mileages are approximately the same. Due to the possible future 345 kV source availability at the West Waconia Substation, the proposed plan is preferred.

3.5 Additional Alternatives

Applicants also considered several additional alternatives to constructing the proposed facilities. These alternatives included: (1) demand side management programs; (2) generation; (3) double-circuiting and upgrading existing facilities; (4) DC lines; (5) undergrounding; and (6) a "no build" alternative. These options are discussed in sections 3.6 through 3.14 below. In the end, Applicants concluded that the proposed Project best meets the identified needs.

3.5.1 Demand Side Management

Applicants present their efforts to reduce energy consumption via demand side management ("DSM") in Appendix C. Although significant reductions in energy consumption have been realized during the past several years, such efforts are not a feasible alternative to the proposed transmission upgrades because demand in the Study area is projected to increase well beyond projected energy reductions realized from the Applicants' respective DSM program.

3.5.2 Distributed Generation

Distributed generation is generally considered to be small generation sources, usually less than 10 MW, that are located close to the ultimate users. However, in some cases generators larger than 10 MW are considered to be distributed generation as well. Distributed generation would not satisfy the identified needs for the Project.

Distributed Generation between Glencoe and West Waconia

The distributed generation option was evaluated by identifying the amount of generation required to serve the same amount of additional load that the preferred transmission option could serve, which is 25 percent beyond existing capacity. Generators were placed strategically to mitigate specific overloads and low voltages identified in Tables 3 and 4 presented above. The City of Glencoe currently has 35 MW of diesel generation in-service, which is sufficient to serve the entire load of the City. Consequently, no additional generation was added at this location because the internal generation mitigates the contingencies identified in Table 4 presented above. However, distributed generation is not an alternative to the

Glencoe – West Waconia section of the 115 kV project as the reliability of the 69 kV line would not be improved from installation of the generation (due to age and condition of the line). Therefore, rebuilding of the 69 kV line would be needed in addition to the distributed generation in the area.

Distributed Generation at St. Bonifacius

The St. Bonifacius Substation has 75 MW of existing generation, therefore no additional generation is required at that location. However, to meet the NERC TPL-002 standard (loss of single element) in the future, the generation may need to be run in anticipation of an outage of the Dickinson – St. Bonifacius line during peak load conditions. Failure to run the generation at St. Bonifacius during peak hours could result in violation of the NERC TPL-002 standard (a Category B contingency, which is an event resulting in the loss of a single element of the transmission system) due to the risk of low voltages following the loss of the Dickinson source. In addition, the system may not be able to meet the NERC TPL-003 standard (loss of two elements), without shedding load, during the loss of the Dickinson source combined with the loss of St. Bonifacius generation.

Distributed Generation between Waconia and Scott County

Generation would be required at either the Chaska or Victoria Substations to prevent overloads and low voltage conditions on the Carver County – Scott County 69 kV transmission line. Approximately 16 MW would need to be installed for the distributed generation option to provide the same incremental loading that either Option A-1 or A-2 would provide (approximately 25 percent load growth, which is expected to be reached in 2027). Table 14 below shows the incremental generation requirements assuming a 2 percent load growth in the region.

Table 14
Distributed Generation
Estimated Generation Requirement

Year	Load on Carver Co – Augusta line (MVA)	MW of generation required
2015	44.3	4
2016	45.2	4.9
2017	46.1	5.8
2018	47.0	6.7
2019	48.0	7.7
2020	48.9	8.6
2021	49.9	9.6
2022	50.9	10.6
2023	51.9	11.6
2024	52.9	12.6
2025	54.0	13.7
2026	55.1	14.8
2027	56.2	15.9

Sixteen megawatts of distributed generation would cost approximately $16 million based on estimated generation costs of $1,000 per kW.[7] This estimate does not include the costs of fuel or operation and maintenance of the generation. The estimate also does not include the cost associated with interconnecting the generation to the transmission system. The cost of building the 2 miles of 69 kV line from West Waconia to the Carver County – August 69 kV line and rebuilding the existing 69 kV line from that point, 7 miles towards Augusta, is approximately $6 million as opposed to the $16 million of distributed generation needed. In addition to that, any new distribution substation that would be built on this line would be built at 69 kV voltage. This would mean any future conversion of the

[7] http://www.energy.ca.gov/distgen/economics/capital.html

line to 115 kV would be more expensive as more individual 69 kV substations would need to be upgraded to 115 kV.

Summary of Distributed Generation Solutions

As discussed above, the use of distributed generation to meet system needs can be summarized as follows:

> Glencoe – West Waconia Area – Existing generation at Glencoe can be used (at increased operational cost) to relieve the line overloads and support voltage levels; however, age and condition of the existing 69 kV line would require rebuilding of the line anyway.
>
> St Bonifacius Area – Existing generation at St Bonifacius can met the systems need; however, this can only be achieved at significant increased operational cost as the generation would need to be run during peak hours to avoid violation of the NERC standard.
>
> Waconia – Scott County Area – Distributed generation could be used (at increased operational cost) to reduce the line overloads and to support the voltage in the area; however, the cost to meet these requirements over the next 20 years would be almost three times what it would cost to solve these system problem with the transmission improvements recommended.

In conclusion, the proposed transmission option is superior when these additional costs are factored into the distributed generation option.

Additionally, any generation alternative would need to replace the reliability provided by adding transmission. Transmission lines have the ability to operate more than 99% of the time. This reliability level is one of the benefits of constructing transmission lines. For comparison purposes, peaking generation cannot be assumed to be available to operate more than 95% of the necessary hours. Consequently, to replicate the 99% reliability found in transmission, redundant generation would need to be installed. Distributed generation also does

not address the reliability problems of the line between Carver County and Glencoe, which due to its age, would require re-building the line.

3.5.3 Renewable Energy Generation

Applicants considered the public policy preference for renewable energy generation. The state policy is embodied in two sections of state law. The first renewable energy preference is contained in Minn. Stat. § 216B.243, subd. 3a. This statute provides:

> Subd. 3a. Use of renewable resource. The commission may not issue a certificate of need under this section for a large energy facility that generates electric power by means of a nonrenewable energy source, or that transmits electric power generated by means of a nonrenewable energy source, unless the applicant for the certificate has demonstrated to the commission's satisfaction that it has explored the possibility of generating power by means of renewable energy sources and has demonstrated that the alternative selected is less expensive (including environmental costs) than power generated by a renewable energy source. For purposes of this subdivision, "renewable energy source" includes hydro, wind, solar, and geothermal energy and the use of trees or other vegetation as fuel.

The second renewable preference is found at Minn. Stat. § 216B.2422, subd. 4, which states:

> The Commission shall not approve a new or refurbished nonrenewable energy facility in an integrated resource plan or a certificate of need, pursuant to section 216B.243, nor shall the Commission allow rate recovery pursuant to section 216B.16 for such a nonrenewable energy facility, unless the utility has demonstrated that a renewable energy facility is not in the public interest.

The Commission has recognized that the renewable generation preference statutes create unique issues when applied to transmission projects. The Commission has found that the preference is not a bar to granting Certificates of Need for transmission facilities where the proposed transmission facility does not immediately interconnect to a new generation source and will not interconnect with a specific generation source. Furthermore, to the extent that upgrading the transmission system in an area improves the overall ability of the system to transmit renewable energy into the transmission grid, it provides an independent benefit that is consistent with the statutory preference. *In the Matter of the Application of Otter Tail Power Company for a Certificate of Need for Appleton-Canby 115 kV High Voltage Transmission Line*, Order Granting Certificate of Need, Docket No. E-017/CN-06-677, p. 9 (April 18, 2007).

The impetus for the Project is system reliability based on load forecasts for the Study area. This area has the potential for future growth and development that cannot reasonably be exploited without new and upgraded transmission infrastructure. Thus, the renewable generation preference, to the extent it applies to this Project, has been satisfied.

3.5.4 C-BED Generation

In evaluating generation as an alternative, Applicants also considered the use of Community-Based Energy Development ("C-BED") generation. C-BED generation, like distributed generation, generally refers to small generation projects. The distinguishing characteristics of a C-BED project are that it is renewable and that it meets certain ownership requirements.[8] As discussed in the Distributed Generation section above, use of generation to meet the load supply needs of the

[8] The distinguishing feature of a C-BED project is the ownership structure. "C BED project" means a new renewable energy project that is either a stand-alone project or part of a partnership under subdivision 8:
(1) has no single qualifying owner owning more than 15% of a C-BED wind energy project unless: (i) the C-BED wind energy project consists of only one or two turbines; or (ii) the qualifying owner is a public entity listed under paragraph (b), clause (5), that is not a municipal utility;
(2) demonstrates that at least 51% of the gross revenues from a power purchase agreement over the life of the project will flow to qualifying owners and other local entities; and
(3) has a resolution of support adopted by the county board of each county in which the project is to be located, or in the case of a project located within the boundaries of a reservation, the tribal council for that reservation.
Minn. Stat. § 216B.1612, subd. 2(g) (amended 2007).

project area is not economical. This conclusion holds true even if the generation used is C-BED generation.

3.5.5 Double Circuiting Existing Transmission Lines

Double circuiting is the construction of two separate circuits on the same structures to increase capacity of the line. It is an appropriate approach if the second circuit is intended to increase capacity, but not where the second line is required for redundancy. Planning engineers examined whether double circuiting was an appropriate solution, in part, to the pending electrical deficiencies in the Glencoe – Waconia area and determined that it was a lower cost, lower impact solution compared to constructing completely new transmission lines in newly acquired right-of-way. Therefore, the Project includes a double circuit configuration of approximately six miles of existing right-of-way to accommodate a second 115 kV circuit in the future. The remaining segment, which is approximately 15 miles of existing 69 kV transmission line will be upgraded to 115 kV capacity. Double circuiting this remaining segment is not a cost effective solution based on forecasted load growth.

3.5.6 Non-Certificate of Need Alternatives

Applicants examined whether transmission improvements that do not require Certificates of Need, including reconductoring existing transmission lines, could meet the identified needs in the area and determined that reconductoring a portion of the existing transmission system in the Project area and upgrading other segments to 115 kV capacity is a reasonable and prudent alternative to constructing significant amounts of new transmission corridor in the Project area. By reconductoring a portion of the existing transmission system in the Project area, only 9 miles of new right-of-way will be required, which will considerably reduce environmental impacts that would be associated if new construction and rights-of-way were being proposed for the entire Project.

3.5.7 DC Lines

Applicants further considered the alternative of a direct current ("DC") line in place of the proposed alternating current ("AC") facilities. DC transmission lines

normally consist of two current-carrying conductors instead of the three associated with an AC configuration. A DC transmission line's primary intended purpose is to deliver electricity from a distant generation location (several hundred miles away) to a load center. Such lines also do not have the capability to provide community service reliability support to an AC system because there are no intermediate substation connections. Rather, there are converter stations at each end of the line. This characteristic of a DC line makes it unsuitable for the needs sought to be addressed by the proposed transmission line, which is to improve system reliability due to increased demand.

3.5.8 Underground Transmission Line

The alternative of placing the proposed transmission line underground was also considered, but ultimately rejected because of cost considerations. Generally, for transmission voltages of 115 kV or greater, overhead construction is the preferred configuration due to costs. Underground transmission lines also have substantially longer construction times and longer repair times than equivalent overhead lines. For example, an overhead 115 kV transmission line constructed with single pole structures spaced 300 to 400 feet apart cost approximately $350,000 - $500,000 per mile. The same facility placed underground could cost up to seven to 10 times as much.

This cost differential is based on the different design requirements for overhead and underground lines. Overhead transmission lines rely on the dielectric properties of air to provide insulation, thereby preventing the occurrence of short circuits. The properties of the air also efficiently dissipate heat away from the conductor surface.

When a transmission line is placed underground, the conductors must be adequately insulated from the ground and each other, and adequately cooled to prevent equipment failure. Thus, the conductors are wrapped with insulating materials and placed inside oil filled pipes. The oil is circulated through cooling stations every few thousand feet along the line.

Some electric cables have been designed with a specially formulated plastic covering that does not require circulating oil to dissipate heat. However, the amount of current that can be applied to such conductors is limited.

Because of the significantly greater expense associated with underground transmission, the use of underground technology is limited to locations where the impacts of overhead construction are completely unacceptable or where physical circumstances allow for no other option. Examples include congested downtown centers where there is no space available between city streets and adjacent buildings for adequate clearance, or airport approaches where an overhead transmission line cannot be constructed for safety reasons. No circumstance warrants underground construction based on Applicants' examination of the environmental and land use setting associated with the proposed Project presented in Chapter 6.

3.6 Consequences of Delay and No Facility Alternative

Consequences of Delay

Minnesota Rules 7849.0300 requires an applicant to discuss the anticipated impacts to its system, neighboring systems, and to the power pool if the proposed project is delayed one, two, three years or indefinitely. The impacts are analyzed based on expected demand, upper confidence level, and lower confidence level.

Table 15
Consequences of Delay

		% overload		
Facility	**Contingency**	**2013**	**2014**	**2015**
Glencoe	Loss of McLeod – Glencoe 115 kV	90%	89%	89%
High Island	Loss of McLeod – Glencoe 115 kV	90%	89%	89%
Plato – Glencoe tap	Loss of McLeod – Glencoe 115 kV	99%	102%	102%
Glencoe – Young America	Loss of McLeod – Glencoe 115 kV	126%	129%	130%
Young America – Carver County	Loss of McLeod – Glencoe 115 kV	114%	117%	118%

		% overload		
Facility	**Contingency**	**2013**	**2014**	**2015**
St. Bonifacius	Loss of Dickinson – St. Bonifacius	93%	92%	92%
West Waconia	Loss of Dickinson – St. Bonifacius	94%	93%	93%
Scott Co 115/69 kV TR1	Loss of Scott Co 115/69 kV TR 2	124%	126%	128%
Scott Co 115/69 kV TR2	Loss of Scott Co 115/69 kV TR 1	121%	123%	125%
Chaska	Loss of Scott Co – Chaska 69 kV line	95%	95%	93.3%

Delaying the Project could result in the City of Glencoe being required to run the City's generation during transmission outages on McLeod – Glencoe 115 kV line, as the existing 69 kV system would experience low voltages when serving the entire load of the City. The cities of Plato and Norwood Young America will continue to experience momentary and sustained outages due to the poor reliability of the aging line. The 115 kV system around Waconia could experience low voltages during transmission outages posing a possible NERC standard violation in the future without St. Bonifacius generation. In addition, load at Chaska, Victoria and Augusta would be at risk of load shedding due to thermal and voltage limitations on transmission facilities in the area.

No-Facility Alternative

The no-facility analysis focuses on the impact to existing facilities, changes in resource requirements, and the equipment or measures that may be used to reduce environmental impacts under a no-facility scenario. For reasons more fully set forth below, the no-facility alternative was found to be an unreasonable option.

Without the Project, low voltage and overloading conditions will arise throughout the study region after 2011. The Project addresses the pending low voltage and overload conditions discovered in the Study. Failure to upgrade the Glencoe – Waconia transmission line to 115 kV capacity could result in NERC violations in the future due to low voltages at St. Bonifacius and Waconia.

Moreover, additional load growth in the area will not be possible after 2011 if the upgrades and new segments of transmission line are not constructed. If growth continues without the Project, load shedding could be required. The voltage and

loading problems confronting the Glencoe – Waconia – Chaska load area demonstrate that a no-facility alternative is not a feasible option. For these reasons, Applicants believe the Project is the best alternative.

Minnesota Rule 7849.0340 further requires the Applicant to discuss the impact on existing facilities under a no-facility analysis, specifically their impact on: (1) the amount of land required; (2) induced traffic; (3) fuel requirements; (4) airborne emissions; (5) water appropriation and conservation; (6) discharges to water; (7) reject heat; (8) radioactive releases; (9) solid waste production; (10) audible noise; and (11) labor requirements (the "Section B Requirements"). There would be little if any impact on existing generation and transmission facilities under a no-facility alternative. The likely consequence of a no-facility scenario would be to shed load. Similarly, the Section B Requirements are not impacted in any significant manner under a no-build scenario. Additionally, since the Section B Requirements will not be significantly impacted, no equipment or measures need be used to mitigate such impacts pursuant to Section C of the Rule.

3.7 Rebuilding the Existing 69 kV line

Rebuilding the existing 69 kV line to a higher load carrying capacity would help alleviate the overloads and low voltages on the 69 kV line between the Carver County Substation and the Young America Substation. However, the incremental load serving capability of such an upgrade would be significantly less than that provided by a 115 kV line. If a higher growth rate is experienced in the area along Highway 212, the newly rebuilt 69 kV transmission line may need to be prematurely removed before the end of its 40-50 year useful life to be upgraded to 115 kV to meet the higher load in the future. Alternatively, a new 115 kV line on a new right-of-way may need to be built to avoid removing the 69 kV line prematurely. Due to these reasons, options involving upgrading the 69 kV line to 115 kV were determined to be prudent.

4 TRANSMISSION LINE OPERATING CHARACTERISTICS

During operation, transmission lines are for the most part passive elements of the environment. Their primary impact is aesthetic, i.e., a man made structure in an agrarian landscape. Because of the line's electrical characteristics, some chemical reactions occur around conductors in the air; noise can occur in some circumstances; interference with electromagnetic signals can occur; and electrical and magnetic fields are created around the conductors. All of these operating characteristics are considered as part of the design of a transmission line to prevent any significant impacts.

4.1 Ozone and Nitrogen Oxide Emissions

Corona consists of the breakdown or ionization of air within a few centimeters of conductors. Usually some imperfection such as a scratch on the conductor or a water droplet is necessary to cause corona. Corona can produce ozone and oxides of nitrogen in the air surrounding the conductor. Ozone also forms 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. Thus 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 molecules and combines readily with other elements and compounds in the atmosphere. Because of its reactivity, it is relatively short lived.

Currently, both state and federal governments have regulations regarding permissible concentrations of ozone and oxides of nitrogen. The state and national ambient air quality standards for ozone are similarly restrictive. The national standard is 0.075 ppm on an eight hour averaging period. The state standard is 0.08 ppm based upon the fourth highest eight hour daily maximum average in one year. Both averages must be compared to the national and state standards because of the different averaging periods. Calculations done for a 345 kV project showed that the maximum one hour concentration during foul weather (worst case) would be 0.0007 parts per million. This is well below both federal and

state standards. Lower voltage lines would have correspondingly lower concentrations. Most calculations of 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.

There is not a state or national standard for general oxides of nitrogen (NOx). The national standard for nitrogen dioxide (NO_2), one of several oxides of nitrogen, is 0.053 ppm on an annual basis and the Minnesota State Air Quality Standard for NO_2 is 0.05 ppm. The operation of the proposed transmission lines would not create any potential for the concentration of these pollutants to exceed the nearby (ambient) air standards.

4.2 Audible Noise

Transmission conductors produce noise under certain conditions. The level of noise depends on conductor conditions, voltage level, and weather conditions. Generally, activity-related noise levels during the operation and maintenance of substations and transmission lines are minimal.

Noise emission from a transmission line occurs during certain weather conditions. In foggy, damp, or rainy weather, 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 background noise level of the rain is usually greater than the noise from the transmission line. As a result, people do not normally hear 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 can produce noise. Noise levels produced by a 115 kV transmission line are generally less than outdoor background levels and are therefore not usually audible. Additionally, noise levels from the proposed 115/69 kV double circuit transmission lines are expected to be only slightly higher than

the existing 69 kV transmission lines. Therefore, noise levels from the new line and double circuit line should not be noticeably greater than existing levels.

At substations, the source of noise is primarily the transformers, which can create a humming noise. The nearest occupied homes to the West Waconia and Plato Substations are located approximately 800 feet northwest and approximately 115 feet southeast of the substations, respectively. It would be very unlikely that substation noise would be audible at these homes.

The substations will be designed and constructed to comply with state noise standards established by the Minnesota Pollution Control Agency ("MPCA"). Since human hearing is not equally sensitive to all frequencies of sound, the most noticeable frequencies of sound are given more "weight" in most measurement schemes. The A-weighted scale corresponds to the sensitivity range for human hearing. Noise levels capable of being heard by humans are measured in dBA, which is 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 level is perceived as a doubling of noise loudness, while a 20 dBA change is considered a dramatic change in loudness. Table 16 below shows noise levels associated with common, everyday sources.

In Minnesota, statistical sound levels (L Level Descriptors) are used to evaluate noise levels and identify noise impacts. The L5 is defined as the noise level exceeded 5% of the time, or for three minutes in an hour. The L50 is the noise level exceeded 50% of the time, or for 30 minutes in an hour.

Land areas, such as picnic areas, churches, or commercial spaces, are assigned to an activity category based on the type of activities or use occurring in the area. Activity categories are then categorized based on their sensitivity to traffic noise. The Noise Area Classification ("NAC") is listed in the MPCA noise regulations to distinguish the categories.

Table 16
Common Noise Sources and Levels

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

Source: Minnesota Pollution Control Agency (2008).

Table 17 identifies the MPCA established daytime and nighttime noise standards by NAC. The standards are expressed as a range of permissible dBA within a one hour period; L_{50} is the dBA that may be exceeded 50 percent of the time within an hour, while L_{10} is the dBA that may be exceeded 10 percent of the time within the hour. Table 18 shows noise levels at the edge of the right-of-way at various voltages.

Table 17
Noise Standards by Noise Area Classification

Noise Area Classification	Daytime		Nighttime	
	L_{50}	L_{10}	L_{50}	L_{10}
1	60	65	50	55
2	65	70	65	70
3	75	80	75	80

Table 18
Calculated Audible Noise (db) for Proposed Transmission Line Designs (3.28 feet above ground)

Structure Type	Noise L5 (50 Feet From Centerline) (Decibels a weighted)	Noise L50 (50 feet From Centerline) (Decibels a weighted)
Braced Post 115kV Steel Pole Single Circuit	18.9	15.4
Braced Post 115kV Steel Pole Single Circuit With Distribution Underbuild	16.6	12.4
Davit Arm 115kV/69kV Steel Pole Double Circuit	16.2	12.7
Davit Arm 115kV/69kV Steel Pole Double Circuit With 12.5kV Distribution Underbuild	15.7	12.2
Davit Arm 115kV/69kV Steel Pole Double Circuit With 34.5kV/34.5kV Distribution Underbuild	19.6	16.8

New transmission lines, substations and substation upgrades will be designed and constructed to comply with state noise standards.

4.3 Radio and Television Interference

Corona from transmission line conductors can generate electromagnetic "noise" at the same frequencies that radio and television signals are transmitted. This noise can cause interference with the reception of these signals depending on the

frequency and strength of the radio and television signal. Tightening loose hardware on the transmission line usually resolves the problem.

If radio interference from transmission line corona does occur, satisfactory reception from AM radio stations previously providing good reception can be restored by appropriate modification of (or addition to) the receiving antenna system. AM radio frequency interference typically occurs immediately under a transmission line and dissipates rapidly within the right-of-way to either side.

FM radio receivers usually do not pick up interference from transmission lines because:

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

A two-way mobile radio located immediately adjacent to and behind a large metallic structure (such as a steel tower) may experience interference because of signal-blocking effects. Movement of either mobile unit so that the metallic structure is not immediately between the two units should restore communications. This would generally require a movement of less than 50 feet by the mobile unit adjacent to a metallic tower.

Television interference is rare but may occur when a large transmission structure is aligned between the receiver and a weak distant signal, creating a shadow effect. 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 facilities in those areas where good reception is presently obtained, Applicants 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.

4.4 Safety

The Project will be designed in compliance with local, state, and NESC standards regarding clearance to ground, clearance to crossing utilities, clearance to buildings, strength of materials, and right-of-way widths. Appropriate standards will be met for construction and installation, and all applicable safety procedures will be followed during and after installation.

The proposed transmission lines will be equipped with protective devices to safeguard the public from the transmission lines if an accident occurs, such as a structure or conductor falling to the ground. The protective devices include breakers and relays located where the line connects to the substation(s). The protective equipment will de-energize the line should such an event occur. Proper signage will be posted warning the public of the risk of coming into contact with the energized equipment.

4.5 Electric and Magnetic Fields

The term electromagnetic field ("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 (referred to as "extremely low frequencies" ("ELF")), EMF should be separated into electric fields ("EFs") and magnetic fields ("MFs"), measured in kilovolts per meter ("kV/m") and milligauss ("mG"), respectively. These fields are dependent on the voltage of a transmission line (EFs) and current carried by a transmission line (MFs). The intensity of the EF is proportional to the voltage of the line, and the intensity of the MF is proportional to the current flow through the conductors. Transmission lines operate at a power frequency of 60 hertz (cycles per second).

4.5.1 Electric Fields

There is no federal standard for transmission line electric fields. The Commission, however, has imposed a maximum electric field limit of 8 kV/meter measured at one meter above the ground. *In the Matter of the Route Permit Application for a 345 kV Transmission Line from Brookings County, South Dakota to Hampton, Minnesota,*

Docket No. ET-2/TL-08-1474, Order Granting Route Permit (*adopting* ALJ Findings of Fact, Conclusions and Recommendation at Finding 194 (April 22, 2010 and amended April 30, 2010)) (September 14, 2010). The standard was designed to prevent serious hazards from shocks when touching large objects parked under AC transmission lines of 500 kV or greater. The maximum electric field, measured at one meter above ground, associated with the Project is calculated to be 1.19 kV/m.

The calculated electric fields for the Project are provided in Table 19.

Table 19
Calculated Electric Fields (KV/M) for Proposed Transmission Line Designs (One meter above ground)

Structure Type	Maximum Operating Voltage (kV)	Distance to Proposed Centerline										
		-300'	-200'	-100'	-50'	-25	0'	25	50'	100'	200'	300'
Braced Post 115kV Steel Pole Single Circuit	121	0.006	0.015	0.057	0.185	0.630	1.193	0.493	0.207	0.052	0.013	0.006
Braced Post 115kV Steel Pole Single Circuit With 12.5kV Distribution Underbuild	121/13	0.004	0.009	0.034	0.111	0.377	0.179	0.196	0.146	0.053	0.014	0.007
Braced Post 115kV Steel Pole Single Circuit (Operating at 69kV)	72.5	0.004	0.010	0.033	0.072	0.117	0.715	0.295	0.124	0.031	0.008	0.003

Structure Type	Maximum Operating Voltage (kV)	Distance to Proposed Centerline										
		-300'	-200'	-100'	-50'	-25	0'	25	50'	100'	200'	300'
Braced Post 115kV Steel Pole Single Circuit (Operating at 69kV) With 13.8kV Distribution Underbuild	72.5/15	0.004	0.010	0.033	0.072	0.117	0.129	0.123	0.087	0.032	0.009	0.004
Braced Post 115kV Steel Pole Single Circuit With 13.8kV Distribution Underbuild	121/15	0.007	0.016	0.054	0.121	0.197	0.180	0.195	0.145	0.053	0.014	0.007
Davit Arm 115kV/69kV Steel Pole Double Circuit With 12.5kV Distribution Underbuild	121/72.5/13	0.006	0.011	0.016	0.046	0.148	0.227	0.241	0.060	0.041	0.017	0.008
Davit Arm 115kV/69kV Steel Pole Double Circuit	121/72.5	0.005	0.010	0.021	0.051	0.407	1.092	0.711	0.076	0.050	0.016	0.007
Davit Arm 115kV/69kV Steel Pole Double Circuit (Active 69kV Ckt) With 34.5kV/34.5kV Distribution Underbuild	72.5/36.2/36.2	0.006	0.012	0.017	0.092	0.292	0.141	0.346	0.140	0.040	0.013	0.006

Structure Type	Maximum Operating Voltage (kV)	Distance to Proposed Centerline										
		-300'	-200'	-100'	-50'	-25	0'	25	50'	100'	200'	300'
Davit Arm 115kV/69kV Steel Pole Double Circuit With 34.5kV/34.5 kV Distribution Underbuild	121/72.5/36.2/36.2	0.005	0.009	0.006	0.079	0.174	0.54	0.144	0.073	0.040	0.017	0.008

4.5.2 Magnetic Fields

There are presently no Minnesota regulations pertaining to MF exposure. Applicants provide information to the public, interested customers, and employees so they can make informed decisions about MFs. Such information includes the availability for measurements to be conducted for customers and employees upon request.

The magnetic field profiles around the proposed transmission lines for each structure and conductor configuration proposed for the Project are shown in Table 20. Magnetic fields are calculated for each section of the Project under three system conditions: the expected peak and average current flows as projected for the year 2015, under normal (system intact) conditions and expected peak current flow for the year 2025 under normal (system intact) conditions. 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. The calculated magnetic fields show that fields decrease rapidly as the distance from the centerline increases (proportional to the inverse square of the distance from source).

The magnetic field produced by the transmission line is dependent on the current flowing on its conductors. Therefore, the actual magnetic fields when the Project is placed in service are typically less than shown in Table 20. This is because the table represents the magnetic field with current flow at expected normal peak

based on projected regional load growth through 2025, the maximum load projection timeline available. Actual current flow on the line will vary with system conditions, so magnetic fields would be less than peak levels during most hours of the year.

Table 20
Calculated Magnetic Flux density (milligauss) for Proposed 115 kV Transmission Line Designs (One meter above ground)

Segment	System Condition	Current (Amps)	Distance to Proposed Centerline										
			-300'	-200'	-100'	-50'	-25	0'	25'	50'	100'	200'	300'
West Glencoe to East Glencoe 115kV Sgl Ckt	2015 Peak	171	0.19	0.37	1.47	5.21	12.67	21.84	11.74	5.39	1.86	0.60	0.32
	2015 Average	103	0.11	0.23	0.89	3.14	7.63	13.15	7.07	3.25	1.12	0.36	0.19
	2025 Peak	210	0.23	0.46	1.81	6.40	15.56	26.82	14.41	6.62	2.29	0.74	0.40
East Glencoe to West Waconia 115kV Sgl Ckt	2015 Peak	153	0.17	0.33	1.32	4.67	11.34	19.54	10.50	4.82	1.67	0.54	0.29
	2015 Average	92	0.10	0.20	0.79	2.81	6.82	11.75	6.31	2.90	1.00	0.32	0.17
	2025 Peak	194	0.21	0.42	1.67	5.92	14.38	24.77	13.31	6.12	2.11	0.68	0.37
East Glencoe to West Waconia 115kV Sgl Ckt With 12.5kV Distribution Underbuild	2015 Peak	153/60	0.14	0.29	0.98	2.54	3.98	5.31	5.09	3.05	1.21	0.40	0.21
	2015 Average	92/36	0.09	0.17	0.59	1.53	2.40	3.19	3.06	1.84	0.73	0.24	0.13
	2025 Peak	194/60	0.18	0.36	1.26	3.33	5.32	6.90	6.43	3.88	1.55	0.51	0.27
West Waconia to Carver Co. Tap & Carver Co. Tap to Augusta 115kV Sgl Ckt	2015 Peak	107	0.12	0.23	0.92	3.26	7.93	13.66	7.344	3.3.7	1.16	0.38	0.20
	2015 Average	64	0.07	0.14	0.55	1.95	4.74	8.17	4.39	2.02	0.70	0.23	0.12
	2025 Peak	120	0.13	0.26	1.04	3.66	8.89	15.32	8.24	3.78	1.31	0.42	0.23
Carver Co. Tap to Augusta 115kV Sgl Ckt (Operated at 69kV)	2015 Peak	360	0.39	0.79	3.11	10.98	26.68	45.97	24.71	11.35	3.92	1.27	0.68
	2015 Average	216	0.23	0.47	1.86	6.59	16.01	27.58	14.82	6.81	2.35	0.76	0.41
	2025 Peak	360	0.39	0.79	3.11	10.98	26.68	45.97	24.71	11.35	3.92	1.27	0.68
East Glencoe to West Waconia East Glencoe to Plato 115kV/69kV Dbl Ckt With 12.5kV Distribution Underbuild	2015 Peak	153/109/ 150	0.29	0.58	1.78	4.34	7.51	10.34	6.64	3.80	1.47	0.42	0.19
	2015 Average	92/65/ 90	0.18	0.35	1.07	2.61	4.51	6.21	3.98	2.28	0.88	0.25	0.12
	2025 Peak	194/109/ 150	0.33	0.65	1.99	4.84	8.30	10.76	7.38	4.58	1.81	0.53	0.25
East Glencoe to West Waconia East Glencoe to Plato 115kV/69kV Dbl Ckt	2015 Peak	153/109	0.32	0.58	1.74	4.72	9.73	21.65	16.30	7.11	2.12	0.61	0.32
	2015 Average	92/65	0.19	0.35	1.04	2.82	5.82	12.99	9.80	4.27	1.27	0.37	0.19
	2025 Peak	194/109	0.39	0.70	2.03	5.30	10.74	26.06	20.42	9.00	2.69	0.77	0.41

Segment	System Condition	Current (Amps)	Distance to Proposed Centerline										
			-300'	-200'	-100'	-50'	-25	0'	25'	50'	100'	200'	300'
West Waconia to Carver Co. Tap Waconia to Carver Co. Tap 115kV/69kV Dbl Ckt With 34.5kV/34.5kV Dbl Ckt Distr UB	2015 Peak	107/92/ 75/75	0.16	0.35	1.15	3.36	8.01	18.41	11.81	5.66	1.80	0.45	0.20
	2015 Average	64/55/ 45/45	0.10	0.21	0.69	2.01	4.81	11.04	7.08	3.39	1.08	0.27	0.12
	2025 Peak	107/92/ 75/75	0.16	0.35	1.15	3.36	8.01	18.41	11.81	5.66	1.80	0.45	0.20
Waconia to Carver Co. Tap 115kV/69kV Dbl Ckt (Active 69kV Circuit) With 34.5kV/34.5kV Dbl Ckt Distr UB	2015 Peak	92/75/75	0.18	0.40	1.46	4.38	9.36	16.67	8.20	3.58	1.23	0.36	0.17
	2015 Average	55/45/45	0.11	0.24	0.87	2.62	5.61	10.0	4.92	2.15	0.74	0.21	0.10
	2025 Peak	92/75/75	0.18	0.40	1.46	4.38	9.36	16.67	8.20	3.58	1.23	0.36	0.17
Carver Co. Tap to Augusta 115kV Sgl Ckt (Operated at 69kV) With 13.8kV Distribution Underbuild	2015 Peak	360/25	0.31	0.70	2.64	7.38	12.75	16.53	13.07	7.76	3.08	0.99	0.51
	2015 Average	216/15	0.19	0.42	1.58	4.43	7.65	9.92	7.84	4.66	1.85	0.59	0.30
	2025 Peak	360/25	0.31	0.70	2.64	7.38	12.75	16.53	13.07	7.76	3.08	0.99	0.51
Carver Co. Tap to Augusta 115kV Sgl Ckt With 13.8kV Distribution Underbuild	2015 Peak	107/25	0.11	0.25	0.89	2.54	4.68	7.07	5.17	2.62	0.89	0.25	0.11
	2015 Average	64/15	0.07	0.15	0.53	1.52	2.80	4.23	3.09	1.57	0.53	0.15	0.07
	2025 Peak	120/25	0.11	0.22	0.80	2.15	3.55	4.54	4.01	2.43	0.97	0.32	0.17

Considerable research has been conducted throughout the past three decades to determine whether exposure to power-frequency (60 hertz) MFs causes biological responses and health effects. Epidemiological and toxicological studies have shown no statistically significant association or weak associations between MF exposure and health risks. Public health professionals have also investigated the possible impact of exposure to EMF upon human health for the past several decades. While the general consensus is that EFs pose no risk to humans, the question of whether exposure to MFs can cause biological responses or health effects continues to be debated.

In 1999, the National Institute of Environmental Health Sciences ("NIEHS") issued its final report on "Health Effects from Exposure to Power-Line Frequency

Electric and Magnetic Fields" in response to the Energy Policy Act of 1992. The NIEHS concluded that the scientific evidence linking MF exposure with health risks is weak and that this finding does not warrant aggressive regulatory concern. However, because of the weak scientific evidence that supports some association between MFs and health effects, passive regulatory action, such as providing public education on reducing exposures, is warranted.

In 2007, the World Health Organization ("WHO") concluded a review of the health implications of electromagnetic fields. In this report, WHO stated:

> Uncertainties in the hazard assessment [of epidemiological studies] include the role that control selection bias and exposure misclassification might have on the observed relationship between magnetic fields and childhood leukemia. In addition, virtually all of the laboratory evidence and the mechanistic evidence fail to support a relationship between low-level [extremely low frequency] magnetic fields and changes in biological function or disease status. Thus, on balance, the evidence is not strong enough to be considered causal, but sufficiently strong to remain a concern. (*Environmental Health Criteria Volume N°238 on Extremely Low Frequency Fields* at p. 12, WHO (2007)).

Also, regarding disease outcomes, aside from childhood leukemia, WHO stated:

> A number of other diseases have been investigated for possible association with ELF magnetic field exposure. These include cancers in children and adults, depression, suicide, reproductive dysfunction, developmental disorders, immunological modifications and neurological disease. The scientific evidence supporting a linkage between ELF magnetic fields and any of these diseases is much weaker than for childhood leukemia and in some cases (for example,

> for cardiovascular disease or breast cancer) the evidence is sufficient to give confidence that magnetic fields do not cause the disease. (*Id.* at p. 12.)

Furthermore, in its "Summary and Recommendations for Further Study" WHO emphasized that:

> The limit values in [ELF-MF] exposure guidelines [should not] be reduced to some arbitrary level in the name of precaution. Such practice undermines the scientific foundation on which the limits are based and is likely to be an expensive and not necessarily effective way of providing protection. (*Id.* at p. 12).

Although WHO recognized epidemiological studies indicate an association on the range of three to four mG, WHO did not recommend these levels as an exposure limit but instead provided: "The best source of guidance for both exposure levels and the principles of scientific review are international guidelines." *Id.* at pp. 12-13. The international guidelines referred to by WHO are the International Commission on Non-Ionizing Radiation Protection ("ICNIRP") and the Institute of Electrical and Electronic Engineers ("IEEE") exposure limit guidelines to protect against acute effects. *Id.* at p. 12. The ICNIRP-1998 continuous general public exposure guideline is 833 mG and the IEEE continuous general public exposure guideline in 9,040 mG. In addition, WHO determined that "the evidence for a casual relationship [between ELF-MF and childhood leukemia] is limited, therefore exposure limits based on epidemiological evidence is not recommended, but some precautionary measures are warranted." *Id.* at 355-56.

WHO concluded that:

> given the weakness of the evidence for a link between exposure to ELF magnetic fields and childhood leukemia, and the limited impact on public health, the benefits of

> exposure reduction on health are unclear and thus, the costs of precautionary measures should be very low… Provided that the health, social and economic benefits of electric power are not compromised, implementing very low-cost precautionary procedures to reduce exposure is reasonable and warranted. (*Id.* at p. 372).

Wisconsin, Minnesota and California have all conducted literature reviews or research to examine this issue. In 2002, Minnesota formed an Interagency Working Group ("Working Group") to evaluate the body of research and develop policy recommendations to protect the public health from any potential problems resulting from HVTL (High Voltage Transmission Lines) EMF effects. The Working Group consisted of staff from various state agencies and published its findings in a White Paper on Electric and Magnetic Field (EMF) Policy and Mitigation Options in September 2002, (Minnesota Department of Health, 2002). The report summarized the findings of the Working Group as follows:

> Research on the health effects of [MF] has been carried out since the 1970s. Epidemiological studies have mixed results – some have shown no statistically significant association between exposure to [MF] and health effects, some have shown a weak association. More recently, laboratory studies have failed to show such an association, or to establish a biological mechanism for how magnetic fields may cause cancer. A number of scientific panels convened by national and international health agencies and the United States Congress have reviewed the research carried out to date. Most researchers concluded that there is insufficient evidence to prove an association between [MF] and health effects; however, many of them also concluded that there is insufficient evidence to prove that [MF] exposure is safe. (*Id.* at p. 1.)

The Public Service Commission of Wisconsin ("PSCW") has periodically reviewed the science on MFs since 1989 and held hearings to consider the topic of MF and human health effects. The most recent hearings on MF were held in July 1998. Recently, January 2008, the PSC published a fact sheet regarding MFs. In this fact sheet the PSC noted that:

> Many scientists believe the potential for health risks for exposure to [MFs] is very small. This is supported, in part, by weak epidemiological evidence and the lack of a plausible biological mechanism that explains how exposure to [MFs] could cause disease. The [MFs] produced by electricity are weak and do not have enough energy to break chemical bonds or to cause mutations in DNA. Without a mechanism, scientists have no idea what kind of exposure, if any, might be harmful. In addition, whole animal studies investigating long-term exposure to power frequency [MF] have shown no connection between exposure and cancer of any kind. (*EMF-Electric & Magnetic Fields*, PSC (January 2008)).

The Minnesota Public Utilities Commission, based on the Working Group and World Health Organization findings, has repeatedly found that "there is insufficient evidence to demonstrate a causal relationship between EMF exposure and any adverse human health effects." *In the Matter of the Application of Xcel Energy for a Route Permit for the Lake Yankton to Marshall Transmission Line Project in Lyon County*, Docket No. E-002/TL-07-1407, Findings of Fact, Conclusions of Law and Order Issuing a Route Permit to Xcel Energy for the Lake Yankton to Marshall Transmission Project at p. 7-8 (Aug. 29, 2008); *See also*, *In the Matter of the Application for a HVTL Route Permit for the Tower Transmission Line Project*, Docket No. ET-2, E015/TL-06-1624, Findings of Fact, Conclusions of Law and Order Issuing a Route Permit to Minnesota Power and Great River Energy for the Tower Transmission Line Project and Associated Facilities at p. 23 (Aug. 1,

2007)("Currently, there is insufficient evidence to demonstrate a causal relationship between EMF exposure and any adverse human health effects.").

The Commission again confirmed its conclusion regarding health effects and MFs in the Brookings County – Hampton 345 kV Route Permit proceeding ("Brookings Project"). In the Brookings Project Route Permit proceeding, Applicants Great River Energy and Xcel Energy and one of the intervening parties provided expert evidence on the potential impacts of electric and magnetic fields on human health. The ALJ in that proceeding evaluated written submissions and a day-and-half of testimony from these two expert witnesses. The ALJ concluded: "there is no demonstrated impact on human health and safety that is not adequately addressed by the existing State standards for [EF or MF] exposure." *In the Matter of the Route Permit Application by Great River Energy and Xcel Energy for a 345 kV Transmission Line from Brookings County, South Dakota to Hampton, Minnesota*, Docket No. ET-2/TL-08-1474, ALJ Findings of Fact, Conclusions and Recommendation at Finding 216 (April 22, 2010 and amended April 30, 2010). The Commission adopted this finding on July 15, 2010. *In the Matter of the Route Permit Application by Great River Energy and Xcel Energy for a 345 kV Transmission Line from Brookings County, South Dakota to Hampton, Minnesota*, Docket No. ET-2/TL-08-1474, Order Granting Route Permit (September 14, 2010).

4.6 Stray Voltage

"Stray voltage" is a condition that can occur on the electric service entrances to structures from distribution lines, not transmission lines. More precisely, stray voltage is a voltage that exists between the neutral wire of the service entrance and grounded objects in buildings such as barns and milking parlors.

Transmission lines do not, by themselves, create stray voltage because they do not connect to businesses or residences. Transmission lines, however, can induce stray voltage on a distribution circuit that is parallel to and immediately under the transmission line. If stray voltage issues arise as a result of the construction of the Project, Applicants will take appropriate measures to address potential stray voltage issues on a case-by-case basis.

4.7 Farming Operations, Vehicle Use, and Metal Buildings Near Power Lines

Insulated electric fences used in livestock operations can pick up an induced charge from transmission lines. Usually, the induced charge will drain off when the charger unit is connected to the fence. When the charger is disconnected either for maintenance or when the fence is being built, shocks may result. Potential shocks can be prevented by using a couple of methods, including:

i. one or more of the fence insulators can be shorted out to ground with a wire when the charger is disconnected; or
ii. an electric filter can be installed that grounds out charges induced from a power line while still allowing the charger to be effective.

Farm equipment, passenger vehicles and trucks may be safely used under and near power lines. The power lines will be designed to meet or exceed minimum clearance requirements with respect to roads, driveways, cultivated fields and grazing lands specified by the NESC. Recommended clearances within the NESC are designed to accommodate a relative vehicle height of 14 feet.

There is a potential for vehicles under high voltage transmission lines to build up an electric charge. If this occurs, the vehicle can be grounded by attaching a grounding strap to the vehicle long enough to touch the earth. Such buildup is a rare event because generally vehicles are effectively grounded through tires. Modern tires provide an electrical path to ground because carbon black, a good conductor of electricity, is added when they are produced. Metal parts of farming equipment are frequently in contact with the ground when plowing or engaging in various other activities. Therefore, vehicles will not normally build up a charge unless they have unusually old tires or are parked on dry rock, plastic, or other surfaces that insulate them from the ground.

Buildings are permitted near transmission lines but are generally discouraged within the right-of-way itself because a structure under a line may interfere with

safe operation of the transmission facilities. For example, a fire in a building on the right-of-way could damage a transmission line. As a result, NESC guidelines establish clear zones for transmission facilities. Metal buildings may have unique issues. For example, metal buildings near power lines of 200 kV or greater must be properly grounded. Any person with questions about a new or existing metal structure can contact Xcel Energy for further information about proper grounding requirements.

5 TRANSMISSION LINE CONSTRUCTION AND MAINTENANCE

In this chapter we describe the sequence of activities that occur during the process of construction of a transmission line, some of the measures that can be taken to mitigate potential impacts during construction, and activities associated with normal maintenance of a transmission line.

5.1 Right-of-Way Acquisition, Survey & Transmission Line Design

Where the Project is expected to use existing rights-of-way, the right-of-way agent will evaluate all existing easements. If the terms of the existing easement are sufficient and no new right-of-way is needed, the right-of-way agent will continue to work with the landowner to address any construction needs, impacts, damages or restoration issues. To the extent new right-of-way acquisition is necessary the right-of-way agent will work with landowners to determine how to expand existing easements.

For those segments of the Project where new right-of-way will be necessary, the acquisition process begins early in the detailed design phase. For transmission lines, utilities acquire easement rights across certain parcels to accommodate the facilities. The evaluation and acquisition process includes title examination, initial owner contacts, survey work, document preparation and purchase. Each of these activities, particularly as it applies to easements for transmission line facilities, is described in more detail below.

The first step in the right-of-way process is to identify all persons and entities that may have a legal interest in the real estate upon which the facilities will be built. To compile this list, a right-of-way agent or other persons engaged by the utility will complete a public records search of all land involved in the project. A title report is then developed for each parcel to determine the legal description of the property and the owner(s) of record of the property, and to gather information regarding easements, liens, restriction, encumbrances and other conditions of record.

After owners are identified, a right-of-way representative contacts each property owner or the property owner's representative. The right-of-way agent describes the need for the transmission facilities and how the Project may affect each parcel. The right-of-way agent also seeks information from the landowner about any specific construction concerns.

The next step in the acquisition process is evaluation of the specific parcel. For this work, the right-of-way agent may request permission from the owner for survey crews to enter the property to conduct preliminary survey work. Permission may also be requested to take soil borings to assess the soil conditions and determine appropriate foundation design. Surveys are conducted to locate the right-of-way corridors, natural features, man-made features and associated elevations for use during the detailed engineering of the line. The soil analysis is performed by an experienced geotechnical testing laboratory.

During the evaluation process, the location of the proposed transmission line or substation facility may be staked with permission of the property owner. This means that the survey crew locates each structure or pole on the ground and places a surveyor's stake to mark the structures or substation facility's anticipated location. By doing this, the right-of-way agent can show the landowner where the structure(s) will be located on the property. The right-of-way agent may also delineate the boundaries of the easement area required for safe operation of the line.

Prior to the acquisition of easements or fee purchase of property, land value data will be collected. Based on the impact of the easement or purchase to the market value of each parcel, a fair market value offer will be developed. The right-of-way agent then contacts the property owner(s) to present the offer for the easement and discuss the amount of just compensation for the rights to build, operate and maintain the transmission facilities within the easement area and reasonable access to the easement area. The agent will also provide maps of the line route or site, and maps showing the landowner's parcel. The landowner is allowed a reasonable amount of time to consider the offer and to present any material that the owner

believes is relevant to determining the property's value. This step is often performed prior to full evaluation in the form of an "option to purchase" contract and can be very helpful in obtaining permission for completion of all necessary evaluations.

In nearly all cases, utility companies are able to work with the landowners to address their concerns and an agreement is reached for the utility's purchase of land rights. The right-of-way agent prepares all of the documents required to complete each transaction. Some of the documents that may be required include: easement; purchase agreement; contract; and deed.

In rare instances, a negotiated settlement cannot be reached and the landowner chooses to have an independent third party determine the value of the rights taken. Such valuation is made through the utility's exercise of the right of eminent domain pursuant to Minnesota Statutes, Chapter 117. The process of exercising the right of eminent domain is called condemnation.

Before commencing a condemnation proceeding, the right-of-way agent must obtain at least one appraisal for the property proposed to be acquired and a copy of that appraisal must be provided to the property owner. Minn. Stat. § 117.036, subd. 2(a). The property owner may also obtain another property appraisal and the company must reimburse the property owner for the cost of the appraisal according to the limits set forth in Minnesota Statute § 117.036, Subd. 2(b). The property owner may be reimbursed for reasonable appraisal costs up to $1,500 for single-family and two-family residential properties, $1,500 for property with an value of $10,000 or less, and $5,000 for other types of properties.

To start the formal condemnation process, a utility files a Petition in the district court where the property is located and serves that Petition on all owners of the property. If the court grants the Petition, the court then appoints a three-person condemnation commission that will determine the compensation for the easement. The three people must be knowledgeable of applicable real estate issues. Once appointed, the commissioners schedule a viewing of the property over and across

which the transmission line easement is to be located. Next, the commission schedules a valuation hearing where the utility and landowners can testify as to the fair market value of the easement or fee. The commission then makes an award as to the value of the property acquired and files it with the court. Each party has 40 days from the filing of the award to appeal to the district court for a jury trial. In the event of an appeal, the jury hears land value evidence and renders a verdict. At any point in this process, the case can be dismissed if the parties reach a settlement.

As part of the right-of-way acquisition process, the right-of-way agent will discuss the construction schedule and construction requirements with the owner of each parcel. To ensure safe construction of the line, special consideration may be needed for fences, crops or livestock. For instance, fences may need to be moved, temporary or permanent gates may need to be installed; crops may need to be harvested early; and livestock may need to be moved. In each case the right-of-way agent and construction personnel coordinate these processes with the landowner.

5.2 Transmission Line Construction

After the final design is completed, and permits are obtained, construction of the project will begin. The timing of the construction will take into account various requirements that may be in place due to permit conditions. Construction and mitigation practices to minimize impacts will be developed based on the proposed schedule for activities, prohibitions, maintenance guidelines, inspection procedures, and other practices. In some cases these activities and schedules are modified to assist in minimizing impacts for sensitive environments.

Portions of vegetation that are disturbed or removed during construction of transmission line towers will naturally reestablish to pre-disturbance conditions. Resilient species of common grasses, sedges, and shrubs typically have few problems with re-establishment after disturbance. Areas of significant soil compaction and disturbance from construction activities along the proposed transmission line corridor will call for assistance in reestablishing the vegetation

stratum and controlling soil erosion. Commonly used methods to control erosion and assist in re-establishing vegetation include, but are not limited to:

- Erosion control blankets with embedded seeds;
- Silt fences;
- Hay bales;
- Hydro seeding; and
- Planting seeds or seedlings of native species.

Erosion control and vegetation establishment practices are regularly used in construction projects and will be developed as part of the storm water permit applications with the Minnesota Pollution Control Agency.

Typical construction equipment used on a project consists of cranes, backhoes, digger derrick line trucks, bucket trucks, bulldozers, flatbed and pickup trucks, and various trailers. Many types of excavation equipment are set on wheel or track driven vehicle. Wood or steel poles are transported on trailers to the specific location.

Typically, access to the transmission line right of way corridor is made directly from roads or trails that run parallel or perpendicular to the transmission line. In some situations, private field roads or trails are used. Permission from the property owner is obtained prior to accessing the transmission line. Installing temporary driveways or placing heavy timber mats are methods used to cross roadway ditches. Plastic interlocking mats are also placed in wet or soft soil locations and narrow ditches to minimize property disturbances.

Poles are delivered to a job site storage yard. At the storage yard, steel pole sections are connected, the arms are attached, and the structure is then loaded onto a pole trailer. The structure is delivered to the staked location and placed within the right of way until the pole is set. Insulators and other hardware are attached while the steel pole is on the ground. A crane is used to lift, place and

secure steel poles on foundations. A crane or boom-truck may be used to lift and set direct embedded, light duty steel poles. In cases where access to the site is too difficult for conventional pole setting equipment, the poles may be installed with the assistance of helicopters.

Although wood poles are not being proposed for this project, if used, wood poles may be placed at the staked location when the line runs parallel with a roadway. This occurs when there is room to safely leave the poles for a short time and adequate access to drop off the pole until it is installed. When wood poles are located away from roadways, they are sorted at the storage yard and loaded onto pole trailers for delivery to the staked location. Because the wood poles weigh less, several wood poles can be placed on the trailer for each delivery. Before the pole is lifted and placed using a line truck, the insulators and other hardware are attached to the pole while it is on the ground. In cases where access to the site is too difficult for conventional pole setting equipment, the poles may be installed with the assistance of helicopters.

When wood pole structures are used, they are directly embedded in the ground. For facilities which will have the structures directly embedded in the ground, the structures will be erected by auguring or excavating a hole typically 10 to 15 feet deep and three to four feet in diameter for each pole. The structures will then be set and the holes backfilled with excavated material, crushed rock, or concrete depending on the site conditions and structure requirements, any excess soil may be offered to the landowner or removed from the site. In poor load bearing soil conditions a galvanized steel culvert is sometimes installed, with the pole set inside.

After structures have been erected, conductors are installed by establishing stringing setup areas within the right-of-way. These stringing setup areas are usually located every two miles along a 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 are installed as needed over existing distribution or communication lines, streets, roads, highways, railways, or other

obstructions after any necessary notifications are made or permits obtained. This ensures that conductors will not obstruct traffic or contact existing energized conductors or other cables. In addition, the conductors are protected from damage.

Some of the corner structures will require the use of steel poles with concrete foundations. In those cases, large holes will need to be drilled in preparation for the concrete foundation. Drilled pier foundations may vary from four to eight feet in diameter and 15 to 30 feet deep. Concrete trucks are normally used to bring the concrete in from a separate processing site, usually a local supplier.

Transmission structures are generally designed for installation at existing grades. Therefore, structure sites will not be graded or leveled unless it is necessary to provide a reasonably level area for construction access and activities. Once construction is completed, any graded area will be restored to its original contour to the extent practicable.

During construction the most effective means to minimize impacts to water bodies and wetland areas is to span all streams and wetlands with structures. In addition, construction equipment will not be driven across waterways except under special circumstances and after the appropriate permits are acquired from the permitting agencies. Where waterways must be crossed to pull in the new conductors and shield wires, workers may walk across, use boats, or drive equipment across the ice in the winter. During construction, temporary removal or relocation of certain fences may occur and installation of temporary or, at landowner request, permanent gates. The right-of-way agent coordinates with the landowners for early harvest of crops where possible, and removal or relocation of equipment and livestock from the right-of-way that may be necessary.

5.3 Right-of-Way Restoration and Clean Up

During construction, ground disturbance at the structure sites occurs. The storage of equipment and materials is located in the temporary storage sites set up along the project route. Other staging areas located within the right of way, are limited

to the structure site areas for structure lay down and framing, prior to structure installation. Disturbed areas are restored to their original condition to the extent practicable as negotiated with the landowner.

Post construction reclamation activities include cleaning up all construction sites, which involves: removing and disposing of debris; removing all temporary facilities including staging and lay down areas; employing appropriate erosion control measures; reseeding 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.

Once construction is completed, each landowner is contacted by the right-of-way agent to determine if any damage has occurred as a result of the construction project. Applicants will compensate the landowner for any damages caused. In some cases, an outside contractor may be used to restore the damaged property as nearly as possible to its original condition.

5.4 Substation Construction

5.4.1 Property Acquisition

During the acquisition phase, individual property owners will be advised as to the construction schedules, needed access to the site and any vegetation clearing required for the Project. The site will be cleared of the amount of vegetation necessary to construct, operate and maintain the proposed modifications to the Plato and Diamond Substations. Also, any vegetation that is in the way of construction equipment may have to be removed.

The Diamond Substation area is presently under cultivation. The crop owner will be advised on the availability of property to be cultivated prior to the start of construction. Crop damage which occurs outside of the substation area of construction will be compensated for at prices agreed to prior to the beginning of construction.

The sites for the substations will require soil analysis prior to construction to assist with the designing of the substation. Applicants will inform landowners at the initial survey consultation that these borings will occur. An independent geotechnical testing company will take and analyze these borings.

Staging areas will be located in the vicinity. If additional property is temporarily required for construction, temporary limited easements may be obtained from landowners during the construction period. The temporary limited easements will be limited to such access and staging needs that are required for construction.

5.4.2 Construction Procedures

Approximately 1 acre of land will be graded to construct the Plato Substation and about 0.925 acre will be graded for Diamond Substation. Concrete foundations will be poured to support the substation equipment and control house. Once the sites are graded, perimeter fences will be erected to secure the sites. After grading, fencing and foundation work have been completed, the substations and control houses erection will commence. Applicants will also construct permanent access roads to provide for ingress and egress for its crews to and from the substations.

Erosion control methods will be implemented to minimize runoff during construction. Applicants will comply with all local, state, NESC, and internal standards regarding clearance to ground, clearance to other utilities in the area, clearance to buildings, and other applicable standards.

5.5 Maintenance Practices

Periodic access will be required to the right-of-way of a completed transmission line to perform inspections and maintenance or to repair any damage. Regular maintenance and inspections will be performed during the life of the facility to ensure its continued integrity. Personnel on foot, snowmobile, ATV, or pick-up truck will typically perform annual inspections. Inspections will be limited to the right-of-way and areas where obstructions or terrain may require non-right-of-way

access. If problems are found during inspection, repairs will be performed. Aerial inspections are conducted more frequently.

The right-of-way will be managed to remove vegetation that interferes with the operation and maintenance of the line. Current practice provides for the inspection of major transmission line right of ways every five years to determine if clearing is required. Right-of-way clearing practices include a combination of mechanical and hand clearing, along with herbicide application where allowed to remove or control vegetation.

Annual operating and maintenance costs associated with transmission lines from 69 kV through 345 kV are approximately $300 to $500 per mile.
Specific maintenance costs will depend on the setting, such as the amount of vegetation management necessary, storm damage occurrences, structure types and materials, age of the line, etc. The principal operating and maintenance costs relate to periodic inspections of the facilities.

Steel poles and concrete foundations require minimal maintenance. Wood poles would require inspection at roughly decade intervals to ensure structural integrity.

Minn. Rule 7849.0260 (C) requires a statement about average annual availability of the proposed transmission lines and their service life. The estimated service life of the proposed transmission lines for accounting purposes varies among utilities. For example, Xcel Energy uses a 40-year life while Otter Tail Power uses 55 years. However, practically speaking, high voltage transmission lines are seldom completely retired. Transmission infrastructure has very few mechanical elements and is built to withstand weather extremes that are normally encountered. With the exception of severe weather such as tornadoes and heavy ice storms, transmission lines rarely fail. Transmission lines are automatically taken out of service by the operation of protective relaying equipment when a fault is sensed on the system. Such interruptions are usually only momentary. Scheduled maintenance outages are also infrequent. As a result, the average annual availability of transmission infrastructure is very high, in excess of 99%.

Substations require a certain amount of maintenance to keep them functioning in accordance with accepted operating parameters and the National Electric Safety Code ("NESC") requirements. Transformers, circuit breakers, batteries, protective relays, and other equipment need to be serviced periodically in accordance with the manufacturer's recommendations. The substation site must be kept free of vegetation and adequate drainage must be maintained. The estimated service life of the proposed substation facilities for accounting purposes is 38 years.

6 ENVIRONMENTAL ANALYSIS

This chapter summarizes the major land use constraints and sensitive natural resources in the Project Area. For this discussion, the Project Area is considered to be the land area within the 29.4 mile transmission line right-of-way. Specific environmental aspects have been studied within this Project Area, and a broader Study Area extending up to 3 miles to each side of the Project Area. This section provides a description of the environmental setting, potential impacts and mitigative measures Applicants propose to take, where appropriate, to minimize the impacts of siting, constructing and operating the Project. If the transmission line was removed in the future, the land could be restored to its prior condition and/or put to a different use. The majority of the measures proposed are part of the standard construction process used by Xcel Energy. Unless otherwise identified in the following text, the cost of the mitigative measures proposed is considered nominal.

6.1 Summary

Land use in the Project Area is predominantly agricultural and rural. Portions of the transmission line are located within the municipal boundaries of the City of Glencoe and Norwood Young America (*see* Figures 1-3). The Plato and West Waconia Substations are located in agricultural and rural residential areas. Approximately 4.1 miles of the Project are located in the City of Glencoe and approximately one mile is located within the City of Norwood Young America, of which approximately 0.5 mile of existing transmission line extends west from the Young America Substation is planned to be retired. A majority of the 29.4 mile Project involves existing transmission right-of-way that is mainly located in agricultural areas. The approximate length of existing transmission line planned to be rebuilt is 22.5 miles. Approximately 6.9 miles of new transmission lines are planned to be constructed, and approximately 0.8 mile of existing transmission line will be retired.

Land Use

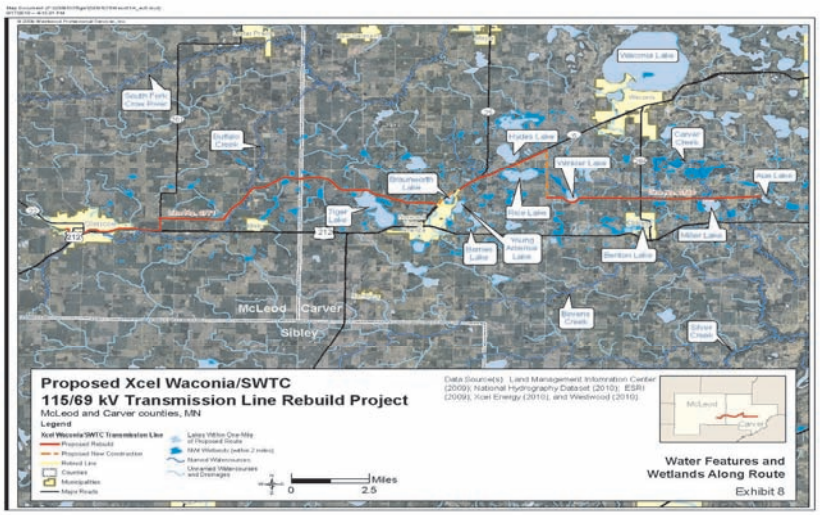
Land use within the Project Area is predominately agricultural and rural residential. The planned residential and commercial development on the north side of the City

of Norwood Young America presents the possibility of potential land use conflicts. However, Applicants will work with the City of Norwood Young America when developing options for siting the new transmission structures and lines for this area to limit possible conflicts. In addition, while it appears there will be no impacts, the Project will have to avoid conflicts with the Glencoe Municipal Airport ("GMA") through compliance with Federal Aviation Administration rules and local airport zoning. Outside the Cities of Glencoe and Norwood Young America, agricultural impacts will be minimized by sharing existing transmission and transportation corridors as much as possible.

Natural Resources

The Project is located within two major hydrologic units ("HUs") of the Upper Mississippi Drainage Region. The Western half of the Project Area drains through the South Fork Crow River HU into the Crow River. The Eastern portion of the Project Area drains through the Minnesota River – Shakopee HU into the Minnesota River. The Project Area intersects several rivers, streams, tributaries and ditches, as well as various wetlands, along its route (*see* Figure 15). The tributaries and streams along the Western portion of the Project Area drain into Buffalo Creek, which in turn drains into the South Fork Crow River north of the Project. Carver Creek flows through the Eastern portion of the Project Area and is fed by many smaller tributaries, some that intersect the transmission route.

Figure 15
Water Features and Wetlands Along Route



The area is primarily agricultural the diverse land cover provides habitat for many species of plants and animals, including potential habitat for state or federally protected migratory bird species, such as the bald eagle as well as other species of concern. Only two Minnesota Department of Natural Resources ("MnDNR") Wildlife Management Areas ("WMAs") are located within ¾ of a mile of the transmission route. A number of lakes and several public parks are located within a mile of the route.

Cultural Resources

The topography of the Project Area and draining of the historic wetlands has affected the purpose and location of cultural resources. Overall, this area contains considerable potential for containing significant cultural resources ranging from early pre-history through historic times. Of the identified archaeological sites within a mile of the Project Area, 31 consist of prehistoric artifacts scatters, two are single artifact finds, and one is a historical documentation record of an abandoned townsite. Two of the previously recorded artifact scatters are Considered Eligible Findings ("CEF") by the Minnesota State Historic Preservation Office ("SHPO"). The eligibility of the remaining inventoried archaeological sites is unevaluated. A total of eighty-two inventoried historic

structures are located within one mile of the Project Area. Of the identified historic structures, four are listed on the National Register of Historic Places ("NRHP") and one is a CEF. The eligibility of the remaining inventoried historic structure is unevaluated. The proposed Project Area will avoid impacts to identified archaeological and historic architectural resources to the extent possible. Should an impact be identified, Applicants will consult with SHPO on whether the resource is eligible for listing in the NRHP.

Mitigation

The Project Area contains both agricultural and rural residential land uses, as well as natural resource, cultural resource, and recreation areas. However, none of these uses or resources appears to present a major barrier to the proposed rebuilding of the existing transmission line or constructing the new transmission line and related modifications to existing substations. Impacts can be avoided or minimized through careful route selection, final design, and construction best management practices.

6.2 Geomorphology and Physiography

Description of Environmental Setting

The proposed transmission line route is located in the counties of McLeod and Carver, Minnesota, near the cities of Glencoe, Plato, Norwood Young America, and Cologne (*see* Figures 1-3). The Project Area is generally a straight line and measures approximately 29.4 miles in length from the Armstrong Substation in Glencoe, MN (Line No. 0771) to northeast of Cologne, MN (Line No. 0740), plus an additional 0.8 mile section of existing transmission line that is planned to be retired, located in mainly agricultural and some rural areas.

The Project extends from the Armstrong Substation in the City of Glencoe in McLeod County extending south approximately 0.5 mile to Highway 212 then extending to the east, paralleling the north side of Highway 212 for approximately 3.1 miles to County Road 1 then extending north for approximately 0.5 mile to the Diamond Substation. From here the Project extends to the east/northeast to the Plato Substation. From this point the proposed route extends northeast/east

crossing into Carver County to the Young America Substation located in Norwood Young America, then northeast along State Highway 25/5 to the West Waconia Substation. From here it extends from State Highway 5 to the intersection of County Road 51, where it turns south and follows County Road 51 to the intersection of Xcel Energy transmission line 0740. The route then extends west approximately 1.5 miles along line 0740 to an existing tap. The route also extends approximately 7 miles east of the intersection of the new line and line 0740 to the end point just short of the Augusta Substation.

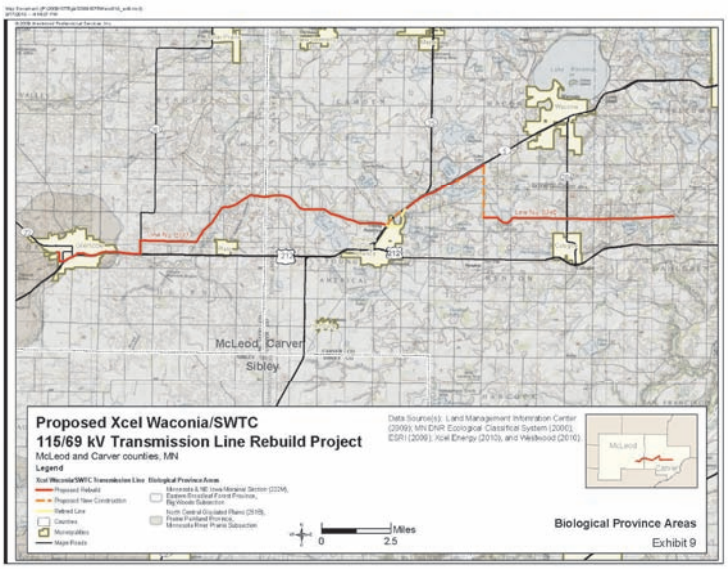
Presettlement vegetation consisted primarily of oak woodland and maple basswood forest. The majority of the Project Area is situated in primarily agricultural areas. Small portions of the transmission line route are located in the cities of Glencoe and Norwood Young America, classified as urban, and other portions cross or pass by water features (Buffalo Creek and many unnamed drainages, Tiger Lake, Brownworth Lake, Hydes Lake, Rice Lake, Barlous Lake, Winkler Lake, and Miller Lake).

Major Ecological Areas

Geologic and topographic information from the MnDNR and the United States Geological Survey ("USGS") was analyzed to determine the existing conditions within the Project Area and the potential effects on those conditions.

The approximate 885.5 acre Project Area is located within the Minnesota and Northeast Iowa Morainal Section (222M), a section within the biogeographic province known as the Eastern Broadleaf Forest Province under the Ecological Classification System ("ECS") developed by the MnDNR and the United States Forest Service ("USFS") (*see* Figure 16). The Project Area is further located within the Big Woods subsection of the Minnesota and Northeast Iowa Morainal Section.

Figure 16
Biogeographical Province Areas



The dominant landscape feature within the Big Woods subsection is circular, level topped hills bounded by smooth side slopes. There are broad level areas between these hills that contain lakes and peat bogs, with the area's drainage controlled by the level of these lakes. The topography of this ECS subsection is gently to moderately rolling. The topography of the Project Area, however, is relatively level and ranges from 1,010 feet above mean sea level in elevation in the west to 950 feet above mean sea level as the transmission line route travels to the east.

According to the MnDNR, irregular topography within the Big Woods subsection favored forests dominated by oak or a maple-basswood mixture prior to settlement. The dominant present day land use is agriculture and only a small portion consisting of either upland forest or wetlands.

6.3 Hydrologic Features

Water Bodies

The Project crosses two major HUs within the Upper Mississippi Drainage Region (Seaber et al, 1987; USDA NRCS, 2003). The Western half of the Project Area drains through the South Fork Crow River HU into the Crow River. The Eastern

portion of the Project Area drains through the Minnesota River – Shakopee HU into the Minnesota River. Lakes and streams are common throughout the Project Area.

Annual precipitation along the route averages 29.2 inches annually, with the Eastern end of the Project receiving slightly more precipitation than the Western end (State Climatology Office 2003).

The Project Area intersects several rivers, streams, tributaries and ditches along its route. In total, sixteen (16) crossings are present within the Project Area, including excavated and natural, perennial and intermittent waterways (*see* Figure 15 in Section 6.1). The tributaries and streams along the western portion of the Project Area drain into Buffalo Creek, which in turn drains into the South Fork Crow River north of the Project.

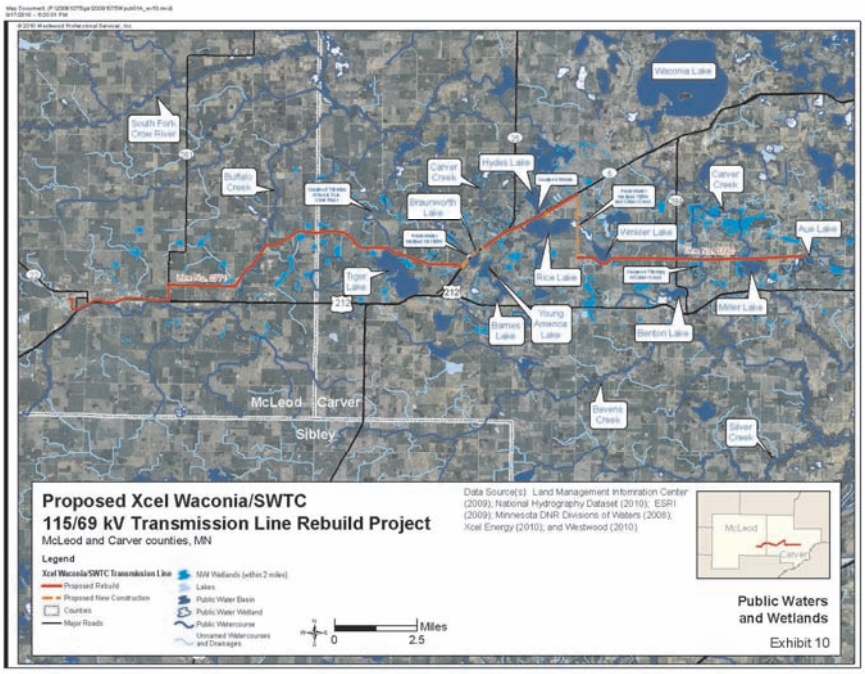
Buffalo Creek is listed as an impaired waterway by the Minnesota Pollution Control Agency ("MPCA") based upon the pollutant load and environmental stressors which the waterway is subject to (MPCA 2006). Buffalo Creek is also one of eight (8) watercourses along the route included in the MnDNR Public Waters Inventory ("PWI") map (MnDNR 1996).

Carver Creek flows through the Eastern portion of the Project Area and is fed by many smaller tributaries, some that intersect the transmission route. Carver Creek flows into the Minnesota River east of the Project Area. Additionally, Carver Creek is listed in the PWI and as an impaired waterway by the MPCA. The local area is predominantly agricultural, which likely accounts for many of the factors in the impaired waters classification, as most of the local waterways are subject to agricultural runoff.

Many water bodies, including Tiger Lake, Braunworth Lake, Young America Lake, Hydes Lake, Rice Lake, Barlous Lake, Winkler Lake, Miller Lake, and Aue Lake, are within close proximity to the Project Area. All of these lakes are included in the PWI. Of these lakes, Hydes, Miller and Winkler are listed as impaired waters

by the MPCA. According to the PWI, the Project transmission route intersects portions of Barlous Lake (67P) and Winkler Lake (10-66 P), although the intersected areas appear to be wetlands and not open water for the duration of the year (*see* Figure 17).

Figure 17
Public Waters and Wetlands



Wetlands

Various large wetland complexes and small isolated wetlands are common through the Project Area, although a higher concentration of wetlands exist near the midsection of the transmission route near Norwood Young America. Many of these wetlands are adjacent to the numerous lakes that lie within close proximity to the Project Area. The National Wetlands Inventory ("NWI") was reviewed to assess which wetlands may be present within the Project Area. Note that the NWI has not been field verified and it sometimes contains inaccuracies; however, it is a good tool for initial wetland identification and assessment. In total, 81 separate wetlands consisting of 18 different wetland types were identified within the 200

foot wide corridors for rebuild and retired segments and the 400 foot wide corridors for new construction segments. Overall, the 200 foot wide transmission line corridor of the existing line and line to be retired extends approximately 29.4 miles and encompasses approximately 885.5 acres, of which approximately 66.88 acres (7.6%) are wetlands (*see* Figure 17 and Table 21).

Table 21
Wetlands

Wetland Type (Cowardin)	Wetland Acres	Number of Wetlands	% Overall Wetland Area
L1UBH	0.97	2	1.45%
PEM/SS1C	0.33	1	0.49%
PEM/SS1Cd	0.78	1	1.17%
PEMA	8.77	10	13.11%
PEMAd	5.83	6	8.72%
PEMC	16.99	27	25.40%
PEMCd	11.16	15	16.69%
PEMCx	0.06	2	0.09%
PEMF	14.89	7	22.26%
PEMFd	3.46	2	5.17%
PFO1C	0.48	1	0.72%
PSS1/EMC	1.46	1	2.18%
PSS1/EMCd	1.10	1	1.64%
PUB/EMF	0.03	1	0.04%
PUBF	0.09	1	0.13%
PUBFx	0.05	1	0.07%
PUBGd	0.35	1	0.52%
PUBGx	0.08	1	0.12%

Of the wetlands present within the Project Area, all but three are classified as Palustrine type wetlands. The other wetland types within the Project Area are Lacustrine, which are associated with lakes.

The Palustrine System includes all nontidal wetlands dominated by trees, shrubs, emergents, mosses or lichens (Cowardin et al. 1979). Of those wetlands the

majority contain emergent vegetation with some displaying a mixture of shrubs and herbaceous vegetation. Additionally, three of the Palustrine wetlands have no vegetation and contain unconsolidated bottoms.

Lacustrine wetland systems are found in the shallow protected areas of lakes with water depth in the deepest part of the wetland basin greater than 6.6 feet. The areas intersected by the route do not appear to be as deep as 6.6 feet, but they are included as part of the same basin. The PWI also identifies protected wetlands, of which two are shown to intersect the Project Area. These wetlands, 10-180W and 188W, are located near the middle of the Project (*see* Figure 17).

Groundwater

The Project is located within the Mississippi River Basin where water generally flows south within this watershed. As a result of glacial activity, all of Carver County and the east side of McLeod County are further located where groundwater supply is from predominately sedimentary bedrock sources. The bedrock layers deposited in ancient seas are the primary aquifers for this area.

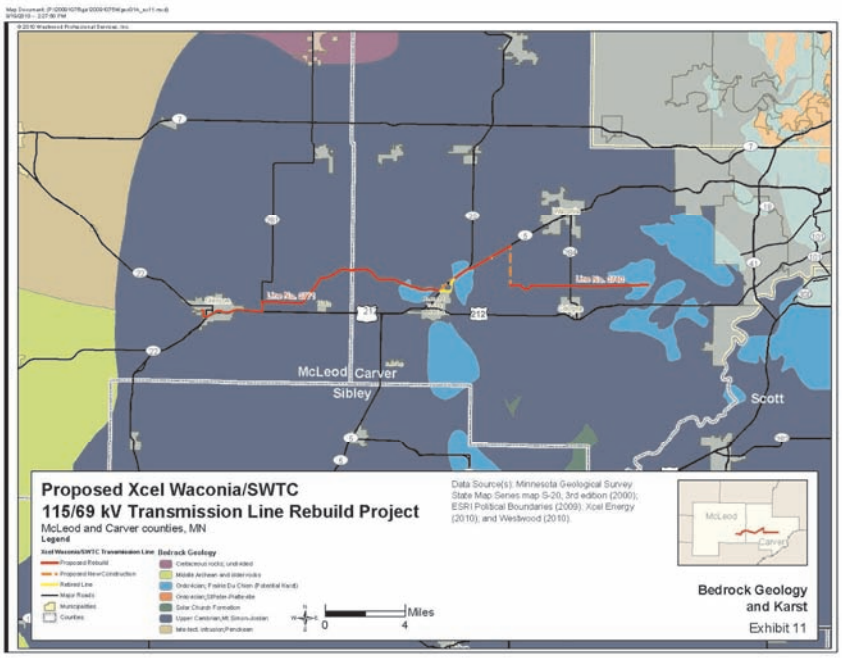
The Project Area within McLeod County is located within the South-Fork Crow River Watershed. Outwash and bedrock aquifers are the two predominant aquifer systems that are found in the McLeod County. Outwash aquifers are generally found along the South Fork of the Crow River and Buffalo Creek and provide a high quality water source for use in domestic and municipal water supplies, irrigation and commercial uses. These aquifers typically yield 25 to 500 gallons-per-minute ("gpm"). Aquifers within the bedrock system are typically found throughout McLeod County, at depths of 200 feet or greater. Yields from bedrock aquifers generally range from 10 to 250 gpm. The quality of aquifers within this system is typically very hard, with high concentrations of sulfate, chloride and dissolved solids in many areas.

The Project Area within Carver County is located within the surface water management area called the Carver County Water Resource Management Area ("CCWRMA"), which is made up of the former watershed management areas of

Chaska Creek, Bevens Creek, Carver Creek, Hazeltine-Bavaria Creek (now East Chaska Creek), and the Crow River. In Carver County, outwash and bedrock aquifers are also the two predominant aquifer systems found in the County. The hydro-geologic structure in Carver County consists of several layers, most of which are, or could be utilized for water supply, at least for domestic purposes. At present, the most important sources are the glacial drift, the Prairie du Chien - Jordan for individual residential use, and the Ironton-Galesville and Mt. Simon aquifers typically used as municipal sources. There is no layer that acts as an aquaclude, or impervious layer that stops vertical water movement. All of the layers conduct water to one extent or another.

While not prevalent, karst topography may be found within a portion of the Project Area located in Carver County. This topography developed from mildly acidic groundwater slowly dissolving carbonate bedrock, forming areas of "karst". Karst aquifers are susceptible to groundwater contamination because sinkholes form passageways that funnel the water from the surface into the groundwater system (Alexander, Jr. 1988, "Sinkholes and Sinkhole Probability," University of Minnesota Geological Survey County Atlas Series (C-3)). There are areas along the west central portion of Carver County that contain mantled karst, which are areas underlain by carbonate bedrock but with more than 100 feet of sediment cover (*see* Figure 18).

Figure 17
Bedrock Geology and Karst



Impacts

Sections of the Project including rebuilding and new construction will span ditches, streams and, possibly, waterbodies. The transmission structures will be designed to avoid all of these features so no direct impacts will occur.

Indirect impacts that are possible during the construction phase include: sedimentation flowing into surface waters due to ground disturbance by grading; excavation; dewatering of holes drilled for transmission structures (if needed); and heavy machinery traffic. In the event this occurs, the local water resources could experience a temporary decline in water quality due to turbidity. These impacts will be avoided to the greatest extent possible by implementing appropriate sediment control practices, construction practices and monitoring. These practices will be outlined in the National Pollutant Discharge Elimination System ("NPDES") permit and Stormwater Pollution Prevention Plan ("SWPPP") prior to the start of construction and will be followed throughout the construction phase.

At this time no wetland impacts are anticipated because the identified wetlands are expected to be avoided with conventional construction techniques. During the design phase of the Project, any direct wetland impacts will be determined and minimized. Temporary impacts are possible during the construction phase of the Project. To minimize such impacts, construction crews will avoid using or placing materials or staging/stringing areas within or adjacent to wetlands as much as possible. All work will be performed in accordance with project-specific agricultural, environmental and storm water monitoring plans.

6.4 Vegetation and Wildlife

The Project is located within the Minnesota and Northeast Iowa Morainal Section (222M), a section within the biogeographic province known as the Eastern Broadleaf Forest Province under the Ecological Classification System ("ECS") developed by the MnDNR and the U.S. Forest Service (MnDNR, 2009). The Project is further located within the Big Woods subsection of the Minnesota and Northeast Iowa Morainal Section. While the area is primarily agricultural the diverse land cover provides habitat for many species of plants and animals.

Wildlife

Wildlife commonly found near the Project Area includes a variety of small to medium sized mammals, reptiles and amphibians, birds, and fish (MnDNR 2009c). The largest mammal typically found in the area is the white-tailed deer, with the exception of an occasional moose or brown bear siting. Other mammals include coyotes, fox, raccoons, beaver, opossum, woodchucks, squirrels, and muskrats.

Reptiles near the Project Area include Snapping turtles, Map turtles, Softshell turtles, Painted turtles, gopher snakes, fox snakes, and northern water snakes. Amphibians include leopard frogs, pickerel frogs, spring peeper, and American toads. Fish species vary depending on the type of water body. The most commonly distributed fish species throughout the Project Area include largemouth bass, sunfish, crappies, northern pike and multiple species of rough fish such as carp and suckers.

Bird species include eagles, turkeys, hawks, pheasants, ducks, herons, and multiple species of song birds.

Vegetation Cover

Historically, this area was primarily covered with hardwoods including Oak, Maple, Basswood, and Hickory with pockets of Brush Prairie and Wet Prairie. The pockets of prairie existed in areas of wet depressions where the soils and water table were not suitable for trees (MnDNR 2009b). Wetlands are present throughout the Project Area with a high distribution near the midsection of the proposed Project route. Some wetlands are isolated while others are part of extensive complexes associated with rivers or lake systems. Many of the native species remain though many wetlands are dominated by invasive species such as reed canary grass or purple loose-strife.

As a result of settlement throughout the 1800's, most of the area's land has been converted to agricultural use. Today the land within the Project Area is predominantly agricultural with mixed stands of woodlots. The dominant species cultivated in the agricultural areas include corn and soybeans, in addition to multiple species of grasses such as smooth brome which are used for hay production. The species historically found in this area still remain. Additionally, many species found near water or in floodplains are common in many of the remaining wooded plots as these areas were unsuitable for farming and were not converted to agriculture. Species in these areas include silver maple, black willow, cottonwood, box-elder, and green ash. Many non-native species which degrade the habitat of native species also inhabit the area including various species of buckthorn and honeysuckle.

Threatened and Endangered Species

A review of the Federal listed species identified on the MnDNR National Historic Information System ("NHIS") identified five locations near the Project Area containing species warranting recognition. Of the species listed within these areas, only the Bald Eagle (*Haliaeetus leucocephalus*) is granted the status of Special Concern

by the State of Minnesota. Although once classified as protected, as of August 9, 2007, the Bald Eagle is no longer protected by the Endangered Species Act ("ESA"). However, there it maintains certain protection under the Bald and Golden Eagle Protection Act of 1940 (amended 1962 and 1972), and the Migratory Bird Treaty Act of 1918.

None of the additional species identified are granted protected status by state or federal agencies. Table 22 displays all state and federally listed species of concern. Evaluation of the locations containing species of concern indicated that these locations, while within land sections abutting the Project Area, are external to the defined boundaries of the Project right-of-way. The Project and construction process will be designed to avoid encroachment and effects on rare species and unique natural resources to the extent practicable. If rare species or unique natural resources will be affected, the Applicants will coordinate with the MnDNR and consider modifying either the construction footprint or the construction practices to minimize impacts. Efforts will be made to determine if the Bald Eagle nesting site is currently occupied. If the nest is determined to be occupied efforts will be made to minimize potential impacts from construction activities which may include alteration of pole locations or scheduling construction to avoid nesting season. Comparable efforts will be made to determine the proximity of the proposed transmission line to nesting grounds of the American Bittern.

Table 22
State and Federally Listed Species of Concern (MnDNR and USFWS, 2009)

Common Name	Scientific Name	Group	Status	County
American Ginseng	*Panax quinquefolius*	vascular plant	State Special Concern	Carver, McLeod
Bald Eagle	*Haliaeetus leucocephalus*	bird	State Special Concern	Carver, McLeod
Beaked Spike-rush	*Eleocharis rostellata*	vascular plant	State Threatened	Carver

Common Name	Scientific Name	Group	Status	County
Black Sandshell	*Ligumia recta*	mussel	State Special Concern	Carver
Blue Sucker	*Cycleptus elongates*	fish	State Special Concern	Carver
Butterfly	*Ellipsaria lineolata*	mussel	State Threatened	Carver
Cerulean Warbler	*Dendroica cerula*	bird	State Special Concern	Carver
Dwarf Trout Lily	*Erythronium propoullans*	vascular plant	Federal Endangered State Endangered	Carver
Eared False Foxglove	*Agalinis auriculata*	vascular plant	State Endangered	McLeod
Ebonyshell	*Fusconaia ebena*	mussel	State Endangered	Carver
Elephant-ear	*Elliptio crassidens*	mussel	State Endangered	Carver
Elktoe	*Alasmidonta marginata*	mussel	State Threatened	Carver
Fluted-Shell	*Lasmigona costata*	mussel	State Special Concern	Carver
Forster's Tern	*Sterna forsteri*	bird	State Special Concern	McLeod
Gophersnake	*Pituophis catenifer*	reptile	State Special Concern	Carver
Hair-like Beak-rush	*Rhynchospora capillacea*	vascular plant	State Threatened	Carver
Hickorynut	*Obovaria olivaria*	mussel	State Special Concern	Carver
Higgins Eye	*Lampsillis higginsi*	mussel	Federal Endangered State Endangered	Carver
Hill's Thistle	*Cirsium hillii*	vascular plant	State Special Concern	McLeod
Horned Grebe	*Podiceps auritus*	bird	State Threatened	McLeod
King Rail	*Rallus elegans*	bird	State Endangered	McLeod
Kitten-tails	*Besseya bulli*	vascular plant	State Threatened	Carver

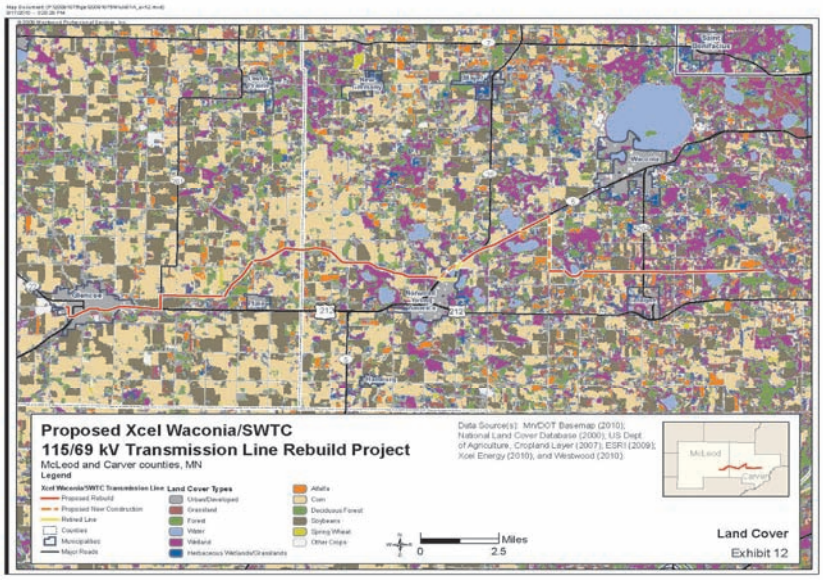
Common Name	Scientific Name	Group	Status	County
Least Darter	*Etheostoma microperca*	fish	USFS Special Concern State Special Concern	Carver
Loggerhead Shrike	*Lanius ludovicianus*	bird	State Threatened	Carver
Marbled Godwit	*Limosa fedoa*	bird	State Special Concern	McLeod
Monkeyface	*Quadrula metanevra*	mussel	State Threatened	Carver
Mucket	*Actinonaias ligamentina*	mussel	State Threatened	Carver
Paddlefish	*Polyodon spathula*	fish	State Threatened	Carver
Pistolgrip	*Tritogonia verrucosa*	mussel	State Threatened	Carver
Powesheik Skipper	*Oarisma powesheik*	insect	State Special Concern	McLeod
Prairie Moonwort	*Botrychium campestre*	vascular plant	State Special Concern	Carver
Pugnose Shiner	*Notrpois anogenus*	fish	State Special Concern	Carver
Red-shouldered Hawk	*Buteo lineatus*	bird	State Special Concern	Carver
Regal Fritillary	*Speyeria idalia*	insect	State Special Concern	McLeod
Rhombic-petaled Evening Primrose	*Oenothera rhombipetala*	vascular plant	State Special Concern	Carver
Rock Pocketbook	*Arcidens confragosus*	mussel	State Endangered	Carver
Round Pigtoe	*Pleurobema coccineum*	mussel	State Threatened	Carver
Sandy Stream Tiger Beetle	*Cicindela macra macra*	insect	State Special Concern	Carver
Sheepnose	*plethobasus cyphus*	mussel	State Endangered	Carver
Small White Lady's-Slipper	*Ctpripedium candidum*	vascular plant	State Special Concern	Carver, McLeod
Smooth Softshell	*Apalone mutica*	reptile	State Special Concern	Carver
Spike	*Elliptio dilatata*	mussel	State Special Concern	Carver

Common Name	Scientific Name	Group	Status	County
Sterile Sedge	*Carex sterillis*	vascular plant	State Threatened	Carver
Sullivant's Milkweed	*Asclepias sullivantii*	vascular plant	State Threatened	McLeod
Trumpeter Swan	*Cygnus buccinators*	bird	State Threatened	Carver
Twig-rush	*Cladium mariscoides*	vascular plant	State Special Concern	Carver
Valerian	*Valeriana edulis ssp. Ciliate*	vascular plant	State Threatened	Carver
Wartyback	*Quadrula nodulata*	mussel	State Endangered	Carver
Washboard	*Megalonaias nervosa*	mussel	State Threatened	Carver
Whorled Nut-rush	*Scleria verticillata*	vascular plant	State Threatened	Carver
Winged Mapleleaf	*Quadrula fragosa*	mussel	Federal Endangered State Endangered	Carver
Yellow Sandshell	*Lampsilis teres*	mussel	State Endangered	Carver

6.5 Land Use and Human Settlement

The major land use issues related to the Project concern agricultural operations along much of the proposed Project Area and some urban development within and near the City of Norwood Young America. Land cover in the Project Area is shown on Figure 18. The City of Norwood Young America is the largest urban area in the region, with a population of over 3,100 (2000 Census). The Western portion of the Project extends through the City of Glencoe, McLeod County. Grass, pasture, and woodlands are concentrated along the lakes, creeks and other water bodies. Figure 18 also indicates that the majority of the Project Area is primarily cultivated with corn and soybeans.

Figure 18
Land Cover



Land Use

Land use in the Project Area is primarily agriculture and undeveloped/open-space, except where the existing and proposed transmission lines pass along the Southern boundary of the City of Glencoe and near the North and Northeast sections of the City of Norwood Young America which are both zoned residential and/or industrial or business. The expanding residential, commercial and industrial development on the northeast side of the City of Norwood Young America (identified by comparing the Metropolitan Council's Land Use Plans for 2005 and 2020) will be evaluated to determine if there could be impacts to such plans as well as to guide routing and design of the proposed transmission line. Outside the areas zoned residential, agricultural impacts will be minimized as much as possible by sharing existing transmission and transportation corridors.

Land Use Near Substations

The current land use near the proposed Diamond and the existing Plato substations is rural residential and agriculture, as shown in detail on Figure 19. Figure 20 shows the area near the existing Young America Substation to be residential and the area near the West Waconia Substation to be rural residential

and agriculture. This figure also shows the potential location of the new proposed transmission line rebuild along Braunworth Lake located north and northeast of the City of Norwood Young America, which is partially residential/rural residential and agriculture.

Figure 19
Land Use Near Diamond and Plato Substations

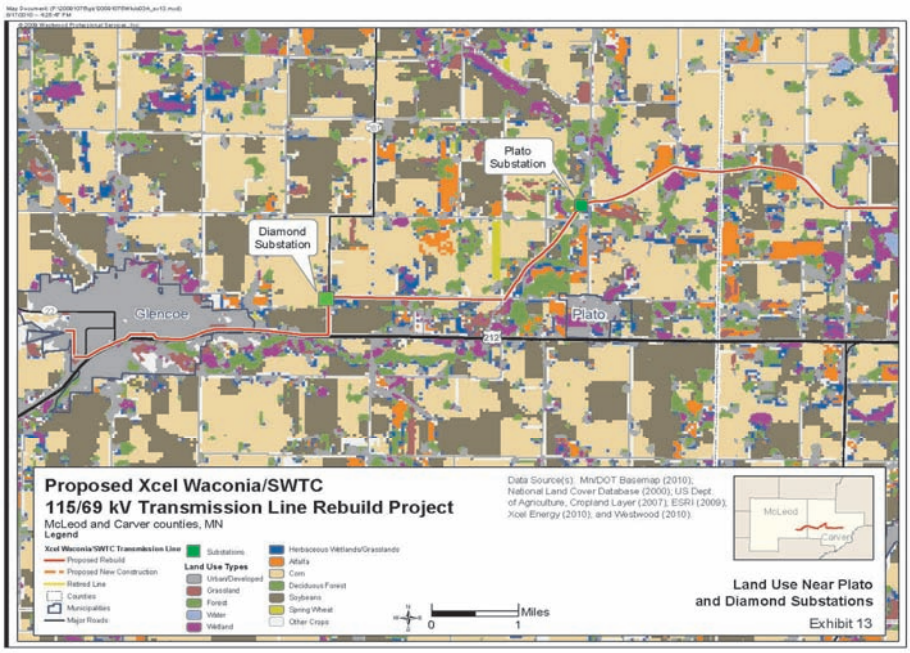
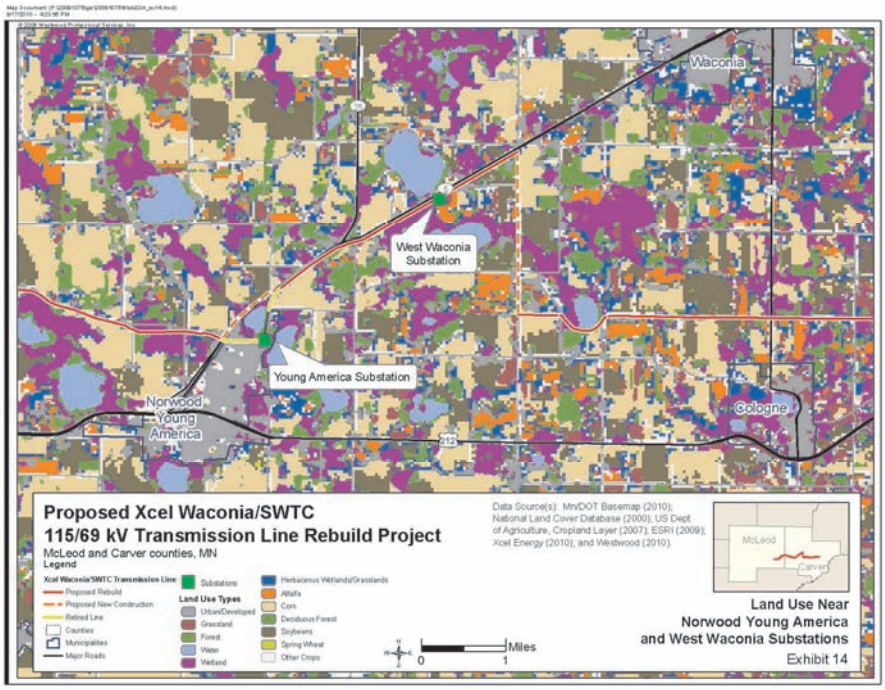


Figure 20
Land Use Near Young America and West Waconia Substations



Human Settlement

The proposed Project Area has segments in both Carver and McLeod counties. Census data for the State of Minnesota, Carver and McLeod counties, and select townships and cities in the vicinity of the Project Area are provided in Table 23.

Table 23
Selected Township, City and County Statistics
(based on 2000 U.S. Census data)

Location	Population	Minority Population	Caucasian Population	Per Capita Income	% Individuals Below Poverty Level
State of Minnesota	5,220,393	11.0%	89.0%	$23,198	9.5%
Carver County	90,043	5.4%	94.6%	$28,486	3.9%
Young America Township	838 (rural)	2.6%	97.4%	$23,216	2.2%

Location	Population	Minority Population	Caucasian Population	Per Capita Income	% Individuals Below Poverty Level
City of Norwood Young America	3,108	1.9%	98.1%	$18,431	2.7%
Benton Township	939	0.5%	99.5%	$22,652	1.2%
Waconia Township	1,284	0.5%	99.5%	$27,437	2.1%
McLeod County	37,165	2.3%	97.7%	$20,137	6.2%
Helena Township	832	1.9%	98.1%	$21,010	2.0%

According to 2000 United States Census data, Carver County is 94.6% Caucasian and McLeod County is 97.7% Caucasian. As shown in Table 23, minority residents make up a relatively small percentage of the population in both counties. In both counties minority population percentages are lower in rural areas and higher in municipal areas. In townships where transmission lines will be rebuilt, the minority population percentage does not exceed 2.0%.

In the Carver County townships where transmission line construction is proposed, the average household per capita income is lower than the average for the county as a whole. In McLeod County, this trend is reversed. For all townships within the Project's region, the percentage of individuals below the poverty level ranges from a high of 2.2% in Young America Township, Carver County, to a low of 1.2% in Benton Township, Carver County. The average percentage of individuals with incomes below the poverty level within the Project's region is 2.04%. This level is well below the average for both Carver County (3.9%) and McLeod County (6.2%), as well as the average for the State of Minnesota (9.5%). Within the Project's region, the average percentages of minority populations and low-income populations are lower than both the county and state averages.

During the construction phase of the Project approximately 30 construction personnel will be employed. This will include approximately 20 for transmission line construction and 10 for required modifications to existing substations. It is anticipated that the construction phase of the Project will last approximately 12

months. Utility personnel and contracted employees will be engaged for all construction activities.

Socioeconomic impacts resulting from the proposed construction will be predominately positive. While no full-time, permanent jobs will be created in the region as a result of the construction phase of this Project, communities in proximity to the Project Area will experience positive economic impacts in the short-term. The positive impacts will be the result of increased commerce related to construction materials and activities. Anticipated long-term economic impacts of the proposed Project are increased local tax base as a result of increase tax revenues from utility property, as well as increased reliability of electric service.

Zoning

The existing and proposed transmission route within the Project Area occupies land in both McLeod and Carver counties in Minnesota. Zoning ordinances for both counties provide for a variety of land usage, including: agricultural; commercial; industrial; and residential. While the state Power Plant Siting Act (Minnesota Statutes Chapter 216E) preempts local land use control generally, Xcel Energy will take into account and accommodate local zoning plans as much as possible during detailed routing.

The majority of the existing and proposed transmission route in both counties is located on land zoned for agricultural use. A portion of the Western segment of the proposed route located within the City of Glencoe and a small segment, near the center of the proposed route and the existing transmission lines that pass through the City of Norwood Young America, are governed by municipal zoning ordinances. Zoning ordinances pertinent to the current proposed route may include the Carver County Code of Ordinances, the Zoning Ordinance of McLeod County, and the Norwood Young America City Code.

Agricultural Production

The primary agricultural crops in Carver and McLeod counties are corn and soybeans. The primary livestock are dairy cows, cattle and hogs. The total

number of acres of land in farm production and the market value of agricultural products is provided below in Table 24 for each of the counties.

Table 24
Agricultural Statistics by County
(based on USDA 2007 Census Data)

	Total Acres in Production	Percentage of Possible Farm Acres in Production	Market Value of Agriculture Products (Annual)
Carver County	169,397	70 percent	$ 92,945,000
McLeod County	243,958	77 percent	$ 125,439,000

Carver County:

Carver County has strong economic dependence on agricultural production. According to the 2007 United States Department of Agriculture ("USDA") Census of Agriculture, Carver County has 800 individual farms, marking a 2% decrease in total number of farms over the previous five years. Agricultural lands cover 169,367 acres, representing over 70% of all lands in Carver County with an average farm size of 212 acres. Carver County ranks among the top twenty Minnesota counties in production of fruits, tree nuts, and berries (ranking 15th statewide); nursery, greenhouse, floriculture, and sod (ranking 10th statewide); and milk and other bovine dairy products (ranking 13th statewide). Nearly $93 million was generated from both crop and livestock sales in 2007.

McLeod County:

McLeod County also has strong economic dependence on agricultural production. According to the 2007 USDA Census of Agriculture, McLeod County has 1,021 individual farms, marking a 3% increase in total number of farms over the previous five years. Agricultural lands cover 243,958 acres, representing over 77% of all land in McLeod County with an average farm size of 239 acres. McLeod County ranks among the top twenty Minnesota counties in production of cattle and calves (ranking 20th statewide); and milk and other bovine dairy products

(ranking 19th statewide). Over $125 million was generated from both crop and livestock sales in 2007.

Repeated access to construction sites for the installation of transmission structures will be required during the construction and rebuilding phases of the Project. Heavy equipment utilized during construction and rebuilding may include: drill rigs; backhoes; cranes; boom trucks; and a variety of smaller vehicles. During construction and rebuilding, it is anticipated that some impacts on farmland will occur, possibly causing rutting and compaction of ground surfaces. The severity of these impacts will vary depending on season of construction and weather conditions.

Forest Production

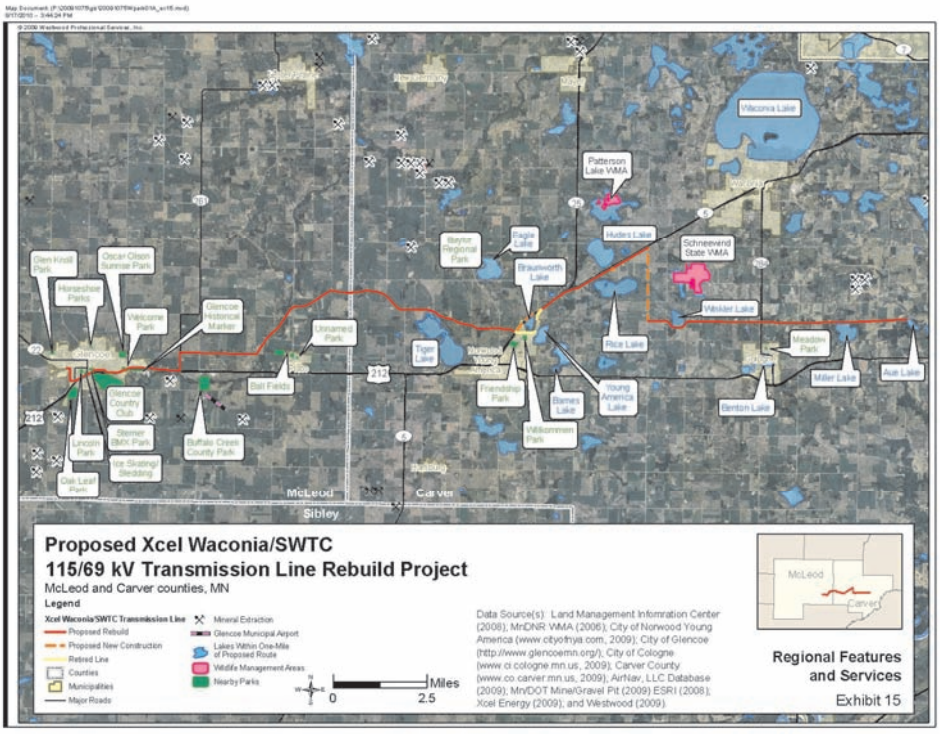
There are no federal or state forests located in the Project Area. There are no forested areas along the Project Area where harvesting occurs. According to Marschner's pre-settlement vegetation map, the proposed transmission line route is anticipated to be located predominantly along agricultural fields within a region historically identified as Brush Prairie and Big Woods–Hardwoods (including oak, maple, basswood, and hickory) regions of Minnesota. Historically, tree cover in the region is potentially the result of forest cover migrating onto the prairies within the past 400 years. Contemporary tree cover in the region is likely a recent feature instigated during the past century by increased fire suppression. The contemporary tree cover in this region is associated with either residential homesteads or major water routes.

Regional Airports

Glencoe Municipal Airport (GMA) is located in Section 21 of Township 115 North, Range 27 west, approximately 1.5 miles south and east of the City of Glencoe, McLeod County, Minnesota (*see* Figure 21). The western segment of the McLeod County portion of the proposed transmission line rebuild area is located within three linear miles of the GMA and is subject to Federal Aviation Administration ("FAA") requirements defining airfield obstructions (14 C.F.R. 77). According to the Standards for Determining Obstructions, proposed structures

within the three mile radius of an airfield cannot exceed 200 feet in height. The pole structures for the proposed transmission line will not exceed this height and are, therefore, not subject to FAA requirements.

Figure 21
Regional Features and Services



Mineral Extraction

There are gravel pits, rock quarries and commercial aggregate sources in the vicinity of the Project Area (*see* Figure 21). Of these, the closest is an inactive gravel pit located approximately 1.5 miles south of the west end of the Project Area and west of the GMA. These resources will be avoided during detailed design of the proposed transmission lines.

Parks and Recreation

There are seven formal recreational areas, between the cities of Cologne and Glencoe, that are located near the Project Area: Friendship Park; Willkommen

Park; Meadow Park; Baylor Regional Park; City of Plato park and ball fields; and Buffalo Creek County Park. There are an additional ten parks and recreation locations in the City of Glencoe located near the Project Area: Glen Knoll Park; Horseshoe Park; Oscar Olson Sunrise Park; Lincoln Park; Ice Skating/Sledding Hill; Buffalo Creek BMX Park; Welcome Park; Glencoe Historical Marker; Glencoe Country Club; and Oak Leaf Park (*see* Figure 21).

Friendship Park and Willkommen Park are both located within the City of Norwood Young America and are approximately 1/3 mile and 1/10 mile south of the Project Area, respectively. Friendship Park has an ice rink, playground areas as well as soccer and softball fields. Willkommen Park has a baseball field, a pavilion, and other public meeting places.

Meadow Park is located within the City of Cologne nearly 2/3 mile south of the Project Area. This park is small community park with playground equipment. Baylor Regional Park, found next to Eagle Lake along County Road 33, is approximately two miles north of the Project Area. This park offers camping sites, swimming, and disc golf along with many other amenities.

The City of Plato has a small park (name unknown) and three ball fields located on the north-central portion of town. The park and ball fields are located approximately one mile and 1/2 mile west of the Project Area, respectively. Buffalo Creek County Park is located three miles east of Glencoe on County Road 1, approximately 2/3 mile south of the Project Area.

There are three parks in the City of Glencoe located greater than 1/3 mile north of the Project Area: Glen Knoll Park; Horseshoe Park; and Oscar Olson Sunrise Park. Glen Knoll Park is located on the northwest corner of Glencoe and is approximately 1/2 mile north of the west end of the Project Area. The Horseshoe Park and Oscar Olson Sunrise Park are located directly north of the Project Area, approximately 2/3 mile and 1/3 mile, respectively. Oscar Olson Sunrise Park includes a community education soccer program, playground, skateboard park as well as two shelters.

An additional three parks in the City of Glencoe parks are located less than 1/3 mile south of the Project Area: Glencoe Historical Marker; Glencoe Country Club; and Oak Leaf Park. However, due to the location of the parks in relation to U.S. Highway 212, it is likely these parks are outside the realm of potentially being impacted.

The remaining four parks in the City of Glencoe are located less than 1/3 mile north of the Project Area: Lincoln Park; Ice Skating/Sledding Hill; Buffalo Creek BMX Park; and Welcome Park. These parks have the highest potential for being impact by the Project.

Tiger Lake, Braunworth Lake, Young America Lake, Barnes Lake, Hydes Lake, Rice Lake, Winkler Lake, Benton Lake, Miller Lake and Aue Lake are all located within one mile of the Project Area. The Project is not expected to directly impact these recreational resources.

Schneewind State Wildlife Management Area ("WMA") is located approximately ¾ mile north of the Project Area near Winkler Lake. Patterson Lake WMA is located next to Patterson Lake and is located nearly one mile north of the Project Area. The Project is not expected to directly impact these resources, and it is not anticipated that the proposed transmission line rebuild will be visible from these resources.

The Glencoe Izaak Walton League State Game Refuge is located along the immediate western boundary of the City of Glencoe. The original 1,000 acre game refuge was initially created in 1927 by Commissioner J. F. Gould at the request of the Glencoe Chapter of the Izaak Walton League. According to Minnesota Rule 6230.0400, Subp. 15, the game refuge is open to trapping. The Project is not expected to directly impact this resource.

6.6 Archeological and Historic Resources

The Project Area is located along the Eastern margins of the Prairie Lakes (Region 2) Archaeological Region, which covers most of the Southwestern and South-central portions of the state (Anfinson, 1990). The majority of Region 2 exhibits the typical swell and swale topography developed in glacial ground moraine deposits. Major physiographic features of the region include the Prairie des Coteau highlands in the west and the Minnesota River and Valley. Small, shallow lakes are found throughout region.

Post Contact Settlement History

At the advent of European Settlement in the region, a majority of the region was covered by tallgrass prairie with an increase in the quantity of tree cover towards the eastern portions of the region. Settlement in the region began in the 1850's with a strong representation of immigrants from Germany and Sweden. Initially, the forest cover in the area inhibited farming, but in the ensuing 100 years, much of the land has been claimed for agricultural production. Dairy farming plays an important role in the region which was once referred to as the "Gold Buckle of the Dairy Belt".

Locations of Prehistoric Cultural Resources

Prehistoric sites are expected to be located near or in close proximity to reliable water sources because this location on the landscape would provide a variety of resources. Larger, more substantial sites, such as habitation sites, are likely to be located near larger, more significant bodies of water. Sites located at a distance to bodies of water are more likely to be the temporary resource extraction sites or temporary hunting camps. Comparable statements can be made regarding the location of historic sites in the region. It is more likely to find both individual homesteads and larger settlements located near permanent, reliable water sources.

Locations of Historic Cultural Resources

Similar to the prehistoric cultural resources in Southeastern Minnesota, the historic resources are also somewhat unique. Although the area now consists of rolling hills and streams, historically it was filled with wetlands. In order to facilitate and

promote farming, the area was extensively drained during the first half of the 20th century. This dramatic change in the landscape also affects where and how historic resources in the area are located (*e.g.*, tops of hills rather than in valleys). Overall, this area contains considerable potential for containing significant cultural resources ranging from early pre-history through historic times. Cultural resources will be evaluated further during detailed design of the proposed transmission lines.

Locations of Cultural Resources

In August 2009, a review of records at the SHPO and the Minnesota Office of the State Archaeologist ("OSA") identified thirty-four (34) archaeological sites and eighty-two (82) inventoried historic architectural properties located within one mile of the existing and proposed transmission line rebuild area. Of the 34 archaeological sites, 31 consist of prehistoric artifacts scatters, two are single artifact finds, and one is a historical documentation record of an abandoned townsite. Two of the previously recorded artifact scatters are CEF by the SHPO. The eligibility of the remaining inventoried archaeological sites is unevaluated. A summary of the inventoried archaeological sites is provided in Table 25.

Of the 82 historic architectural properties four are listed on the National NRHP and one is a CEF. The three NRHP properties are: (1) the Johann Schimmelphennig Farmstead, located approximately one mile east of the City of Norwood Young America, Carver County; (2) Young America City Hall, located in the northeastern segment of Norwood Young America, Carver County; (3) McLeod County Courthouse, located in the City of Glencoe, McLeod County; and (4) the American House Hotel, located in the City of Glencoe, McLeod County. The American House Hotel has been razed. The CEF is the Klepperich Farmstead located near the eastern terminus of the Project. The eligibility of the remaining inventoried historic architectural properties is unevaluated.

Table 25
Archaeological Sites

Site Number	Site Name	T(n)	R(w)	Sec	Status	Property Type
21CR0007	Arlo Hasse	115	25	3	unevaluated	Artifact Scatter, Habitation
21CR0012	Trende	115	24	6	unevaluated	Artifact Scatter
21CR0013	Miller Lake	115	24	5	unevaluated	Earthwork, Artifact Scatter, Cemetery, Habitation
21CR0018		116	25	31	unevaluated	Artifact Scatter
21CR0019		115	24	8	unevaluated	Lithic Scatter
21CR0023	Manteufel	115	25	4	unevaluated	Lithic Scatter
21CR0024		115	25	5	unevaluated	Lithic Scatter
21CR0025		115	25	5	unevaluated	Lithic Scatter
21CR0026		115	25	5	unevaluated	Artifact Scatter
21CR0027	Barlous Lake	115	25	5	unevaluated	Artifact Scatter
21CR0028	Barlay	115	25	7	unevaluated	Lithic Scatter
21CR0029		115	25	9	unevaluated	Lithic Scatter
21CR0030	Joos	115	25	12	unevaluated	Lithic Scatter
21CR0039	Tiger Lake	115	26	4	unevaluated	Artifact Scatter
21CR0040	Barnes Lake	115	26	12	unevaluated	Lithic Scatter
21CR0054		116	25	30	unevaluated	Artifact Scatter
21CR0055	Hardy Hodge	116	25	31	unevaluated	Artifact Scatter
21CR0072	Carver Creek No. 1	115	24	8	CEF	Lithic Scatter
21CR0073	Carver Creek No. 2	115	24	8	CEF	Lithic Scatter
21CR0077	Young America	115	26	11	unevaluated	Lithic Scatter
21CR0082	Roepke	116	25	30	unevaluated	Lithic Scatter
21CR0086	Schmid	116	25	31	unevaluated	Lithic Scatter
21CR0089		116	25	32	unevaluated	Lithic Scatter
21CR0090		115	24	7	unevaluated	Lithic Scatter
21CR0121		115	25	3	unevaluated	Lithic Scatter
21CR0122		115	25	3	unevaluated	Lithic Scatter
21CR0146	Laumann	115	24	7	unevaluated	Single Artifact
21CR0147	Pautsch	115	24	8	unevaluated	Single Artifact

Site Number	Site Name	T(n)	R(w)	Sec	Status	Property Type
21CRaf	Hasse III	115	25	3	unevaluated	Artifact Scatter
21Crag	Hasse IV	115	25	3	unevaluated	Artifact Scatter
21CRah	Hasse V	115	25	3	unevaluated	Artifact Scatter
21CRai	Hasse VI	115	25	3	unevaluated	Artifact Scatter
21CRe	Benton	115	25	12	unevaluated	Historic Documentation, Ghost Town
21MC0006		116	27	35	unevaluated	Lithic Scatter

Table 26
Historic Structures

Inventory Number	Property Name	T(n)	R(w)	Sec	Status	Property Category	Property Type
CR-BNT-005	Johann Schimmelphennig Farmstead	115	25	7	NRHP	Agriculture	Creamery
CR-BNT-123	Round Barn	115	25	9	unevaluated	Agriculture	Barn
CR-BNT-127	farmhouse	115	25	5	unevaluated	Domestic	Single Dwelling Residence
CR-BNT-128	farmhouse	115	25	5	unevaluated	Domestic	Single Dwelling Residence
CR-DHL-001	farmhouse	115	24	8	unevaluated	Domestic	Single Dwelling Residence
CR-DHL-018	Bridge No. 4766	115	24	7	unevaluated	Transportation	Bridge
CR-DHL-046	Farmstead	115	25	9	unevaluated	Agriculture	Farmstead
CR-DHL-048	Klepperich Farmstead	115	24	8	CEF	Agriculture	Farmstead
CR-DHL-049	Schmidt Farmstead	115	24	8	unevaluated	Agriculture	Farmstead
CR-HNC-005	Haller Farmstead	115	25	4	unevaluated	Agriculture	Farmstead
CR-HNC-006	Farmstead	115	25	3	unevaluated	Agriculture	Farmstead
CR-WAC-027	farmhouse	116	25	33	unevaluated	Domestic	Single Dwelling Residence
CR-YAC-001	Chicago Northwestern Railroad Depot	115	26	11	unevaluated	Transportation	Train Depot

Inventory Number	Property Name	T(n)	R(w)	Sec	Status	Property Category	Property Type
CR-YAC-002	Henry Bruckschen House	115	26	11	unevaluated	Domestic	Single Dwelling Residence
CR-YAC-003	Humboldt Lodge No. 312	115	26	11	unevaluated	Social	Meeting Hall
CR-YAC-004	Young America City Hall	115	26	11	NRHP	Government	City Hall
CR-YAC-005	St. John's Lutheran Church	115	26	11	unevaluated	Religion	Church
CR-YAC-006	Chicago Northwestern Agent's House	115	26	11	unevaluated	Transportation	
MC-GLC-001	house	115	28	14	unevaluated	Domestic	Single Dwelling Residence
MC-GLC-002	house	115	28	14	unevaluated	Domestic	Single Dwelling Residence
MC-GLC-003	Glencoe Water Treatment Plant	115	28	14	unevaluated	Industry	Waterworks
MC-GLC-004	Lincoln Park Gazebo	115	28	14	unevaluated	Recreation	Outdoor Facility
MC-GLC-005	Hubbard House	115	28	14	unevaluated	Domestic	Single Dwelling Residence
MC-GLC-006	house	115	28	14	unevaluated	Domestic	Single Dwelling Residence
MC-GLC-007	Glencoe Creamery	115	28	13	unevaluated	Agriculture	Creamery
MC-GLC-008	Glencoe Motors	115	28	14	unevaluated	Transportation	Garage
MC-GLC-010	house	115	28	13	unevaluated	Domestic	Single Dwelling Residence
MC-GLC-011	Louis Albrecht House	115	28	13	unevaluated	Domestic	Single Dwelling Residence
MC-GLC-012	house	115	28	13	unevaluated	Domestic	Single Dwelling Residence
MC-GLC-013	house	115	28	13	unevaluated	Domestic	Single Dwelling Residence
MC-GLC-014	house	115	28	13	unevaluated	Domestic	Single Dwelling Residence
MC-GLC-015	house	115	28	13	unevaluated	Domestic	Single Dwelling Residence
MC-GLC-016	Peace United Church of Christ	115	28	14	unevaluated	Religion	Church
MC-GLC-017	Glencoe Depot	115	28	14	unevaluated	Transportation	Train Depot

Inventory Number	Property Name	T(n)	R(w)	Sec	Status	Property Category	Property Type
MC-GLC-018	Masonic Building	115	28	14	unevaluated	Social	Meeting Hall
MC-GLC-019	commercial buildings	115	28	14	unevaluated	Commercial	Commercial Building
MC-GLC-020	Brockmeyer Building	115	28	14	unevaluated	Commercial	Commercial Building
MC-GLC-021	commercial buildings	115	28	14	unevaluated	Commercial	Commercial Building
MC-GLC-022	Gould Building	115	28	13	unevaluated	Commercial	Commercial Building
MC-GLC-023	Glencoe Library	115	28	13	unevaluated	Education	Library
MC-GLC-024	Glencoe House	115	28	13	unevaluated	Commercial	Commercial Building
MC-GLC-025	Enterprise Building	115	28	13	unevaluated	Commercial	Commercial Building
MC-GLC-026	McLeod County Courthouse	115	28	13	NRHP	Government	Courthouse
MC-GLC-027	Henry Hill High School	115	28	13	unevaluated	Education	School
MC-GLC-028	Sts. Peter & Paul Catholic Church & Rectory	115	28	13	unevaluated	Religion	ch/parsonage
MC-GLC-029	Sts. Peter & Paul Catholic Convent	115	28	13	unevaluated	Religion	Convent
MC-GLC-030	church	115	28	14	unevaluated	Religion	Church
MC-GLC-031	American House Hotel	115	28	14	NHRP (razed)	Commercial	Commercial Building
MC-GLC-032	house	115	28	14	unevaluated	Domestic	Single Dwelling Residence
MC-GLC-033	commercial building	115	28	14	unevaluated	Commercial	Commercial Building
MC-GLC-034	house	115	28	13	unevaluated	Domestic	Single Dwelling Residence
MC-GLC-035	house	115	28	13	unevaluated	Domestic	Single Dwelling Residence
MC-GLC-036	house	115	28	13	unevaluated	Domestic	Single Dwelling Residence
MC-GLC-037	Dr. Barrett House	115	28	13	unevaluated	Domestic	Single Dwelling Residence
MC-GLC-038	house	115	28	13	unevaluated	Domestic	Single Dwelling Residence

Inventory Number	Property Name	T(n)	R(w)	Sec	Status	Property Category	Property Type
MC-GLC-039	Brechet House	115	28	13	unevaluated	Domestic	Single Dwelling Residence
MC-GLC-040	house	115	28	14	unevaluated	Domestic	Single Dwelling Residence
MC-GLC-041	First Congregational Church	115	28	14	unevaluated	Religion	Church
MC-GLC-042	Holm House	115	28	14	unevaluated	Domestic	Single Dwelling Residence
MC-GLC-043	Mayer House	115	28	14	unevaluated	Domestic	Single Dwelling Residence
MC-GLC-044	First Evangelical Lutheran Church	115	28	13	unevaluated	Religion	Church
MC-GLC-045	Lutheran School	115	28	13	unevaluated	Education	School
MC-GLC-046	house	115	28	13	unevaluated	Domestic	Single Dwelling Residence
MC-GLC-047	W. G. Gould House	115	28	14	unevaluated	Domestic	Single Dwelling Residence
MC-GLC-048	Glencoe Water Tower	115	28	14	unevaluated	Industry	Water Works / Tower
MC-GLC-049	Church of St. George	115	28	11	unevaluated	Religion	Church
MC-GLC-050	Glencoe City Hospital	115	28	11	unevaluated	Healthcare	Hospital
MC-GLC-051	Glencoe Water Tower	115	28	13	unevaluated	Industry	Water Works / Tower
MC-GLC-052	McLeod County Jail (razed)	115	28	13	unevaluated	Government	Jail
MC-GLC-053	Old City Hall (razed)	115	28	13	unevaluated	Government	City Hall
MC-HEL-001	school	115	27	2	unevaluated	Education	School
MC-HEL-005	farmstead	115	27	18	unevaluated	Agriculture	Farmstead
MC-HEL-006	Bridge No. 5326	115	27	16	unevaluated	Transportation	Bridge
MC-HEL-007	Bridge No. L0302	115	27	11	unevaluated	Transportation	Bridge
MC-PLC-001	building	115	27	14	unevaluated	Government	Property
MC-PLC-002	Plato Garage	115	27	14	unevaluated	Transportation	Garage

Inventory Number	Property Name	T(n)	R(w)	Sec	Status	Property Category	Property Type
MC-PLC-003	Plato Milling Co.	115	27	14	unevaluated	Agriculture	Outbuilding
MC-PLC-004	St. Paul's Deutsch Evangeische Kirke	115	27	14	unevaluated	Religion	Church
MC-PLC-005	Diedrich Bergman House	115	27	14	unevaluated	Domestic	Single Dwelling Residence
MC-PLC-006	Plato Public School	115	27	14	unevaluated	Education	School
MC-PLC-007	Plato Water Tower	115	27	14	unevaluated	Industry	Water Works / Tower
MC-PLC-008	St. John's Evangelical Lutheran Church	115	27	11	unevaluated	Religion	Church

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8 ACRONYMS

Following are a list of acronyms used in this Application:

ACOE	Army Corps of Engineers
ACSS	Aluminum Core Steel Supported
APE	Area of Potential Effect
APP	Avian Protection Plans
Application	Route Permit Application
CCVT	Coupling Capacitor Voltage Transformers
CFR	Code of Federal Regulations
Commission	Minnesota Public Utilities Commission
CON	Certificate of Need
CSAH	County State Aid Highway
dB/dBA	A-weighted sound level in decibels
DC	Direct Current
DFIRM	Digital Flood Insurance Rate Map
ELF	Extremely Low Frequency
EMF	Electric and Magnetic Fields
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
GIS	Geographic Information System
HU	hydrologic units
HVTL	High Voltage Transmission Line
kV	Kilovolt
kV/m	Kilovolts Per Meter
mA	Milliamperes
MCOV	Maximum Continuous Operating Voltage Rating
MEQB	Minnesota Environmental Quality Board
MnDNR	Minnesota Department of Natural Resources
mG	Milligauss
MnDOT	Minnesota Department of Transportation
MOU	Memorandum Of Understanding
MPCA	Minnesota Pollution Control Agency
MPUC	Minnesota Public Utilities Commission

NAC	Noise Area Classification
NERC	North American Electric Reliability Corporation
NESC	National Electric Safety Code
NEV	Neutral-to-Earth Voltage
NHIS	National Heritage Information System
NIEHS	National Institute of Environmental Health Sciences
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
OEC	Minnesota Department of Commerce - Office of Energy Security
PPM	Parts Per Million
PPSA	Power Plant Siting Act
PWI	MnDNR Public Water Inventory
SHPO	Minnesota State Historic Preservation Office
SWPPP	Stormwater Pollution Prevention Plan
USDA	United States Department of Agriculture
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WHO	World Health Organization
Working Group	Interagency Working Group