Pleasant Valley to Byron Transmission Line Project
Draft Environmental Impact Statement

PUC Docket #E002/TL-09-1315 and CN-08-992

Source: Xcel Energy

October 2010

office of energy security

85 7th Place East, Suite 500, St. Paul, MN 55101-2198
main: 651.296.4026 tty: 651.296.2860 fax: 651.297.7891
www.commerce.state.mn.us

BLANK PAGE

Table of Contents

APPENDICES

List of Tables

List of Figures

Figures in Text

Figures in Appendix

List of Acronyms and Abbreviations

AADT	annual average daily traffic
AC	alternating current
ACSS	Aluminum Core Steel Supported
APE	Area of Potential Effect
APP	Avian Protection Plan
ASR	Antenna Structure Registration
BMP	best management practice
CFR	Code of Federal Regulations
CO	carbon monoxide
CRP	Conservation Reserve Program
dBA	A-weighted decibels
DCTA	Dodge County Trail Association
EIS	environmental impact statement
ELF	extremely low frequency
EMF	electric and magnetic fields
EMI	electromagnetic interference
EPA	U.S. Environmental Protection Agency
ER	Environmental report
ERM	Environmental Resources Management
ESA	Endangered Species Act
FCC	Federal Communications Commission
FR	Federal Register
ft	feet
FY	fiscal year
GPS	Global Positioning System
HVTL	high voltage transmission line
kHz	kilohertz
kV	kilovolt
MA	Management Areas
mA	milliamperes
MDOC	Minnesota Department of Commerce
MnDNR	Minnesota Department of Natural Resources
mi	miles
mG	milliGauss
Mn/DOT	Minnesota Department of Transportation
MPCA	Minnesota Pollution Control Agency
mph	miles per hour
MPUC	Minnesota Public Utilities Commission
MW	megawatt
NAAQS	National Ambient Air Quality Standards
NAC	Noise Area Classification
NACE	National Association of Corrosion Engineers
NESC	National Electrical Safety Code
NEPA	National Environmental Policy Act

NERC	North American Electric Reliability Corporation
NHIS	Natural Heritage Information System
NHPA	National Historic Preservation Act
NO2	nitrogen dioxide
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NWI	National Wetland Inventory
OSHA	Occupational Safety and Health Act
OES	Office of Energy Security
PM10	particulate matter less than or equal to 10 microns in diameter
ppm	parts per million
PPSA	Power Plant Siting Act
PSD	Prevention of Significant Deterioration
PUC	Public Utilities Commission
PWI	Public Waters Inventory
RES	Renewable Energy Standard
RF	radio frequency
ROCOG	Rochester-Olmsted County of Governments
ROW	right-of-way
SFH	special flood hazard
SHPO	State Historic Preservation Office
SMMPA	Southern Minnesota Municipal Power Agency
SO2	sulfur dioxide
SWPPP	Storm Water Pollution Prevention Plan
TMDL	total maximum daily load
UHF	ultra-high frequency
USACE	U.S. Army Corps of Engineers
USC	U.S. Code
μT	micro Teslas
USDA	U.S. Department of Agriculture
USDOT	U.S. Department of Transportation
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Service
WHO	World Health Organization
WMA	Wildlife Management Area

Abstract

Responsible Governmental Unit

Office of Energy Security
85 7th Place East, Suite 500
St. Paul, MN 55101-2198

OES Representative
Matthew Langan
State Permit Manager
Energy Facility Permitting
(651) 296-2096

Project Owner

Xcel Energy Company
414 Nicollet Mall
Minneapolis, MN 55401

Project Representative
Thomas G. Hillstrom
Supervisor
Siting and Permitting, Xcel Energy
(612) 330-6538

The Public Utilities Commission (Commission) is considering the Project proposed by Xcel Energy to connect the Pleasant Valley and Byron Substations with a 161 kV transmission line to be located in Dodge, Mower, and Olmsted counties, Minnesota.

This Draft Environmental Impact Statement (EIS) was produced to satisfy the environmental review requirements for the Project.

Additional information on the Project is available in the Project application listed in the References chapter of this EIS. Other material related to this docket is available online at: http://energyfacilities.puc.state.mn.us/Docket.html?Id=25695

This Draft EIS was released on October 4, 2010. Comments on the adequacy of the Draft EIS will be accepted until November 5, 2010. Comments should be sent by email or U.S. mail to:

Matthew Langan, State Permit Manager
Minnesota Department of Commerce
85 7th Place East, Suite 500
St. Paul, MN 55101-2198
Email: matthew.langan@state.mn.us

Following the comment period, the Draft EIS will be revised to incorporate comments and a Final EIS will be issued.

List of Preparers

Contributors to this document included:

Matthew Langan, State Permit Manager
Office of Energy Security, Minnesota Department of Commerce

Environmental Resources Management, Inc. (ERM)

Summary

Xcel Energy (the Applicant) has proposed to construct a new 161 kilovolt (kV) transmission line (referred to herein as the "Project") in Dodge, Mower, and Olmsted counties in southeastern Minnesota. The approximately 18-mile transmission line would connect the Pleasant Valley and Byron Substations. Right-of-way (ROW) required for the transmission line would be 80 feet, with 40 feet extending from each side of the centerline. Equipment modifications to each of the two substations would be included in the Project. The stated need of the Project is to interconnect two existing 100 MW wind generation projects and provide additional outlet capacity to serve future generators in the Pleasant Valley Substation area (Xcel Energy, 2009b).

The Applicant identified the following two Route Alternatives in the route permit application submitted to the Minnesota Public Utilities Commission on December 3, 2009. For each of the Route Alternatives, the Applicant requested a 400-foot route width, with one exception for the northwest portion of Route Alternative 2 where a route width of 1,000 feet was requested to provide flexibility in avoiding a commercial business.

Route Alternative 1 (Applicant's Preferred Route) – The approximately 18.3 mile Route Alternative would be located within or adjacent to existing road and highway ROW for approximately 96 percent of its length (Xcel Energy, 2009a).

Route Alternative 2 (Applicant's Alternate Route) – The approximately 18.2 mile Route Alternative would be located within or adjacent to existing road and highway ROW for approximately 88 percent of its length (Xcel Energy, 2009a).

In addition to the Route Alternatives identified, the Application included analysis of a Crossover Segment, which would allow for the permitted route to be a combination of Route Alternatives 1 and 2 if such an alignment is preferable to avoid sensitive resources.

Crossover Segment – The approximately 2 mile segment would be located adjacent to 60th Street SW, which travels west to east between Route Alternatives 1 and 2. The 400-foot route developed for the Crossover Segment encompasses an existing 69 kV transmission line owned by People's Cooperative Services. If the Crossover Segment is used for the Project alignment, the Project structures would be adjacent to existing transmission structures such that a portion of the Project ROW could overlap with the existing ROW.

The Scoping Decision issued by the Director of the OES on July 9, 2010 identified one additional Route Alternative and three Segment Alternatives as variations to Route Alternative 1 (the Applicant's Preferred Route) to be evaluated in the EIS.

Route Alternative 3 – The approximately 16.2 mile Route Alternative would parallel an existing 345 kV transmission line for its entire length between the Pleasant Valley and

Byron Substations. A feasible alignment for Route Alternative 3, which was referred to in the Scoping Decision as the "345" Alternative, would be located to the east of the existing 345 kV transmission line, and a portion of the Project ROW would overlap with the existing 345 kV transmission line ROW.

Segment Alternative A – The approximately 2.4 mile Segment Alternative was proposed during the scoping process as a variation to Route Alternative 1 that would avoid an agri-tourism business located on 19th Avenue SW and a location identified as a potential site for a future U.S. 14 interchange west of the city of Byron.

Segment Alternative B – The approximately 3 mile Segment Alternative was proposed during the scoping process as a variation to Route Alternative 1 that would avoid residences located on County Highway 15 between County Highway 6 and 650th Street.

Segment Alternative C – The approximately 2 mile Segment Alternative was proposed during the scoping process as a variation to Route Alternative 1 that would co-locate the Project's crossing of Salem Creek with an existing crossing by a 345 kV transmission line. South of the Salem Creek crossing, the route would either follow Route Alternative 3 to the Pleasant Valley Substation or re-join Route Alternatives 1 or 2 through use of the Crossover Segment.

Project Alternatives
This EIS satisfies the requirements of Minnesota Rules 7849.1500 for an environmental review for projects requiring a Certificate of Need. In accordance with Minnesota Rule 7849.1500, this EIS describes and analyzes the following alternatives:

- No-Build Alternative;
- Demand Side Management;
- Purchased Power;
- Conservation;
- Existing Line or System Improvements; and
- Generation Alternatives.

An evaluation of project alternatives is provided in Chapter 7 of this EIS. None of the alternative evaluated would meet the stated need of the Project, which is to interconnect two existing 100 MW wind generation projects and provide additional outlet capacity to serve future generators in the Pleasant Valley Substation area (Xcel Energy, 2009b).

Summary of Impacts and Comparison of Route Alternatives
Chapter 6 of the Draft EIS describes the human, environmental, and socioeconomic setting as it relates to the Project Study Area, defined as the route widths for each Route and Segment Alternative. The resource sections presented in Chapter 6 identify sensitive resources within the Study Area and evaluate the Project's potential direct or indirect impact on those resources. Where applicable, mitigation measures are provided. Table S-1 summarizes the direct and indirect impacts anticipated from

construction and operation of the Project specific to each Route Alternative. Route-specific impacts include the following:

Route Alternative 1 – Route Alternative 1 would be approximately 18.3 miles in length and require a total ROW of 177.7 acres. No residential displacement is anticipated, although 25 residences would be located within 300 feet of the feasible centerline evaluated, with one residence located within 100 feet of the feasible centerline evaluated. The Route Alternative would require tree removal at 10 residences, but would require less vegetative removal at the crossing of Salem Creek compared to Route Alternatives 2 or 3. Route Alternative 1 would parallel an underground natural gas pipeline for approximately 1 mile and could support an under-built transmission line associated with the Pleasant Valley Wind Farm for approximately 1.5 miles of its length.

Route Alternative 1 would require eight total crossings of Public Water Inventory (PWI) water bodies, three of which are designated as impaired waters. However, the Applicant has stated an intention to span all water bodies (Xcel Energy, 2009a). Up to 178 acres of soil and 116 acres of prime farmland could be temporarily disturbed during construction. Pole placement could displace up to 0.28 acres of soil long-term. Approximately 1.52 acres of wetlands would be crossed by the ROW, including 0.05 acres of forested wetlands that would undergo long-term wetland type conversion.

Route Alternative 1 would limit the placement options for an interchange at U.S. 14 and 19th Avenue/280th Avenue, which has been designated by the Minnesota Department of Transportation (Mn/DOT) and the city of Byron as a potential future interchange location. Use of Segment Alternative A in connection with Route Alternative 1 would avoid any potential impacts to the designated interchange location.

Route Alternative 2 – Route Alternative 2 would be approximately 18.2 miles in length and require a total ROW of 176.3 acres. No residential displacement is anticipated, although 26 residences would be located within 300 feet of the feasible centerline evaluated. The Route Alternative would require tree removal at seven residences and would cross Salem Creek in a previously undisturbed heavily wooded area.

Route Alternative 2 would require seven total crossings of PWI water bodies, five of which are designated as impaired waters. However, the Applicant has stated an intention to span all water bodies (Xcel Energy, 2009a). Up to 176 acres of soil and 121 acres of prime farmland could be temporarily disturbed during construction. Pole placement could displace up to 0.28 acres of soil long-term. Approximately 2.84 acres of wetlands would be crossed by the ROW, none of which are forested wetlands.

Route Alternative 3 – Route Alternative 3 would be the shortest of the Route Alternatives at approximately 16.2 miles in length. The Route Alternative would require a total ROW of 157.6 acres. The Project ROW would overlap with ROW for an existing 345 kV transmission line. No residential displacement is anticipated and only four residences would be located within 300 feet of the feasible centerline evaluated.

Route Alternative 3 would require 10 total crossings of PWI water bodies, three of which are designated as impaired waters. However, the Applicant has stated an intention to span all water bodies (Xcel Energy, 2009a). Up to 158 acres of soil and 93 acres of prime farmland could be temporarily disturbed during construction. Pole placement could displace up to 0.25 acres of soil long-term. Approximately 15.2 acres of wetlands would be crossed by the ROW, including 4.56 acres of forested wetlands that would undergo long-term wetland type conversion. Due to the length of wetlands located within Route Alternative 3, it may not be possible to span all wetland complexes.

All three Route Alternatives would have similar temporary or short-term impacts related to air quality, noise, interference with utility systems and public services, fauna, rare and unique natural resources/critical habitat, socioeconomics, safety and health, and recreation, which could be avoided or reduced through mitigation measures. No significant impacts from the Project are expected for these resources.

The HVTL route permit issued by the Commission may require certain mitigation measures to prevent or minimize short-term and long-term impacts on resources from construction and operation of the Project. The mitigation sub-sections within each resource section list mitigation measures agreed to by the Applicant in the route permit application and additional mitigation measures that could reduce the potential impacts identified in the EIS. Table S-2 provides a summary of potential mitigation measures. Mitigation measures are described in detail in the resource-specific discussions in Chapter 6.

Table S-1: Summary of Impacts and Comparison of Route Alternatives

Resource and Impact	Route Alternative 1	Route Alternative 2	Route Alternative 3
Route length (miles)	18.3	18.2	16.2
Area of total ROW (acres)	177.7	176.3	157.6
Proximity to Structures	25 residences within 300 feet of centerline; 1 residence within 100 feet of centerline; no residential displacement anticipated	26 residences within 300 feet of centerline; 0 residences within 100 feet of centerline; no residential displacement anticipated	4 residences within 300 feet of centerline; 0 residences within 100 feet of centerline; no residential displacement anticipated
	Would require relocation of an existing shed or the crossing County Highway 15 at a diagonal. Use of Segment Alternative B would avoid this location.		
Aesthetics	Addition of vertical component to existing landscape	Addition of vertical component to existing landscape	Would add vertical component to previously disturbed corridor
	Tree removal required at 10 residences Least amount of tree removal required at Salem Creek crossing; would add vertical visual intrusion at County Highway 15 Salem Creek crossing	Tree removal required at 7 residences Tree removal required at Salem Creek crossing; would cross Salem Creek in previously undisturbed area, adding a vertical visual intrusion and require clearing of new corridor through a forested creek valley	Minimal residential tree removal required Tree removal required at Salem Creek crossing; would cross Salem Creek near existing 345 kV transmission line
Noise	Noise generated during construction	Noise generated during construction	Noise generated during construction
	Audible noise during operation of transmission line during certain weather conditions	Audible noise during operation of transmission line during certain weather conditions	Audible noise during operation of transmission line during certain weather conditions
Interference with Utility and Public Services	Interference with AM radio, two-way radio, and TV reception; however, the Applicant would restore reception to pre-Project quality	Interference with AM radio, two-way radio, and TV reception; however, the Applicant would restore reception to pre-Project quality	Interference with AM radio, two-way radio, and TV reception; however, the Applicant would restore reception to pre-Project quality
	Temporary service disruptions on existing distribution and transmission lines in the Study Area during construction	Temporary service disruptions on existing distribution and transmission lines in the Study Area during construction	Temporary service disruptions on existing distribution and transmission lines in the Study Area during construction
Archaeological and Historic Resources	3 archaeological and 9 historic sites	1 archaeological and 3 historic sites	2 archaeological and 3 historic sites

	located within 0.5 miles of route	located within 0.5 miles of route	located within 0.5 miles of route
	Potential for damage to existing archaeological resources not yet identified	Potential for damage to existing archaeological resources not yet identified	Potential for damage to existing archaeological resources not yet identified
	Change in viewshed to/from historic properties and temporary effects (e.g., dust and noise) that could alter the user's experience	Change in viewshed to/from historic properties and temporary effects (e.g., dust and noise) that could alter the user's experience	Change in viewshed to/from historic properties and temporary effects (e.g., dust and noise) that could alter the user's experience
Safety and Health	Potential for stray voltage when following or crossing distribution lines. Potential for induced voltage on vehicles parked beneath the transmission line.	Potential for stray voltage when following or crossing distribution lines. Potential for induced voltage on vehicles parked beneath the transmission line.	Potential for stray voltage when following or crossing distribution lines. Potential for induced voltage on vehicles parked beneath the transmission line.
	Would follow natural gas pipeline for approximately 1 mile. Potential for conductance or voltage induction on pipeline. Low potential for simultaneous leak from pipeline and fault on transmission line to result in ignition if safe distances are not provided.		
Air Quality	Potential for localized formation of ozone from corona; impact expected to be negligible	Potential for localized formation of ozone from corona; impact expected to be negligible	Potential for localized formation of ozone from corona; impact expected to be negligible
	Vehicle emissions and dust particulate generated during construction	Vehicle emissions and dust particulate generated during construction	Vehicle emissions and dust particulate generated during construction
	Loss of carbon sequestration potential through vegetation clearing in the ROW. Impact would be temporary if ROW is restored per HVTL permit conditions	Loss of carbon sequestration potential through vegetation clearing in the ROW. Impact would be temporary if ROW is restored per HVTL permit conditions	Loss of carbon sequestration potential through vegetation clearing in the ROW. Impact would be temporary if ROW is restored per HVTL permit conditions
Soils and Geology	Up to 178 acres of temporary soil disturbance in ROW (assuming 80-foot ROW) during construction	Up to 176 acres of temporary soil disturbance in ROW (assuming 80-foot ROW) during construction	Up to 158 acres of temporary soil disturbance in ROW (assuming 80-foot ROW) during construction
	Up to 0.28 acres of long-term soil displacement (assuming foundation diameter of 8 feet and poles placed 400 feet apart)	Up to 0.28 acres of long-term soil displacement (assuming foundation diameter of 8 feet and poles placed 400 feet apart)	Up to 0.25 acres of long-term soil displacement (assuming foundation diameter of 8 feet and poles placed 400 feet apart)
Water Resources	8 total crossings of PWI rivers and streams; all crossings could be spanned	7 total crossings of PWI rivers and streams; all crossings could be spanned	10 total crossings of PWI rivers and streams; all crossings could be spanned

	3 crossings of impaired waters	5 crossings of impaired waters	3 crossings of impaired waters
	Potential for soil erosion and sedimentation during construction	Potential for soil erosion and sedimentation during construction	Potential for soil erosion and sedimentation during construction
	Would cross Salem Creek valley at its narrowest point, reducing likelihood of placement of a Project structure adjacent to the water body.	Would cross Salem Creek at a wider point in the ravine-cut valley surrounding the creek than Route Alternative 1, increasing the likelihood of placement of a Project structure adjacent to the water body.	Would cross Salem Creek at a wider point in the ravine-cut valley surrounding the creek than Route Alternative 1, increasing the likelihood of placement of a Project structure adjacent to the water body.
Wetlands	1.52 acres of wetlands would be crossed by 80-foot ROW evaluated	2.84 acres of wetlands would be crossed by 80-foot ROW evaluated	15.20 acres of wetlands would be crossed by 80-foot ROW evaluated Length of wetlands within route reduces the potential to span all wetlands.
	Temporary loss of wetland functions during construction due to soil compaction or vegetation removal.	Temporary loss of wetland functions during construction due to soil compaction or vegetation removal.	Temporary loss of wetland functions during construction due to soil compaction or vegetation removal. Temporary losses would be higher for Route Alternative 3 due to the greater acreage of wetlands within the ROW.
	Long-term conversion of wetland type where clearing of forested wetlands required. Approximately 0.05 acres of forested wetlands in ROW.	No forested wetlands in ROW.	Long-term conversion of wetland type where clearing of forested wetlands required. Approximately 4.56 acres of forested wetlands in ROW.
Flora	Tree removal required at 10 residences Least amount of tree removal required at Salem Creek crossing.	Tree removal required at 7 residences Tree removal required at Salem Creek crossing; would cross Salem Creek in previously undisturbed area.	Minimal residential tree removal required Tree removal required at Salem Creek crossing; would cross Salem Creek near existing 345 kV transmission line.
	Clearing of vegetation would provide opportunity for spread of noxious and invasive weed species.	Clearing of vegetation would provide opportunity for spread of noxious and invasive weed species.	Clearing of vegetation would provide opportunity for spread of noxious and invasive weed species.
Fauna	Temporary restrictions to habitat use due to noise and increased activity in ROW during construction.	Temporary restrictions to habitat use due to noise and increased activity in ROW during construction.	Temporary restrictions to habitat use due to noise and increased activity in ROW during construction.
	Some potential for avian collisions and electrocutions.	Some potential for avian collisions and electrocutions.	Some potential for avian collisions and electrocutions.

			Would cross the South Fork Zumbro River WMA.
Rare and Unique Natural Resources/Critical Habitat	Would cross known occurrences of prairie bush clover.	No known federally-listed rare and unique natural resources/critical habitat in ROW.	Would cross more wetland acreage than Route Alternatives 1 and 2, resulting in a greater potential to impact sensitive wetland species.
	Route Alternative 1 would cross the shortest length of wooded area surrounding Salem Creek of the three Route Alternatives and could result in fewer impacts to sensitive species near Salem Creek.		
Socioeconomics	Increase in local tax revenue from utility property taxes.	Increase in local tax revenue from utility property taxes.	Increase in local tax revenue from utility property taxes.
	Increase in generation outlet capacity in Study Area, which may encourage economic growth.	Increase in generation outlet capacity in Study Area, which may encourage economic growth.	Increase in generation outlet capacity in Study Area, which may encourage economic growth.
	Temporary disruption in agricultural production where fences or livestock need to be moved for construction.	Temporary disruption in agricultural production where fences or livestock need to be moved for construction.	Temporary disruption in agricultural production where fences or livestock need to be moved for construction.
Property Values	Potential decrease in perceived and/or real market value of a property in response to health/safety concerns, potential noise and visual intrusion, and interference with future land uses. 25 residences located within 300 feet of centerline	Potential decrease in perceived and/or real market value of a property in response to health/safety concerns, potential noise and visual intrusion, and interference with future land uses. 26 residences located within 300 feet of centerline	Potential decrease in perceived and/or real market value of a property in response to health/safety concerns, potential noise and visual intrusion, and interference with future land uses. 4 residences located within 300 feet of centerline
Land-Based Economies	Up to 116 acres of prime farmland temporarily disturbed in 80-foot ROW	Up to 121 acres of prime farmland temporarily disturbed in 80-foot ROW	Up to 93 acres of prime farmland temporarily disturbed in 80-foot ROW
	Up to 0.28 acres of long-term soil displacement (assuming foundation diameter of 8 feet and poles placed 400 feet apart)	Up to 0.28 acres of long-term soil displacement (assuming foundation diameter of 8 feet and poles placed 400 feet apart)	Up to 0.25 acres of long-term soil displacement (assuming foundation diameter of 8 feet and poles placed 400 feet apart)
	Potential to limit access for aerial spraying	Potential to limit access for aerial spraying	Greatest potential to limit access for aerial spraying due to the proximity of the route

			to the existing 345 kV transmission line
	Potential for construction impacts (increased noise, dust, and traffic) to lower attendance at agri-business and tourism locations. Tweite's Pumpkin Patch is located within Route Alternative 1. Use of Segment Alternative A would avoid Tweite's Pumpkin Patch.		
	Would require relocation of an existing agricultural shed or the crossing County Highway 15 at a diagonal. Use of Segment Alternative B would avoid this location.		
Zoning and Compatibility with Planning	177.7 acres of total ROW required Loss of land use to owners due to creation of easement	176.3 acres of total ROW required Loss of land use to owners due to creation of easement	157.6 acres of total ROW required Loss of land use to owners due to creation of easement Requires 20 acres less of total ROW than Route Alternatives 1 and 2.
	Potential to limit Mn/DOT and city of Byron plans for a future interchange at US 14 and 19th Ave/280th Ave. Use of Segment Alternative A would avoid the potential interchange location.		
Recreation	Temporary access restrictions to recreational resources during construction. Potential to temporarily alter the user's experience due to increases in noise, dust, and traffic during construction.	Temporary access restrictions to recreational resources during construction. Potential to temporarily alter the user's experience due to increases in noise, dust, and traffic during construction.	Temporary access restrictions to recreational resources during construction. Potential to temporarily alter the user's experience due to increases in noise, dust, and traffic during construction.
	Tweite's Pumpkin Patch is located within Route Alternative 1. Use of Segment Alternative A would avoid Tweite's Pumpkin Patch.		Would cross the South Fork Zumbro River WMA.
Transportation	Would be located within or adjacent to	Would be located within or adjacent to	Does not follow existing road ROW.

	existing road ROW for 96 percent of its length.	existing road ROW for 88 percent of its length.	
	Potential for increased traffic from road lane closures at crossings with US 14 and MN 30, and on county highways paralleled by the route.	Potential for increased traffic from road lane closures at crossings with US 14 and MN 30, and on county highways paralleled by the route.	Potential for increased traffic from road lane closures at crossings with US 14 and MN 30.
	Would limit placement options for US 14 interchange at 19th Avenue/280th Avenue. Use of Segment Alternative A would avoid area of potential impact.	Potential interference with Mn/DOT improvement project on MN 30 (if Mn/DOT project is moved up from 2015 schedule and construction is simultaneous).	

Table S-2: Summary of Potential Mitigation Measures

Resource	Mitigation Measure
Proximity to Structures	Place transmission line on opposite side of the road from residences, where possible.
	Equip transmission lines with protective devices (circuit breakers and relays) to safeguard against accidents related to structures or conductors falling.
Aesthetics	Avoid placement of structures directly in front of buildings to minimize visual impact, where possible.
	Communicate with property owners to determine preferred placement for structures on private property to minimize visual impacts.
	Remove only those trees located in the ROW that would affect the safe operation of the line.
	Use low growing vegetation in the ROW to help screen the line and diffuse visual effects.
Noise	Adhere to local noise ordinances.
Interference with Utility Systems and Public Services	Work with those experiencing radio or television interference to restore reception to pre-Project quality.
	Schedule planned service disruptions with utility line owners and notify affected customers in advance.
	Have utility crews present or on-call during construction to respond to unplanned incidents that may result in an interruption to electric service.
Archaeological and Historic Resources	Conduct a Phase I survey for the route selected, focusing on areas where the Project would impact the ground surface.
	Conduct additional field investigations, archival research, local history and map review, and public records review for the route selected.
	Avoid impacts to potentially eligible historic sites by selective structure placement and appropriate construction methods.
Safety and Health	Model potential AC interference effects on the natural gas pipeline.
	Address stray voltage on a case by case basis, if and where present.
Air Quality	Maintain construction vehicles.
	Limit idle times and shutdown construction equipment when not in use.
	Minimize dust through control procedures.
Soils and Geology	Restore areas disturbed during construction to their original condition to the extent practicable.
	Limit ground disturbance where possible.
	Employ sediment and control best management practices (BMPs), which may include reseeding of vegetation and use of erosion control blankets and/or silt fences.
Water Resources	Span water resources and floodplains to the extent possible.
	Avoid water resource crossings to the extent possible by movement of the ROW within the selected route.
	Plant or seed non-agricultural areas disturbed during construction to prevent runoff into water resources.
	Employ sediment and control BMPs, as required by applicable permits.
	Restore floodplain contours to their pre-construction profile if contours are disrupted during construction.
Wetlands	Span wetlands and drainage systems to the extent possible.
	Employ sediment and control BMPs, as required by applicable permits.
	Schedule construction in wetlands during frozen ground conditions to the extent practicable.
	Access wetlands via the shortest route to result in the least amount of physical impact.

	Assemble structures on upland areas before they are brought into wetlands.
	Use construction mats when ground cover is not frozen.
Flora	Restore the ROW to its original vegetative state to the extent possible.
	Restore lay down areas, access roads, temporary work spaces, and any other areas outside of the ROW disturbed by the Project.
	Limit tree removal to those within the ROW or those that would affect safe operation of the transmission line.
	Place the transmission line on the opposite side of the road from residences to limit removal of trees that provide residential shade and wind control.
	Wash or manually remove material from construction vehicles if equipment has traveled from an area contaminated by noxious weeds.
	Plant crop cover or stabilizing vegetation in non-agricultural areas to prevent disturbed areas from becoming available to noxious weeds.
Fauna	Adhere to the Avian Protection Plan, developed by the Applicants for the State of Minnesota as part of a 2002 Memorandum of Understanding with the USFWS.
Rare and Unique Natural Resources/Critical Habitat	Survey all likely habitat for prairie bush clover, American ginseng, and Valerian so that the ROW and structure placement can be sited to avoid known occurrences.
	Prohibit refueling within 100 feet of wetlands or water bodies.
Socioeconomics	Compensate landowners for damaged crops and either compensate for or chisel-plow soils compacted during construction.
Property Values	Direct impacts to property values would be mitigated through landowner compensation for the use of their land through easement payments.
Land-Based Economies	Place structures adjacent to existing road and utility ROW to allow Project ROW to overlap with existing ROW and minimize the amount of private land needed for the Project ROW.
	Use of Segment Alternative A in association with Route Alternative 1 to avoid placement of structures near or on Tweite's Pumpkin Patch.
	Construct the Project before crops are planted or following harvest.
	Mark transmission line according to local, state, and NESC standards to minimize risk of plane collision during aerial applications.
Zoning and Compatibility with Planning	Place structures adjacent to existing road and utility ROW to allow Project ROW to overlap with existing ROW and minimize the amount of private land needed for the Project ROW.
	Locate structures as close to property division lines as reasonably possible to reduce loss of land use.
Recreation	Work with private land and business owners to place structures in such a way that would accommodate existing land uses.
	Use of Segment Alternative A in association with Route Alternative 1 to avoid placement of structures near or on Tweite's Pumpkin Patch, and agri-tourism business.
Transportation	Comply with Mn/DOT and applicable road authorities' management standards.
	Work with Minnesota State Patrol and county officials to safeguard the public and construction workforces during construction.
	Notify the public of planned road closures and detours.
	Coordinate construction schedules with Mn/DOT to avoid construction at the same time as roadway resurfacing projects.
	Use of Segment Alternative A in association with Route Alternative 1 to avoid the location identified as a possible location for a future US 14 interchange.

1. Introduction

Xcel Energy (the Applicant) has proposed to construct a new 161 kilovolt (kV) transmission line (referred to herein as the "Project") in Dodge, Mower, and Olmsted counties in southeastern Minnesota. The approximately 18-mile transmission line would connect the Pleasant Valley and Byron Substations. Equipment modifications to each of the two substations would be included in the Project.

The construction of a high voltage transmission line in the State of Minnesota requires a route permit from the Minnesota Pubic Utilities Commission (the Commission). The route permitting process is governed by Minnesota Rules, parts 7850.1000 to 7850.6500. Additional description of regulatory requirements is presented in Chapter 2. The Applicant submitted a route permit application for the Project to the Commission on December 3, 2009, which was accepted by the Commission as complete on February 9, 2010.

As part of the permitting process for a high voltage transmission line, the Minnesota Department of Commerce Office of Energy Security (OES) is required to prepare an environmental review document, in this case, this Environmental Impact Statement (EIS).

On July 9, 2009, the OES issued the Scoping Decision for the EIS, which is included in Appendix B. Included in the scope of the EIS were two route alternatives and a crossover segment identified by the Applicant and a third route alternative and three segment alternatives as variations to the Applicant's preferred alternative to be evaluated in the EIS.

The following issues were determined to be outside the scope of the EIS:

- *Any route alternatives not specifically identified in the scoping decision; and*
- *The manner in which land owners are paid for transmission rights-of-way (ROW) easements* (OES, 2010).

For this Project, the Environmental Report required under a Certificate of Need proceeding is combined with the environmental review required for the Route Permit in the form of this Environmental Impact Statement. This EIS is in accordance with the OES's Scoping Decision and has been prepared to identify, to the extent feasible, the potential for significant environmental impact from the Project. This EIS contains information on the impacts of the Project Route Alternatives as related to human settlement, socioeconomics, and the environment, and mitigation measures to reduce identified impacts.

1.1. Project Description

The Project consists of an approximately 18-mile 161 kV transmission line that would connect the Pleasant Valley Substation, located in Pleasant Valley Township, to the Byron Substation, located in the city of Bryon. Modifications within the existing footprints would be required at each of the two substations (Xcel Energy, 2009a).

Structures for the Project would be single weathering steel poles ranging in height between 70 and 90 feet. The distance between poles would be approximately 400 to 650 feet. The Project would require an 80-foot wide right-of-way (ROW), with 40 feet of ROW extending from each side of the centerline.

Upon issuance of a route permit by the Commission, the Applicant would begin ROW acquisition. Construction is expected to begin in February 2011. The estimated in-service date of the Project is fourth quarter 2011. Assuming this schedule is met, the estimated completion date for final ROW cleanup would be December 2011. (Xcel Energy, 2009a)

1.2. Purpose of the Project

The stated need of the Project is to interconnect two existing 100 MW wind generation projects and provide additional outlet capacity to serve future generators in the Pleasant Valley Substation area (Xcel Energy, 2009b). The Grand Meadow Wind Farm and Wapsipinicon Wind Farm, each located in Mower County, have been operational since December 2008. The Project transmission line was identified as a required system improvement to accommodate the wind farms in the 2007 Midwest Independent Transmission System Operator (MISO) Interconnection System Impact Study (Xcel Energy, 2009b). Although operational, the wind farms are limited in the amount of generation delivered to the electric system due to the existing output capacity.

In addition to providing capacity for the existing wind farms, the Project would add approximately 150 MW of additional outlet capacity for the Pleasant Valley Substation area (Xcel Energy, 2009b). The Project was recommended in a 2008 RIGO Study to increase generation outlet capacity in the area (Xcel Energy, 2009b). A need for future outlet capacity for the area is anticipated due to the increase in wind farm development in the region. Under the Renewable Energy Standard (RES), Minnesota utilities are required to generate or purchase 25 percent of their retail electric sales from renewable generation sources, including wind energy (Xcel Energy, 2009b).

1.3. Project Location

The Project would be located in Dodge, Mower, and Olmsted counties in southeastern Minnesota. The approximately 18-mile transmission line would extent north from the Pleasant Valley Substation in Mower County to the Byron Substation in Olmsted County. An overview of the Study Area is shown in Figure 1.

1.4. Alternatives in the Route Permit Application

The Applicant identified the following two Route Alternatives in the route permit application submitted to the Minnesota Public Utilities Commission on December 3, 2009. For each of the Route Alternatives, the Applicant requested a 400-foot route width, with one exception for the northwest portion of Route Alternative 2 where a route width of 1,000 feet was requested to provide flexibility in avoiding a commercial business.

In addition to the Applicant's proposed Route Alternatives, the public has requested inclusion of an additional Route Alternative and three Segment Alternatives through the public scoping process. These Route and Segment Alternatives are described in detail in Chapter 5 of this document and displayed in Figures 1 through 5 in Appendix A.

Route Alternative 1 (Applicant's Preferred Route) – The approximately 18.3 mile Route Alternative would be located within or adjacent to existing road and highway ROW for approximately 96 percent of its length (Xcel Energy, 2009a). Route Alternative 1 is the westernmost Route Alternative and would be oriented in a north-south direction, crossing portions of Dodge, Mower, and Olmsted counties.

Route Alternative 2 (Applicant's Alternate Route) – The approximately 18.2 mile Route Alternative would be located within or adjacent to existing road and highway ROW for approximately 88 percent of its length (Xcel Energy, 2009a). Route Alternative 2 is the easternmost Route Alternative and would be oriented in a north-south direction, crossing portions of Mower and Olmsted counties.

In addition to the Route Alternatives identified, the Application included analysis of a Crossover Segment, which would allow for the permitted route to be a combination of Route Alternatives 1 and 2 if such an alignment is preferable to avoid sensitive resources.

Crossover Segment – The approximately 2 mile segment would be located adjacent to 60th Street SW, which travels west to east between Route Alternatives 1 and 2. The 400-foot route developed for the Crossover Segment encompasses an existing 69 kV transmission line owned by People's Cooperative Services. If the Crossover Segment is used for the Project alignment, the Project structures would be adjacent to existing transmission structures such that a portion of the Project ROW could overlap with the existing ROW.

1.5. Substation Modifications

Modifications at the Pleasant Valley and Byron Substations would be required to accommodate the Project. At the Pleasant Valley Substation, modifications would include installation of new circuit breakers and bus work and switches to complete connections. At the Byron Substation, a new 161 kV line terminal bay, 161 kV circuit breaker, and associated switches, bus work, and controls would be added. At each of the substations, all modifications and equipment installations would be conducted

within the existing substation fences, such that no new land or grading would be necessary. (Xcel Energy, 2009a)

1.6. Route Width

The Applicant has requested a route width of 400 feet for each of the Route Alternatives. The transmission line alignment and associated 80-foot-wide ROW could be located anywhere within the 400-foot wide route, as feasible. An expanded route width of 1,000 feet has been requested by the Applicant for the northernmost portion of Route Alternative 2, adjacent to the south of the Byron Substation, where additional flexibility may be necessary to avoid an existing commercial property.

1.7. Rights-of-Way Requirements

The Project would require an 80-foot ROW, with 40 feet extending from either side of the centerline. In some locations, Project ROW could overlap with existing road or transmission line ROW. It is not expected that the Project would displace any residences or businesses (Xcel Energy, 2009a).

1.8. Project Costs

The estimated cost of the Project is $10.5 million for Route Alternative 1 and $10.9 million for Route Alternative 2 (Xcel Energy, 2009a). Because Route Alternative 3 was not included by the Applicant in the route permit application, a total cost for this Route Alternative has not been estimated. However, due to the similarities in design and length of Route Alternative 3 with Route Alternatives 1 and 2, it is expected that the total cost for Route Alternative 3 would be similar to Route Alternatives 1 and 2.

1.9. Sources of Information

Much of the information presented in the EIS was provided by the Applicant and representatives of the Applicant in the form of the route permit application and written correspondence between the Applicant and OES. Additional sources of information, including all communication with federal, state, and local agencies, are provided in Chapter 9, References.

2. Regulatory Framework

In Minnesota, authority for reviewing and permitting High Voltage Transmission Lines (HVTLs) is under the jurisdiction of the Minnesota Public Utilities Commission (the Commission). The proposed Pleasant Valley to Bryon transmission line project requires two major decisions by the Commission, a certificate of need and a route permit.

This chapter summarizes the principal state regulations affecting the permitting process and the required environmental documentation for the Project. The Project would be subject to additional federal, state, and local regulations and permit conditions identified in Chapter 8.0, Required Permits and Approvals.

2.1. Route Permit

The Project is considered a HVTL under Minnesota Statutes, chapter 216E (Minnesota Power Plant Siting Act). In accordance with the Minnesota Power Plant Siting Act, a route permit from the Commission and an environmental review document are required. The route permit application for the Project was submitted by the Applicant to the Commission on December 3, 2009. The application was accepted as complete by the Commission on February 9, 2010.

The Commission's route permit determination must be guided by the state's goals to conserve resources, minimize environmental impacts, minimize human settlement and other land-use conflicts, and ensuring the state's electric energy security through efficient, cost-effective power supply and electric transmission infrastructure (Minn. Stat. 213E.03, subd. 7a).

The Route Permit issued by the Commission would identify where the Project will be constructed. The Route Permit would identify the right-of-way (ROW) that the Applicant has the right-to-acquire for the Project. The ROW width may vary throughout the route, depending upon the engineering and routing constraints. In some areas, the Route Permit may identify a precise route, for instance an 80-foot ROW to be located on the east side of a road, while in other areas the Route Permit may specify the width of ROW but designate a larger route to allow the Applicant to negotiate with landowners.

The Route Permit would also define the Project that is being permitted. If the Applicant wishes to, at some point in the future, upgrade the transmission line to a greater voltage, or add another transmission line of more than 100 kV, the Applicant would need to apply to the Commission for a permit for a new transmission line.

2.2. Certificate of Need

Because the Project is considered a Large Energy Facility under Minnesota Statute 216B.2421, a Determination of Need for the Project also is required from the Commission. A Large Energy Facility is defined to include transmission lines between

100 kV and 200 kV if they are more than 10 miles long (Minnesota Statutes, section 216B.2421, subdivision 2(2) and (3)). The Applicant applied for a Certificate of Need for the proposed transmission line on December 3, 2009. The application was accepted as complete by the Commission on February 9, 2010.

The Certificate of Need process is designed to evaluate the level of need, as well as the alternatives available (including a no-build alternative) to satisfy that need. The Certificate of Need process is the only proceeding under Minnesota Statute in which a no-build alternative and the size, type, timing, system configuration, and voltage of a proposed project would be considered. The Commission determines the basic type of facility (if any) to be constructed, the size of the facility, and the timing of the facility (e.g., the projected in-service date). The Certificate of Need requires an Environmental Report (ER) on the proposed alternatives. For this Project, the required ER is combined with the environmental review required for the Route Permit in the form of this EIS.

2.3. Environmental Review

Applications for HVTL permits are subject to environmental review, which is conducted by the OES staff under the procedures defined in Minnesota Rule 7850.1700, Full Routing Process of the Power Plant Siting Act. Environmental review begins with a determination of the scope of the EIS by the Director of the OES. Two public scoping meetings were held on March 25, 2010 in Byron, Minnesota, to solicit public input on the scope of the EIS to be prepared. A Scoping Decision was issued by the Director of the OES on July 9, 2010.

The EIS is an environmental review document that describes the human and environmental impacts of a proposed project and selected alternative routes and methods to mitigate such impacts. The public has the opportunity to comment on the Draft EIS through public comment periods and at OES sponsored meetings. Comments received during the comment period will be incorporated into the Final EIS as appropriate.

Applications for HVTL permits require a public contested-case hearing upon completion of the Draft EIS pursuant to Minnesota Rules part 7850.2600. The hearing must be conducted by an administrative law judge from the Office of Administrative Hearing pursuant to the contested case procedures of Minnesota Statutes, chapter 14.

3. Engineering and Operation Design

The proposed transmission line and modifications to the Pleasant Valley and Byron Substations would be designed to meet or surpass all relevant local and state codes, the National Electric Safety Code (NESC), North American Electric Reliability Corporation (NERC) requirements, and the Applicant's own standards (Xcel Energy, 2009a). Final engineering and operation design would be determined when a Route Alternative is selected and specific ROW and pole placement determined.

3.1. Transmission Line Structures

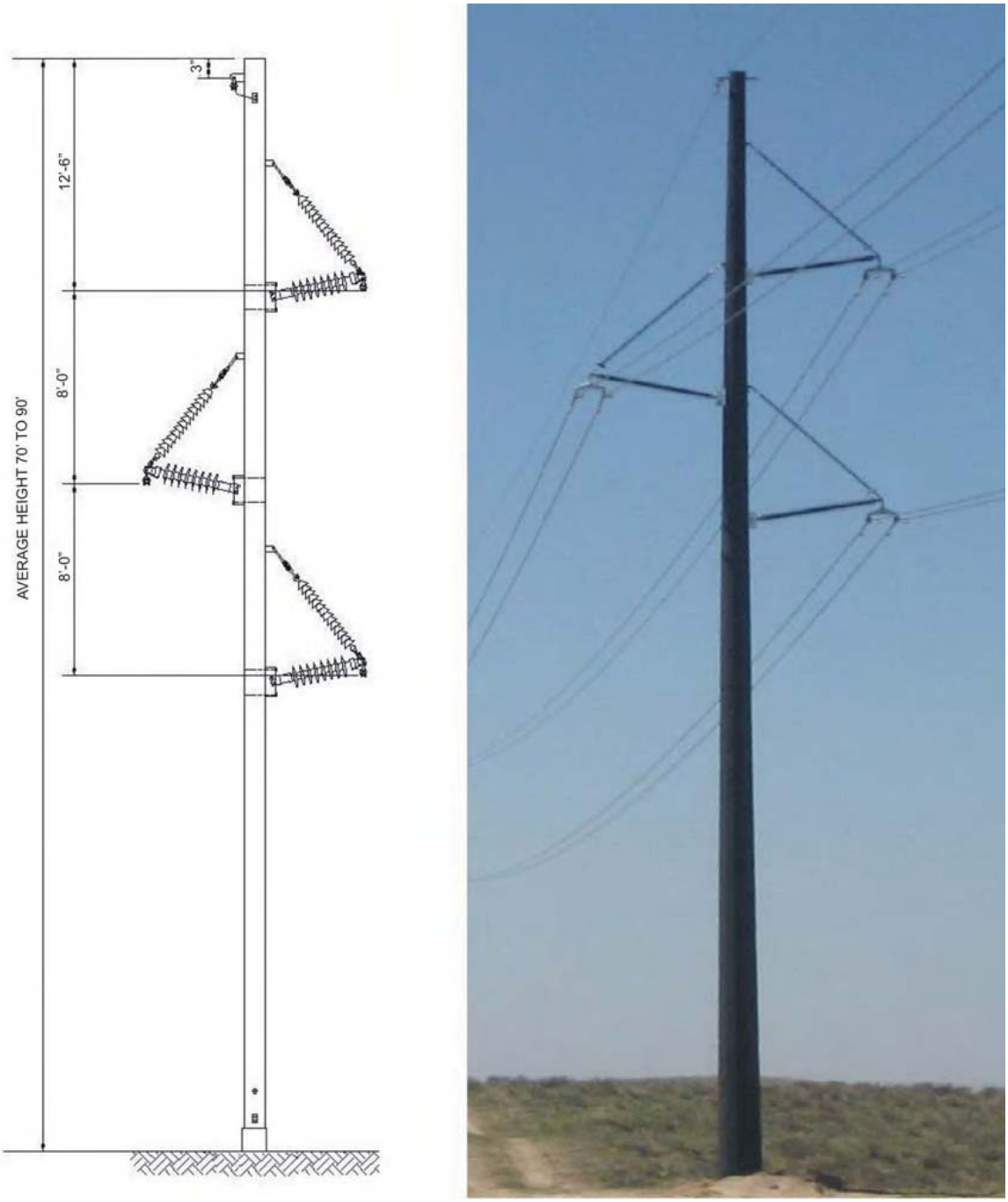
The Applicant has proposed that the 161 kV transmission line be constructed as a single circuit line using single-pole, weathering steel structures with brace post insulators. The height of the transmission line structures would range from 70 to 90 feet. The span between structures would range from 400 to 650 feet, and structures would be located along or near the centerline of a right-of-way (ROW) with a width of 80 feet. Figure 3-1 shows a common 161 kV single-circuit, single-pole, weathering steel structure design with brace post insulators. Note that Figure 3-1 shows two conductors per phase, while the proposed transmission line structure for the Project would use only one conductor per phase (Xcel Energy, 2009a). Table 3-1 summarizes the structure design and foundation for the Project.

Table 3-1: Structure Design Summary

Line Type	Structure Type	Structure Material	ROW Width (feet)	Structure Height (feet)	Structure Base Diameter (inches)	Foundation Diameter (feet)	Span Between Structures (feet)
Single Circuit 161 kV	Single Circuit Brace Post	Weathering Steel	80	70-90	24-42 (tangent structures) 36-72 (angle structures)	5-8	400-650

Source: Xcel Energy, 2009a

Figure 3-1: Typical 161 kV Single-Circuit, Single-Pole, Weathering Steel, Brace Post Insulators



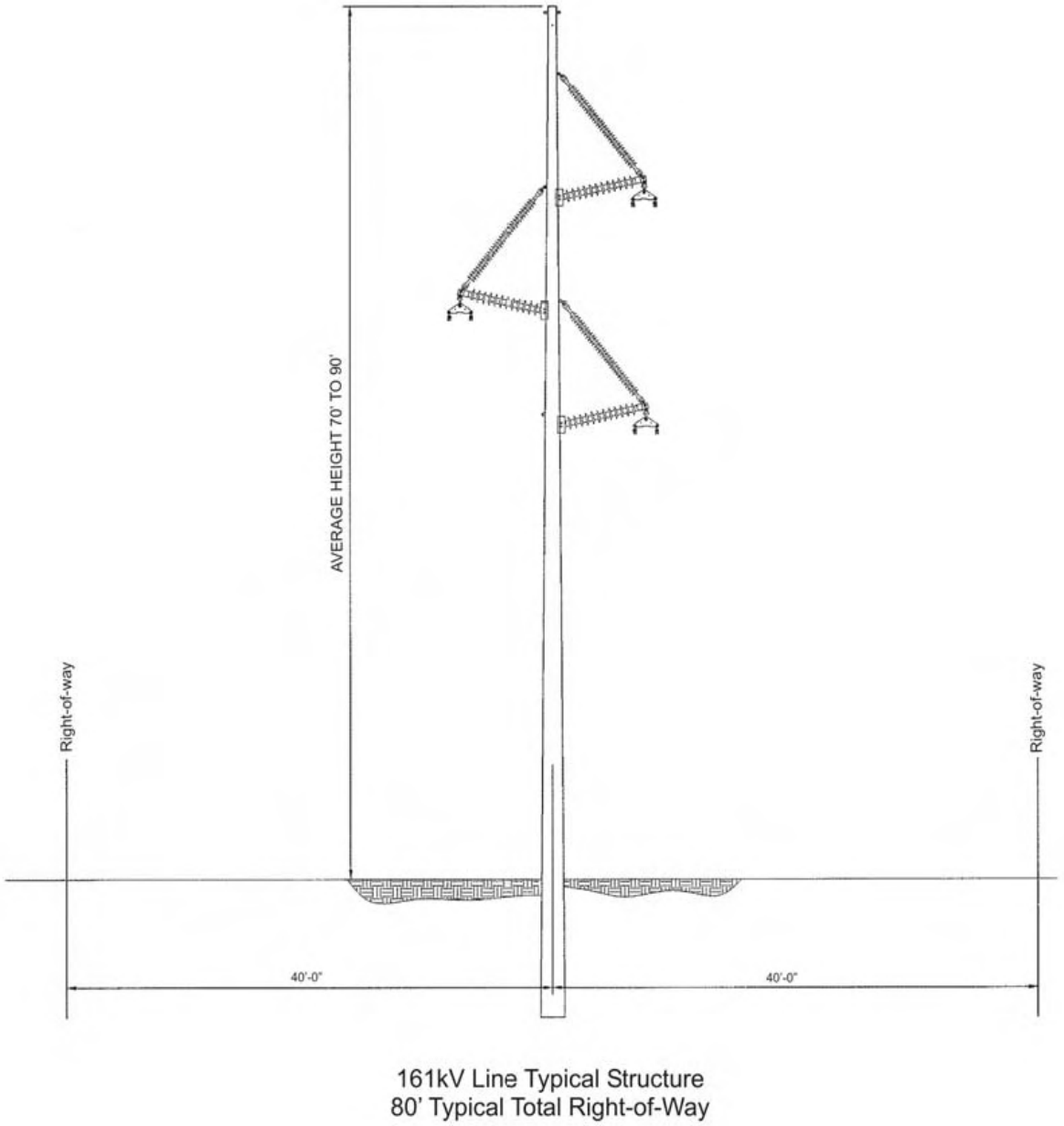
Source: Xcel Energy, 2009a

The transmission line would require an 80-foot ROW. If the transmission line is placed across private land, an easement for the entire ROW would be acquired from the affected landowner(s). The Applicant would locate the poles as close to property division lines as reasonably possible (Xcel Energy, 2009a). Figure 3-2 shows the ROW requirements for the proposed structures.

When the Project transmission line parallels other existing infrastructure ROW such as roads or other utilities, the Project ROW could overlap and share a portion of the existing ROW. In these locations, the Applicant has proposed that structures be placed on adjacent private property a few feet away from the existing ROW, reducing the size of the easement required (Xcel Energy, 2009a).

The ROW acquisition process is discussed in detail in Section 4.2

Figure 3-2: Right-of-Way Requirements



Source: Xcel Energy, 2009a

3.2. Transmission Line Conductors

The transmission line would be constructed with a single 795 kcmil 26/7 Aluminum Core Steel Supported (ACSS) conductor per phase (Xcel Energy, 2009a). A phase consists of one or more conductors made up of aluminum strands around a core of steel. To prevent damage from lightning strikes, shield wires are typically strung between structures above the phases.

3.3. Substations

Modifications at two existing substations, the Pleasant Valley Substation owned by Great River Energy and the Byron Substation owned by Southern Minnesota Municipal Power Agency (SMMPA), would be required to accommodate the new 161 kV transmission line.

3.3.1. Pleasant Valley Substation

The Pleasant Valley Substation would be modified by Great River Energy to accommodate the Project transmission line. The upgrades would include new circuit breakers for protecting the transmission line, as well as new bus work and switches to complete the connections. No additional grading work would be needed and all new equipment would be installed within the existing substation fence (Xcel Energy, 2009a).

3.3.2. Byron Substation

The Byron Substation in the city of Byron would be modified by SMMPA to accommodate the Project transmission line. Modifications to the Byron Substation would include adding a new 161 kV line terminal bay along with new associated circuit breakers, bus work, switches, and controls. All new equipment would be installed within the existing substation fence (Xcel Energy, 2009a).

4. Construction

Construction of the Project would begin following the decision of the Commission and the issuance of required permits and approvals. Prior to construction, all easement rights and ROW must be acquired and soil conditions established to finalize the construction design.

Transmission line structures would generally be designed for installation at existing grades. Typically, structure sites with 10 percent or less slope would not be graded or leveled. Sites with more than 10 percent slope would have working areas graded level or fill brought in for working pads (Xcel Energy, 2009a).

Construction of the Project would require temporary lay down and staging areas, which may be located outside the Project ROW. These areas would be used for the temporary storage of construction materials and equipment. The exact location of lay down and staging areas would be determined once the route is selected. These areas would be temporarily leased from local landowners through rental agreements and would not require permanent ROW or easement acquisition. Prior to installation, poles would be moved from the staging areas and delivered to the staked location and placed within the ROW until the structure is set. Insulators and other hardware would be attached while the pole is on the ground. The pole would be lifted, placed, and secured using a crane (Xcel Energy, 2009a).

Structures that are considered medium angle, heavy angle or dead-end structures would have drilled pier concrete foundations. These foundations would vary from 5 to 8 feet in diameter and 12 or more feet deep (Xcel Energy, 2009a). The transmission line poles would be bolted to the concrete foundation. Tangent and light angle structures may be placed on poured concrete foundations or direct embedded (Xcel Energy, 2009a). Direct embedding involves digging a hole for each pole that is partially filled with crushed rock and setting the transmission line pole on top of the rock base. The area surrounding the pole would be backfilled with rock and/or soil.

Route Alternatives 1 and 2 have been designed to span water bodies and wetlands. Due to the length of wetlands crossed by Route Alternative 3, placement of structures within or adjacent to wetlands may be necessary. Where water bodies and wetlands would be crossed by the Project, the Applicant would conduct construction over ice during winter months to the extent possible (Xcel Energy, 2009a). All vehicle and equipment fueling and lubricating would occur away from water bodies (Xcel Energy, 2009a).

Regardless of the route or technique selected, similar construction equipment would be required. Equipment that would be used for construction includes: tree removal equipment, mowers, cranes, backhoes, digger-derrick line trucks, track-mounted drill rigs, dump trucks, front end loaders, bucket trucks, bulldozers, flatbed tractor-trailers, flatbed trucks, pickup trucks, concrete trucks, and various trailers (Xcel Energy, 2009a).

4.1. Property/Right-of-Way Acquisition

The Project would require an 80-foot ROW. In locations where the transmission line structures can be placed adjacent to an existing roadway or utility, the Project would partially share the existing ROW. This would allow for a lesser width of ROW to be acquired from private landowners.

Roads that would be paralleled by the Project ROW vary in width between 22 and 32 feet. Minnesota Highway 30, which would be crossed by all three Route Alternatives and would be paralleled by Route Alternative 2 for short segment, has an existing ROW of 150 feet. County Highway 15, which would be paralleled by Route Alternative 1, has an existing ROW that varies between 100 and 120 feet. All other roadways that would be paralleled by the Project ROW have an existing ROW between 66 and 100 feet.

The acquisition of utility easement on private land consists of a multi-step process that includes examining titles, contacting owners, surveying, preparing documents and purchasing the ROW. The first step in the ROW process is to 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 and to gather information about easements, liens, restrictions, encumbrances and other conditions of record (Xcel Energy, 2009a). Owners of private land located within the desired ROW easement would be contacted by a ROW agent acting on behalf of the Applicant to discuss the land use needs specific to their parcel and any site-specific concerns of the land owner. Contact with private land owners would occur following the issuance of the Route Permit. The ROW agent would request permission to access the property to conduct a land survey and soil borings. The purpose of the survey is to identify natural features, man-made features, and elevations needed for detailed engineering design of the transmission line (Xcel Energy, 2009a).

The ROW agent conducts negotiations with the land owner to acquire easement rights to build, operate, and maintain the transmission line and associated structures. The ROW agent would offer compensation for the easement. The specific location of structures associated with the transmission line would be staked during easement negotiations. If the land owner does not agree with the easement value offered by the ROW agent, the land owner and/or the Applicant may have an appraisal made. Reimbursement for the cost of the appraisal, up to $3,000, could be awarded by the court-appointed Commissioner in the condemnation process, as stipulated in Minnesota Statutes, section 117.189.

The Applicant anticipates that land owner concerns would be addressed and an agreement reached regarding the purchase of land rights (Xcel Energy, 2009a). If an agreement cannot be reached regarding the acquisition of easement rights, the Applicant can exercise the right of eminent domain, also referred to as the condemnation process, under Minnesota Statutes, chapter 117. Under the condemnation process, the Applicant files a Petition in the district court where the property is located. The Petition would be served to all owners of the property. If granted by the courts, a three-person condemnation commission would be established to evaluate compensation for the

easement. The three-person committee would be comprised of third-party individuals familiar with real estate issues, who would view the property in question. The commission would conduct a valuation hearing, at which the property owners would be allowed to testify regarding the fair market value or the easement. Following the hearing, the commission would make an award as to the value of the property, which would be filed with the court. Each party is given a 40-day window to appeal to the district court for a jury trial.

After ROW is acquired, the ROW agent would contact all land owners to discuss the construction schedule. If personal property must be moved temporarily for the construction of the Project (e.g., property fences), the ROW agent would discuss this with the land owner.

4.2. Cleanup and Restoration

During construction, the Applicant would attempt to limit ground disturbance wherever possible (Xcel Energy, 2009a). The HVTL route permit would require the Applicant to restore the ROW following construction. This may include the replacement of personal property removed or damaged during construction, re-grading areas where fill material was used, and assisting in the reestablishment of vegetation. It is anticipated that portions of vegetation that are disturbed or removed during construction, specifically resilient species of grasses and shrubs, would naturally reestablish to pre-disturbance conditions. Areas with significant soil compaction and disturbance from construction activities would require assistance in reestablishing the vegetation stratum and controlling soil erosion (Xcel Energy, 2009a).

4.3. Damage Compensation

Following construction of the Project, the ROW agent would contact private land owners to inquire whether any damage occurred to the property during construction and what repairs may be needed. The Applicant would be responsible for restoring all areas to their original condition to the maximum extent possible. If non-repairable damage occurs to a property, the Applicant would reimburse the landowner for such damages.

4.4. Maintenance

Although the estimated service life of the Project for accounting purposes is 40 years, in practicality the Project would not have a specified service end point. The overhead transmission lines would be designed to operate indefinitely with minimal routine maintenance requirements. Transmission infrastructure has very few mechanical elements and is built to withstand weather extremes that are normally encountered, such that transmission lines rarely fail except in the case of severe weather (Xcel Energy, 2009a). If a fault is sensed on the transmission system, the transmission line would automatically be taken out of service with use of protective relaying equipment.

5. Route Alternatives to be Evaluated in the EIS

Three transmission line Route Alternatives that would connect the Pleasant Valley and Byron Substations are evaluated in the EIS. Route Alternatives 1 and 2, referred to as the Preferred Route and Alternate Route in the route permit application, respectively, were proposed by the Applicant. In addition, a Crossover Segment, proposed by the Applicant in the route permit application as a corridor to connect Route Alternatives 1 and 2 if it was determined that a route combination of Route Alternatives 1 and 2 was preferable, is evaluated in the EIS. Route Alternative 3, which would parallel an existing 345 kV transmission line that runs north to south between Route Alternatives 1 and 2, was identified as a potential Route Alternative during the scoping process. Finally, three variations to Route Alternative 1, identified in the scoping process and referred to as Segment Alternatives A, B, and C, are evaluated in the EIS.

5.1. Route Alternative 1 (Applicant's Preferred Route)

Route Alternative 1 is the westernmost Route Alternative and would be approximately 18.3 miles in length. Route Alternative 1 was designated in the route permit application as the Applicant's preferred route. The Route Alternative would be oriented in a north-south direction and cross portions of Dodge, Mower, and Olmsted counties, as shown in Figures 2 through 5.

Route Alternative 1 was designed to primarily follow existing roads. The Route Alternative would be located within or adjacent to existing road ROW for approximately 96 percent of its length (Xcel Energy, 2009a).

In the route permit application, the Applicant evaluated Route Alternative 1 as two separate segments, referred to as the southwest segment and northwest segment, with the terminus of the Crossover Segment as the dividing point between the southwest and northwest segments. The southwest segment would be approximately 9.1 miles in length and follow existing road ROW for 97 percent of its length. From the Pleasant Valley Substation, the southwest segment of Route Alternative 1 would follow 310th Street west for approximately 0.4 miles and then head north to follow Dodge County Road V and County Highway 15 for approximately 8 miles.

The northwest segment would begin at the terminus of the intersection of the southwest section with the Crossover Segment. The northwest segment would be approximately 9.2 miles in length and follow existing road ROW for approximately 95 percent of its length. From the terminus of the southwest segment, the northwest segment of Route Alternative 1 would continue north on County Highway 15 for approximately 5 miles before heading east on 650th Street for approximately 1 mile. The northwest segment would head north on 280th Avenue SW for approximately 1.7 miles before turning east to follow existing railroad ROW north of 4th Street NW for 0.4 miles and head north 0.1 miles into the Byron Substation.

If Route Alternative 1 is selected, the southern approximately 1.5 miles of transmission line would be located in close proximity to a proposed 138 kV transmission line route associated with the proposed Pleasant Valley Wind Farm. The proposed location for the 138 kV transmission line would join Route Alternative 1 near the intersection of 680th Avenue and 325th Street, south of the Mower County Line, and follow 680th Avenue south to the Pleasant Valley Substation (Pleasant Valley Wind, 2009). The 138 kV transmission line would be permitted under a Conditional Use Permit issued by Mower County. If Route Alternative 1 and the 138 kV transmission line are constructed, it could be possible to locate both transmission lines on the same structures to reduce the amount of new ROW required.

5.2. Route Alternative 2 (Applicant's Alternate Route)

Route Alternative 2 is the easternmost Route Alternative and would be approximately 18.2 miles in length. Route Alternative 2 was designated in the route permit application as the Applicant's alternate route. The Route Alternative would be oriented in a north-south direction and cross portions of Mower and Olmsted counties, as shown in Figures 2 through 5.

Route Alternative 2 was designed to primarily follow existing roads. The Route Alternative would be located within or adjacent to existing road ROW for approximately 88 percent of its length (Xcel Energy, 2009a).

In the route permit application, the Applicant evaluated Route Alternative 2 as two separate segments, referred to as the southeast segment and northeast segment, with the terminus of the Crossover Segment as the dividing point between the southeast and northeast segments. The southeast segment would be approximately 10.4 miles in length and follow existing road ROW for 97 percent of its length. From the Pleasant Valley Substation, the southeast segment of Route Alternative 2 would follow 310th Street east for approximately 2 miles and then head north to follow County Highway 10, County Highway 3, County Road 149, and 110th Avenue for approximately 8 miles.

The northeast segment would begin at the terminus of the intersection of the southeast section with the Crossover Segment. The northeast segment would be approximately 7.8 miles in length and follow existing road ROW for approximately 79 percent of its length. From the terminus of the southeast segment, the northeast segment of Route Alternative 2 would continue north on 110th Avenue to 40th Street SW. The northeast segment then turns west for 0.3 miles and north for 1.2 miles to County Highway 25. The segment would head east for 0.3 miles to 109th Avenue SW and then travel north and west to the Byron Substation.

Due to the presence of a commercial business on Route Alternative 2, south of the Byron Substation, the Applicant has requested an extended route width of 1,000 feet for the northernmost portion of the Route Alternative 2 to increase flexibility of the final alignment to avoid interference with the existing business.

5.3. Route Alternative 3 ("345" Alternative)

During the scoping process, numerous commenters requested that an alternative route be identified that would closely follow an existing 345 kV transmission line that runs north to south between the Byron and Pleasant Valley Substations. The existing 345 kV transmission line is located between Route Alternatives 1 and 2 and is located on a 150-foot wide ROW, with 75 feet of ROW extending from each side of the centerline.

A feasible alignment for Route Alternative 3, which was referred to in the Scoping Decision as the "345" Alternative, would be located to the east of the existing 345 kV transmission line, as shown in Figures 2 through 5. The Project transmission line structures could be aligned 5 feet within the existing 345 kV transmission line ROW such that the western 40 feet of Project ROW and eastern 5 feet of the Project ROW would overlap with existing ROW for the 345 kV transmission line. Placement of the Project structures within the existing 345 kV transmission line ROW would reduce the width of new ROW required to approximately 35 feet. If Route Alternative 3 were constructed, the total combined ROW of the Project and existing 345 kV transmission line would be 185 feet.

In general, the existing 345 kV transmission line is placed to the west of the property lines of private landowners. A Project alignment to the east of the 345 kV transmission line would result in the Project's poles being placed very near to property boundaries, where they exist, and limit the potential loss of land use. Additionally, it was determined that an alignment of the Project to the east of the existing 345 kV transmission line would require less tree removal than an alignment to the west of the 345 kV transmission line. As such, a feasible alignment and Project ROW to the east of the existing 345 kV transmission line is evaluated in the EIS. However, the width of the route (400 feet) would allow flexibility in placement, such that an alignment of Route Alternative 3 to the west of the 345 kV transmission line would be possible.

Due to reliability concerns, the Applicant did not include an alternative that would parallel the existing 345 kV transmission line in the route permit application. In general, reliability is reduced when two lines performing the same function are located in close proximity such that a single event could cause a simultaneous outage of both lines. The Applicant has stated that co-locating the Project on adjacent or overlapping ROW with the 345 kV transmission line would not provide separate and redundant circuits needed to increase generator outlet capacity (Xcel Energy, 2010). Under the feasible centerline alignment evaluated for Route Alternative 3, Project conductors would be approximately 36 feet from existing conductors on the 345 kV transmission line. This would be a similar, albeit greater, distance than the Project and existing 345 kV conductors under a double-circuiting scenario, in which conductors would be approximately 30 feet apart (Xcel Energy, 2010). An alternative that would double-circuit the Project 161 kV transmission line with the existing 345 kV transmission line was determined not to meet the stated need of the Project and is discussed further in Section 7.

Although the Applicant has expressed reliability concerns over co-locating the Project's 161 kV transmission line with the existing 345 kV transmission line on overlapping ROW, the Project and existing 345 kV transmission line would serve different purposes. The stated need of the Project is to provide generator outlet from the Pleasant Valley Substation Area. The Project was not proposed to provide reliability or redundancy to the existing 345 kV transmission line. Further, the Project's 161 kV transmission line would not be able to physically serve as full back-up of the 345 kV transmission line if the 345 kV transmission line segment between the Pleasant Valley and Byron Substations is lost. The Project could assist in handling a loss of the 345 kV segment, but could not fully carry the current from the 345 kV transmission line without some loss of load or generation re-dispatch. As such, the Project would not be a redundant substitute to the existing 345 kV transmission line and co-location of the transmission lines on overlapping ROW would not violate any NERC Reliability Standards. Additionally, due to the distance between the transmission line structures under the feasible ROW evaluated for Route Alternative 3, a pole from either the Project or existing 345 kV transmission line would have a greater than 180 degree fall angle. This would reduce the probability of one pole falling and taking out a pole associated with the other transmission line. Placement of the Project 161 kV transmission line on separate structures and overlapping ROW with the existing 345 kV transmission line would not violate NERC Standard TPL-003-0a (Category C).

5.4. Crossover Segment

The Crossover Segment, also referred to in the route permit application as the "connector segment," is an approximately 2 mile segment that would connect Route Alternative 1 with Route Alternative 2. Use of the Crossover Segment would allow the permitted route to be a combination of the southwest segment of Route Alternative 1 and northeast segment of Route Alternative 2 or northwest segment of Route Alternative 1 and southeast segment of Route Alternative 2. The total length of the Project transmission line with use of the Crossover Segment would be approximately 2 miles longer than either Route Alternative 1 or Route Alternative 2.

The Crossover Segment would follow an existing ROW for a 69 kV transmission line owned by People's Cooperative Services. The Segment follows 700th Street in Dodge County, which becomes 60th Street SW in Olmsted County. The Crossover Segment would follow existing road and transmission line ROW for its entire length.

5.5. Alternative Segment A

Segment Alternative A was proposed during the scoping process as a variation to Route Alternative 1 (the Applicant's Preferred Route) that would avoid an agri-tourism business located on 19th Avenue SW and a location identified as a potential site for a future U.S. 14 interchange west of the city of Byron. Potential impacts to the agri-business and U.S. 14 are discussed in Sections 6.3.3 and 6.3.6, respectively. Use of Segment Alternative A as a variation of Route Alternative 1 would avoid placement of

the Project structures within 300 feet of five residences located along Route Alternative 1. Three residences are located within 300 feet of the potential centerline for Segment Alternative A.

From the Byron Substation, Segment Alternative A would head south adjacent to the existing 345 kV transmission line for approximately 1.85 miles. At 10th Street SW, the Segment Alternative would travel west for approximately 0.5 miles and re-join Route Alternative 1 for the remaining distance to the Pleasant Valley Substation. The total length of Segment Alternative A would be approximately 2.36 miles and the total acreage within the ROW would be approximately 22.84 acres. Use of Alternative Segment A in association with Route Alternative 1 would result in approximately the same total length as Route Alternative 1 without the use of Segment Alternatives. The route width would allow for an alignment of Segment Alternative A to the east or west of the existing 345 kV transmission line and north or south of 10th Street SW.

5.6. Alternative Segment B

Segment Alternative B was proposed during the scoping process as a variation to Route Alternative 1 that would avoid residences located on County Highway 15 between County Highway 6 and 650th Street. Use of Segment Alternative B as a variation of Route Alternative 1 would avoid placement of the Project structures within 300 feet of six residences located along Route Alternative 1. However, up to seven residences could be located within 300 feet of the centerline of Segment Alternative B, depending on the alignment of the transmission line.

Use of Segment Alternative B would avoid a location on Route Alternative 1 south of the intersection of County Highway 15 and 660th Street where a residence and adjacent shed located across County Highway 15 are each located within 40 feet of the roadway ROW on either side of the road, such that placement of the transmission line on either side of County Highway 15 could require removal of a building. However, the feasible centerline developed by the Applicant would cross County Highway 15 at an angle in the location described, such that the Project ROW would be centered over County Highway 15 during the crossing and existing structures could remain in place. Alternatively, the Project could be aligned on the east side of County Highway 15 and the Applicant could reimburse the landowner for moving the shed outside the Project ROW.

Segment Alternative B would begin at the intersection of 280th Avenue and 650th Street, where Route Alternative 1 would head west along 650th Street after travelling south out of the Byron Substation. Segment Alternative B would continue to follow 280th Avenue south for approximately 2 miles and turn west to follow County Highway 8 for approximately 1 mile to rejoin Route Alternative 1 at the intersection of County Highway 8 and County Highway 15. The total length of Segment Alternative B would be approximately 2.99 miles and the total acreage within the ROW would be approximately 29.04 acres. Use of Alternative Segment B in association with Route

Alternative 1 would result in approximately the same total length as Route Alternative 1 without the use of Segment Alternatives.

5.7. Alternative Segment C

Segment Alternative C was proposed during the scoping process as a variation to Route Alternative 1 that would co-locate the Project's crossing of Salem Creek with an existing crossing by a 345 kV transmission line. The cleared ROW for the existing 345 kV transmission line is 150 feet wide, with 75 feet extending in each direction of the centerline. Similar to Route Alternative 3, the Project transmission line structures could be aligned 5 feet within the existing 345 kV transmission line ROW and the western 40 feet of Project ROW and eastern 5 feet of Project ROW would overlap with existing ROW for the 345 kV line. Placement of the Project structures within the existing 345 kV transmission line ROW would reduce the width of new ROW required in the vicinity of the Salem Creek crossing to approximately 35 feet.

Segment Alternative C was proposed as a variation to Route Alternative 1, which would cross Salem Creek in the same location as an existing crossing of County Highway 15. Depending on final engineering design selected to cross Salem Creek, the Project structures along Route Alternative 1 could be placed at the edge of the roadway ROW such that half of the Project ROW (40 feet) would overlap with the existing roadway ROW and the width of new ROW required would be approximately 40 feet.

Segment Alternative C would begin at the intersection of 280th Avenue and 650th Street, where Route Alternative 1 would head west along 650th Street after travelling south out of the Byron Substation. Segment Alternative C would continue to follow 280th Avenue south for approximately 1.4 miles and turn east to follow County Highway 25 for approximately 0.55 miles to the existing 345 kV transmission line and Route Alternative 3 alignment. South of the Salem Creek crossing, the route would either follow Route Alternative 3 to the Pleasant Valley Substation or re-join Route Alternatives 1 or 2 through use of the Crossover Segment. If Segment Alternative C continued south along Route Alternative 3, the route would overlap the existing 345 kV transmission line ROW for a total of approximately 13 miles.

The total length of Segment Alternative C would be approximately 1.98 miles and the total acreage within the ROW would be approximately 19.24 acres. Compared with Route Alternative 1, use of Alternative Segment C in association with Route Alternative 3 would decrease the length of the Project transmission line by approximately 1 mile.

6. Affected Environment, Impacts, and Mitigation

This chapter describes the human, environmental, and socioeconomic setting as it relates to the Project Route Alternatives. Alternatives to the Project are discussed in Chapter 7. The Study Area is defined as the 400-foot route width for each Route and Segment Alternative, which is expanded to 1,000 feet for the northernmost portion of Route Alternative 2. Typically, the direct and indirect effects discussion is limited to the 80-foot wide Project right-of-way (ROW), unless otherwise noted. The mitigation discussions include Applicant-proposed and additional mitigation strategies to reduce or avoid impacts of the Project.

6.1. Human Settlement

The Project has the potential to affect various resources related to human settlement in the Study Area. Potential effects related to proximity to structures, aesthetics, noise, interference with public services and utilities, archaeological and historic resources, and safety and health are addressed in this section.

6.1.1. Proximity to Residential Structures

Rural residences and farmsteads are located along the roads that the Route Alternatives would parallel, with a higher density of residences near the city of Byron. To compare the Route Alternatives, residences in the Study Area were identified, and the number of residences within 100 feet, 101 - 200 feet, and 201 - 300 feet of the feasible centerline for each Route and Segment Alternative was tabulated. Due to the potential for the final permitted route to incorporate portions of Route Alternatives 1 and 2 through use of the Crossover Segment, residential counts for these Route Alternatives were divided into southwest and northwest segments (Route Alternative 1) and northeast and southeast segments (Route Alternative 2). This information is presented in Table 6.1.1-1.

Table 6.1.1-1 Number of Residences within 300 Feet of the Project Centerlines

Route	Segment	Residences within 100 Feet	Residences within 101-200 Feet	Residences within 201-300 Feet	Total Residences within 300 Feet
Route Alternative 1	SW	0	4	6	10
	NW	1	7	7	15
	Total	1	11	13	25
Route Alternative 2	NE	0	8	3	11
	SE	0	6	9	15
	Total	0	14	12	26
Route Alternative 3	---	0	0	4	4
Crossover Segment	---	0	1	2	3
Segment Alternative A	---	1	2	0	3
Segment Alternative B	---	1	3	3	7
Segment Alternative C	---	1	5	2	8

Source: Xcel Energy, 2009a.

As shown in Table 6.1.1-1, 25 and 26 residences are present within 300 feet of the feasible centerline alignments evaluated for Route Alternatives 1 and 2, respectively. Four houses are located within 300 feet of the feasible alignment centerline evaluated for Route Alternative 3. Three houses are located within 300 feet of the feasible alignment centerline evaluated for the Crossover Segment (Xcel Energy, 2009a). Residences are located a minimum of 3,100 feet to the northwest of the Pleasant Valley Substation and 580 feet to the south of the Byron Substation (Xcel Energy, 2009a).

A review of aerial photography indicated that few businesses outside of farming are located within the Study Area. The closest schools are located within the city of Byron and are over one-half mile from the substation. The nearest public school, Byron Middle School, is located on 4th Street Northwest, approximately 0.6 miles east of the Byron Substation. The East St. Olaf Cemetery is located approximately 0.96 miles east of Route Alternative 2 on County Highway 3. No religious facilities, nurseries/preschools, or hospitals are located within the Route and Segment Alternatives.

Direct and Indirect Impacts – Proximity to Residential Structures

Potential direct effects to properties that are located in proximity to transmission line towers include the following:

- Required demolition of existing structures for placement of Project structures; and
- Changes or limitation to existing land use.

Potential indirect effects on these properties include impacts to the following:

- Health and safety (e.g., stray voltage, electro-magnetic fields, and interference with existing utilities);
- Aesthetics;
- Noise;
- Socioeconomics; and
- Property Values.

Potential indirect impacts related to structure proximity are addressed in the respective sections of the EIS, and as such, are not presented in this evaluation.

Required Demolition of Existing Structures

The National Electric Safety Code (NESC) and Xcel Energy standards require certain clearances between transmission line facilities and buildings for safe operation of the transmission line. Therefore, the Applicant would acquire a ROW for transmission lines that is sufficient to maintain these clearances (Xcel Energy, 2009a). For the Project, the Applicant has requested a total ROW width of 80 feet, with 40 feet extending from each side of the centerline.

While displacement or demolition would occur if an existing structure is located within the ROW for a new transmission facility, the Applicant has identified a feasible centerline and ROW for each Route Alternative such that all existing residences would be outside the ROW and no demolition of residences or displacement of residents would be required (Xcel Energy, 2009a).

Use of Segment Alternative B would avoid a location on Route Alternative 1 south of the intersection of County Highway 15 and 660th Street where a residence and adjacent shed are located across County Highway 15 from one another. In this location, both the shed and residence are located within 40 feet of the roadway ROW on either side of the road, such that placement of the transmission line on either side of County Highway 15 could require removal of a building. However, the feasible centerline developed by the Application would cross County Highway 15 at an angle in the location described, such that the Project ROW would be centered over County Highway 15 during the crossing and existing structures could remain in place. Alternatively, the Project could be aligned on the east side of County Highway 15 and the Applicant could reimburse the landowner for moving the shed outside the Project ROW.

Use of Segment Alternative B as a variation of Route Alternative 1 would avoid placement of the Project structures within 300 feet of six residences located along Route Alternative 1. However, up to seven residences could be located within 300 feet of the centerline of Segment Alternative B, depending on the alignment of the transmission line.

Changes or Limitation to Existing Land Use
While some land may be removed from agricultural use for the construction and operation of the transmission line, the overall zoning and land use designations would not be altered. However, if an easement is needed, some land may not be fully utilized for its intended purpose. Potential loss of land use is further discussed in Section 6.3.4, Zoning and Compatibility with Planning.

Mitigation – Proximity to Residential Structures

In order to mitigate effects to structures located near or within the Project ROW, the Applicant refined the routes to avoid the following to the extent possible:

- Existing or planned residences;
- Areas where clearances are limited because of trees or nearby structures; and
- Agricultural areas, agricultural operations, or other related land uses (Xcel Energy, 2009a).

Where possible, during detailed design, the Project transmission lines would be placed on the opposite side of the road from residences to further mitigate potential effects on structures within or near the ROW (Xcel Energy, 2009a). Proper safeguards also would be implemented for construction and operation of the facility. The Project would be designed in compliance with local, state, NESC, and Xcel Energy standards for clearance

to ground, crossing utilities and buildings, strength of materials, and ROW widths (Xcel Energy, 2009a).

The proposed transmission lines would be equipped with protective devices (circuit breakers and relays located in the substation where the transmission lines terminate) to safeguard the public if an accident were to occur, such as a structure or conductor falling to the ground (Xcel Energy, 2009a). The protective equipment would de-energize the transmission line.

6.1.2. Aesthetics

The Study Area consists primarily of agricultural land with areas of limited residential development. Southern Minnesota is recognized for the rural lifestyles and values associated with the various farming communities in Dodge, Mower, and Olmsted counties. As indicated in Section 6.3.4, Zoning and Compatibility, many of the comprehensive and land use plans for these communities focus on maintaining these qualities and balancing agricultural conservation and new development.

While much of the Study Area is located on agricultural lands, the area also is crossed by transportation and utility corridors including a 69 kV line owned by Peoples Cooperative; 69 kV and 161 kV lines owned by Southern Minnesota Municipal Power Agency; a 161 kV line owned by Great River Energy; and a 345 kV line owned by Xcel Energy (Xcel Energy, 2009a). Existing transmission lines in the vicinity of the Study Area are shown in Figure 1. Although these corridors have already created a visual impact, the Project's transmission lines and structures would contrast with the existing landscape creating an additional, incremental visual impact.

Direct and Indirect Impacts - Aesthetics

Potential temporary and long-term direct impacts from the Project include the following:

- Disruption to the existing landscape from the addition of transmission lines;
- Loss of trees; and
- Devaluation of high-value or sensitive scenic resources.

Temporary indirect impacts primarily are associated with construction. For example, construction of the transmission line could create visual impacts due to the presence of equipment, the creation of staging areas, and the installation of the structures and lines. These impacts may disrupt a generally passive experience felt by residents and visitors in the rural areas of the Study Area.

More long-term indirect impacts would be associated with the placement of the poles and the potential loss of trees and agricultural land, and as a result, the sentiments associated with these resources. The long-term indirect impacts likely would occur once the transmission line and substations were in operation.

Minimal direct and indirect impacts are anticipated in the locations of the substations, as the modifications would be conducted within the existing fenced areas. Activities associated with the modifications would be consistent with the overall industrial atmosphere, albeit noticeable to some existing users.

Casual, Interested/Participant, and Residential Viewers
The construction of an overhead transmission line involves tall, man-made structures (i.e., the poles and wires) that can be seen from varying distances depending on the surrounding landscape and topography of an area. The presence of these facilities can detract from the visual landscape and overall character of a particular geographic location. The measure of an aesthetic impact, however, largely is dependent on the perception or response of an individual viewer. In general, aesthetic value relies on human perception and how each person visually sees or understands his or her surroundings. The presence of natural and man-made resources can contribute to the overall visual character and feel of a location.

An individual viewer's sensitivity typically relates to his or her concern for a particular viewshed. In this manner, the following three types of viewers may experience potential impacts within the Study Area:

- Casual Viewer – Drivers in automobiles viewing transmission lines from the perspective of the roads as they travel.
- Interested/Participant Viewer – Recreational users, such as bird watchers, hikers, hunters, and other individuals whose activity is related to the geographic location and who are sensitive to its physical characteristics. These viewers would be sensitive to man-made structures and their impact on the natural environment.
- Resident – Residential viewers, who own property within 300 feet of the transmission lines, and are concerned about the structures and how they impact the view of the natural/rural environment (Wenck Associates, Inc., 2010).

The impacts associated with the aesthetic appeal within the Study Area are evaluated with respect to these types of viewers.

Disruption to the Existing Landscape from the Addition of Transmission Lines
As indicated in Section 4, structures proposed for the Project would be Core 10 (weathering-steel). The single-circuit brace poles would be 70 to 90 feet in height. The span range for the poles would be 400 to 650 feet (Xcel Energy, 2009a). The use of the poles and wires would create a permanent vertical intrusion in a landscape dominated by agricultural fields. Rural landscapes generally consist of farmsteads, silos, barns, pasture, and/or fenced areas. These structures tend to be clustered and setback from a roadway or utility line. For this reason, the poles and wires would be more noticeable as opposed to those located in urban environments where the scale and density of buildings tends to be larger.

The overall placement of transmission lines and poles would likely have a greater impact to the residential viewer as compared to the casual and interested/participant viewer. The Project would be more permanent and in constant view to a residential view, whereas a casual and interested participant viewer would only be subject to the viewshed for limited times. The total number of residences that would be visually impacted by the Project would depend on the selected route, topography, and existing vegetation. As shown in Table 6.1.1-1, 25 and 26 residences are present within 300 feet of the feasible centerline alignment for Route Alternatives 1 and 2, respectively. In contrast, only four houses are located within 300 feet of the feasible centerline alignment for Route Alternative 3.

The initial impact likely would be perceived as greater than the impacts over time, as the first change in the landscape/setting would be more apparent. As time progresses, the steel poles would weather and blend more into the surroundings. It is possible that the different viewers would become more accustomed to the presence of the structures.

Loss of Trees
Trees in the Study Area are generally found in windbreaks associated with residences (Xcel Energy, 2009a). In areas where trees would be removed, the transmission lines and poles would be visible to resident and interested/participant viewers.

The addition of transmission lines would add a vertical component to the existing landscape, while at the same time vegetative cover that typically would shield the infrastructure would be removed in some locations along the route alignment to allow for the placement of the poles and wires. With the removal of trees, open space would take on a disturbed/developed appearance in areas where trees were removed, as opposed to the agricultural setting associated with this rural environment.

Tree removal could be necessary near residences at 10 locations along Route Alternative 1, at seven locations along Route Alternative 2, and at one location along the Crossover Segment (Xcel Energy, 2009a). No residences are located within 200 feet of the centerline evaluated for Route Alternative 3; as such, minimal to no residential tree removal is anticipated. Where possible, tree impacts may be minimized by moving the transmission line to the opposite side of the road to avoid residences (Xcel Energy, 2009a).

Devaluation of High-Value or Sensitive Scenic Resources
High value and/or sensitive scenic resources include both natural and man-made resources. These may include forests, lakes and rivers, parks, and trails. These resources can be appreciated for their visual qualities or the feelings associated with the experiences of the users.

No federal or state forests are located within the Study Area, and no natural lakes are present within the Study Area; however, some wooded areas are present along streams and agricultural windbreaks, with occasional small wooded uplands present (Xcel Energy, 2009a). The area surrounding Salem Creek is one of the more densely wooded

areas within the Study Area. All Route Alternatives would require a single crossing of Salem Creek. Of the three Route Alternatives, Route Alternative 1 would likely require the least tree removal at the Salem Creek crossing to the narrower width of the valley in which Salem Creek is located. Route Alternative 3 would cross Salem Creek near an existing 345 kV transmission line crossing of the creek; users of the creek in this location would be accustomed to the visual intrusion of utility poles and lines. Route Alternative 1 would cross Salem Creek near an existing County Highway 15 crossing of the creek. Addition of the Project structures would introduce a vertical intrusion in this location. Segment Alternative C would result in the crossing of Salem Creek in the location described for Route Alternative 3 to minimize the number of locations of utility crossings. Route Alternative 2 would cross Salem Creek in a previously undisturbed area, which would result in the addition of a man-made visual intrusion and clearing of a new corridor through a forested valley.

The visual and aesthetic quality that currently is felt by existing users would be impacted along open portions of these wooded spaces as users would be subject to the views of the construction activities. All three types of viewers would be impacted to a similar degree. These settings often provide a sense of calm and serenity, as well as an association with nature. These sentiments may be interrupted by the presence of heavy machinery and workers, although for only a short time, for the duration of construction.

During operation, indirect impacts associated with the Project would consist of a disruption to environments associated with a rural lifestyle and the serenity of the wooded areas. To the interested/participant and resident viewers, these areas would no longer be entirely rural in nature and could have a more industrial or developed feel. Consequently, sentiments associated with these places would be impacted.

Mitigation - Aesthetics

The transmission lines would be visible by some residents located near the Project ROW. However, the Applicant has stated that the Route Alternatives were developed to maximize the use of existing corridors and avoid residences to the extent possible (Xcel Energy, 2009a). To further mitigate visual impacts, the Applicant could place the transmission poles and wires in a manner to minimize direct impacts (e.g. avoid placing transmission structures directly in front of a building). Where feasible, the location of pole structures, ROW, and other disturbed areas could be determined by considering input from property owners to minimize visual impacts.

To minimize impacts to trees, removal could be limited to only those trees located within the ROW that would affect the safe operation of the transmission line.

Landscaping also could be used to diffuse the effects of the power lines within and adjacent to the ROW in order to help screen the lines from residences. Screening can enhance the overall quality of a ROW by creating the perception that the poles and wires have receded into the distance. Low growing vegetation could be placed within the ROW along with larger vegetative species near the edges (Holisko, 2008).

6.1.3. Noise

Noise is typically defined as "unwanted sound." It can be as minor as a small nuisance or severe enough to inhibit communication, affect behavior, and cause temporary or permanent hearing loss.

Noise is measured in units called decibels (dB). Because human hearing is not equally sensitive to all frequencies of sound, certain frequencies are given more "weight." The A-weighted decibel (dBA) scale corresponds to the sensitivity range for human hearing. Thus, noise levels capable of being heard by humans are measured in dBA. Typically, a noise level change of 3 dBA is barely perceptible to average human hearing. A 10 dBA change in noise levels is in effect perceived as a doubling (for an increase) or halving (for a decrease) of noise loudness.

Noise levels also vary depending upon the distance from a point or stationary source. In general, for every doubling of the distance from the stationary source of noise, the sound level decreases by 6 decibels. For straight line sources such as highways, the sound level decreases by 3 decibels for every doubling of distance from the source of the sound. Table 6.1.3-1 provides the approximate decibel levels for some common noise sources. Existing background noise levels in urban residential areas, such as the northern portion of the Study Area near the city of Byron, are typically in the range of 45-55 dBA. Along the busier city streets and highways, sound levels can be in the 55-75 dBA range. Existing background noise levels would be much lower for rural, agricultural areas.

Table 6.1.3-1: Common Noise Sources and Levels

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

Source: Rau and Wooten, 1980

The Minnesota noise regulations are administered by the Minnesota Pollution Control Agency (MPCA) under Minnesota Rule 7030.0050. This Rule lists activity categories according to a Noise Area Classification (NAC). NAC 1 refers typically refers to areas such as schools, residences, churches, hotels, and correctional institutions. NAC 2 refers to railroad and airport terminal, retail and commercial business areas, while NAC 3 refers to locations at or near highways, industrial facilities, amusement parks, and forestry related activities.

Table 6.1.3-2 identifies the established noise standards for daytime (7:00 a.m. to 10:00 p.m.) and nighttime (10:00 p.m. to 7:00 a.m.) for each classification. The standards are expressed as a range of dBA within a one hour period; L_{50} is the dBA that is exceeded 50 percent of the time within an hour, while L_{10} is the dBA that is exceeded 10 percent of the time within the hour.

Table 6.1.3-2: MPCA Noise Standards (dBA – Decibel, A-weighted)

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

Source: MPCA, 2008

Direct and Indirect Impacts - Noise

Due to the similarity in length and design of the Route Alternatives, there would be no significant differences in the duration or level of noise emitted from each Route Alternative during construction or operation of the Project. As such, the effects discussed apply equally to all Route and Segment Alternatives.

Noise generated by construction equipment would likely constitute the greatest noise impact as a result of the Project. Earth moving machinery including bulldozers, front-end loaders, and other supporting equipment such as air compressors, cranes, and concrete mixers, would generate temporary noise when in operation.

Operational noise impacts could potentially occur along the transmission line. Transmission conductors could produce audible noise levels depending upon weather conditions and their design (e.g., conductor conditions and voltage levels). In damp, rainy, or snowy weather conditions, power lines typically emit a subtle crackling sound due to the small amount of electricity ionizing the moist air near the wires (Xcel Energy, 2009a). At times of heavy rain, the audible noise of the transmission line more than doubles when the conductor is wet. However, the sound made by heavy rain would be greater than that produced by the transmission line.

The audible noise levels of a transmission line also depend significantly upon the line's geometry and operating voltage. The audible noise of a 161 kV line during fair weather would likely be very low and seldom noticeable, even when standing directly under the line.

The Applicant has predicted that the L_5 and L_{50} level of noise measured at the edge of the ROW would be 35.0 and 31.5 dBA, respectively. These estimates were calculated by the Applicant using transmission line noise level algorithms developed by the Bonneville Power Administration. The predicted noise levels are below the lowest MPCA nighttime L_{50} limit of 50 dBA for Noise Area Classification 1.

An increase in operational noise could occur at the Byron and Pleasant Valley Substations with the addition of transformer equipment. For the Pleasant Valley Substation, the nearest residence is located 3,100 feet northwest of the site. For the Byron Substation, the nearest residence is located 580 feet to the south of the site.

Mitigation - Noise

The Applicant intends to design the substation equipment to attenuate noise to levels below the MPCA noise limits at the nearest receptors (Xcel Energy, 2009a). As such, no additional noise mitigation measures are warranted for the substation modifications.

For the transmission lines, the audible noise levels are expected to be below all MPCA noise area classifications outside of the ROW. Therefore, no additional mitigation is required.

For noise generated during construction, the Applicant would be required by state regulation to adhere to local ordinances dictating when noise can be generated (e.g., daytime only) from construction–related activities. It is expected that noise from construction would be intermittent and temporary in nature.

6.1.4. Interference with Utility Systems and Public Services

Utility Systems and Public Services in the Study Area include AM and FM radio; television; global positioning systems (GPS); existing utilities; cellular signals; and emergency service providers (e.g., "911" and emergency management systems (EMS)).

Communications networks in the Study Area were identified through a search of current antenna licenses with the Federal Communication Commission (FCC). Existing transmission lines in the Study Area were identified by the Applicant in the route permit application, and verified through observations.

Communication networks in the Study Area rely on omnidirectional and unidirectional signals. Omnidirectional antennae transmit or receive signals in any direction at the same time. Radio, television, cellular phone, and wireless internet signals are typically omnidirectional. Unidirectional signals, such as microwave signals, transmit or receive signals in a single direction.

Based on a review of FCC databases, no AM broadcasting towers, FM broadcasting towers, TV stations, ASR towers, or broadcast microwave pathways were identified

within the Study Area, which is defined as the 400-foot wide route width for each Route and Segment Alternative. One AM radio broadcast antenna and five FM radio broadcast antenna located within a 15 km (9.32 miles) radius of the city of Byron were identified on the FCC database (FCC, 2010). One television broadcast antenna is registered within a 15 km radius of the city of Byron (FCC, 2010). GPS units and two-way communication devices may also be used by residents, visitors, and emergency personnel in the Study Area.

Emergency service providers that would respond to an emergency in the Study Area are located within the city of Byron and the city of Kasson, MN (approximately 4 miles west of the city of Byron). The Byron City Fire Hall is located on Frontage Road Northwest, approximately 0.7 miles east, north-east of Route Alternative 2.

Existing utilities within the Study Area include power lines, telephone lines, and fiber optic cables. Natural gas pipelines are located within the Study Area, and the potential for interference on pipelines from the Project are discussed in Section 6.1.6, Safety and Health. A 69 kV line owned by Peoples Cooperative, 69 kV and 161 kV lines owned by Southern Minnesota Municipal Power Agency, a 161 kV line owned by Great River Energy, and a 345 kV line owned by Xcel Energy are present in the Study Area (Xcel Energy, 2009a), as shown on Figure 1. Landlines provide telephone service for the Study Area, and are installed both underground and on existing overhead transmission and distribution line structures.

Direct and Indirect Impacts – Interference with Utility Systems and Public Services

The Project could cause interference with utility systems and public services, resulting in a temporary suspension or change of quality in services.

Radio and Television Signals

Transmission lines have the potential to interfere with existing utilities through corona and gap discharges. Corona is a phenomenon associated with energized transmission lines. Under certain conditions, the localized electric field near an energized conductor can be sufficiently concentrated to produce a tiny electric discharge that can ionize air close to the conductors. This partial discharge of electrical energy is called corona discharge or corona (Electric Power Research Institute, 1982 as cited in PG and E, 2005). Several factors, including conductor voltage, shape and diameter, and surface irregularities, such as scratches, nicks, dust, or water drops, can affect a conductor's electrical surface gradient and its corona performance (PG and E, 2005).

Corona from transmission lines could generate electromagnetic signals in the same frequencies as those used for radio and television signals, depending on the frequency and strength of the radio and television signal. Corona discharges cause short pulses of voltage and current to be propagated along the transmission line, resulting in radio frequency noise in the vicinity of the line (PG and E, 2005).

In addition to corona, gap discharges also may be present. These types of discharges could occur "at locations where tiny electrical separations (gaps) develop between mechanically connected metal parts. A small, electric spark discharge across the gap can create unwanted electrical noise" (PG and E, 2005). Generally, interference due to gap discharges is less frequent for high voltage transmission lines than lower voltage lines (PG and E, 2005). Interference issues from transmission lines generally could be corrected by tightening any loose or separated parts on the transmission lines (BPA, 2002 and Xcel Energy, 2009a).

Interference also depends on the weather conditions. In humid conditions, corona is higher than it would be in dry weather. Under ideal conditions, the conductor cables would be free of corona discharges; protrusions, such as water droplets on the cable, enhance the electric field in the vicinity of the droplet to a size where corona could become present (Straumann and Fan, 2009).

AM radio reception (in broadcast bands 535 to 1605 kilohertz (kHz)) interference typically is stronger if a radio unit and/or antenna is located beneath the transmission line and dissipates rapidly within the ROW to either side of the transmission line. Modifying a radio antenna and/or relocating a radio unit (i.e., away from a transmission line and away from a metallic tower-type structure) are simple ways to restore AM reception on a device that originally had good reception prior to the interference (Xcel Energy, 2009a). FM radio reception is rarely affected by the presence of transmission lines. Since corona generated radio frequency noise currents decrease in magnitude as frequency increases, the effects of corona are quite small in a FM broadcast band (88-108 Megahetz). In addition, FM radio systems have inherent excellent interference rejection properties (Xcel Energy, 2009a).

Television signals are rarely affected by corona interference. However, some interference may be possible, if a shadow effect is created when a large transmission structure is aligned between a receiver and a weak signal (Xcel Energy, 2009a). Digital signals are more tolerant of electric interference. Interference with television reception can be corrected by several methods including adjusting the television antenna, installing a remote antenna, and installing a translator (Xcel Energy, 2009a).

Global Positioning Systems (GPS) Signals
GPS collects and coordinates data from at least four satellites at any one time. As such, constellation, positioning of the four satellites, and signal strength are the most important factors that decide accuracy of the GPS. In 2002, the Institute of Electronics and Electrical Engineers (IEEE) conducted a series of experiments to observe if overhead transmission lines interfere with the GPS function. One of the tests utilized a Trimble GPS receiver near a 345 kV line to determine if corona noise and gap discharge could affect the "lock" a receiver had on the satellite constellation above. The results from this experiment by IEEE are as follows:

- Generally, GPS function is very minimally affected by transmission line electromagnetic interference (EMI).

- Interference that is caused could be either due to corona noise or gap discharges.
- Rarely, transmission structure may cause a drop in accuracy due to blocking a view of at least one of the satellites from GPS. However, corona noise and gap discharges do not cause loss of a satellite signal "lock" (IEEE, 2002 as cited in Minnkota Power Cooperative, Inc., n.d.).

Based on this research, GPS signals very rarely experience interference from overhead transmission lines. On rare occasions, a transmission line structure may cause a drop in accuracy within a GPS device due to blocking a view to one satellite, but this would only occur if the receiver, tower, and satellite are in a line, which is rare. Typically, if there is any EMI present, proper GPS function is usually restored in minutes (IEEE, 2002 as cited in Minnkota Power Cooperative, Inc., n.d.).

Cellular Signals and Wireless Internet
Cell phones and wireless internet devices operate at an ultra-high frequency (UHF). In general, as frequency increases, radio frequency noise decreases. Radio frequency noise is generally not existent in the UHF range. High voltage transmission lines are not known to cause interference in cellular phone and wireless internet function.

Emergency Service Providers
Emergency service providers, such as police/fire ("911" calls) or emergency medical systems (EMS) could experience interference with two-way radio systems. These systems rely on omnidirectional signals; as such, potential interference from transmission lines would be similar to that described above for radios. A two-way radio user may experience interference when located adjacent to or behind a large metallic structure such as a steel transmission line pole. Movement away from the structure would eliminate interference; generally, movement of less than 50 feet from the structure is required to avoid interference (Xcel Energy, 2009a).

Existing Utilities
Modern telephone lines and other communication circuits are typically well shielded to prevent potential interference from transmission lines. When landlines parallel transmission lines for long distances, inductive coupling (i.e., coupling between the energized source and electrical equipment) could occur. The induced voltage of the landline could be avoided by increasing the distance between parallel transmission lines and landlines, as well as electrical shielding of the line (NYRI, 2008).

Existing overhead distribution lines are located within the feasible ROWs evaluated for Route Alternatives 1 and 2. Route Alternative 3 would parallel an existing 345 kV transmission line for its entire length. Distribution lines located within the route selected would either be double-circuited with the Project, placed underground, or located on the opposite side of the street as the Project transmission line structures (Xcel Energy, 2009a). During construction, existing distribution and transmission lines may be taken out of service temporarily.

Mitigation - Interference with Utility Systems and Public Services

The Project would be constructed to comply with NESC standards (Xcel Energy, 2009a). No large scale adverse effects of the Project on utility systems are expected.

If radio or television interference occurs because of the Project, the Applicant has stated a commitment to work with the affected customer to restore reception to pre-Project quality (Xcel Energy, 2009a).

Any planned service disruptions to electric utility services that are necessary during construction activities could be scheduled with the affected owners of the existing transmission and distribution lines in accordance with reliability standards. Advanced scheduling of these disruptions would allow for alternative arrangements for electrical service to be made when possible and to allow for customers to be notified in advance. Furthermore, utility repair crews could be present or on-call during construction activities to respond to any unplanned incidents that may result in an interruption to electric service.

6.1.5. Archaeological and Historic Resources

For the evaluation of archaeological and historic resources, the Study Area is defined as the 400-foot wide route identified for each Route Alternative and a 0.5 mile buffer around each of the 70 to 90-foot tall transmission poles.

Cultural resources include material remains of past human activities, both prehistoric and historic. Cultural resources management seeks to identify and protect all of these types of cultural resources with the goals of enhancing understanding of human behavior and protecting cultural practices.

A historic property is defined through the National Historic Preservation Act (NHPA) of 1966. The NHPA defines a historic property as follows:

> *…any Pre-European contact or historic district, site, building, structure, or object included in, or eligible for listing on the National Register, including artifacts, records, and material remains related to such a property or resource* (46 CFR 800, as amended 2006, Title III, Section 301, #5).

Protection is also afforded to historic properties by the Minnesota Historic Sites Act (Statute 138.661 – 138.6691). The State of Minnesota maintains a state register of historic places in order to preserve the historical values of the state. Historic properties selected for inclusion in the state register of historic places are based on the same criteria as historic properties selected for inclusion on the National Register of Historic Places (NRHP). These criteria are defined by the U.S. Department of the Interior, National Park Service, and are listed below.

- Historic places that are associated with events that have made a significant contribution to the broad patterns of our history;

- That are associated with the lives of significant persons in our past;
- That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
- That has yielded or may be likely to yield, information important in history or prehistory.

If a direct or indirect effect on an historic property is identified, consulting parties must agree on whether the effect is adverse. If an effect is adverse, either avoidance of the effect or mitigation for the effect is required under NHPA.

The Study Area was evaluated in a records search and review of existing records contained at the Minnesota State Historic Preservation Office (SHPO) conducted in 2008 by 10,000 Lakes Archaeology, Inc. The records search was conducted to determine if significant archaeological, architectural, or tribal resources have been documented within the Study Area. Both archaeological and historic sites were documented within 0.5 miles of each of the Route Alternatives, as discussed below. Archaeological and historic sites within the Study Area are shown in Figure 6.

Route Alternative 1
The records search of existing cultural resources identified three previously recorded archaeological sites and nine historic structures within 0.5 mile of Route Alternative 1 (Xcel Energy, 2009a). Table 6.1.5-1 identifies these archaeological and historic sites.

Table 6.1.5-1: Route Alternative 1 Archaeological and Historic Sites

Site Number	Site Type	Location
ARCHAEOLOGICAL SITES		
21DO0003	Lithic Scatter	T105 R16 S12
21DOae	Sacred Cultural Property	T104 R15
21OL0034	Lithic Scatter	T104 R15 S6
HISTORIC SITES		
DO-CAN-001	Ole Carlson House	T106 R16 S25
DO-CAN-002	George W. Gleason Farmstead	T106 R16 S13
DO-CAN-003	Charles Van Allen House	T106 R16 S14
DO-CAN-004	School	T106 R16 S26
DO-CAN-005	School	T106 R16 S12
DO-VRN-0011	Bridge	T105 R16 S23
DO-VRN-0012	School	T105 R16 S12
DO-VRN-0013	Bridge No. 6746	T105 R16 S24
DO-VRN-0014	Bridge No. 89136	T105 R16 S23

Route Alternative 2
The records search of existing cultural resources identified one previously recorded archaeological site and three historic structures within 0.5 mile of Route Alternative 2 (Xcel Energy, 2009a). Table 6.1.5-2 identifies these archaeological and historic sites.

Table 6.1.5-2: Route Alternative 2 Archaeological and Historic Sites

Site Number	Site Type	Location
ARCHAEOLOGICAL SITES		
21OL0020	Artifact Scatter	T106 R15 S20
HISTORIC SITES		
OL-SLM-002	Log House	T106 R15 S7
OL-SLM-008	Bridge No. 55510	T106 R15 S19
OL-HFT-003	Bridge No. L6150	T104 R15 S5

In addition, there are two non-registered historic structures within 0.5 mile of Route Alternative 2 (Xcel Energy, 2009a).

Route Alternative 3
The records search of existing cultural resources identified two previously recorded archaeological sites and three historic structures within 0.5 mile of Route Alternative 3 (Xcel Energy, 2009a). Table 6.1.5-3 identifies these archaeological and historic sites.

Table 6.1.5-3: Route Alternative 3 Archaeological and Historic Sites

Site Number	Site Type	Location
ARCHAEOLOGICAL SITES		
21DOae	Sacred Cultural Property	T104 R15
21OL0034	Lithic Scatter	T104 R15 S6
HISTORIC SITES		
DO-VRN-0013	Bridge No. 6746	T105 R16 S24
OL-SLM-002	Log House	T106 R15 S7
OL-SLM-008	Bridge No. 55510	T106 R15 S19

In addition, there is one non-registered historic structure within 0.5 mile of Route Alternative 3 (Xcel Energy, 2009a).

Direct and Indirect Impacts – Archaeological and Historic Resources

Disruption or damage to existing archaeological resources not yet identified could occur during ground clearing and excavation for Project structures. The potential for unrecorded archaeological sites would be higher in areas not previously disturbed and where archaeological potential is typically high, such as near lake and river crossings.

Although extensive landscaping and contouring are not planned, possible impacts to archaeological resources that would apply to all of the Routes and Segment Alternatives include the following:

- Subsurface excavations necessary to install structures;
- Disturbance to surface soils from heavy construction vehicle equipment operation;
- Disturbance to surface soils from dragging heavy objects (e.g., transmission line poles); and/or
- Disturbance to surface soils through grubbing, stump removal, and grading.

Since the substation modification construction activities involve no additional grading and all new equipment will be installed within the existing substations fence, it is expected that these activities will not affect archaeological sites.

Indirect effects from the Project on historic buildings and other historic structures may include a change in the historic viewshed to or from historic structures, which has the potential to affect the setting and feeling of historic structures or alter landscapes. Potential effects of the Project on aesthetics are further discussed in Section 6.1.2. During construction, noise and dust in the vicinity of historic properties could temporarily alter the experience of visitors. Route Alternative 1 has a greater number of archaeological and historical sites than Route Alternatives 2 or 3, and would result in a greater occurrence of indirect effects.

The substation modifications are not expected to alter the viewshed to or from historic structures because of the nature of the modifications.

Mitigation – Archaeological and Historic Resources

The Applicant commissioned a Phase 1A Background Research for the Project, which was conducted by 10,000 Lakes Archaeology, Inc. The Phase 1A Background Research report provided recommendations for treatment of cultural resources identified and not yet identified within the vicinity of the Study Area that may be impacted by the Project. These recommendations were based on the results of the records search, historic map review, and the location of the Project in relation to areas that have a high potential for archaeological sites. The recommendations are provided as follows:

- For archaeological resources, 10,000 Lakes Archaeology recommended archaeological investigations be conducted to determine if cultural resources are located within the Project corridor (Gronhovd, 2008). Initial archaeological investigations could consist of a Phase 1 survey, which would focus on areas with high to moderate potential for archaeological sites and areas where the Project would impact the ground surface.

- For historic structures, 10,000 Lakes Archaeology recommended further investigations (Gronhovd, 2008), which could include field examination, archival research, local history and historic map review, and public record review. This research would help determine if the structures and landscapes retain historic significance, and if the Project would have an impact on historic resources deemed significant.

The Applicant has stated that if an artifact is discovered during construction, consultation would be conducted with the SHPO to determine whether or not the resource would be eligible for listing in the NRHP (Xcel Energy, 2009a). The Applicant has proposed to conduct Phase I or Phase II surveys if a potentially eligible artifact is discovered and cannot be spanned (Xcel Energy, 2009a).

Any archaeological sites identified by investigation or during Project construction could be avoided through flexibility in siting of the Project structures and ROW. If sites are not avoidable, they should be evaluated for significance and potential listing, and subsequent mitigation performed as needed. Potential visual impacts to the viewshed to/from historic sites could be reduced through coordinating pole placement with the land owner(s) and other interested parties.

6.1.6. Safety and Health

The following five sources of potential safety and health impacts from construction and operation of the Project and are evaluated in the EIS: Electric and Magnetic Fields (EMFs); Interference with Implantable Medical Devices; Stray Voltage; Interference with Natural Gas Pipelines; and Interference with Motorists.

Electric and Magnetic Fields (EMF)

EMFs are invisible regions of force resulting from the presence of electricity. Naturally occurring EMFs are caused by the earth's weather and geomagnetic field. Man-made EMFs are caused from electrical devices and found wherever people use electricity. EMFs are characterized and distinguished by their frequencies, which is measured by the rate at which the fields change direction each second. All power lines within the United States have a frequency equivalent to 60 cycles per second, defined as 60 Hertz (Hz). EMFs at this frequency level and within the range of 3 - 3,000 Hz are considered to be Extremely Low Frequency (ELF) EMFs.

Electric fields are created by the electric charge (i.e., voltage) on a conductor (e.g., a transmission line). Electric fields are solely dependent upon the voltage of a conductor, not the actual flow of electricity (i.e., current). Electric field strength is measured in kilovolts per meter (kV/m). The strength of an electric field decreases rapidly as the distance from the source increases. Electric fields are easily shielded or weakened by most objects and material, such as trees, buildings, and even human skin.

Although there is no federal regulation, the Minnesota PUC has imposed a permit condition of 8 kV/m for the maximum electric field for previously permitted high voltage transmission lines (HVTLs) (measured at centerline and at 1 meter above ground). In addition to Minnesota, six other states have state-specific regulations for the maximum electric field of a transmission line, as shown in Table 6.1.6-1.

Table 6.1.6-1: State-Specific Standards for Electric Fields

State	Maximum Electric Field (kV/m)	Notes
California	---	No kV/m standard; however, a setback distance of 100 ft is required between new schools and the edge of HVTL ROWs for lines between 50 and 133 kV
Florida	8	Applies to HVTL between 69 and 230 kV
Minnesota	**8**	
Montana	7	
Oregon	9	
New Jersey	7	Standard applies to highway crossings
New York	7 - 11.8	A standard of 7 kV/m applies to highway crossings; a standard of 11 kV/m applies to private road crossings; the maximum electric field for all locations is 11.8 kV/m

Source: California Electric and Magnetic Fields Program, 2000.

Magnetic fields are created by and are solely dependent upon the electrical current in a conductor. Magnetic field strength is measured in milliGauss (mG). Similar to electric fields, the strength of a magnetic field decreases rapidly as the distance from the source increases. However, unlike electric fields, magnetic fields are not easily shielded or weakened by objects or materials.

There are no federal or Minnesota regulations for the permitted strength of a magnetic field from a transmission line. Only Florida, Massachusetts, and New York have state regulations for the permitted strength of a magnetic field from a transmission line, which are set at 150 mG, 85 mG, and 200 mG, respectively, for transmission lines less than 230 kV in size. A number of international health and safety organizations have developed guidelines for EMF exposure, which are shown in Table 6.1.6-2.

Table 6.1.6-2: International Guidelines and Standards for EMF

Regulating Body	Maximum Electric Field (kV/m)	Maximum Magnetic Field (mG)	Notes
American Conference of Governmental and Industrial Hygienists (ACGIH)	25	10,000	Occupational standard for general worker
International Commission on Non-Ionizing Radiation Protection (ICNIRP)	4.2	833	General public continuous exposure
Non-Ionizing Radiation Committee of the American Industrial Hygiene Association	---	4,170	
Institute of Electrical and Electronics Engineers (IEEE) Standard C95.6	5	9.040	General public continuous exposure
UK, National Radiological Protection Board (NRPB)	12	833	General public continuous exposure
Australian Radiation Protection and Nuclear Safety Agency (ARPANSA)	---	3,000	

Source: EPRI, 2003; Union of the Electric Industry – EUROELECTRIC, 2003.

Health Studies

A common concern related to EMFs is the potential for human exposure to EMFs to result in adverse health effects. Studies on whether or not EMFs are associated with adverse health effects have been conducted by numerous organizations including the National Institute of Environmental Health Sciences (NIEHS), the US Environmental Protection Agency (USEPA), the World Health Organization (WHO), and the Minnesota State Interagency Working Group (MSIWG).

In 1992, the US Congress authorized the Electric and Magnetic Fields Research and Public Information Dissemination Program (EMF-RAPID Program) in the Energy Policy Act. The Congress instructed NIEHS, National Institute of Health, and the US Department of Energy (DOE) to direct and manage a program of research and analysis aimed at providing scientific evidence to clarify the potential for health risks from exposure to ELF-EMFs (NIEHS, 1999). The EMF-Rapid Program provided the following conclusions to Congress on May 4, 1999:

- *The scientific evidence suggesting that ELF-EMF exposures pose any health risk is weak.*
- *Epidemiological studies have serious limitations in their ability to demonstrate a cause and effect relationship whereas laboratory studies, by design, can clearly show that cause and effect are possible. Virtually all of the laboratory evidence in animals and humans and most of the mechanistic work done in cells fail to support a causal relationship between exposure to ELF-EMF at environmental levels and changes in biological function or disease status. The lack of consistent positive findings in animal or mechanistic studies weakens the belief that this association is actually due to ELF-EMFs, but it cannot completely discount the epidemiological findings.*
- *The NIEHS concludes that ELF-EMF exposure cannot be recognized as entirely safe because of weak scientific evidence that exposure may pose a leukemia hazard. In our opinion, this finding is insufficient to warrant aggressive regulatory concern. However, because virtually everyone in the United States uses electricity and therefore is routinely exposed to ELF-EMF, passive regulatory action is warranted such as a continued emphasis on educating both the public and the regulated community on means aimed at reducing exposures. The NIEHS does not believe that other cancers or non-cancer health outcomes provide sufficient evidence of a risk to currently warrant concern* (NIEHS, 1999).

The USEPA states the following viewpoint of the associated health effects of EMFs on its website:

> *Much of the research about power lines and potential health effects is inconclusive. Despite more than two decades of research to determine whether elevated EMF exposure, principally due to magnetic fields, is related to an increased risk of childhood leukemia, there is still no definitive answer. The general scientific consensus is that, thus far, the evidence available is weak and is not sufficient to establish a definitive cause-effect relationship* (USEPA: *Electric and Magnetic Fields (EMF) Radiation from Power Lines*, 2010).

The WHO states the following viewpoint of the associate health effects of EMFs on its website:

> *Based on a recent in-depth review of the scientific literature, the WHO concluded that current evidence does not confirm the existence of any health consequences from exposure to low level electromagnetic fields. However, some gaps in knowledge about biological effects exist and need further research* (WHO, 2010).

In September of 2002, the MSIWG on EMF Issues, published "A White Paper on Electric and Magnetic Field (EMF) Policy and Mitigation Options," referred to as the "White Paper." The MSIWG was formed to examine the potential health impacts of EMFs and to provide useful, science-based information to policy makers in Minnesota. Work Group members included representatives from the Department of Commerce, the Department of Health, the Pollution Control Agency, the Public Utilities Commission, and the Environmental Quality Board (MSIWG, 2002). The White Paper concluded the following findings:

- *Some epidemiological results do show a weak but consistent association between childhood leukemia and increasing exposure to EMF (see the conclusion of IARC and NIEHS). However, epidemiological studies alone are considered insufficient for concluding that a cause and effect relationship exists, and the association must be supported by data from laboratory studies. Existing laboratory studies have not substantiated this relationship (see NTP, 1999; Takebe et al., 2001), nor have scientists been able to understand the biological mechanism of how EMF could cause adverse effects. In addition, epidemiological studies of various other diseases, in both children and adults, have failed to show any consistent pattern of harm from EMF.*
- *The Minnesota Department of Health concludes that the current body of evidence is insufficient to establish a cause and effect relationship between EMF and adverse health effects. However, as with many other environmental health issues, the possibility of a health risk from EMF cannot be dismissed. Construction of new generation and transmission facilities to meet increasing electrical needs in the State is likely to increase exposure to EMF and public concern regarding potential adverse health effects.*
- *Based upon its review, the Work Group believes the most appropriate public health policy is to take a prudent avoidance approach to regulating EMF. Based upon this approach, policy recommendations of the Work Group include:*
    - *Apply low-cost EMF mitigation options in electric infrastructure construction projects;*
    - *Encourage conservation;*
    - *Encourage distributed generation;*
    - *Continue to monitor EMF research;*
    - *Encourage utilities to work with customers on household EMF issues; and*
    - *Provide public education on EMF issues* (MSIWG, 2002).

Continued Research

It is important to note that although expert panels and agencies, such as the ones discussed above, have not yet identified any viable cause and effect relationships between exposure to EMFs and adverse health effects, alternative hypotheses have existed and continue to be researched.

For example, Dr. David O. Carpenter, during the recent public hearing proceedings for the proposed 345 kV transmission line from Brookings County, South Dakota to Hampton, Minnesota, provided pre-filed direct testimony regarding his findings on health effects associated with EMF. Dr. Carpenter is a public health physician and Director of the Institute for Health and the Environment at the University of Albany, SUNY. He researched and wrote a document titled, *Setting Prudent Public Health Policy for Electromagnetic Field Exposures*. Carpenter concludes "there is strong scientific evidence that exposure to magnetic fields from power lines greater than 4 mG is associated with an elevated risk of childhood leukemia" and that some studies have indicated that there is scientific evidence to suggest that exposures above 2 mG could increase leukemia risks. Carpenter goes on to suggest that "lifetime exposure to magnetic fields in excess of 2 mG is associated with an increased risk of neurodegenerative diseases in adults, including Alzheimer's disease and amyotrophic lateral sclerosis (ALS)." (Carpenter, 2008)

Additionally, during his recent testimony on the proposed 345 kV HVTL in response to whether EMF similar to power line exposure can affect biological tissue, he states the following (Carpenter, 2010):

> *Any one of these actions* [actions that alter cell tissue] *might be responsible for the carcinogenic and/or neurodegenerative actions of EMFs. As with many environmental agents, however, assuming that only one mechanism of action exists would be a mistake, particularly where more than one disease is involved. It is more likely that multiple mechanisms of action would contribute to disease.*

Interference from Implantable Medical Devices

Research has established that electric fields can potentially interfere with implantable medical devices, such as cardiac pacemakers and implantable cardioverter defibrillators (ICDs). This interference, referred to as Electromagnetic Interference (EMI), can cause inappropriate triggering of a device or inhibit the device from responding appropriately (PSCW, 2010). Medtronic and Guidant, manufacturers of various implantable medical devices, have indicated that electric fields below 6 kV/m are unlikely to cause interactions affecting operation of most of their devices. Medtronic recommends an exposure threshold of 1.0 Gauss (G) for magnetic fields and a 2 to 3 foot distance from the implantable medical device to HVTLs for every 10,000 volts for electric fields (PSCW, 2001).

Stray Voltage

Stray voltage is a condition that can occur at the electric service entrances to structures from distribution lines. More precisely, stray voltage is a voltage that exists between the neutral wire of the service entrance and grounded objects in buildings. 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 and immediately under the transmission line.

Interference with Natural Gas Pipelines
The presence of a high voltage transmission line near a natural gas pipeline could result in conductance or voltage induction. Electrical conductance would be caused by direct contact between a transmission line and pipeline or ground fault conditions (Bonds, 1999). Voltage induction would occur where there is extended or close paralleling of a transmission line and pipeline, and there is phase imbalance in the pipeline. The likelihood of this type of interference is dependent on the operating current of the transmission line, coating of the pipeline, and length of pipeline and transmission line that be located parallel to one another.

If these electrical interference effects are great enough during normal operation, then a potential shock hazard exists for anyone that touches an above-ground part of the pipeline, such as a valve or cathodic protection test station. In addition, during normal operation, if the induced AC current density at a flaw in the pipeline coating is great enough, AC pipeline corrosion may occur.

Although low in probability, a simultaneous leak on a pipeline and fault on a transmission line could result in ignition if a transmission line is not located at a minimum safe distance from natural gas pipelines. In the event of a natural gas leak from a pipeline, natural gas could accumulate in a plume before the leak is detected by the pipeline sensor and the associated pipeline compressor station shut down. If the plume of natural gas is located at the transmission line before being dissipated into the atmosphere and a fault occurs on the transmission line, the natural gas plume could ignite. To result in ignition, a gas leak would need to occur and a plume form before the pipeline sensor shut down at the compressor station. A fault would need to occur on the transmission line in the location of the natural gas plume before the natural gas dissipated into the atmosphere. The probability of all events occurring simultaneously and resulting in ignition would be extremely low. Ignition could also occur if natural gas is released from a pressure relief valve located at a pipeline compressor station.

Generally, the ROW for transmission lines and pipelines do not overlap because of the clearance and safety criteria for each utility. The potential exists for damage to occur to underground pipelines during excavation and grading activity. Use of the Gopher One-Call system to identify existing utilities during construction and sub-surface maintenance of foundations would avoid impacts to underground pipelines and any associated distribution lines. If buried pipelines are crossed by heavy equipment, use of matting on access roads would help protect the pipeline from damage caused by heavy loads.

Interference with Motorists
Depending on the design of roadways and ROW requirements, transmission line ROW could overlap existing roadway ROW. This would allow for a lesser width of easement required from private landowners along the required ROW. The route width would allow flexibility in the alignment of the transmission line such that roadways could be crossed in order to avoid certain sensitive resources. The transmission line would be designed in accordance with National Electrical Safety Code (NESC) standards, which

establish clearances required between transmission lines and transportation structures (e.g., roadways, driveways, and cultivated fields with tractor use) and tree lines. These clearances are designed to accommodate a relative vehicle height of 14 feet, such that vehicle use could safety occur beneath the transmission line (Xcel Energy, 2009a).

When a metal object, such as a vehicle, is in close proximity to a transmission line, the HVTL can induce a voltage on the object. If the object is touched by a person, the built-up electric charge on the object could discharge through the person to the ground, resulting in a mild shock. The NESC requires that any discharge from a metal object as a result of a transmission line be less than 5 milliamperes (mA).

Direct and Indirect Impacts – Safety and Health

Due to the similarity in length and design of the Route Alternatives, there would be no significant differences in direct and indirect effects on safety and health from each Route Alternative during construction or operation of the Project. As such, the effects discussed apply equally to all Route and Segment Alternatives.

Electric and Magnetic Fields

A viable cause and effect relationship between the exposure to EMFs and adverse health effects has not been established. The calculated electric fields for the Project at 1 meter (approximately 3.28 feet) above ground are displayed in Table 6.1.6-3. Estimates of the anticipated strength of the magnetic field associated with the Project routes are displayed in Table 6.1.6-4.

The maximum electric field associated with the Project (1.46 kV/m) would be significantly less than the maximum limit of 8 kV/m, which would be a permit condition imposed by the PUC.

The maximum calculated peak magnetic field strength at 1 meter aboveground would be 53.43 mG. The Commission does not impose permit conditions that limit magnetic field strength.

Table 6.1.6-3: Calculated Electric Fields (kV/m) for the Project (1 meter above ground)

Structure Type	Maximum Operating Voltage (kV)	Minnesota Standard (kV/m)	Distance to Purposed Centerline of Transmission Line Structure										
			-300'	-200'	-100'	-50'	-25'	0'	25'	50'	100'	200'	300'
Braced Post 161 kV Steel Pole Single Circuit	169	8	0.01	0.02	0.09	0.39	0.85	1.46	1.02	0.33	0.10	0.02	0.01

Source: Xcel Energy, 2009a

Table 6.1.6-4: Calculated Magnetic Flux Density (milligauss) for the Project (1 meter above ground)

Structure Type	System Condition	Current (Amps)	Distance to Proposed Centerline of Transmission Line Structure										
			-300'	-200'	-100'	-50'	-25'	0'	25'	50'	100'	200'	300'
Single Circuit 161 kV Line	Peak	402	0.44	1.02	3.93	12.69	28.64	53.43	33.95	14.82	4.54	1.22	0.56
	Average	241	0.27	0.61	2.36	7.61	17.17	32.03	20.35	8.88	2.72	0.73	0.34

Source: Xcel Energy, 2009a

Implantable Medical Devices
EMFs may cause EMI with implantable medical devices. This interference disrupts the cardiac device's ability to sense normal electrical activity in the heart. Although most modern cardiac devices are less susceptible to effects from EMFs due to engineering design, older designs can still be affected. In the event that a cardiac device is impacted, the effect is typically a temporary asynchronous pacing (i.e., fixed rate pacing) and the device would return to its normal operation when the person moves away from the source of EMFs (PSCW, 2010).

The Project's maximum calculated electric field at 1 meter above the ground would be 1.46 kV/m and would occur directly under the centerline of the transmission line. For all distances from the centerline, the calculated electric fields would be below the common manufacturer guideline of 6 kV/m for avoiding EMI.

Stray Voltage
Stray voltage safety concerns are primarily associated with distribution lines. Stray voltage is not identified as a safety concern associated with the Project; however, since transmission lines can induce stray voltage on distribution circuits that are parallel and immediately under a transmission line, mitigation measures may be necessary if the Project transmission line parallels or crosses distribution lines. Each of the Project Route Alternatives would require crossing and paralleling distribution lines. Stray voltage is often not noticeable to humans, but may be felt by an animal (PSCW, 2010).

The Applicant would address stray voltage issues on a case by case basis (Xcel Energy, 2009a). The three primary methods to reduce or eliminate stray voltage are cancellation, separation, and enhanced grounding. Cancellation entails the arranging of transmission line phase conductors in a configuration to minimize EMF levels, bonding distribution neutral and transmission shield wires together, and bonding an under-built transmission shield wire to distribution neutral wires rather than a normal overhead shield wire. Separation entails increasing the distance between transmission and distribution lines through re-locating distribution lines underground, placing the transmission line on the opposite side of the road as existing distribution lines, or increasing the vertical distance between the transmission line phase conductor and under-built distribution line. Enhanced grounding would reduce stray voltage potential through connecting counterpoises to the distribution neutral wire and/or transmission shield wire.

Interference with Natural Gas Pipelines
Route Alternative 1 would parallel an existing natural gas pipeline for approximately 1 mile. The existing pipeline follows 680th Avenue from a location approximately 1,000 feet north of 330th Street to approximately 1,000 feet south of 325th Street. Computer modeling of potential AC interference effects on the natural gas pipeline would be necessary prior to installing and energizing the Project transmission line.

Although low in probability, a simultaneous leak on a pipeline and fault on the transmission line could result in ignition if the Project is not located at a minimum safe distance from natural gas pipelines. The National Association of Corrosion Engineers (NACE) develops standards to ensure pipeline safety and integrity. The NACE standards do not specify a safe separation distance between a pipeline and transmission line, but require analysis to determine the safe separation distance. In Canada, the separation distance between a pipeline and transmission line must be 10 meters (approximately 30 feet) or greater. The 10-meter separation would prevent arcing from the transmission line to the pipeline. Depending on the fault current level, the soil resistivity in the area of the fault, and mitigation measures, a pipeline and transmission line could potentially be located within less than 10 meters of each other and comply with all NACE standards. The 400-foot route width would allow for flexibility in transmission line alignment and ROW placement to avoid interference with existing natural gas lines.

The potential exists for damage to occur to underground pipelines during excavation and grading activity. Use of the Gopher One-Call system to identify existing utilities during construction, including pipelines and any associated distribution lines, would reduce the likelihood of potential damage. If punctured, a release from a natural gas line could occur.

Interference with Motorists
The potential impacts of the Project on transportation are discussed further in Section 6.3.6. In locations where the Project would parallel existing roadways, the Project ROW could overlap the existing roadway ROW. However, structures would not be placed within the curb line of existing roadways, and as such would not restrict traffic flow or present a hazard to motorists during operation. Because Project structures would be placed at the edge of the existing roadway ROW, structures would be a distance from the curb line or edge of the road and potential collision with structures would be low.

If a vehicle is parked beneath the transmission line, the line could induce a voltage on the vehicle. When the vehicle is touched by touched by a person, a mild shock could result as the induced voltage discharges through the person to the ground. The Applicant has stated that the discharge from a mobile vehicle (e.g., car, truck, bus, or farm equipment) beneath the transmission line would be less than the 5 mA limit required by NESC (Xcel Energy, 2009a). If necessary, the Applicant would ground other large metal objects (e.g., fences) in proximity to the Project to ensure that the NESC limit is not exceeded (Xcel Energy, 2009a).

Mitigation – Safety and Health

Potential effects of the Project on safety and health would be avoided through adherence to industry design standards and compliance with federal regulations, including NESC standards.

No conclusive health or safety concerns have been identified with EMF exposure, although potential health and safety effects would be minimized through maximizing the distance between the transmission line and residences.

Significant impacts from stray voltage are not anticipated from the Project. However, the Applicant would address stray voltage issues on a case by case basis (Xcel Energy, 2009a). The three primary methods to reduce or eliminate stray voltage are cancellation, separation, and enhanced grounding. The specific techniques used to address stray voltage would depend on the Route Alternative selected and whether existing distribution lines are buried underground, located on the opposite side of the street as the Project structures, or re-located to the Project structures as under-built lines.

The 400-foot route width would allow for flexibility in transmission line alignment and ROW placement to maximize the distance from residential homes and avoid interference with existing natural gas lines and roadways.

If Route Alternative 1 is selected, computer modeling of potential AC interference effects on the existing natural gas pipeline would be necessary prior to installing and energizing the Project transmission line. Use of the Gopher One-Call system to identify existing utilities during construction, including pipelines and any associated distribution lines, would reduce the likelihood of potential damage. If buried pipelines are crossed by heavy equipment, use of matting on access roads would help protect the pipeline from damage caused by heavy loads.

6.2. Environmental Setting

The Project has the potential to affect various resources related to the environmental setting in the Study Area. Potential effects related to air quality, soil and geology, water resources, wetlands, flora, fauna, rare and unique resources/critical habitat are addressed in this section.

6.2.1. Air Quality

Pursuant to the requirements of the 1990 Clean Air Act (CAA), the United States Environmental Protection Agency (USEPA) was mandated with setting National Ambient Air Quality Standards (NAAQS) for pollutants that are considered harmful to public health and the environment. The USEPA's Office of Air Quality Planning and Standards (OAQPS) subsequently set the standards for six principal pollutants, which are called criteria pollutants. These pollutants are sulfur dioxide (SO_2), nitrogen dioxide (NO_2), particulate matter ($PM_{10}/PM_{2.5}$), ozone (O_3), carbon monoxide (CO), and lead (Pb). The original CAA established two types of national air quality standards (see Table 6.2.1-1). Primary standards set limits to protect public health, including the health of "sensitive" populations such as asthmatics, children, and the elderly. Secondary standards set limits to protect public welfare, including protection against decreased visibility, damage to animals, crops, vegetation, and buildings. These standards are mathematically defined using both parts per million (ppm) by volume and micrograms per cubic meter of air ($\mu g/m^3$) (USEPA, 2010a).

The MPCA operates a network of 54 air quality monitoring sites throughout the state, with the nearest air monitoring site to the Study Area located approximately 10 miles east in Rochester. The air quality data collected from these monitors are analyzed to determine compliance with the NAAQS locally, regionally, and statewide. As reported in the MPCA Annual Air Monitoring Network Plan for the State of Minnesota (MPCA, 2010), the entire state of Minnesota, including the Study Area, has been in compliance with the NAAQS for all criteria pollutants since 2002.

Table 6.2.2-1 National Ambient Air Quality Standards

Averaging		NAAQS	
Emission Type	**Period**	**Primary µ/m³ (ppm)**	**Secondary µ/m³ (ppm)**
Carbon Monoxide (CO)	8-hour [a]	10,000 (9)	--
	1-hour [a]	40,000 (35)	--
Sulfur Dioxide (SO_2)	Annual	80 (0.03)	--
	24-hour [a]	365 (0.14)	--
	3-hour [a]	--	1,300 (0.5)
	1-hour [d]	(.075)	--
Nitrogen Dioxide (NO_2)	Annual	100 (0.05)	Same as Primary
	1-hour [f]	(.100)	--
Ozone (O_3)	8-hour [b]	(.075)	Same as Primary
PM_{10}	Annual [g]	50	Same as Primary
	24-hour [a]	150	Same as Primary
$PM_{2.5}$[d]	Annual [c]	15	--
	24-hour	35	--
Lead (Pb) [e]	Rolling 3-Month Average	0.15	--

Source: EPA, National Primary and Secondary Ambient Air Quality Standards (40 CFR 50).
Notes:
a. Not to exceed more than once per year, per monitor location, averaged over a three year period.
b. As of May 27, 2008, the 8-hour ozone standard is met if the 3-year average of the fourth highest 8-hour ozone concentration at each monitor is not greater than 0.075 ppm.
c. Spatial average standard, applied by EPA over a neighborhood scale.
d. 1-hour SO_2 standard based on 3-year average of the 99th percentile of the annual distribution of daily maximums.
e. The final rule for new lead standard was signed on October 15, 2008
f. 1-hour NO_2 standard based on 3-year average of the 98th percentile of the annual distribution of daily maximums.
g. Standard is only a Minnesota standard.

Direct and Indirect Impacts – Air Quality

Potential impacts from the Project include changes in air quality and contribution to climate change through the loss of carbon sequestration potential. Due to the similarity in length, anticipated construction duration, and design of the Route Alternatives, there would be no significant differences in direct and indirect effects on air quality or climate from each Route Alternative during construction or operation of the Project. As such, the effects discussed apply equally to all Route and Segment Alternatives.

Air Quality Impacts during Construction

Constriction activity would result in air emissions from heavy equipment. Emissions from machinery and vehicle can potentially include particulates, hydrocarbons, sulfur oxides, nitrogen oxides, and carbon monoxide. Additionally, as a consequence of earth moving activity and travel on roads, dust (i.e., particulates) could re-entrain into the ambient air and transport or deposit downwind.

Air Quality Impacts during Operation

During operation of the Project, the transmission line may result in the formation of ozone and to a lesser extent nitrogen oxides due to corona at transmission line

conductors. Corona consists of the breakdown or ionization of air within a few centimeters or less of the conductors. It usually occurs when the electric field intensity, or surface gradient, on the conductor exceeds the breakdown strength of air. Usually some imperfection, such as a scratch on the conductor or a water droplet, is necessary to cause corona (Xcel Energy, 2009a).

The production rate of ozone is typically directly proportional to temperature and sunlight, and inversely proportional to humidity. Humidity (or moisture), the same factor that usually increases corona discharges from transmission lines, inhibits the production of ozone (Xcel Energy, 2009a). Typically, the greatest amount of ozone formation would only be detected during heavy corona in foul weather, often a time with low background ozone levels. Studies of monitored concentrations of ozone due to transmission line corona show no significant incremental ozone concentrations at ground level, and minimal (0.001 to 0.008 ppm) concentrations at an elevation nearer to the transmission line. Additional testing showed that production of nitrogen oxides due to corona would be approximately one-fourth of the production of ozone due to corona. Relative to the NAAQS, increased concentrations of ozone due to corona would likely be on the order of one–hundredth to one-tenth of the standard near the elevated transmission line, and would be insignificant temporally and spatially.

Climate Impacts

Carbon dioxide (CO_2) is the most abundant greenhouse gas in the atmosphere. Plant life, particularly trees, is highly efficient at absorbing CO_2 and converting it to oxygen. Permanent removal of tree and vegetation as a result of the construction related activities and operation of the Project could potentially decrease the level of carbon sequestration in the Study Area. However, the removal of vegetation is expected to be minimal and would be off-set by the Applicant's restoration of cleared vegetation following construction. Additionally, the Project would allow for more use of wind generation sources, resulting in reduced greenhouse gas emission potential from baseload power generation facilities.

No long-term air quality or climate impacts are expected from the Project.

Mitigation – Air Quality

During construction of the transmission lines, emissions from vehicles and other equipment, and fugitive dust from earth moving activities are expected to occur, but these activities will be temporary, intermittent, and vary in location such that air quality impacts overall are expected to be minimal (Xcel Energy, 2009a).

Ensuring that all vehicles are well maintained would reduce potential impacts from use of construction vehicles. Limiting idle times and performing shutdowns of equipment when not in use could also be practiced. Temporary impacts from fugitive dust could be minimized or avoided by engaging in procedures to control dust during construction of the Project.

Upon cessation of construction activities and transition to operating mode, air quality impacts from actual operation of the substations and transmission lines are expected to be nominal. As such, mitigation measures are not warranted during operation of the Project.

6.2.2. Soils and Geology

The surface topography in the Study Area includes moderately flat upland areas, dissected hills, and valleys with steep walls of exposed bedrock (NRCS, 2009). The Project is located along the edge of the driftless area, which was not covered by the most recent glaciation (Xcel Energy, 2009a). Sinkholes are common to the area.

The geology of this Study Area consists of varying depths of loess over Orvidovician-age dolomites, limestones, and sandstones. These layers can be exposed in areas such as steep ravines, where loess cover is thin (MnDNR, 2010w). Karst topography may be present along the South Fork Zumbro River and the North Branch Root River (Xcel Energy, 2009a). The Study Area is located within the Paleozoic Plateau Section and covers portions of the Rochester Plateau subsection (MnDNR, 2010w; MnDNR, 2010x). This subsection is characterized by end moraines on the western edge of the subsection transitioning to blufflands on the eastern side. Moraines are topographically diverse deposits of mixed glacial till, left behind by retreating glaciers. The drainage network is well established, but sinkholes may carry surface water into groundwater.

The U.S. Department of Agriculture Natural Resource Conservation Service (NRCS) describes the soil resources within the Study Area as ranging from well-drained loams and silt loams in upland areas, steep slopes with exposed limestone bedrock on valley walls, and poorly-drained hydric soils found river bottoms and low areas.

Direct and Indirect Impacts – Soils and Geology

Due to the suficial nature of the Project, no changes to topography or geology are expected. Potential direct effects to soils include the movement/disturbance and displacement of soil. During construction, surface soils in the 80-foot wide ROW would be temporarily disturbed. Disturbed soils can be subject to erosion caused by site clearing and earthmoving.

During extended periods of saturation, poorly drained soils can be prone to compaction and rutting from operation of heavy equipment. Soil compaction has a restrictive action on water penetration, root development, and the rate of oxygen diffusion into soils. Low density and change of vegetation types may be an indirect effect of soil compaction. Compacted soils may result in reduced crop productivity.

Long-term displacement of soils would result from the placement of Project structures. Assuming a maximum foundation diameter of 8 feet, each Project structure would displace up to approximately 50 square feet of soil. Table 6.2.2-1 displays estimated temporary disturbance and long-term displacement of soils, assuming that temporary

disturbance would occur to the entire 80-foot ROW and 8-foot diameter structures would be placed at a distance of 400 feet apart.

Table 6.2.2-1 Temporary and Long-Term Soil Disturbance/Displacement

Route Alternative	Temporary Disturbance (acres)	Long-term Displacement (acres)
1	178	0.28
2	176	0.28
3	158	0.25

Due to similarities in length, Route Alternatives 1 and 2 would be expected to disturb and displace a similar total surface area of soil. Route Alternative 3, which is approximately two miles shorter than Route Alternatives 1 and 2, would disturb and displace less surface area of soil in the Study Area than Route Alternatives 1 and 2. The exact number and location of Project structures would be determined during final engineering design, after a Route Alternative has been selected.

Mitigation – Soils and Geology

The Applicant has agreed to restore areas disturbed during construction to their original condition to the extent practicable and to limit ground disturbance wherever possible (Xcel Energy, 2009a). Where disturbance and excavation cannot be avoided, it could be minimized using Best Management Practices (BMPs). These may include reseeding of vegetation and use of erosion control blankets and/or silt fence. In areas where soils have been compacted, the Applicant could use techniques such as ripping to reduce compaction and avoid future impacts to agricultural crops.

Additionally, the Applicant would be required to obtain coverage under the state general permit for storm water discharges associated with construction activities, and to develop a Storm Water Pollution Prevention Plan (SWPPP) prior to the start of construction. The plan is required to outline the BMPs that would be used during construction, especially focusing upon erosion and sediment control.

6.2.3. Water Resources

Water resources in the Study Area include surface waters, groundwater, and floodplains. Information about Public Waters in Minnesota was obtained from the Minnesota Department of Natural Resources (MnDNR). Information about surface and groundwater quality was obtained from the Minnesota Pollution Control Agency (MPCA). Floodplain information was obtained from the Federal Emergency Management Agency (FEMA).

Surface Waters

The Study Area primarily lies within the Lower Mississippi River Basin. This water basin covers all or parts of 17 counties in the southeastern corner of Minnesota (MPCA, 2010b). It encompasses 12 watersheds and approximately 7,266 miles. The rivers and streams that make up the area watercourse flow east into the Mississippi River. A watercourse is defined as a named flowpath through a drainage network, from the source of a river to its mouth (MnOET, 2010) Within this water basin, the project is located within the Zumbro River and Root River watersheds. The Zumbro River Watershed covers 910,468 acres, approximately 80 percent of which is agricultural. Approximately 72 percent of the Root River Watershed's 1,064,970 acres are agricultural. Surface waters within both watersheds flow easterly towards the Mississippi River.

The USACE has regulatory jurisdiction over waters of the United States including many lakes, rivers, streams, and wetlands pursuant to Section 404 of the Clean Water Act. The placement of transmission line pole structures, land clearing that involves soil disturbance, or placement of construction mats within jurisdictional waters may be considered a discharge of fill material that would require a permit from the Department of the Army pursuant to Section 404 of the Clean Water Act.

State-protected Public Waters are water basins and watercourses in Minnesota with significant recreational or natural resource value, as defined in Minnesota Statutes § 103G.005. The MnDNR has regulatory jurisdiction over these waters. A license would be required for the Project to cross public waters or lands administered by the MnDNR. Licenses are issued by the MnDNR Division of Lands and Minerals. The Applicant would need to supply information detailing the type of work to be performed, the location of the work, restoration methods, and maintenance methods in the application license.

Public Water Inventory rivers and streams within or adjacent to the Route Alternatives are shown in Table 6.2.3-1 and Figure 7. Public waters are defined as all water basins and watercourses that meet the criteria set forth in Minnesota Statutes, section 103G.005, subdivision 15 and identified on PWI maps authorized by Minnesota Statutes, section 103G.201 (MnDNR, 2009). At 10 crossings, Route Alternative 3 has slightly more river and stream crossings than Route Alternatives 1 or 2, which have eight and seven crossings, respectively. While the Salem Creek crossing for Route Alternative 1 or 3 would follow existing ROW, Route Alternative 2 would require a new crossing of Salem Creek in a previously undisturbed area.

Table 6.2.3-1: PWI Rivers and Stream Crossings by Route Alternatives

PWI Watercourses	Route 1	Route 2	Route 3
N Branch Root River	1	1	1
Sargeant Creek	1	-	1
Unnamed S. Fork Zumbro River Tributary	2	-	-
Unnamed S. Fork Zumbro River Tributary	1	-	-
S. Fork Zumbro River	1	1	5
Salem Creek	1	1	1
Salem Creek Tributary	-	1	1
Cascade Creek	1	3	1
Total Crossings	**8**	**7**	**10**

Source: MnDNR, 2010v

Water Quality

MPCA oversees water quality studies and regulations in Minnesota. A list of impaired waters within the State is maintained by MPCA. Table 6.2.3-2 displays the water bodies within the Study Area that the MPCA has identified as impaired. In total, two water bodies exceed total maximum daily load (TMDL) levels for turbidity and one exceed TMDLs for fecal coliform. All three Route Alternatives cross the North Branch Root River where turbidity levels are exceeded. Similarly, both Salem Creek and Cascade Creek are crossed by all Route Alternatives, and Route Alternative 2 has multiple crossings of Cascade Creek in areas in which TMDLs are exceeded.

Table 6.2.3-2: Water Resources with Designated Impairments in the Study Area

Water Resource	Type of Impairment*	Route 1 (# of crossings)	Route 2 (# of crossings)	Route 3 (# of crossings)
North Branch Root River	Turbidity	1	1	1
Salem Creek	Fecal Coliform	1	1	1
Cascade Creek	Turbidity	1	3	1

Note: *Impairment is defined as exceeding the MPCA TMDL levels.
Source: MPCA, 2010a

Groundwater

The Project is located in two Minnesota groundwater provinces: the south-central province and the southeast province. Groundwater resources specifically include the upper carbonate aquifer, comprised of limestone, dolomite, and shale. In these groundwater provinces, water availability is fairly limited in superficial and buried sand levels but is considered good at the bedrock level. Depth to the water table varies greatly in this area, but is typically 55-70 feet from the surface (MnDNR, 2009a). Due to the karst landforms in this area, groundwater is more susceptible to contamination from surface sources.

Floodplains
Floodplains are low-lying areas that are subject to periodic inundation due to heavy rains or snow melt. Floodplain areas are generally adjacent to lakes, rivers, and streams. In their natural state, floodplains provide necessary temporary water storage during flooding events. The periodic flooding and drying in these areas creates a unique habitat that supports a wide variety of plant and animal species.

Federal Emergency Management Agency (FEMA) Floodplain data have not been fully developed for Olmsted and Mower counties. Identified FEMA areas of Special Flood Hazards (SFHs) in Dodge County include (FEMA, 2010):

- The unnamed tributary to the South Fork Zumbro River (south of CSAH 30)
- South Fork Zumbro River
- Salem Creek
- Cascade Creek

Other floodplain or floodway areas are likely present within the Study Area, but have not been included in the FEMA GIS dataset. These areas include the water bodies listed above as they extend into Olmsted County, as well as additional water bodies such as Sargeant Creek and the North Branch Root River in Mower County.

Direct and Indirect Impacts – Water Resources
Potential direct effects on water resources from the Project include:

- Changes in surface water quality or flow; and
- Changes in groundwater quality or flow.

Potential indirect effects from the Project include:

- Soil erosion and sedimentation resulting in changes in water turbidity, which can affect vegetation, aquatic, and wildlife habitat;
- Fuel and chemical spills in water resources that could adversely affect surface water quality; and
- Increased potential for runoff from cleared ROWs that could adversely affect surface water quality.

Surface Water
If pole placement were to occur within a water basin (e.g., lakes and ponds) or watercourse (e.g., rivers and streams), temporary direct impacts may include soil erosion along the shoreline and sedimentation caused by construction. The deposition of sediment could result in a long-term impact to water turbidity. The Project has been designed to span surface water bodies in order to avoid such impacts (Xcel Energy, 2009a).

Indirect impacts are possible due to construction activity within or adjacent to water bodies. Construction activities, including use of heavy equipment on sloped shore banks, could result in erosion along the shoreline and increased runoff into water resources from cleared ROWs. Increased run-off could result in changes in sedimentation and turbidity, which could affect water quality and aquatic habitat. The quantity and extent of acreage affected by erosion would depend on the localized soil qualities and placement and movement of equipment within the ROW. Additionally, fuel or chemical spills from construction equipment could degrade storm water runoff quality. The potential likelihood of fuel or chemical releases would be reduced through implementation of Best Management Practices (BMPs) as required to be contained in the Applicant's Storm Water Pollution Prevention Plan (SWPPP). The SWPPP is also required to contain BMPs that would reduce the likelihood of erosion and sedimentation. Impacts to surface water quality could also result from the use of herbicides or pesticides in maintaining the transmission line ROW during operation.

Temporary or long-term direct impacts to surface water resources are unlikely to occur to PWI watercourses. In areas where surface water features are present, it is anticipated that ROW alignments could be directed to avoid surface water or that water bodies could be spanned. All water crossings under all of the alternatives would be spanned by poles placed from 400 to 650 feet apart. All stream and river crossings within the Study Area can be spanned, and the feasible 80-foot ROWs evaluated avoid crossing larger water bodies.

As shown in Table 6.3.2-1, Route Alternative 1 would cross seven PWI water bodies, including one multiple crossing for a total of eight PWI crossings. Route Alternative 2 would cross five PWI water bodies, including one multiple crossings for a total of seven PWI crossings. Route Alternative 3 would cross six PWI water bodies, including one multiple crossing for a total of 10 crossings.

Route Alternatives 1 and 3 would cross the least impaired water bodies. Route Alternatives 1 and 3 would cross each of the three impaired water bodies once, while Route Alternatives 2 would cross impaired water bodies five times.

Each of the three Route Alternatives would cross Salem Creek in an area of relatively steep topography, which could require placement of Project structures at the base of the Salem Creek valley, near, but not within the water body. Route Alternative 1 would cross Salem Creek at a narrower point in the ravine-cut valley than Route Alternatives 2 or 3, potentially reducing the need for construction adjacent to the water body.

Groundwater
The Applicant proposes to use single-pole, weathering steel structures with brace post insulators for a majority of the Project length. The poles would have a foundation diameter between 5 and 8 feet with a pole base diameter of between 24 to 72 inches installed to a depth of 12 or more feet. After the poles are embedded, the holes would then be backfilled crushed rock, soil, or concrete. Due to the depth of groundwater in the Study Area (between 55 and 70 feet below ground surface), groundwater resources

are unlikely to be encountered during construction. In areas where shallow groundwater is encountered, dewatering prior to structure installation may be required. Depending on the scale of dewatering activities, it would be possible that shallow groundwater levels could be directly affected from dewatering. However, because installation of structure foundations would be installed at depths of 12 feet, changes in groundwater levels would be confined to shallow groundwater with no resulting effect on deep water aquifers.

No water storage, reprocessing, or cooling is required for the construction or operation of the transmission line or substation modifications and no associated discharges to surface water or groundwater are anticipated. The Project would not be expected to result in violations of groundwater quality standards, unless a significant fuel or chemical spill associated with construction equipment or substation operations were to occur. Impacts to groundwater are expected to be similar for all proposed route alternatives and segments.

Floodplains
Due to the footprint of the Project transmission line structures and that the Route Alternatives have been sited to cross surface waters, wetlands, and floodplains perpendicularly rather than in parallel, the Project is not expected to result in adverse affects to floodplains. Thus, there are no potential indirect effects identified.

The Project would locate structures outside of floodplains to the extent practicable, such that potential impacts are expected to be minimal. If Project structures were placed directly in floodplains, construction of the transmission line is not expected to alter existing drainage patterns or floodplain elevations due to the small footprint of the poles and their relatively wide spacing. The transmission structures placed in floodplains have a small cross section, resulting in negligible fill. No change in floodplain functions would occur from construction of the Project. Impacts to floodplains are expected to be similar for all proposed Route and Segment Alternatives.

Mitigation – Water Resources

To mitigate the potential for erosion and sedimentation, the Applicant would be required to implement reasonable measures to manage runoff during construction, as specified by a Storm Water Pollution Prevention Plan. Control measures could include the use of silt fences, erosion control blankets or matting, and seeding of non-agricultural areas that were disturbed by construction activities to prevent runoff and impacts to water resources. Additional mitigation measures specific to water resources are discussed below.

Surface Water
To minimize long-term impacts to surface water resources, the Applicant proposes to span water resource when possible and avoid water resource crossings by movement of the ROW within the selected route (Xcel Energy, 2009a).

The Project would require a number of water resource permits, including coverage under the National Pollution Discharge Elimination System (NPDES) General Permit for Storm Water Discharges Associated with Construction, License to Cross Public Waters, and Public Waters Work Permit. Additional permits or approvals may be required by local governmental units. The placement of transmission line pole structures, land clearing that involves soil disturbance, or placement of construction mats may be considered a discharge of fill material that would require a permit from the Department of the Army pursuant to Section 404 of the Clean Water Act. These permits would require the Applicant to develop and implement BMPs for sediment and erosion control during construction and operation of the Project to protect topsoil and adjacent surface and groundwater resources, and to minimize soil erosion. Typical BMPs may include:

- Locate structures and disturbed areas away from rivers and lakes, where practicable;
- Contain stockpiled material, including fuel and chemicals, away from stream banks and lake shorelines;
- Install sediment control measures prior to construction, in accordance with plans and permits. In addition to those mentioned above, these may include, but are not limited to, the following: using mulch produced through the chipping of removed trees; using soils berms; and partially burying logs along the ROW;
- Use wastewater and storm water control measures to meet the effluent limits in permits prior to discharging from construction sites to surface waters;
- Spread topsoil and seed in a timely manner;
- Avoid use of fertilizers, pesticides, or herbicides in or near water bodies, including wetlands; and
- Fuel construction vehicles outside of water bodies, including wetlands, and use appropriate spill prevention and containment procedures.

Groundwater
As described above in Section 6.2.4.2, temporary impacts during construction may occur if dewatering is necessary to install the transmission structures. Given the nature of construction and that all Project structures would be aboveground with a foundation depth of 12 feet, any dewatering effects on water tables are expected to be localized and short-term. If dewatering is necessary, a permit would be required by the MnDNR.

Floodplains
The Project would locate structures outside of floodplains to the extent practicable, such that potential impacts are expected to be minimal.

The following available mitigation measures could prevent or reduce potential impacts to floodplains:

- Span floodplains and water resources to the extent possible to avoid potential impacts.
- Use construction techniques to minimize run-off into floodplains during construction.

- Plant or seed non-agricultural areas that were disturbed during construction.
- Restore floodplain contours to their pre-construction profile if contours are disrupted during construction.

6.2.4. Wetlands

Wetlands can serve many functions, including ground water recharge and discharge; flood storage and alteration or attenuation; nutrient and sediment removal or transformation; toxicant retention; and shoreline stabilization. In addition, wetlands provide habitat for fish and wildlife, and support wildlife breeding, migration, and wintering. Wetlands also support recreational activities.

USFWS NWI maps were used to identify mapped wetlands existing within each of the Route Alternatives, which comprise the Study Area. The USFWS has developed NWI maps showing the locations, size, and types of wetlands throughout the United States. These maps were developed using aerial photography interpretation techniques. The purpose of these maps was to provide better geospatial information about wetlands than had been previously available from other sources and to provide a consistent classification system across the United States. Because of the inherit limits of photo interpretation, the intent was not to map all wetlands and deepwater habitats, but rather the larger types that could be identified by such techniques. Forested wetlands are especially underrepresented in NWI maps due to limitations in identifying this wetland type from aerial photography. Thus, although these maps serve as an excellent screening or preliminary evaluation tool, on-the-ground field surveys are required to identify all wetlands, their boundaries, and their quality.

Table 6.2.4-1 shows NWI wetlands located within the feasible 80-foot ROW evaluated for each Route Alternative. The Study Area is located within the Zumbro River Watershed and the Root River Watershed. Freshwater emergent wetlands are the most common type found in the Study Area, comprising the most wetland acreage.

Table 6.2.4-1: NWI Wetlands Identified within the 80-foot ROW for the Route Alternatives

Type	Route Alternative 1 (acres)	Route Alternative 2 (acres)	Route Alternative 3 (acres)
Freshwater Emergent	0.87	1.91	9.89
Freshwater Forested	0.05	-	4.56
Freshwater Scrub Shrub	0.22	0.65	0.75
Riverine	-	0.27	-
All NWI Wetlands	**1.52**	**2.84**	**15.20**

Note: This evaluation was prepared using National Wetland Inventory (NWI) data only, the results have not been field verified.

Acreage of wetlands that would be crossed by the Project are similar for Route Alternatives 1 and 2, and include mostly emergent wetlands. Scrub-shrub wetlands

make up the second largest category of wetlands for Route Alternatives 1 and 2. The ROW evaluated for Route Alternative 3 would cross 15.20 acres of wetlands, significantly higher than the acreage crossed by Route Alternatives 1 and 2, which ranges from 1.52 to 2.84 acres crossed. In addition, Route Alternative 3 would cross 4.56 acres of forested wetlands, compared to little or no forested wetlands for the other alternatives. Acreage of wetlands crossed by Route Alternative 3 is greater due to the location of the route within open agricultural areas rather than along existing roadway ROW.

Public Water Inventory Wetlands
No PWI wetlands or basins would be crossed by the Project. Table 6.2.3-1 in Section 6.2.3, Water Resources, shows the number of MnDNR PWI watercourses that would be crossed by each Route Alternative. MnDNR public waters include all water basins (i.e., lakes and ponds) and watercourses (i.e., rivers and streams) that meet the criteria set forth in Minnesota statutes (Section 103G.005, subd. 15), and that are identified on PWI maps and lists authorized by Minnesota statutes (Section 103G.201). Section 6.2.3 provides a more detailed discussion about PWI streams. Limited field verification of wetlands has been completed by the Applicant for Route Alternatives 1 and 2.

Direct and Indirect Impacts – Wetlands

Potential direct impacts resulting from construction and maintenance of the Project could include:

- Long-term and temporary loss of wetlands and/or wetland functions; and
- Conversion of wetland types.

Potential indirect impacts from the Project could include:

- Change in water quality and water recharge;
- Loss of habitat; and
- Impacts from construction and maintenance access.

Long-term loss of wetlands and/or wetland functions would only occur if a wetland could not be spanned, if dredging or filling was required for structure installation, or if construction resulted in permanent conversion of wetland type. Removal of woody vegetation may incorporate a discharge of fill material that requires a Department of the Army Permit if mechanized land clearing involves soil disturbance in waters of the United States. The amount and area of fill required for structure installation and access roads would depend on the Route Alternative selected and final structure placement. Construction requiring access over wetlands could be conducted in the winter season when wetlands are frozen to avoid impacts from the creation of access roads with fill materials. The Applicant designed Route Alternatives 1 and 2 to span wetlands to the extent possible; however, due to the length of wetlands crossed by Route Alternative 3, it is possible that Project structures would be placed in wetlands.

Long-term conversion of wetland type would occur where the clearing of forested wetland areas would be required within the ROW. Removal of woody vegetation within a wetland area would convert the forested wetland area to a different vegetative class and thus a different wetland type, for example, a forested wetland may be converted to a scrub-shrub or emergent wetland. The converted wetland would be maintained during operation with the periodic removal of forest vegetation. Wetland conversion could result in changes in wetland functions, including water retention and recharge. Conversion from one wetland type to another would also result in a change in wildlife species composition and diversity.

Temporary wetland losses or losses of wetland function due to construction activities may occur to wetland areas that are not within the footprint of a structure or converted to another wetland type. Soil compaction or vegetation removal may occur where a wetland area is traversed by construction equipment. Some wetlands temporarily affected by the Project would return to their original function, including scrub-shrub and emergent wetlands.

Due to the nature of construction activities and the potential to enter wetlands, which could compact soil, disturb wetlands, or result in wetland type conversion, all wetlands identified as crossed by the Project ROW could experience some level of impact. Potential impacts for Route Alternatives 1 and 2 would occur up to 1.52 and 2.84 acres of wetlands, respectively. Up to 15.20 acres of wetlands impacts are possible within the ROW for Route Alternative 3, some of which may be farmed wetlands. This alternative crosses wetlands associated with Salem Creek and the South Fork Zumbro River. Due to the higher amount of forested and scrub-shrub wetlands, wetland conversion would also be greatest for Route Alternative 3.

Mitigation – Wetlands

For long-term wetland impacts that were not avoidable, including wetland filling and wetland type conversion, the Project would be subject to wetland replacement siting rules (*Minnesota Rules* part 8420.0522), state compensatory mitigation requirements under state water quality standards (*Minnesota Rules* part 7050.0186), and the USACE *St. Paul District Policy for Wetland Compensatory Mitigation in Minnesota* (2009). Supplemental St. Paul District Army Corps of Engineers policy and guidance may also apply to compensatory mitigation for this Project.

The Project could require a number of water and wetland-related permits, including coverage under the General Permit for Storm Water Discharges Associated with Construction Activities and associated Storm Water Pollution Prevention Plan (SWPPP), National Pollution Discharge Elimination System Permit (NPDES), License to Cross Public Waters, Public Waters Work Permit, and Section 404 Clean Water Act permit. The placement of transmission line pole structures, land clearing that involves soil disturbance, or placement of construction mats may be considered a discharge of fill material that would require a permit from the Department of the Army pursuant to

Section 404 of the Clean Water Act. These permits would require the Applicant to develop and implement Best Management Practices (BMPs) for sediment and erosion control during construction and operation of the Project to protect topsoil and adjacent wetlands and surface water resources.

The Applicant has proposed several BMPs for Project construction. The Applicant proposes to avoid or minimize major disturbance of individual wetlands and drainage systems during construction by spanning wetlands and drainage systems, where possible (Xcel Energy, 2009a). When it is not possible to span the wetland, the Applicant would draw upon several options during construction to minimize impacts (Xcel Energy, 2009a):

- When possible, construction would be scheduled during frozen ground conditions;
- Crews would attempt to access a wetland with the least amount of physical impact to the wetland (i.e., shortest route);
- The structures would be assembled on upland areas before they were brought to the site for installation, when practical; and
- When construction during winter was not possible, construction mats would be used where wetlands would be affected.

6.2.5. Flora

The Study Area is located in an area of southeastern Minnesota that consists of mixed upland prairie and burr oak savannah (MnDNR, 2010q). This area is a borderland between the dry prairie landscape to the west and the driftless area to the east. Approximately 90 percent of the Study Area is agricultural, used for hay crops, pastures, and row crops such as corn and soybeans. The Project would cross areas of prime farmland, including farmland that would be considered prime if drained or protected from farming, as well as farmland of statewide importance. Acres of prime farmland and other land use types that would be crossed by the Route Alternatives are discussed in Sections 6.3.3 and 6.3.4 of the EIS.

Some of the land in the Study Area is enrolled in the Conservation Reserve Program (CRP), which aims to reduce soil erosion by planting permanent vegetation, trees, and shrubs on land that is highly erodible or ecologically sensitive (Xcel Energy, 2009a). CRP areas also provide habitat for various wildlife species.

Trees within the Study Area are mainly associated with residences, rivers, streams, wind breaks, and small wooded uplands. The Study Area is located within the Eastern Broadleaf Forest Province (MnDNR, 2010q). These trees are mainly deciduous species such as oak, basswood, ash, elm, and maple.

Direct and Indirect Impacts – Flora

Direct effects to flora would potentially include the loss of an individual due to disturbance from construction or related ROW clearing, and loss of an individual due to disturbance from maintenance activities.

In general, the loss of trees and vegetation can lead to the following indirect effects:

- Loss of habitat for wildlife species, as discussed in Section 6.2.6;
- Loss of atmospheric carbon absorption and reduced ability of absorption of other pollutants including particulates, SO_2, and NOx, as discussed in Section 6.2.1;
- Loss of wind control capacity; and
- Increased susceptibility to noxious and invasive weed infestations.

The area surrounding Salem Creek is one of the more densely wooded areas within the Study Area. All Route Alternatives would require a single crossing of Salem Creek. Of the three Route Alternatives, Route Alternative 1 would likely require the least tree removal at the Salem Creek crossing to the narrower width of the valley in which Salem Creek is located. The Route Alternative 1 crossing is approximately 0.5 miles shorter than the Route Alternative 2 crossing and follows an existing road corridor. Route Alternative 3 would cross Salem Creek near an existing 345 kV transmission line crossing of the creek. Clearing for the 345 kV line has been conducted in the Salem Creek area and the Project ROW could overlap with existing cleared ROW, although an additional 35 feet of cleared ROW would be required for the Project. Segment Alternative C would result in the crossing of Salem Creek in the location described for Route Alternative 3 to minimize the number of locations of utility crossings. Route Alternative 2 would cross Salem Creek in a previously undisturbed area where existing ROWs are not present to overlap, which would result clearing of a new 80-foot corridor through a forested valley (Xcel Energy, 2009a).

Tree lines surrounding residences and roads provide wind control and act as living snow fences to prevent blowing snow. Tree removal could be necessary near residences at 10 locations along Route Alternative 1, at seven locations along Route Alternative 2, and at one location along the Crossover Segment (Xcel Energy, 2009a). Where possible, tree impacts may be minimized by moving the transmission line to the opposite side of the road to avoid residences (Xcel Energy, 2009a). No residential tree removal is anticipated along Route Alternative 3 due to the distance of residences from the ROW. However, Route Alternative 3 would require 35 feet of new ROW through predominately agricultural areas and may require tree removal in non-residential locations.

The clearing of trees and shrubs and the removal of existing vegetation may create opportunities for the spread of noxious and invasive weed species. Species such as Birdsfoot trefoil (*Lotus corniculatus*) and Canada Thistle (*Cirsium arvense*) thrive in disturbed soils and are included on the Minnesota Department of Agriculture's Prohibited noxious weed list for Minnesota (MDA, 2010a; MDA, 2010b).

Mitigation – Flora

The HVTL permit could include restoration conditions that would require the Applicant to restore the ROW to its original vegetative state to the extent possible. Restoration conditions could be applied to the Project ROWs, lay down areas, access roads, and temporary work spaces.

To minimize impacts to trees in the Study Area, removal could be limited to only those trees located within the ROW that would affect the safe operation of the transmission line. The Applicant has stated a commitment to place the transmission line on the opposite side of the road from residences where possible, which would reduce the number of residential shade and wind control trees removed from the Project (Xcel Energy, 2009a).

The Applicant could wash or manually remove material from construction vehicles prior to the start of construction if equipment has traveled from an area contaminated by noxious weeds. Cover crop or other stabilizing vegetation could be planted in non-agricultural areas following construction in order to prevent disturbed areas from becoming available to weed species.

6.2.6. Fauna

The Project would be located primarily along existing road ROWs in a cultivated agricultural environment with patches of natural areas present. These natural areas include habitat such as grasslands, upland and lowland deciduous forests, emergent wetlands, and riparian woodlands.

These habitats provide forage, nesting, and breeding habitat for resident wildlife, as well as stopover habitat for migratory species. Resident species common to south-east Minnesota forests, wetlands, and grasslands include mammals such as mice, shrews, voles, white tailed deer, and coyotes. Numerous songbird and waterfowl species are common as well as frogs, turtles, and snakes (MnDNR, 2010m).

State Wildlife Management Areas/Scientific Natural Areas

There are three State Wildlife Management Areas (SWMAs) within 1 mile of the Project. Only Route Alternative 3 would require crossing a WMA. The South Fork Zumbro River WMA is located in Dodge and Olmsted counties, bordered to the north by CSAH 26. Route Alternative 3 would cross through the eastern portion of this WMA. The South Fork Zumbro River WMA consists primarily of riparian woodland. The management objective of the WMA is to provide habitat for deer and turkeys. This WMA is located between Route Alternative 1 and Route Alternative 2 and is crossed by both the South Fork Zumbro River and the existing 345 kV transmission line.

The Tri-cooperative WMA is located in Dodge County, approximately 0.25 miles east of Route Alternative 1 near the intersection of County Highway 15 and CSAH 17. The habitat area includes upland grassland, young deciduous tree stands, and brush cover

(MnDNR, 2010n). The habitat consists of emergent wetlands, and riparian woodland, which includes lowland deciduous trees and shrub cover (MnDNR, 2010o).

The Rock Dell WMA is located in Olmsted County and is bordered to the south by CSAH 26, approximately 0.5 miles east of Route Alternative 2. This large WMA contains a mixture of grassland, woodland, and riparian habitat (MnDNR, 2010p). County Road 3 and the South Fork Zumbro River both cross this WMA.

There are no Scientific Natural Areas located within 1 mile of the Project.

National Wildlife Refuge/Waterfowl Production Areas
There are no National Wildlife Refuges or Waterfowl Production Areas located within 1 mile of the Project. The closest wildlife refuge is the Upper Mississippi River National Wildlife and Fish Refuge, located approximately 50 miles south of the Project. The Refuge includes 240,000 acres of marsh, riparian forest, channels, and pools (USFWS, 2010).

Direct and Indirect Impacts – Fauna

Potential direct effects to wildlife include the following:

- Loss of an individual due to habitat destruction and fragmentation or avian collision with structures; and
- Disturbance from construction, clearing, and maintenance activity.

Potential indirect effects to wildlife include the following:

- Increased competition for resources or habitat due to displacement of individuals from the affected area into the territory of other animals;
- Changes in mortality;
- Reduced breeding; and
- Recruitment in the future population.

Due to the similarity in length, impacts to terrestrial wildlife would be similar for all Route and Segment Alternatives. Construction noise and increased activity levels would temporarily limit the use of the habitat along the routes. The clearing of trees along the ROW may displace nesting or burrowing wildlife. Due to the availability of adjacent habitat, displacement of any species would be short-term.

Collision with tall structures is one of the causes of bird mortality. The Study Area is not directly adjacent to any Wildlife Refuge Areas known to be major stopover points for migrating waterfowl. However, as birds utilize wide areas for migratory routes, it would be reasonable to expect migratory birds to pass through the Study Area. Due to similarity in length and design, the potential for avian collision would be similar for all Route and Segment Alternatives. Overall potential for avian collision would be reduced

by the north-south alignment of the Project transmission line, as migratory birds generally follow a north-south orientation (Xcel Energy, 2009a).

Transmission lines pose a potential electrocution hazard to large birds such as raptors, waterfowl, and other large bird species. Electrocution occurs when birds with large wingspans come into contact with two conductors or a conductor and a grounding device. The Project design proposed by the Applicant would ensure adequate spacing to eliminate the risk of electrocution (Xcel Energy, 2009a).

Aquatic species are not anticipated to be adversely affected because the Project would span the water features within the ROWs such that no permanent structures would be placed within water bodies.

Mitigation – Fauna

The Applicant has been working with agencies such as the MnDNR, USFWS, and USACE to identify areas where measures could be taken to reduce avian structure collisions. In general, the Applicant avoids structure placement in areas known to be major flyways or migratory bird resting areas. A part of a 2002 Memorandum of Understanding with the USFWS, the Applicant has developed an Avian Protection Plan for the State of Minnesota. (Xcel Energy, 2009a).

As previously stated, adjacent suitable habitat in the vicinity of the Study Area would reduce displacement impacts to terrestrial wildlife species from the Project.

6.2.7. Rare and Unique Natural Resources/Critical Habitat

Threatened and endangered species in Minnesota are protected from death, harm, and harassment under the Federal Endangered Species Act (ESA), as amended (16 U.S.C. §§ 1531 – 1544) and the Minnesota Endangered Species Statute (*Minnesota Statutes*, section 84.0895). The Federal ESA defines the regulations pertaining to plant and animal species federally-designated as threatened or endangered to ensure that any project or action would not jeopardize the continued existence of any listed species or adversely modify designated critical habitats. Minnesota's Endangered Species Statute requires the MnDNR to adopt rules designating species meeting the statutory definitions of endangered, threatened, or species of concern. The Endangered Species Statute also authorizes the MnDNR to adopt rules that regulate treatment of species designated as endangered and threatened. These regulations are codified as *Minnesota Rules*, parts 6212.1800 to 6212.2300 and impose a variety of restrictions, a permit program, and several exemptions pertaining to the taking of species designated as endangered or threatened. The results of field studies and detailed project plans determine whether a takings permit is required.

Within 1 mile of the Study Area, one federally-listed species was identified by the NHIS (Natural Heritage Information System): the Prairie bush clover (*Lespedeza leptostacya)*. Twelve state-listed species (one bird, one amphibian, two reptiles, two fish, two mussels,

and four plants) and three special communities have been identified within 1 mile of the Study Area. Table 6.2.7-1 lists the species within 1 mile of the Route and Segment Alternatives, their status, and their preferred habitat. Rare and unique natural resources are shown in Figure 8.

Table 6.2.7-1 Federal and State-listed Species within 1 mile of the Project

Common name	Scientific name	Federal status	State status	Habitat
Prairie bush clover	*Lespedeza leptostachya*	T	T	Mesic and dry-mesic prairie habitats, often on well-drained slopes. May also occur in prairies used for pasture (MnDNR, 2010a).
Glade Mallow	*Napaea dioica*	None	T	Along banks and in floodplains adjacent to small to medium streams. Wide range of growing conditions, from full sun openings to fully shaded canopy environments (MnDNR, 2010b).
Valerian	*Valeriana edulis ssp. ciliata*	None	T	Remnant prairie and fen habitats, typically found on road and rail-road rights-of-way. In the Study Area, the species is often found in thin, rocky soil on cliff ledges in dry bluff prairies (MnDNR, 2010c).
American ginseng	*Panax quinquefolius*	None	SC	Forests, typically with a closed canopy of maple, basswood, or red oak. Does not tolerate habitat that is seasonally flooded. May be harvested commercially in Minnesota, provided that the seeds are planted where the parent plant was removed (MnDNR, 2010d).
Northern cricket frog	*Acris crepitans*	None	E	Wetland and stream habitats with abundant emergent vegetation. Lays its eggs in water and may overwinter in natural depressions such as holes or cracks (MnDNR, 2010e).
Wood turtle	*Clemmys insculpta*	None	T	Typically found in fast-moving streams with adjacent forest habitat. May forage in agricultural areas along their habitat. Overwinters along rivers and streams in bank undercuts or near log jams (MnDNR, 2010f).
Loggerhead shrike	*Lanius ludovicianus*	None	T	Grasslands with scattered small trees, vegetated fence lines (MnDNR, 2010g).
Timber rattlesnake	*Crotalus horridus*	None	T	Forested bluffs and south-facing rock outcroppings, bluff prairies. May use adjacent forests, prairies, and agricultural lands as feeding grounds (MnDNR, 2010h).
Ozark minnow	*Notropis nubilus*	None	SC	Zumbro and Root Rivers and tributaries in gravel and pebble riffles. Intolerant of turbidity and siltation (MnDNR, 2010i).
Northern brook lamprey	*Ichthyomyzon fossor*	None	SC	Adults found over course substrate in swift water, riffles, or runs. Larvae burrow in fine sediment or organic debris in quiet waters and side channels with embedded woody debris (MnDNR, 2010j).
Ellipse	*Venustaconcha ellipsiformis*	None	T	Gravel riffles of river headwaters, silty areas along banks (MnDNR, 2010k).
Creek heelsplitter	*Lasmigona compressa*	None	SC	Creeks, small rivers, and upstream areas of larger rivers in sand, fine gravel, and mud (MnDNR, 2010l).

Notes: T - Threatened; E - Endangered; and SC – Special Concern

Direct and Indirect Impacts – Rare and Unique Natural Resources/Critical Habitat

Impacts to the species identified above would be considered significant if the Project would result in:

- Direct effects to Federal or State-listed species including the taking (removal or loss) of an individual or population due to habitat destruction; a change in an individual or population's habitat use due to noise; or visual disturbance from construction, clearing, and maintenance activity.
- Indirect effects to Federal or State-listed species, such as increased competition for resources or habitat due to displacement of individuals from the affected area into the territory of other animals; or other indirect effects which cause mortality or reduced breeding and recruitment in the future population.
- Direct or indirect effects on habitat types that affect population size and long-term viability for Federal or State-listed species. Direct effects include vegetation removal by clearing, burial, or other destructive activity. Indirect effects include changes within larger ecological units, but not necessarily within 1 mile of the Project, that could occur at a later point in time such as a change in long-term vegetation composition or dominance; habitat conversion; habitat fragmentation; invasion by non-native species; or disruption of natural disturbance regimes (e.g., the annual natural hydrological cycle).

Upland plant species, including the Prairie bush clover, Valerian, and American ginseng may be disturbed by construction activities. Animal species such as the loggerhead shrike and timber rattlesnake are highly mobile and individuals are less likely to be impacted, but populations may experience loss or fragmentation of habitat.

The Applicant has stated that water bodies would be spanned when possible (Xcel Energy, 2009a). As such, significant impacts to aquatic habitats are not anticipated for the Ozark minnow, Northern brook lamprey, ellipse, or creek heelsplitter. Species dependent upon wetland habitat, including the Northern cricket frog, wood turtle, and glade mallow may be impacted by construction activities if wetlands cannot be spanned and poles are placed within wetlands. Wetland species may also be impacted if construction mats are installed or construction equipment travels across wetland areas.

In general, potential impacts to sensitive species would be similar for all Route and Segment Alternatives. However, Route Alternative 1 would cross known occurrences of prairie bush clover, which are avoided by Route Alternatives 2 and 3.

As described in Section 6.2.4, Route Alternative 3 would cross more wetland acreage than Route Alternatives 1 and 2. As such, it has a greater potential to impact sensitive wetland species through construction and structure placement within wetlands.

Each of the three Route Alternatives would cross Salem Creek and adjacent wooded area surrounding the creek that provides suitable habitat for species. Route Alternative 1 would cross the shortest length of wooded area surrounding Salem Creek of the three

Route Alternatives and could result in fewer impacts to sensitive species near Salem Creek.

Mitigation – Rare and Unique Natural Resources/Critical Habitat

In upland areas, the Applicant has agreed to conduct detailed planning and survey all likely habitat for the prairie bush clover (Xcel Energy, 2009a). Surveys could also be conducted for the American ginseng and Valerian and efforts taken to avoid potential impacts to these species.

The Applicant proposes to span water bodies and wetlands to the extent possible and avoid crossing wetlands with equipment except when absolutely necessary (Xcel Energy, 2009a). Erosion and sediment control devices would be used to minimize discharges into wetlands and water bodies. As such, potential impacts to water bodies and aquatic habitats are not expected. Refueling could be prohibited within 100 feet of wetlands and water bodies and the Applicant could consult with agencies such as the MnDNR prior to working within or crossing wetlands.

6.3. Socioeconomic Setting

The Project has the potential to affect various resources related to the socioeconomic setting in the Study Area. Potential effects related to socioeconomics, property values, land-based economies, zoning and compatibility with planning, recreation, and transportation are addressed in this section.

6.3.1. Socioeconomics

For the analysis of socioeconomic resources, the Study Area is expanded from the Route Alternatives to include all of Dodge, Mower, and Olmsted counties. Data for the city of Byron are also provided. In general, data were obtained from the United States Census Bureau decennial census.

The discussion of the existing conditions provides a baseline against which to compare changes in the socioeconomic status of individuals and/or the communities in which the Project would be located.

Population Characteristics

Population data for the Study Area, along with the city of Byron, are presented in Table 6.3.1-1. Information is based upon U.S. Census Bureau data from 2000 and Minnesota State Demographic Center estimates from 2009.

Table 6.3.1-1 Population Characteristics

Location	Population 2000	Population 2009 Estimate	Percent Change in Population (2000 – 2009)	2000 Minority Population (Percentage)	2000 Caucasian Population (Percentage)
State of Minnesota	4,919,479	5,300,942	7.75%	10.6	89.4
Dodge County	17,731	19,747	11.37	4.4	96.6
Mower County	38,603	38,105	-1.29%	5.3	94.7
Olmsted County	124,277	143,378	15.37%	9.7	90.3
City of Byron	3,500	5,045	44.14%	2.2	97.8

Source: U.S. Census Bureau, 2000a-e; Minnesota State Demographic Center, 2009.

As shown in Table 6.3.1-1, minority residents make up a relatively small percentage of the population in all three counties. The percentage of minority populations within the Study Area in all locations is less than that of the state of Minnesota. Olmsted County has the largest percentage of a minority population among the three counties within the Study Area.

Income Characteristics

Table 6.3.1-2 provides the income characteristics for the Study Area, as well as the State of Minnesota. Information is based upon U.S. Census Bureau data from 2000 and Minnesota State Demographic Center estimates from 2005.

Table 6.3.1-2 Income Characteristics

Location	Per Capita Income 2000	Per Capita Income 2005 Estimate	Percentage of Population Below the Poverty Level 2000
State of Minnesota	$23,198	$37,290	7.9
Dodge County	$19,259	$32,298	5.8
Mower County	$19,795	$30,930	9.2
Olmsted County	$24,939	$39,204	6.4
City of Byron	$20,297	N/A	3.6

Source: U.S. Census Bureau, 2000a-j; Minnesota State Demographic Center, 2005.
Notes: N/A: Not Available

As shown in Table 6.3.1-2, per capita income estimates for the Study Area ranged from $19,259 to $24,939 in 2000 and $30,930 to $39,204 in 2005. A slightly higher percentage of persons with income levels below the federal poverty line live in Mower County than in either Olmsted or Dodge counties. Only Mower County has a greater percentage of the population below the poverty level than the State of Minnesota.

Employment Characteristics

Table 6.3.1-3 provides a summary of employment information for the population aged 16 years old and above. It includes background information for the number of employed persons and the rate of unemployment based on the year 2000. Estimates for 2010 were obtained from the Minnesota Department of Employment and Economic Development.

Table 6.3.1-3 Employment Characteristics

Location	Population 16 Years and Over	Population within the Labor Force	Unemployment Percentage 2000	Unemployment Percentage 2010 Estimate
State of Minnesota	3,781,756	2,691,709	4.1	6.9
Dodge County	13,073	9,707	3.5	6.0
Mower County	30,132	19,380	3.9	5.8
Olmsted County	94,560	69,525	3.7	5.5
City of Byron	2,433	2,004	1.4	N/A

Source: U.S. Census Bureau, 2000a-j; Minnesota Department of Employment and Economic Development, 2010.
Notes: N/A: Not Available

In 2000, the percentage of unemployed persons was less than 4 percent throughout the geographic areas contained within the Study Area. Current unemployment levels are estimated to be higher across all areas, ranging between 5.5 and 6.0 percent. The

percentage of unemployment in the Study Area is less than the percentage for the State of Minnesota.

Housing Characteristics
Table 6.3.1-4 provides housing information for the Study Area, including the total number of housing units and occupancy for the year 2000.

Table 6.3.1-4 Housing Characteristics

	Dodge County	Mower County	Olmsted County	City of Byron
Total Housing Units	6,642	16,251	49,422	1,206
Total Occupied Units	6,420	15,582	47,807	1,179
Owner-Occupied	5,396	12,183	36,304	1,001
Renter-Occupied	1,024	3,399	11,503	178
Total Unoccupied Units	222	669	1,615	27
Year-Round Units	204	621	1,389	26
Seasonal, recreational, or occasional use units	18	48	226	1

Source: U.S. Census Bureau, 2000a-e.

As shown in Table 6.3.1-4, currently unoccupied, year-round housing units are present in each of the three counties. The number of currently unoccupied, year-round housing units ranges from 204 in Dodge County to 1,389 in Olmsted County. Only 26 units are available in the city of Byron.

In addition, housing within the Study Area consists of approximately 15.1 housing units per square mile in Dodge County; 22.8 in Mower County; and 75.6 in Olmsted County. Within Byron, 840 housing units per square mile are present (Xcel Energy, 2009b).

Direct and Indirect Impacts – Socioeconomics

No places of business and/or residences would be removed or demolished for the Project. As such, no direct impacts from the Project would be anticipated. The Project may result in indirect effects to the populations located near the transmission line routes. These impacts may include changes to the overall local economy and individual residences and businesses. The impacts associated with construction typically would be felt in the short-term, while those impacts occurring during operation, such as tax payments received from utility easements, have the potential to affect the long-term resources of the communities located within the Study Area. While property values also would be impacted by the construction and operation of the Project, these effects are discussed separately in Section 6.3.2., Property Values.

Local Economy

During construction of the transmission line, approximately 15 to 25 workers would be needed over 26 weeks to construct the transmission line. The estimated labor cost for the line is approximately $700,000 (Xcel Energy, 2009a). Construction effort would be similar regardless of the Route and Segment Alternatives selected. To the extent that local workers are used for portions of the construction, the total direct wages and salaries paid to these workers could contribute to the total personal income of residents within the Study Area. This increase likely would be minimal due to the small size of the work force.

Alternatively, if local workers were not used for the construction, the increase in the population from the Project would be minimal, representing approximately 1.2 percent of the labor force in the city of Byron or less than one percent of its total population (i.e., the community evaluated with the lowest population and smallest geographic area). As with the local workers, the increase in total direct wages and salaries likely would provide a minimal contribution to the local economy. As demonstrated, available units are present within the Study Area. The economic contribution of these workers, therefore, likely would be negligible with regard to additional property taxes typically generated from the construction of new housing.

In addition to wages and salaries, the Applicant may purchase some materials required for construction and operation within the Study Area. The expenditures for equipment, energy, fuel, and/or other needed products and services may benefit some local businesses. Through the circulation and recirculation of dollars paid out by the Applicant as business expenditures and taxes, some additional personal and public income would be generated within the Study Area. Likewise, revenue likely would increase for some local businesses, such as restaurants, gas stations, and grocery stores, due to increased spending from workers associated with construction of the Project. While some positive revenue would be generated, these contributions would be negligible due to the small size of the construction work force and minimal purchases in the Study Area.

Minimal costs are associated with the operation and maintenance of the transmission lines. Based on similar projects, annual maintenance and operating costs typically average approximately $300 to $500 per mile of transmission ROW (Xcel Energy, 2009a). If the maintenance activities were to contribute to the local economy, the associated impacts likely would be negligible, albeit positive.

During operation, an increase to the local tax base also would occur, resulting in an incremental increase in revenue from utility property taxes. According to Minnesota legislation, property owned by a private utility is subject to property tax, unless specifically exempted. Utilities are valued and assessed under a dual property tax system. In this system, the Department of Revenue values the property that constitutes the utility's operating property using the unit value system. The unit value is then apportioned among the jurisdictions where the property is located. The second includes the non-operating property, such as offices, garages, warehouses, and land (Minnesota

House of Representatives, 2006). Consequently, the addition of power facilities could have a long-term and positive economic effect to the Study Area, although most likely minimal.

Once in operation, the Project is expected to assist in the increase of generation outlet capability in the Study Area. Additional capacity not only would provide electricity for economic growth from new or enlarged industry and businesses, but it also would help to assure that income would not be lost as a result of potential brownouts or temporary losses of power from severe weather events. The availability of reliable power also could have a positive effect on the quality of services provided to the public.

While positive socioeconomic impacts generally are anticipated to result from the construction and operation of the Project, some indirect negative impacts may occur. For instance, landowners engaged in agricultural production may need to suspend a portion of those activities while construction activities occur on their properties. To ensure safe construction of the transmission line, special consideration may be needed for fences, crops, or livestock. Fences may need to be moved or temporary or permanent gates may need to be installed; crops may need to be harvested early; and livestock may need to be moved (Xcel Energy, 2009a). These temporary changes may impact local economic activities (e.g., scheduling of crop planting/harvesting, transport of materials and products, etc.), although the impacts would be off-set by easement payments and reimbursements for damages. Additional discussion of impacts to agricultural land and activities is provided in Section 6.3.3, Land-Based Economies.

Other temporary indirect effects from construction of the Project may include visual intrusions, noise, dust, and traffic that may impede or detract some visitors from entering or performing business within the Study Area. These impacts are discussed in more detail in the respective sections of the EIS.

Loss of Individual Residences and Businesses
No places of business or residences would be removed or demolished for the construction and operation of the Project (Xcel Energy, 2009a). The transmission line would be designed so that all existing residences are located outside of the ROW. For portions of the Project that would be constructed on public land (e.g., ROW on county highways or roads), the Applicant would obtain all necessary approvals to construct the facilities. Where private land rights need to be acquired, the ROW acquisition process would begin early and typically would require easement rights across parcels to accommodate the facilities. A ROW representative would personally work with each of the property owners or their representatives. Affected landowners would be compensated for their property at fair market value, or in some situations, other arrangements would be made (Xcel Energy, 2009a).

Mitigation – Socioeconomics

Since no direct impacts are anticipated to socioeconomic resources from the Project, the following mitigation measures are intended to address indirect impacts associated with socioeconomic resources:

- The Applicant has stated that if crops were to be damaged and/or if soil were compacted, farmers would be compensated by repairing the ground or by using contractors to chisel-plow the site. Typically, a declining scale of payments would be set up over a period of a few years (Xcel Energy, 2009a).
- When property easements are needed the Applicant would work with individual landowners to provide just compensation for property easements; the ROW representative would contact the owners of each parcel to discuss the construction schedule and construction requirements, as well as activities to occur after construction (Xcel Energy, 2009a).

6.3.2. Property Values

Property values generally are determined by a combination of individual property characteristics and local market trends. These characteristics may include, but are not limited to, size, age, condition, and amenities. These characteristics are associated with both residential and non-residential properties. Local market trends typically are determined from detailed analyses of property sales within a given geographic area.

Residents living near existing or proposed overhead transmission lines often are concerned about how the proximity to the line could affect the value of their properties. Research on this issue, however, does not identify a clear cause and effect relationship between the two variables. Instead, the presence of a transmission line becomes one of several factors that interact to affect the value of a particular property. A power line may either increase or decrease the value of a property dependent on an individual's perception of a property's worth. This perception is indicative of how much one is willing to pay for the property.

Effects of transmission lines on property values are difficult to quantify as numerous variables may influence the final value of a property. These variables may include the type and size of power lines, the distance to the power lines, and amenities offered by the property. Researchers have not been able to isolate a leading variable that could predict the impact of transmission lines on property values. A summary of recent research for residential and non-residential properties is presented below.

Residential Properties

Since the 1950's, researchers have evaluated the impact of high voltage transmission lines on property values. Many of the early studies, however, were contradictory and unsupportive in regard to the selected research methodologies. In the 1970's, research became more systematic, including attitudinal and statistical evaluations. These types of studies continue today (Kroll and Priestley, 2003).

In 2000, the Public Service Commission of Wisconsin evaluated the results of 30 papers, articles, and court cases covering the period from 1987 through 1999. The authors of this research were interested in determining the impact of a transmission line on property values for inclusion in a Final Environmental Impact Statement for the Arrowhead – Weston Electric Transmission Line Project (PSCW, 2000). Their analysis identified two types of property value impacts that property owners may experience, which include potential economic impacts associated with the amount paid by a utility for a ROW easement and the value regarding the future marketability of the property. The first type of property value typically refers to the market price of the land with a transmission line and one without (PSCW, 2000). The second type of value refers to a combination of the sale price, the amount of time required to sell a property, and the debt amount carried over that period (PSCW, 2000).

The Wisconsin FEIS included six general observations from the studies evaluated, which are as follows:

- A potential reduction in sale price for single family homes may range from 0 to 14 percent;
- Adverse effects on the sale price of smaller properties could be greater than effects on the sale price of larger properties;
- Other amenities, such as proximity to schools or jobs, lot size, square footage of a house, and neighborhood characteristics, often have a much greater effect on sale price than the presence of a power line;
- Adverse effects created by the presence of a power line appear to diminish over time;
- Effects on the sale price of property most often are observed for property crossed by or immediately adjacent to a power line. However, effects also have been observed for properties that are located farther away from the line; and
- The value of agricultural property is likely to decrease if the power line poles are placed in an area that inhibits farm operations (PSCW, 2000).

The FEIS study also demonstrated that homes not directly adjacent to the ROW or beyond 200 feet from the ROW were affected to a much lesser degree than those abutting the line or ROW (PSCW, 2000). Based on these observations, however, the authors concluded that "It is very difficult to make predictions about how a specific transmission line (would) affect the value of specific properties" (PSCW, 2000).

Other authors evaluating the potential impacts of transmission lines on property values determined that a negative impact on value diminished with the distance from the power lines and became negligible at a distance of 200 meters (656.2 feet) (Colwell, 1990 and Hamilton and Schwann, 1995). Likewise, another author determined that prices could be expected to be affected within 100 feet of a transmission line, but that little effect would be perceived beyond that distance (DiMento, 1982 as cited in Kroll and Priestley, 1992).

In other evaluations of property values, some authors demonstrated that individual perceptions of property values were dependent on the size of the support structures (i.e., the height of the poles) and the amount of voltage carried. In this regard, larger transmission lines were perceived to have a greater impact on property value than lower support structures and lower voltage lines (Hamilton and Schwann, 1995). Other types of studies that evaluated perception suggested that those with higher status employment were more concerned over the presence of a transmission line than those with lower job status. These individuals often were concerned not only with property value, but also health and safety (Priestly and Evans, 1990 as cited in Kroll and Priestley, 1992).

Conversely, within a professional study of property sales in New England, the author found no evidence of systematic effects of either distance or visibility of a 345 kV transmission line on residential property values. Instead, the author of this study found a slight negative effect due to the presence of the transmission line easement on adjacent properties (Chalmers, 2009).

Based upon the conclusions from the evaluated studies, the presence of transmission wires and poles is not always indicative of a reduction in residential property value. Other factors may influence an individual's perception of the overall value and thus, in turn, the market value of a property. Furthermore, impacts on property values from the transmission lines likely would vary throughout the Study Area, since no two properties have the same characteristics.

Non-residential Properties
Studies on the effects of transmission lines and substations on non-residential property values are limited as compared to the availability of research on residential property values. In general, non-residential property value is determined by the location, size, and individual amenities associated with a specific parcel.

As aforementioned, the Project would utilize two existing substations. One of these properties is located within the city of Byron within an area zoned for industrial use. For this reason, a study of industrial property values is presented.

Dean Chapman (2005) conducted surveys and interviews concerning industrial property owners in the American Southwest in order to determine impacts on industrial property values. His surveys included over 100 interviews with buyers, sellers, tenants, property managers, and brokers. Chapman defined industrial properties, such that they "…not only include standard tiltup warehouses and distribution centers, (but) also… business parks, offices and even service-oriented retail uses."

Chapman concluded that the sale price generally was not affected by the presence of transmission lines. Instead, one of the major considerations for the determination of industrial property value was whether or not the property could provide the "highest and best use" for the owner. For example, according to Chapman (2005), if the "highest and best use" were to include a parking lot, and no change in use or design was

possible, the presence of a transmission line would not inhibit construction or operation of the parking lot. Therefore, if the best use of the property was affected directly by the presence of transmission lines, the property value then could be affected, as well (Chapman, 2005).

Other factors, such as building size, ease of access, number of loading docks, and health concerns, also were considered. For example, interviews with property managers of business parks showed that rent between units facing high voltage transmission lines and those where the lines were hidden from view was not different. Comments from interviews also did not suggest a lower rent or selling price due to concerns over health issues (Chapman, 2005).

Direct and Indirect Impacts – Property Values

The Project would impact overall property values in both a direct and indirect manner. The perceived and/or real market value of a property may decrease in response to one or more of the following direct and indirect effects:

- Concern or fear of possible health/safety effects (e.g., electro-magnetic fields, fall distances, etc.);
- Potential noise and visual interference due to the presence of the transmission line; and
- Potential interference with existing activities or existing or future land uses.

Conversely, the perceived and/or real market value of property could increase if increased local electrical reliability enhanced opportunities for development.

Direct and indirect impacts on property values could be experienced by residences located in proximity to the transmission line. Route Alternatives 1 and 2 have the greatest number of residential homes within 300 feet of the feasible centerline alignments evaluated for each Route Alternative with 25 and 26 residences, respectively. In comparison, only 4 residences are located within 300 feet of the feasible centerline alignment evaluated for Route Alternative 3. One residence is located within 100 feet of the centerline alignment evaluated for Route Alternative 1; none of the other Route Alternatives would be located within 100 feet of a residence.

The following provides a discussion of health and safety, aesthetic, land use, and development impacts that may affect overall property values. Residential and non-residential properties are discussed jointly. Differences between the two property types are noted only where applicable.

Health and Safety
Concerns over possible health effects (e.g., exposure to electric and magnetic fields) from transmission lines may influence the perceived value of a property and in turn the potential market value. Therefore, properties in the vicinity of transmission lines and/or substations could have a smaller pool of potential buyers as compared to an equivalent property located elsewhere.

Additional information on health and safety is provided in Section 6.1.6, Safety and Health, while a discussion of proximity to the transmission lines and associated facilities is provided in Section 6.1.1, Proximity to Structures.

Aesthetics
The presence of high voltage transmission lines may be considered to have an adverse impact on the overall quality and feel of a community, and thereby indirectly may reduce the perceived and/or market value of a property.

As demonstrated in recent studies, potential buyers may consider the presence of transmission lines when purchasing a property. The degree to which the perception of the landscape and the value of the property are affected by the presence of transmission lines is dependent on the individual. People viewing the transmission lines as incompatible with their expected viewshed may not be as willing to purchase a property in the vicinity of transmission lines. Therefore, the pool of potential buyers could be reduced due to the presence of the transmission lines.

In addition, the presence of trees on a residential property adds direct value. The loss of trees could impact both the perceived and market value of property. As part of the Project, tree removal may be required at 10 locations along Route Alternative 1, compared to seven locations along Route Alternative 2 (Xcel Energy, 2009a); the centerline for Route Alternative 3 would be located adjacent to an existing transmission line and within the existing ROW, as such, and less tree removal would be expected.

Section 6.1.2, Aesthetics, provides a more detailed discussion of the potential visual impacts associated with the Project.

Land Use
ROW may be obtained from public and private landowners for the Project. A decrease of useable lot space due to a transmission line easement could have a negative direct effect on the value of the property (additional discussion of impacts to agricultural land is provided in Section 6.3.3, Land-Based Economies). For instance, a limited amount of land may no longer be available for agricultural activities. To the extent possible, the Applicant would work with individual landowners to provide compensation for any loss of use (Xcel Energy, 2009a).

While the exact location for the transmission lines and support towers has not yet been determined, comments in scoping suggested that individual property owners were concerned as to the extent that future expansion on both private and public property

could be impacted by the presence of the Project. As stated in the route permit application, the Applicant would locate the poles as close to property division lines as reasonably possible in order to allow property owners the most complete use of their land (Xcel Energy, 2009a).

Modifications to the substation would occur within the existing fenced area; as such, no additional land would be needed to accommodate the Project in these two locations.

Development
The transmission line would be designed to meet current and projected needs. In addition, both the Pleasant Valley Substation and Byron Substation were designed and constructed to accommodate future transmission line interconnections (Xcel Energy, 2009a). As such, the transmission line could indirectly enhance opportunities for development of commercial or industrial interests due to the increase in electrical reliability. Residential, commercial, and industrial property values, therefore, may have the potential to increase if the increase in reliable power is perceived as a locational advantage to potential developers.

Mitigation – Property Values

Direct impacts to property values would be mitigated through landowner compensation for the use of their land through easement payments. Mitigation measures for indirect impacts associated with safety and health, aesthetics, and land use are summarized below and discussed in detail within the respective sections of the EIS.

Mitigation measures for indirect impacts associated with safety and health, aesthetics, and land use are as follows:

- **Safety and Health** - Potential effects would be avoided through adherence to industry design standards and compliance with federal regulations and through maximizing the distance between the transmission line and residences. The Applicant has committed to address stray voltage on a case by case basis (Xcel Energy, 2009a).

- **Aesthetics –** The Applicant has developed the Route Alternatives to maximize the use of existing corridors and to avoid residences to the extent possible (Xcel Energy, 2009a). In addition, the transmission poles and wires could be placed in a manner to minimize direct impacts (e.g. avoid placing transmission structures directly in front of a building) and sited by considering input from property owners. To minimize impacts to trees, removal could be limited to those trees located in the ROW that would affect the safe operation of the line. Landscaping also could be used to diffuse the effects of the power lines within and adjacent to the ROW in order to help screen the lines from residences (Holisko, 2008).

- **Land Use** - Zoning designations and land uses near the transmission lines are not expected to change as a result of the construction and operation of the Project.

Temporary and permanent impacts would be limited to the area where poles are placed and to the construction areas. Therefore, for all of the Route Alternatives, impacts to agricultural operations would be minimized by placement of the Project within or adjacent to existing roadway ROW and utility ROW to the extent possible. The Applicant has stated that poles would be located as close to property division lines as reasonably possible (Xcel Energy, 2009a).

6.3.3. Land-Based Economies

Land-based economies in Dodge, Mower, and Olmstead counties include agriculture (i.e., farming, livestock, and agri-business and tourism), mining, and forestry-based economies.

Agriculture

The land in Dodge, Mower, and Olmsted counties is primarily used for agricultural cultivation. Soybeans and corn are the primary crops grown in the tri-county area, with hay fields and pasture land scattered throughout the area. Total land under agricultural cultivation in the three counties is shown in Table 6.3.3-1.

Table 6.3.3-1 Land under Agricultural Cultivation (in acres)

	Total Cropland	Harvested Cropland	Percent Cropland in Production
Dodge	226,101	215,200	95
Mower	391,611	378,764	96
Olmsted	227,550	207,162	91

Source: USDA, 2007

Sheep and hogs are the primary livestock in Dodge and Mower counties, while cattle, hogs, and sheep are the primary livestock in Olmsted County (USDA, 2007). The market value of crops and livestock for the three counties is shown in Table 6.3.3-2.

Table 6.3.3-2 Market Value of Agricultural Products (in $1,000)

	Market value of Crops	Market value of Livestock
Dodge	91,966	80,996
Mower	166,424	121,179
Olmsted	83,020	71,904

Source: USDA, 2007

Soils utilized for agricultural cultivation may be classified as prime farmland, prime farmland if drained, prime farmland if protected from flooding, and farmland of statewide importance. Prime farmland is defined by the US Department of Agriculture as "land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber and oilseed crops and is available for these uses" (7 C.F.R. 657.5(a)(1)). Within Dodge, Mower, and Olmsted counties, approximately 65 percent, 49 percent, and 53 percent of farmland, respectively, is considered prime

farmland or farmland of statewide importance. An additional 26 percent, 48 percent, and 13 percent of the land in Dodge, Mower and Olmsted counties, respectively, is considered prime farmland if drained or protected from flooding (NRCS, 2005).

Several areas of agricultural land within the Study Area are part of the Conservation Reserve Program (CRP). The CRP program encourages environmental enhancement and provides an opportunity to convert highly erodible cropland or environmentally sensitive area to permanent vegetative cover, such as grasses or trees.

Farm Operations
A variety of farm equipment, passenger vehicles, and trucks are used in farm operations. The power lines would be designed to meet or exceed minimum clearance requirements over roads, driveways, cultivated fields, and grazing lands, and farm vehicles may be safely operated under the transmission lines. NESC recommends clearance height that generally accommodates a relative vehicle height of 14 feet.

Farm equipment and vehicles used under the HVTL have the potential to build up an electric charge. Such buildup is generally rare as vehicles are effectively grounded through modern tire design. In addition, metal parts of farming equipment are frequently in contact with the ground during farming operations, thus grounding the equipment. Vehicles may build up a charge if they have unusually old tires or are parked on dry rock, plastic, or other surface that insulate the vehicle from the ground. In such cases, the vehicle can be grounded by attaching a grounding strip. Health and safety effects of build up charges are discussed in Section 6.1.6, Safety and Health.

Insulated electric fences used in livestock operations can also pick up induced charges. Usually, the induced charge will drain off when the charger unit is connected to the fence. However, shocks may result when the charger is disconnected, either for maintenance or during fence construction. To prevent potential shocks, one or more of the fence insulators can be shorted out to ground with a wire when the charger is disconnected. In addition, an electric filter can be installed that grounds out charges induced from a power line while still allowing the charger to be effective (Xcel Energy, 2009a).

NESC guidelines establish build-free clear zones for transmission lines. Buildings are generally prohibited within the transmission line ROW. Metal buildings in close proximity to high voltage transmission lines can be properly grounded to avoid build-up of charge.

Aerial Applications
Crops grown in the Study Area may be subject to aerial applications of pesticides, fertilizers, or seeds. Power lines present an obstruction to low-flying application aircraft that follow a regular flight pattern for most efficient application, and the pilot may have to spot-treat the areas missed due to obstruction avoidance (Overhults, nd). Data on utilization of aerial applications in the Study Area was not available. The presence of

high voltage transmission lines could limit access to fields, increase the time needed to complete aerial applications, and could pose additional collision risks (NAAA, 2010).

Health Effects in Livestock
If stray voltage resulting from a transmission line inducing voltage on a distribution circuit reaches sufficient levels, animals coming in contact with it may receive a mild electric shock. Studies demonstrate that animals exhibit behavioral responses to stray voltage at animal specific thresholds. Exposure of hens to voltages up to 18V had no effects on their production and behavior (Reinemann, 2008). For cows, pigs, and sheep, levels of exposure just above the threshold level will result in a mild behavioral reaction, such as a blink of an eye. As the current intensity goes up, behavioral responses become more pronounced and more persistent, including involuntary muscle contractions and behaviors indicative of annoyance and pain (Reinemann, 2009).

Animals may start avoiding certain exposure locations which may result in reduced food and water intake (if the exposure occurs at those locations), and difficulty in handling or moving the animals. Contact with painful stimuli may also result in a release of stress hormones. However, studies performed in cows show that levels of voltage exposure that lead to behavioral changes do not compromise the immune function of dairy cows (Reinemann, 2009).

The literature published to date has shown little evidence of adverse effects of EMF from overhead power lines on farm animals and wildlife. Studies of animal reproductive performance, behavior, milk production, meat production, health and navigation have found minimal or no effects of EMF (Empetus, 2006). Studies have also been performed on farm animals (e.g. swine, sheep or cattle) grazing under power lines (50/60 Hz) or in the vicinity of broadcasting antennas. The studies found that there were no adverse effects found on cattle grazing below power lines (WHO, 2005).

Agri-business and tourism
Tweite's Pumpkin Patch, an agriculturally focused amusement park, is located near the city of Byron, along Route Alternative 1. The business comprises 20 acres of permanent amusements, such as a corn maze and other interactive activities for children, and 6 to 8 acres of self-pick pumpkins. For six weeks in a year, the business is open to the general public seven days a week. The rest of the year it is open for private events only (Tweite's, 2010). In 2009, the attendance was approximately 30,000 people (Tweite, 2010).

Mining
Gravel pits, quarries, and commercial aggregate sources are located within Olmsted, Dodge, and Mower counties. In Dodge County, the Route Alternative 1 would pass through undeveloped potential sand and gravel resources and potential crushed stone (limestone) resources. Although not located within the route, there are two quarries and numerous gravel pits located in the vicinity of Route Alternative 1. Olmsted County is considered a region of many crushed stone operations (MnDNR, 1998). Within Olmsted County, Route Alternative 2 would be adjacent to two gravel pits and be located

through undeveloped sand and gravel resources of moderate and low potential (MnDNR, 2010u). Route Alternative 3 would also be located adjacent to two gravel pits, near the intersection of MN 30 with the Dodge-Olmsted County line, and be located through undeveloped sand and gravel resources of moderate and low potential (MnDNR, 2010u). None of the feasible centerlines and associated ROW for the three Route Alternatives would cross active mining resources.

Forestry
There are no federal or state forests located within the Study Area. Wooded areas are present along streams and agricultural windbreaks, with occasional small wooded uplands present. A stand of virgin forest is present along Salem Creek.

Direct and Indirect Impacts – Land-Based Economies

The three Route Alternatives would be primarily located in areas used for agricultural cultivation. Long term impacts to agricultural land would include loss of land due to pole placement. Depending on the final alignment, CRP land may also be impacted by pole placement. Assuming a foundation diameter of 8 feet, each Project structure would displace up to approximately 50 square feet of soil. If poles are placed at an average distance of 400 feet apart, long-term loss of farmland would be up to 0.28 acres for Route Alternatives 1 and 2, and up to 0.25 acres for Route Alternative 3 due to the route's shorter distance.

Overall, agricultural production would be minimally impacted by the Project as farming and grazing activities could continue around and under the HVTLs. Temporary impacts during construction could include soil compaction, disruption of agricultural practices (e.g., center pivot irrigation or drain tile) and crop damage within the ROW. Temporary impacts could occur within the 80-foot ROW. Tables 6.3.3-3 and 6.3.3-4 show the total farmland types within the 80-foot feasible ROW evaluated for each Route and Segment Alternatives.

Table 6.3.3-3: Farmland Types within 80-foot ROW for the Route Alternatives

	Route Alternative 1		Route Alternative 2		Route Alternative 3	
Farmland Type	Area (acres)	Percent	Area (acres)	Percent	Area (acres)	Percent
Prime Farmland	116.4	65.5	121.3	68.8	92.8	58.8
Prime Farmland if Drained	48.7	27.4	33.4	19.0	35.3	22.4
Prime if Protected from Flooding	1.4	0.8	3.6	2.0	2.5	1.6
Statewide Importance	3.2	1.8	9.9	5.6	9.8	6.2
Other	8.0	4.5	8.0	4.6	17.3	10.9
Total	177.7	100	176.2	100	157.7	100

Source: Xcel Energy, 2009a

Table 6.3.3-4: Farmland Types within 80-foot ROW for the Segment Alternatives

	Segment Alternative A		Segment Alternative B		Segment Alternative C		Crossover Segment	
Farmland Type	Area (acres)	Percent	Area (acres)	Percent	Area (acres)	Percent	Area (acres)	Percent
Prime Farmland	18.0	78.9	20.4	70.1	8.2	42.7	12.8	65.0
Prime Farmland if Drained	2.2	9.7	2.9	10.0	4.8	25.0	1.4	7.1
Prime if Protected from Flooding	0	0	0	0	0	0	0.2	1.0
Statewide Importance	1.7	7.5	4.7	16.1	3.2	16.7	4.2	21.3
Other	0.9	3.9	1.1	3.8	3	15.6	1.1	5.6
Total	22.8	100	29.1	100	19.2	100	19.7	100

As shown in Tables 6.3.3-3 and 6.3.3-4, temporary impacts to prime farmlands would range from approximately 158 acres for Route Alternative 3 to 176 acres for Route Alternative 2 and 178 acres for Route Alternative 1. Route Alternative 3 also has a lower percentage of prime farmland within the ROW than Route Alternatives 1 or 2.

The Applicant has designed all routes to avoid displacement of residences and other structures. However, at one residence located on Route Alternative 1, a shed and residence are located on opposite sides of County Highway 15 are within 40 feet of the road ROW, such that placement of the transmission line on either side of County Highway 15 would require removal of a building. However, the feasible centerline developed by the Applicant would cross County Highway 15 at an angle in the location described, such that the Project ROW would be centered over County Highway 15 during the crossing and existing structures could remain in place. Alternatively, the Project could be aligned on the east side of County Highway 15 and the Applicant could reimburse the landowner for moving the shed outside the Project ROW. The shed is the only known agricultural structure that would be directly affected by the Project. Segment Alternative B, which heads east on County Highway 8 and north of 280th Avenue towards the Byron Substation, would avoid this location.

Farm equipment, passenger vehicles, and trucks may be safely used under and near power lines. Some farming equipment may require additional grounding to prevent buildup of electric charge, and refueling activities should occur over 100 feet from the power line.

Transmission lines can induce stray voltage on a distribution circuit that is parallel to and immediately under the transmission line. Effects of stray voltage could be felt by the cattle, potentially leading to modification of behavior. The Applicant has agreed to evaluate measures to address potential stray voltage issues on a case by case basis (Xcel Energy, 2009a). The three primary methods to reduce or eliminate stray voltage are cancellation, separation, and enhanced grounding. These methods are discussed further in Section 6.1.6. No adverse health impacts are expected to occur in livestock as a result of EMF exposure.

Access for agricultural aerial applications could be limited or made more hazardous due to the presence of the transmission line. Fields located between closely spaced transmission lines could experience the biggest restrictions, such as would occur if Route Alternative 3 is selected and the Project structures are placed 70 feet from the centerline of the existing 345 kV transmission line.

Temporary impacts at agri-businesses and tourism sites, including traffic increases due to lane closures, dust, and noise from construction, could lower attendance. Tweite's Pumpkin Patch is located along Route Alternative 1, south of the intersection of U.S. 14 and 280th Avenue. Tweite's is open to the public six weeks a year, typically from late September to October 31. In addition to construction related impacts noted above, construction during the six-week operational period could limit parking for visitors, which is conducted on the western portion of Tweite's site, adjacent to the east of 19th Avenue. An alignment of the Project on the west side of 19th Avenue would eliminate the placement of Project structures on the attraction property, although construction-related impacts could be experienced if construction is conducted in the fall. Use of Segment Alternative A would avoid Tweite's Pumpkin Patch by following the existing 345 kV transmission line between the Byron Substation and 10th Street SW.

No impacts on mining resources are expected as the Applicant has proposed to avoid gravel pits, rock quarries, and commercial aggregates sources during detailed design of the transmission line (Xcel Energy, 2009a).

Mitigation – Land-Based Economies

To mitigate impacts of transmission lines to agricultural resources, landowners would be compensated for the use of their land through easement payments. Additionally, to minimize loss of farmland (while still ensuring reasonable access to the land near poles), the Applicant would place the Project structures on private property adjacent to existing road ROW, allowing the Project ROW to overlap with road ROW and minimizing the amount of private land needed for the transmission ROW (Xcel Energy, 2009a).

The Applicant has committed to working with the owners of Tweite's Pumpkin Patch to place structures in such a way as to accommodate public use areas, if possible (Xcel Energy, 2009a). This might include an alignment of the Project to the west of 19th Avenue, which would avoid structure placement within the recreational facility. Use of Segment Alternative A in connection with Route Alternative 1 would avoid Tweite's Pumpkin Patch.

The Applicant has proposed that, when possible, the transmission line could be constructed before crops are planted or following harvest (Xcel Energy, 2009a). Landowners would be compensated for crop damage and soil compaction that occurs as a result of the Project. For soil compaction, the Applicant has stated that the farmers would be compensated to repair the ground themselves or contractors would be used to chisel-plow the site. Typically, a declining scale of payments could be set up over a period of a few years (Xcel Energy, 2009a).

To further minimize agricultural impacts, the Applicant has stated that springtime construction would be avoided to the extent possible. If construction during springtime is necessary, disturbance to farm soil from access to each structure location would be minimized by using the shortest access route, including construction of temporary driveways. Construction mats could also be used to minimize impacts on the access paths and in construction areas. (Xcel Energy, 2009a)

Transmission lines must be marked according to the local, state, and NESC standards to improve visibility and minimize risk of collision with power lines during aerial applications.

6.3.4. Zoning and Compatibility with Planning

The Project would be located in Dodge, Mower, and Olmsted counties, each of which maintains specific zoning regulations and designations and land use planning guidelines.

Although the Route Permit preempts local land use controls, the Applicant has stated that existing zoning designations and regulations would be accommodated during detailed routing, to the extent possible (Xcel Energy, 2009a). Zoning designations indicate acceptable land uses and provide insight into the possible impacts of the Project on future development plans. General zoning designations and regulations for Dodge, Mower, and Olmsted counties and the city of Byron are provided as part of this evaluation.

County and City Zoning Ordinances

Within Dodge County, zoning ordinances provide for agricultural, urban expansion, residential, commercial, and industrial uses. The operation of transmission lines is not specifically addressed within the Dodge County ordinance (2006), but are considered an essential service.

Accordingly, essential services can be provided within an agricultural district and urban expansion district as a conditional use and within residential, commercial, and industrial districts as a permitted use. Setback requirements vary by district. According to the county ordinance, transmission lines generally are to be placed in easements or dedicated public ways within new subdivision developments (§ 2005. General Subdivision Plat Design Standards).

As part of its county regulations, Mower County (2003) provides for the allowance of transmission lines. Similar to Dodge County, transmission lines are considered essential services. Electric transmission lines under 35 kV are permitted within an agricultural district, whereas larger capacity facilities are conditional uses (Mower County, 2003).

Similar to other geographic areas within the Study Area, Olmsted County and the city of Byron also have zoning ordinances. Olmsted County is zoned for multiple uses

including agricultural, industrial, commercial, and residential per the Zoning Ordinance (2010). Within this ordinance, transmission lines and associated substations are recognized as essential services. They are both permitted and conditional uses depending on the location and zoning designation. Within agricultural districts, for instance, essential services are conditional uses.

Six townships within Olmsted County are a part of the Township Cooperative Planning Association. This organization focuses on assisting members with overall land use planning and the development of zoning regulations. It provides technical assistance to its member communities rather than serving as a regulatory agency (TCPA, n.d.). For that reason, no specific regulations regarding transmission line development were noted from the Township Cooperative Planning Association.

Within the city of Byron, zoning regulations are provided for residential, commercial, industrial, and agricultural districts (City of Byron, n.d.). Similar to Dodge and Olmsted counties, transmission lines are considered essential services. These are outright uses within all zoning districts (§ 152.031 District Regulations). Industrial districts, in particular, can be utilized for transmission and distribution uses. The city's subdivision (§ 151.62 Utilities) requirements, however, provide for underground utility installments, unless already within existing public roads and ROW.

County and City Zoning Designations
Route Alternative 1 is located in Dodge, Mower, and Olmsted counties, with approximately 75 percent of the route located in Dodge County. The portion of the route in Dodge County is zoned as an agricultural district, in Mower County as rural management, and in Olmsted County as an agricultural protection district. Within the city of Byron, the land is zoned as industrial (Xcel Energy, 2009a).

Route Alternative 2 is located in Mower and Olmsted counties, with approximately 85 percent of the route located in Olmsted County. The portion of the route in Mower County is zoned as rural management and the portion in Olmsted County zoned as an agricultural protection district. Within the city of Byron, the land is zoned as industrial (Xcel Energy, 2009a).

Route Alternative 3 is located between Route Alternatives 1 and 2 within Dodge, Mower, and Olmsted counties. A majority of the route is within Olmsted County. The route in Dodge County is zoned as an agricultural district, in Mower County as rural management, and in Olmsted County as an agricultural protection district. Within the city of Byron, the land is zoned as industrial.

The Crossover Segment is located in both Dodge and Olmsted counties, with approximately 50 percent of the segment located in each county. Segment Alternative A is located entirely within Olmsted County while Segment Alternatives B and C are located within Dodge and Olmsted counties.

The Pleasant Valley Substation (owned by Great River Energy) is located in Pleasant Valley Township, Mower County, and the land is zoned as rural management. The Byron Substation (owned by Xcel Energy) is located in the city of Byron in an area zoned as industrial (Xcel Energy, 2009a).

Land Use Planning and Land Cover

The county comprehensive and land use plans often provide a description of existing and future land uses, as well as policies and goals for the respective communities. The initiatives cited within these plans usually are developed with public input and coordination among various county departments and officials. The plans typically provide for both short-term and long-term initiatives.

In order to establish a baseline for comprehensive planning initiatives, communities often provide a description of existing land use/cover types. Existing land use within the 80-foot feasible ROW evaluated for each of the Route Alternatives is presented in Table 6.3.3-1. Land use/cover is derived from the United States Department of Agriculture (USDA), National Land Cover Dataset. The total acreage and percentage of each individual land use/cover type was calculated using geographic information systems. Land cover types within the Study Area are shown in Figure 9, Land Use.

Table 6.3.3-1 Existing Land Cover within the 80-foot ROW of each Route Alternative

	Route Alternative 1		Route Alternative 2		Route Alternative 3	
Land Cover	**Acres**	**Percentage**	**Acres**	**Percentage**	**Acres**	**Percentage**
Alfalfa	0.42	0.23%	2.60	1.47%	0.00	0.00%
Corn	6.58	3.70%	7.48	4.24%	51.98	32.99%
Grass/Pasture/Non-Agriculture	0.00	0.00%	0.00	0.00%	0.02	0.01%
Misc. Vegetables and Fruits	0.00	0.00%	0.00	0.00%	2.69	1.70%
NLCD - Barren	0.22	0.13%	0.22	0.13%	0.55	0.35%
NLCD - Deciduous Forest	1.18	0.67%	4.38	2.49%	13.10	8.32%
NLCD - Developed/Low Intensity	35.44	19.94%	13.15	7.46%	1.08	0.69%
NLCD - Developed/Medium Intensity	0.67	0.38%	0.22	0.13%	0.10	0.06%
NLCD - Developed/Open Space	96.06	54.06%	98.22	55.73%	6.83	4.34%
NLCD - Grassland Herbaceous	26.43	14.88%	32.80	18.61%	46.46	29.49%
NLCD – Herbaceous Wetlands	0.00	0.00%	0.52	0.30%	0.34	0.22%
NLCD – Woody Wetlands	0.00	0.00%	0.34	0.19%	0.57	0.36%
Soybeans	10.68	6.01%	16.32	9.26%	33.83	21.47%
Total	**177.68**	100.00%	**176.26**	100.00%	**157.56**	100.00%

As shown in Table 6.3.3-1, Route Alternative 1 contains approximately 54 percent of developed/open space within the ROW evaluated. This type of land cover is the most prevalent in this Route Alternative. Likewise, Route Alternative 2 contains approximately 56 percent of developed/open space. Unlike Route Alternatives 1 and 2, the most dominant land cover types within the ROW evaluated for Route Alternative 3 are corn production and grassland herbaceous areas. Route Alternative 3 would require a total ROW of approximately 20 acres less than Route Alternative 1 or 2; however,

because it does not parallel existing roadways, the ROW for Route Alternative 3 would encompass more vegetative and agricultural land.

County Comprehensive and Land Use Plans
Dodge County maintains a draft Comprehensive Plan; however, the plan was not available for public review at the time of this EIS. According to the Dodge County Zoning Ordinance, the Comprehensive Plan provides the overall policies, statements, goals, and interrelated plans for private and public land and water use, transportation, and community facilities including recommendations for the future development of the county (Dodge County, 2006). Existing land use within Dodge County consists primarily of cultivated land. Some forest cover and residential areas also are present (LMIC, 1999).

The Mower County Comprehensive Plan (2002) provides guidance for current and future land use decisions for eight land use categorizations, including urban service, rural service, urban expansion, rural, agricultural, freeway interchange, conservation, and ground water quality. In general, the policies for these areas direct appropriate land use choices, which minimize impacts to rural areas and provide a balance of urban development and rural growth. In particular, in agricultural areas, preservation of the rural lifestyle and values is a main objective, as well as the protection of the maximum amount of agricultural land. Essential services are addressed in that they are permitted in the various land use areas, as long as they meet minimum development standards, such as, but not limited to, waste disposal. In general, existing and future land uses within agricultural areas of the county are anticipated to remain the same.

Within Olmsted County, the general land use plan defines four future land use categories (Olmsted County, 2006). These consist of the following:

- Resource protection areas – Reserved for the exclusive purposes of agriculture, limited residential development, recreation commercial and other business related uses; protection of natural resources; and exception areas to accommodate some subdivision activity.
- Urban service areas – Reserved for municipalities and additional developed and undeveloped land area around each municipality needed to accommodate development over the next 25 to 50 years.
- Urban reserve areas – Designated to delineate the best areas for anticipated urban growth between the years 2020 and 2045, to encourage development patterns that would not interfere with future urban growth, and to allow for compatible agricultural or other resource uses.
- Suburban development areas – Located adjacent to urban service areas and are intended to accommodate low-density residential development and not new commercial or industrial uses.

The development of transmission lines specifically is addressed in the resource protection area policies. Within these areas, the policy is such that these "…uses should

be controlled to the extent allowable to minimize potential aesthetic and other public health or welfare impacts including property impacts" (Olmsted County, 2006).

Transmission lines also are considered in the calculation of amenity scores[1] for suburban areas. Those located within 300 feet of high voltage electric transmission lines and substations are given a score of 0 out of a possible 100 for the Adjacent Land Use Compatibility Score (Olmsted County, 2006). This scoring suggests that while these are needed within communities, they are not a desirable land use within suburban developments.

In addition, Olmsted County is part of the Rochester-Olmsted County of Governments (ROCOG), which provides planning services to its member governments. The city of Byron also is located within its transportation planning area. As part of its plans, the ROCOG developed the 2035 Long Range Transportation Plan (2005), which provides for a future interchange on U.S. Highway 14. The intent of this interchange is to serve the city of Byron for future development (ROCOG, 2005).

Direct and Indirect Impacts – Zoning and Compatibility with Planning

Potential land use and zoning impacts from the Project include the following:

- Incompatibility with local land use, zoning, and comprehensive planning;
- Incompatibility with planned development; and
- Loss of use to landowners.

Local Land Use, Zoning, and Comprehensive/Land Use Plans

Due to the amount of land required for the Project, between 157 and 179 acres, the transmission line ROW would not directly impact local zoning categorizations and land use patterns; hence, these designations and land cover types would not be altered by the construction and operation of the Project.

However, indirect impacts to overall land use would result from the construction and operation of the transmission line. For this analysis, the discussion of the indirect impacts associated with land use is provided in the context of consistency and compatibility with county level comprehensive and land use plans.

The following general policies and goals are recommended within the various comprehensive and land use plans for the three counties:

- Preserve the rural character and values of agricultural areas;

[1] The Suburban Development Score (i.e., amenity score) is calculated as a function of site amenities and the energy and fiscal impact of the area on the community. According to the Olmsted County General Land Use Plan, the "amenity" score generally is modeled as a function of proximity to water bodies, varied terrain, and wooded vegetation, and separation from obnoxious influences, such as feedlots and junkyards (Olmsted County, 2006).

- Encourage development that provides a balance between commercial, residential, and industrial needs; and
- Minimize potential aesthetic and other impacts by locating essential services in existing ROW or easements.

The Project generally would be consistent with the goals set forth by the various communities. The Project is intended to enable two new 100 megawatt wind farms to reliably deliver power and to provide additional generation outlet capability in the Pleasant Valley Substation area. This in turn would allow the surrounding communities to supply additional capacity that would better support existing users and could be used for future residences and businesses (Xcel Energy, 2009b).

While positive benefits are associated with the creation of additional power capacity, adverse indirect impacts could also result. The presence of the transmission lines would not be consistent with the preservation of the rural character. The transmission line routes would create visual sight lines that are inconsistent with rural development. Residential and non-residential development also may be impacted indirectly due to a potential reduction in perceived and/or real market property values. A potential reduction in value may indirectly interfere with the goal of pursuing a balance of development activities and types within a community. Some developers may not be attracted to locations within the Study Area based on these perceived notions of value.

As indicated in the Olmsted County land use plans, proximity to a transmission line was not viewed as a preferable amenity (Olmsted County, 2006). Further discussion of this potential impact is provided in Section 6.3.2, Property Values.

Planned Development
Generally, the Project would be located within or adjacent to existing ROWs. These areas typically are reserved for utilities and other construction related activities. The introduction of transmission lines would not alter the future zoning categorization and the overall future land use. However, as previously discussed, indirect impacts are associated with the transmission lines, including but not limited to visual impacts and overall desirability.

In general, the parcels on which the lines would be located could be redeveloped in accordance with the goals and objectives outlined by the various comprehensive and land use plans without interference from the transmission lines. Individual landowners would be allowed to develop their properties outside the necessary easements.

As discussed in Section 6.3.6, the intersection of U.S. 14 and 19th Avenue/280th Avenue near the city of Byron has been identified by Mn/DOT and the city of Byron as a potential future location for an interchange. Development of an interchange could involve road widening or construction of additional lanes. Placement of the Project within or adjacent to the existing road ROW across U.S. 14 on 280th Avenue would limit placement options for a future interchange in the same location.

The ROCOG 2035 Long Range Transportation Plan indicated the following regarding this interchange:

> *The plan for Byron is adopted as part of Byron's comprehensive plan. As a result of the recently completed TH 14 West Corridor Plan Update, there are some inconsistencies in the long term growth area north of the existing city proper which need to be addressed, along with future adjustments that will be needed once interchange locations on TH 14 are finalized* (ROCOG, 2005).

Furthermore, the ROCOG 2035 Transportation Plan suggested that, "final interchange locations need to be finalized after more detailed design, cost, and impact analysis is completed" (ROCOG, 2005).

Although the location of the interchange has not been finalized, the city of Byron has included the interchange in zoning and planning decisions (Monosmith, 2010). Use of Segment Alternative A for Route Alternative 1 would avoid the potential interchange location identified by the city of Byron by routing the transmission line south from the Bryon Substation adjacent to the existing 345 kV line ROW and heading west on 10th Street SW to re-join Route Alternative 1.

Loss of Use

Landowners may experience both a temporary and permanent loss of use in areas where existing utilities are not currently located and a new easement is required for the Project. The temporary loss of use for landowners would occur during construction. During operation, the Project would require an 80-foot ROW. When the transmission line is placed along an undeveloped corridor across private land, an easement for the entire ROW (i.e., 80 feet in width) would be acquired from the affected landowner(s) (Xcel Energy, 2009a). Building structures would not be allowed within the ROW, which would result in a loss of potential land use. However, landowners would be allowed to use the ROW for other activities, including agricultural uses.

Route Alternatives 1 and 2 would be located within or adjacent to existing road ROW for approximately 96 and 88 percent of their length, respectively. Where the Route Alternative would be co-located with existing roads, the Project structures would be placed at or near the edge of the existing road ROW, such that approximately 40 feet of the Project ROW would overlap with the existing road ROW and a 40-foot easement would be required from private landowners, rather than a full easement width of 80 feet. Route Alternative 3 does not follow existing road ROW, but instead was developed to parallel an existing 345 kV transmission line. The Project transmission line structures would be aligned 5 feet within the existing 345 kV transmission line ROW such that the western 40 feet of Project ROW would overlap with existing ROW for the 345 kV line and 5 feet of the Project ROW extending to the east of the Project centerline would overlap with existing ROW. Placement of the Project structures within the existing 345 kV transmission line ROW would reduce the width of new ROW required to approximately 35 feet. Alignment of Route 3 to the east of the existing transmission line

would place Project structures nearer to property boundaries, where they exist, and limit loss of land use.

The two existing substations would be modified to accommodate the Project. At the Pleasant Valley and Byron Substations, all new equipment would be installed within the existing substation fences. As such, no direct impacts are anticipated to occur to existing and future zoning and land use categorizations. Likewise, since these are existing facilities, the Project would not be inconsistent with current and future land use plans. No loss of use would result, since the existing use is maintained.

Mitigation – Zoning and Compatibility with Planning

Zoning designations and land uses near the transmission lines are not expected to change as a result of the construction and operation of the Project. Temporary and permanent impacts would be limited to the area where poles are placed and to the construction areas.

For all of the Route Alternatives, impacts to agricultural operations would be minimized by placement of the Project within or adjacent to existing roadway ROW and utility ROW to the extent possible.

The Applicant would locate the poles as close to property division lines as reasonably possible (Xcel Energy, 2009a). Landowners also would be compensated for the use of their land through easement payments.

6.3.5. Recreation

Recreational resources located in the Study Area include businesses and activities focused on agri-business and tourism, fishing, hunting, trails (for biking and snowmobile use), waterways, and wildlife observation.

Agri-business and tourism

Tweite's Pumpkin Patch, an agriculturally focused amusement park, is located near the city of Byron, along Route Alternative 1. The business comprises 20 acres of permanent amusements, such as a corn maze and other interactive activities for children, and 6 to 8 acres of self-pick pumpkins. For six weeks in a year, the business is open to the general public seven days a week. The rest of the year it is open for private events only (Tweite's, 2010). In 2009, the attendance was approximately 30,000 people (Tweite, 2010). Tweite's Pumpkin Patch is further discussed in Section 6.3.3, Land-Based Economies.

Fishing
Streams and rivers located within the Study Area may be used by recreational fisherman. A fishing license is required for all people 16 or older wishing to engage in fishing activities. Within the Study Area, there is a continuous open season for many of the fish found in the local rivers, including crappies, sunfish, rock bass, white bass, and catfish (MnDNR, 2010y). Other species, such as stream trout, have specific catch seasons and catch limits (MnDNR, 2010aa).

There are no MnDNR designated trout lakes or trout streams within the Study Area (MnDNR, 2010z). However, Salem Creek is considered a popular fishing resource. Fishing effort and catch data were not available for water bodies in the Study Area.

Hunting
Within the vicinity of the Study Area, the eight state wildlife management areas (WMA) provide public land for hunting deer, small game, pheasants, waterfowl, and turkeys. Hunting may also occur on private lands. Most hunting activities require hunting permits, which are allocated across the state's 77 permit areas. The majority of the Study Area is encompassed by permit area 343, which issues a relatively high number of permits. For example, 1,875 permits out of 2,000 available were issued for the spring 2010 turkey season in the permit area, with 646 turkeys harvested (Dunton, 2010). In 2009, the permit area contained estimated 4,456 firearm hunters (MnDNR, 2009). The exact numbers of permitted hunters and harvested game are unknown for the Study Area.

Parks
There are no designated federal, state, or local parks, located within the Study Area. A stand of virgin forest is located along Salem Creek.

Trails
There are several snowmobile trails located in the Study Area. Driftskippers Trail (Trail 181), Dodge Co Trail (Trail 126), and Kasson-Monterville Trail (Trail 302) run east-west and would intersect with the proposed route alternatives. Tiger Bear I Trail (Trail 182) runs north-south through the eastern section of the Study Area and would not intersect with the Route Alternatives (MnDNR, 2010bb).

The Dodge County Trail Association (DCTA) has constructed several bike trails in Dodge County which may be used by bikers and cross-country skiers. None of the trails pass through the Study Area. Although no designated bike trails are present in the Study Area, the roads present within the Study Area may be used by recreational bikers. The DCTA plans construction of additional trails in Dodge County. To date, the future trails do not appear to cross the Study Area (DCTA, nd).

Waterways
Numerous creeks and intermittent tributaries are located in the Study Area, the largest of which include the South Fork of Zumbro Creek and North Branch of Root River, further discussed in Section 6.2.3, Water Resources. As shown on Figure 7, Water

Resources, Route Alternative 1 would result in eight waterway crossings, Route Alternative 2 would result in seven waterway crossings, and Route Alternative 3 would result in 10 waterway crossings. The waterways within the Study Area may be used for fishing, swimming, canoeing, or other recreational activities. According to Minnesota regulations, a stream or lake is open to recreational use over its entire surface if it is capable of floating a canoe and if it is lawfully accessible (MnDNR, 2010aa).

Salem Creek and other waterways may be used for recreational swimming by the residents of the Study Area. A section of the North Branch of Root River located outside of the Study Area is a designated water trail (MnDNR, 2010y). Recreational canoe and kayak use of the Root River water trail may possibly continue past the designated water trail area and into the Study Area. However, there are no public water access points maintained by local or State governments within the Study Area, and use of the waterways by non-residents is not expected to be significant.

Wildlife Management Areas

Wildlife management areas (WMAs) are part of Minnesota's outdoor recreation system. The WMAs protect wildlife habitat, provide citizens with opportunities for hunting, fishing, and wildlife watching, and promote wildlife-based tourism in the state (MnDNR, 2010cc). There are eight WMAs located within the study area which provide hunting and wildlife watching opportunities, as described in Table 6.3.5-1. The locations of WMAs are shown on Figure 10, Recreational Resources.

Table 6.3.5-1: Wildlife Management Areas in the Study Area

WMA Name	Size (acres)	Description	Recreation Opportunities
High Forest	69	Dominated by shrub-carr vegetation of grasses, forbs and shrubs. The terrain is relatively flat to rolling and there are 2 intermittent streams flowing through the property.	▪ Hunting for deer, small game, and pheasant ▪ Wetland wildlife and prairie wildlife viewing
Marian Marshall	59	Two native grassland plantings, wet riparian meadows with woody species of willow, red osier dogwood, green ash and soft maple. The easement is gated during the summer months.	▪ Hunting for deer, small game, and pheasant ▪ Wetland wildlife viewing
Nelson Fen	79	Established native grasses and wet meadow with aspen clones. A small 3 acre food plot and a calcareous fen are also present.	▪ Hunting for deer, small game, pheasant, and turkeys ▪ Wetland wildlife and prairie wildlife viewing
Rock Dell	494	Mix of grassland and woodland with approximately 2 miles of the Zumbro River flowing through it.	▪ Hunting for deer, small game, pheasant, and turkeys ▪ Fishing ▪ Prairie and forest wildlife viewing
South Fork	29	Primarily riparian woodland. The management objective for this unit is to provide habitat for deer and turkeys.	▪ Hunting for deer, waterfowl, and turkeys ▪ Forest wildlife viewing
Suess	54	Managed for deer and pheasants. The primary cover type is wet meadow with scattered aspen clones. Small mature conifer planting, some native prairie plants, and calcareous fen are also present.	▪ Hunting for deer, small game, and pheasant ▪ Wetland wildlife viewing
Tri-cooperative	47	Young forest and brushland habitats. Grassland, shrub rows and conifer cover planted on former cropland areas.	▪ Hunting for deer, small game, forest game birds, pheasant, doves, and turkeys ▪ Wetland, prairie, and forest wildlife viewing
Vernon	85	Part of a broad wetland area along the South Fork of the Zumbro River, dominated by willow and dogwood brushlands. Upland cover is mainly old field and seeded prairie grasslands.	▪ Hunting for deer, small game, pheasant, doves, and turkeys ▪ Wetland wildlife and prairie wildlife viewing

Source: MnDNR, 2010cc

Direct and Indirect Impacts – Recreation

Potential impacts to recreational resources would be similar for the three Route Alternatives, and are discussed collectively. No impact to recreational resources is expected from the substation modifications.

The operation of the Project would have no long-term direct impact on the recreational resources in the Study Area, as the Project would be designed to avoid displacement of buildings and outdoor recreational activities could occur within the ROW after construction.

The construction of the Project could have temporary indirect impacts on the agribusiness, fishing, hunting, trails, waterways, and wildlife management areas in the Study Area. Construction impacts including noise, dust, and increased traffic in the Study Area could diminish the user's experience of recreational resources. In addition, access to recreational resources could be temporarily limited during construction. Impacts related to maintenance activities would be similar to those experienced during construction and would also be temporary in nature.

Numerous waterways and three snowmobile trails would be crossed by the proposed transmission routes. Indirect aesthetic impacts could occur for recreational waterway and trail users passing underneath the transmission lines, as well as fishermen and hunters in the vicinity of the line.

Route Alternatives 1 and 2 would not be visible from the WMAs present in the Study Area (Xcel Energy, 2009a). However, Route Alternative 3 may be visible from South Fork Zumbo River WMA. Since the line would run along an existing transmission line, it would only slightly increase the visual intrusion to users of the WMA.

Mitigation – Recreation

Mitigation measures to reduce potential impacts from noise, dust, and visual intrusion, are discussed in applicable sections of the EIS.

The Applicant has agreed to work with the owners of Tweite's Pumpkin Patch to place structures in such a way as to accommodate public use areas, if possible (Xcel Energy, 2009a). If Route Alternative 1 is selected, construction near the agri-business could be conducted outside of Tweite's operational season, which typically runs from late September to the end of October. Use of Segment Alternative A in connection with Route Alternative 1 would avoid Tweite's Pumpkin Patch.

6.3.6. Transportation

The Study Area is accessible by a system of local, collector, and arterial roads. Table 6.3.6-1 lists the annual average daily traffic (AADT) volumes for U.S., Minnesota (MN), and County Highways crossed or paralleled by the 400-foot routes developed for each Route Alternative. County highways and local roads could be crossed multiple times by the Project transmission line to avoid residential homes. The number and locations of highway crossings would vary depending on the final alignment of the transmission line ROW within the route.

Table 6.3.6-1: Average Annual Daily Traffic Volumes of Highways near the Study Area

Highway	Location	Route Alternatives	AADT
U.S. 14	Dodge and Olmsted counties: Northern portion of Study Area, south of Byron Substation (runs east to west)	1, 2, and 3	17,700 - 18,700
MN 30	Dodge and Olmsted counties: Center of the Study Area (runs east to west)	1, 2, and 3	2,100 - 2,400
Cty Hwy 15	Dodge County: Western portion of Study Area (runs north to south)	1	730
Cty Rd V	Dodge County: County 15 becomes Couty Road V	1	120-175
Cty Hwy 8	Dodge County: Western portion of Study Area (runs east to west)	1	140
Cty Hwy 6	Dodge County: Center of Study Area (runs east to west)	1	440
Cty Hwy 4	Dodge County: Center of Study Area (runs east to west), connects to Olmsted Couty Highway 26	1	210
Cty Hwy 26	Olmsted County: Center portion of Study Area (runs east to west), connects to Dodge County Highway 4	2 and 3	435
Cty Hwy 17	Olmsted County: Center of Study Area (runs east to west)	2 and 3	295
Cty Hwy 25	Olmsted County: Center of Study Area (runs east to west)	2 and 3	300
Cty Hwy 10	Mower County: Southeast portion of Study Area (runs north to south)	2	450
Cty Rd 149	Olmsted County: Mower County Highway 10 turns into County Road 149 in Olmsted County	2	25

Source: Mn/DOT, 2006; Mn/DOT 2008; and Mn/DOT 2009

There are two trunk highways that would be crossed by the Project: U.S. 14 and MN 30. The two highways would be crossed by each of the three Route Alternatives with or without the use of Segment Alternatives. Installation or relocation of a utility within a trunk highway ROW would require a permit from the Minnesota Department of Transportation (Mn/DOT).

Route Alternatives 1 and 2 have been designed to parallel and overlap existing roadway ROW to minimize the amount of new ROW required from private landowner(s). However, structures would not be placed within the curb line of existing roadways, and as such would not restrict traffic flow. The Applicant has proposed that in locations where the Project ROW would overlap the existing roadway ROW, the Project structures be placed at the edge of the roadway ROW, such that approximately 40 feet of the Project ROW overlaps with existing ROW and 40 feet of new ROW is required.

Roads that would be paralleled by the Project ROW vary in width between 22 and 32 feet. Minnesota Highway 30, which would be crossed by all three Route Alternatives and would be paralleled by Route Alternative 2 for short segment, has an existing ROW of 150 feet. County Highway 15, which would be paralleled by Route Alternative 1, has an existing ROW that varies between 100 and 120 feet. All other roadways that would be paralleled by the Project ROW have an existing ROW between 66 and 100 feet. In locations where the Project ROW and existing ROW would be overlapping, the total ROW would vary between 106 and 190 feet in width. If the Project ROW were placed

adjacent to, but not overlap, existing roadway ROW, total ROW width would vary between 146 and 230 feet.

The route width would allow flexibility in the alignment of the transmission line such that roadways could be crossed in order to avoid certain sensitive resources. The transmission line would be designed in accordance with National Electrical Safety Code (NESC) standards, which establish clearances required between transmission lines and transportation structures. These clearances are designed to accommodate a relative vehicle height of 14 feet, such that vehicle use could safety occur beneath the transmission line (Xcel Energy, 2009a).

The intersection of U.S. 14 and 19th Avenue/280th Avenue was designated as a potential location for a future interchange in the 2004 Trunk Highway 14 West Subarea Study, prepared by Mn/DOT, the cities of Byron, Kasson, and Rochester, and Dodge and Olmsted counties (Mn/DOT, 2004). The Subarea Study evaluated numerous alternatives and variations for potential interchanges and grade separations for U.S. 14 and 19th Avenue /280th Avenue and County Highway 15. Based on analysis provided in the study and feedback from public comments, local government agencies, and a steering committee, the study concludes that a potential alternative to address major stakeholder concerns would consist of a full interchange at U.S. 14 and 19th Avenue/280th Avenue that is linked by connector roads to County Highway 15. Under the scenario, 19th Avenue/280th Avenue would be upgraded to a local collector road between 23rd Street NW and Frontier Road SE (Mn/DOT, 2004). Although the alternative described was proposed in the study to address major concerns, the study does not come to a definitive consensus on the preferred location of the interchange and notes that addition studies would be required prior to construction. District Mn/DOT personnel indicated that final selection of the interchange location and detailed planning have not been conducted (Schoenfelder, 2010). The interchange is not included in the District's 10-year plan, but could be constructed earlier if special legislative funding became available (Schoenfelder, 2010).

Route Alternative 1 would parallel 19th Avenue/280th Avenue and cross U.S. 14 near the proposed interchange location. The intersection is currently equipped with a two-way stop for vehicles crossing U.S. 14. West Frontage Road was designed and built by the city of Byron to accommodate a future interchange at that location (Monosmith, 2010). The area immediately north of the intersection is zoned as an eight-lot industrial park; two of the lots have been sold (Monosmith, 2010). Future access to U.S. 14 from the industrial park was identified as a concern for the park's development and viability in the Subarea Study (Mn/DOT, 2004).

Mn/DOT has indicated that the following three resurfacing projects are planned for trunk highways in the vicinity of the Study Area.

- State Project #5501-35AC consists of a heavy bituminous mill and overlay for U.S. 14 from Olmsted County 5 to Rochester. The project is scheduled for 2013. None of the Project Route or Segment Alternative would cross or parallel the

location included in the resurfacing; the westernmost start of the resurfacing project would be located approximately 1,000 feet east of Route Alternative 2.

- State Project #2004-02 consists of a mill and overlay for MN 30 from Hayfield, Minnesota to U.S. 63. The project is scheduled for 2015. Route Alternatives 1 and 3 would cross MN 30 in the location scheduled for resurfacing. Route Alternative 2 would parallel MN 30 for approximately 2,000 feet in an area scheduled for resurfacing.
- A yet unnamed state project scheduled for 2019 would consist of a mill and overlay for U.S. 63 from MN 30 to Rochester, Minnesota. None of the Project Route or Segment Alternative would cross or parallel the location included in the resurfacing; the start of the project would be approximately eight miles east of the Study Area.

One rail line is located within the Study Area. The Dakota, Minnesota & Eastern (DM&E) Railroad Corporation maintains an east-west rail line south of the Byron Substation for the movement of freight. The line is currently crossed by the existing 345 kV transmission line and would be crossed by all three Route Alternatives.

When a high-voltage alternating current (AC) transmission line is located adjacent to a railway, the railway's tracks and signals may be subject to electrical interference from capacitive, electric and magnetic, and conductive effects. The American Railway Engineering and Maintenance-of-Way Association (AREMA) has specifications for steady state rail-to-ground and equipment-to-ground voltage levels to ensure the safety of railway operating personnel and the public.

There are three registered airports located within 10 miles of the Study Area. Table 6.3.6-1 lists these airports and the Route Alternatives nearest to each airport.

Table 6.3.6-1: Airports near Project Route Alternatives

Airport	Location	Neareat Route Alternatives	Distance from Route Alternative
Rochester International Airport (public)	Rochester, MN	2	6 miles east
Dodge Center Airport (public)	Dodge Center, MN	1	6 miles west
Scrabeck Airport (private)	High Forest, MN	2	4 miles east

Known heliports located within 10 miles of the Study Area include St. Mary's Hospital, Charlton Building Heliport, Mn/DOT Heliport, and the Mayo One helipad at the Mayo Clinic, all of which are located in Rochester, Minnesota at a distance of over 5 miles from the Study Area.

Emergency services available in the vicinity of the Study Area include emergency transportation via the Mayo One helicopter service. There are four Mayo One aircraft, three helicopters and one plane, which service a 150-mile radius extending from Rochester, Minnesota; Mankato, Minnesota; and Eau Claire, Wisconsin (Mayo Clinic,

2010). Medical helicopters utilize temporary landing zones during responses to medical emergencies. The helicopter may land in fields and roadways to get as close as safely possible to patients (Zhuikov, 2010). According to an Omniflight Helicopters, Inc. representative, Mayo One can land in a variety of areas, as long as the landing area and the approach surface are clear of obstructions (Representative of Omniflight, personal communication, September 30, 2010). Typically, first responders to an emergency via ground vehicles would identify a suitable landing zone for Mayo One aircraft. Safety of the landing zone would be confirmed through use of aircraft equipment (Mayo One, 2008). Safety features installed on the helicopter include a wire strike kit that enables the helicopter to cut through power lines in case of accidental contact (Mayo Clinic, 2010).

Although specific landing information for Mayo One was not available, the same helicopter model is used by various other organizations located throughout the country. For example, the Wyoming Life Flight utilizes EC145 helicopter and, following the National EMS Pilots Association guidelines, requires the touchdown area to be 75 feet by 75 feet during daytime and 125 feet by 125 feet during nighttime. The landing area must be clear of people, vehicles, trees, poles, wires, posts, stumps, and debris that could blow into the rotor (WMC, 2010). The approach and departure area must also be clear of overhead obstructions, such as wires, trees, and light posts. The presence of high voltage transmission lines near other types of obstructions, such as trees, light poles, and residences, would not add significantly to the landing restrictions already present.

The Federal Aviation Administration (FAA) regulates the use of lighting and markers for transmission lines above certain heights. The FAA requires a Notice of Proposed Construction or Alternation for transmission line projects within specified distances to airports and heliports to evaluate potential interference with air traffic and instrumentation.

Direct and Indirect Impacts – Transportation

Construction of the Project would result in temporary construction-related detours and road closures, resulting in an overall increase in traffic and travel times for the heavier travelled roads in the Study Area, U.S. 14 and MN 30. Road or lane closures would occur where the alternatives cross and (to some degree) parallel roads. Closures and detours would typically be necessary to string transmission lines across roads, or to allow for the movement of construction vehicles and the delivery of construction materials. Due to the traffic volumes on local roads, it is not expected that lane closures would significantly delay travel times.

A portion of the Project ROW could overlap existing roadway ROW. The grading of highway ROW is designed to assure proper drainage of water and any changes to the grade due to Project structures or grading could cause erosion of the highway grade or impede surface water drainage.

Route Alternatives 1, 2, and 3 would each cross U.S. 14 approximately 1,000 to 3,000 feet west of the section of U.S. 14 scheduled for an overlay in 2013. Due to the distance

between the Project and overlay project, no direct impacts are anticipated. However, increased traffic delays could occur on U.S. 14 if construction of the Project and the road overlay project occurred simultaneously and required lane closures.

All three Route Alternatives would require crossing the DM&E railroad line south of the Byron Substation. If the DM&E ROW is entered during Project construction, approval would be required from DM&E. At locations where the Project crosses the railroad, rail traffic would be halted or redirected during Project construction. Construction (including delivery and installation of materials, and stringing of transmission lines across the railroad) could be timed to avoid most rail traffic.

Due to the distance of each airport from the Route and Segment Alternatives, the placement of Project structures within the Route and Segment Alternatives is not expected to create obstacles or hazards for air traffic. The Study Area is developed with an existing overhead 345 kV transmission line, 69 kV transmission lines, and distribution lines of similar height as the Project. A discussion of potential interference with aerial applications of pesticides appears in Section 6.3.3.

Route Alternative 1
Route Alternative 1 would be located within or adjacent to road ROW for approximately 96 percent of its length (Xcel Energy, 2009a). Route Alternative 1 is the only Route Alternative that would cross U.S. 14 in the location identified in a Mn/DOT 2004 Subarea Study are a potential site for a future interchange. Although the study did not reach a definitive consensus on the preferred location of the interchange, the city of Byron has identified 19th Avenue/280th Avenue as the city's preferred location and modified access roads and industrial zoning to accommodate the interchange. Because the interchange has not been designed, specific impacts from the Project on the interchange are unknown. The existing intersection consists of a two-way stop for traffic on 19th Avenue/280th Avenue. Development of an interchange could involve road widening to accommodate a diamond interchange or J-turns (Schoenfelder, 2010). Placement of the Project within or adjacent to the existing road ROW across U.S. 14 on 280th Avenue would limit placement options for a future interchange in the same location. Use of Segment Alternative A for Route Alternative 1 would avoid the potential interchange location identified by the city of Byron by routing the transmission line south from the Bryon Substation adjacent to the existing 345 kV line ROW and heading west on 10th Street SW to re-join Route Alternative 1.

Route Alternative 2
Route Alternative 2 would be located within or adjacent to road ROW for approximately 88 percent of its length (Xcel Energy, 2009a). Unlike Route Alternatives 1 and 3, Route Alternative 2 parallels MN 30 for a portion of its length. Due to the traffic volume on MN 30, Project related traffic delays are expected to be greater on MN 30 than local roads. Route Alternative 2 would parallel MN 30 for approximately 2,000 feet in an area scheduled for resurfacing in 2015. The Project could interfere with resurfacing activities and temporarily increase traffic through road and lane closures if the project schedules

coincide. However, no impacts are anticipated if construction of the Project is completed prior to resurfacing.

Route Alternative 3
Route Alternative 3 would parallel an existing 345 kV transmission line that largely traverses agricultural land and does not parallel existing roadways. Thus, traffic increases related to road and lane closures would be less for Route Alternative 3 than Route Alternatives 1 or 2. In addition, Route Alternative 3 would not interfere with planned Mn/DOT road improvement projects.

Mitigation – Transportation

The Project would be designed in accordance with NESC standards to minimize impacts to transportation. NESC standards establish clearances required between transmission lines and transportation structures.

HVTL permits issued by the Commission direct the Permittee to comply with Mn/DOT and all applicable road authorities' management standards and policies during construction. The permits also direct the permittee to provide written notice of construction to Mn/DOT and applicable city, township, and county road authorities.

Construction workforces could work closely with the Minnesota State Patrol and county officials to ensure the implementation of appropriate measures to safeguard the public and construction workforces, and to notify the public about planned road closures and detours. Potential interference with highway resurfacing projects could be reduced by coordinating construction schedules with Mn/DOT.

If Route Alternative 1 is selected, use of Segment Alternative A would avoid the location identified by the city of Byron as a preferred site for a future U.S. 14 interchange.

7. Alternatives to the Project

Environmental review in a Certificate of Need proceeding provides the Commission and the public with information on the potential environmental impacts of a proposed project and alternatives to the project that would meet the stated need of the project. Certificate of Need proceedings evaluate matters of size, type, and timing. In accordance with Minnesota Rule 7849.1500, this EIS describes and analyzes the following alternatives:

- No-Build Alternative;
- Demand Side Management;
- Purchased Power;
- Conservation;
- Existing Line or System Improvements; and
- Generation Alternatives.

7.1. Need of the Proposed Project

The stated need of the Project is to interconnect two existing 100 MW wind generation projects and provide additional outlet capacity to serve future generators in the Pleasant Valley Substation area (Xcel Energy, 2009b). The Grand Meadow Wind Farm and Wapsipinicon Wind Farm, each located in Mower County, have been operational since December 2008. The Project transmission line was identified as a required system improvement to accommodate the wind farms in the 2007 Midwest Independent Transmission System Operator (MISO) Interconnection System Impact Study (MISO, 2007). Although operational, the wind farms are limited in the amount of generation delivered to the electric system due to the existing output capacity. The Grand Meadow Wind Farm is owned by the Applicant. The Wapsipinicon Wind Farm is owned by enXco and power from the wind farm is purchased by Southern Minnesota Municipal Power Agency (SMMPA). The Applicant has an obligation to construct the Project transmission line under an agreement with Midwest Independent Transmission System Operator, Inc., SMMPA, and Wapsipinicon Power, dated March 13, 2009 (Xcel Energy, 2009b).

The Grand Meadow and Wapsipinicon wind farms operate under an agreement with Great River Energy that allows the wind farms to use existing transmission capacity belonging to Great River Energy's Pleasant Valley Generating Station when capacity is not needed for the generating station (Xcel Energy, 2009b). The arrangement curtails the outlet capacity of the wind farms when the generating station is operating at a level that uses all available transmission capacity from the Pleasant Valley Substation. The Applicant estimates that Grand Meadow Wind Farm will experience a four percent curtailment prior to substation modifications, which could increase in the absence of additional transmission capacity (Xcel Energy, 2009b).

In addition to providing capacity for the existing wind farms, the Project would add approximately 150 MW of additional outlet capacity for the Pleasant Valley Substation area (Xcel Energy, 2009b). The Project was recommended in a 2008 RIGO Study to increase generation outlet capacity in the area (Xcel Energy, 2008). A need for future outlet capacity for the area is anticipated due to the increase in wind farm development in the region. Under the Renewable Energy Standard (RES), Minnesota Utilities are required to generate or purchase 25 percent of their retail electric sales from renewable generation sources, including wind energy (Xcel Energy, 2009b).

7.2. No-Build Alternative

Under a No-Build Alternative, the Project would not be constructed. The Grand Meadow and Wapsipinicon wind farms would be limited in the amount of future generation delivered to the electric system due to the existing output capacity. The Applicant anticipates that the wind farms will experience curtailment in the absence of additional transmission capacity (Xcel Energy, 2009b). The No-Build Alternative would not meet the stated need of the Project to interconnect the two wind farms and provide additional outlet capacity.

Under a No-Build Alternative, no land would be required for transmission line ROW and there would be no changes to the existing environment in the Study Area.

7.3. Demand Side Management

Demand side management refers to actions that would influence the quantity or patterns of energy consumption. Common demand side management techniques include incentives for installation and use of energy efficient technologies, incentive pricing programs to reduce demand during peak consumption hours, and load leveling and control measures.

Use of demand side management techniques could reduce energy consumption during peak demand periods. A reduction in demand would decrease the need for additional future generation outlet capacity in the Pleasant Valley Substation area. However, demand side management would not provide the infrastructure needed for the existing Grand Meadow and Wapsipinicon wind farms to transmit their full generating capacity to the system.

7.4. Purchased Power

Purchased power refers to one utility purchasing energy from other utilities. Under a purchased power alternative, the overall demand for energy and needed generation outlet capacity would remain the same. A 2008 RIGO Study identified the need for increase generation outlet capacity in the Study Area (Xcel Energy, 2008). The Applicant estimates that under the Renewable Energy Standard, Minnesota utilities will need to generate or purchase approximately 5,000 to 6,000 MW of renewable generation (Xcel

Energy, 2009b). In order to transmit renewable energy either by the generator or under a purchased power agreement, significant transmission infrastructure would be necessary (Xcel Energy, 2009b). Any new transmission lines constructed under this alternative would negate any benefit of a purchased power alternative over the Project. In addition, an alternative that relied on purchased power would not provide the infrastructure needed for the existing Grand Meadow and Wapsipinicon wind farms to transmit their full generating capacity to the system.

7.5. Conservation

Energy conservation efforts could reduce the need for electric generation and thus decrease the need for additional future generation outlet capacity in the Pleasant Valley Substation area. However, these measures would not provide the infrastructure needed for the existing Grand Meadow and Wapsipinicon wind farms to transmit their full generating capacity to the system.

7.6. Existing Line or System Improvements

The Applicant evaluated the possibility of double-circuiting the Project 161 kV transmission line with the existing 345 kV transmission line that runs between the Pleasant Valley and Byron Substations. Under a double circuiting scenario, the 161 kV line would share the existing pole structures of the 345 kV line and no new structures or ROW would be required. Double circuiting is used when two circuits serve different functions or where high capacity, but not redundancy, is required (Xcel Energy, 2009a). Where redundancy is required, double circuiting would jeopardize reliability because of the greater risk that an outage would occur on both lines simultaneously (Xcel Energy, 2009a).

Double circuiting of the Project with the existing 345 kV transmission line would approximately triple the cost of construction (Xcel Energy, 2009b). In addition, double circuiting would require suspending service on the 345 kV line, which provides bulk transmission support to the Rochester area (Xcel Energy, 2009b).

The existing 345 kV line is constrained under a Special Protection Scheme (SPS) that requires curtailment of generation at the Pleasant Valley Substation when there are high north-south flows on the transmission line. If the Project and 345 kV transmission lines were double circuited, NERC would consider both of the circuits to be a single contingency type of event and generation would have to be curtailed on the new double circuited line. Thus, no additional outlet capacity would be achieved through double circuiting and the stated need of the Project would not be achieved. (Xcel Energy, 2009a)

The 2008 RIGO analysis evaluated a transmission alternative to the Project that would not require a new 161 kV transmission line. The stated need for additional generation outlet capacity could be met through upgrading approximately 50 miles of existing 161 kV lines and the construction of a second Pleasant Valley 346/161 kV transformer initially, followed by a 10 mile upgrade of existing 161 kV lines by 2016. Total cost of the

improvements is estimated at $21 million and approximately 60 miles of construction would be required (Xcel Energy, 2009b).

Under the transmission line upgrade alternative, no new ROW would be required. However, impacts to land cover, agricultural use, flora, and fauna could occur when the existing ROW is re-disturbed during upgrade activities. Construction and ROW clearing activities would be similar to those identified for the Project in Chapter 6, but would occur for a length of 60 miles.

7.7. Generation Alternatives

The stated need of the Project is to increase the transmission capacity to serve the needs of two 100 MW wind farms operating in Mower County and transport renewable generation from the Study Area to a load that is generally north of the location of renewable generation. An increase in generation would not provide the infrastructure needed for the existing Grand Meadow and Wapsipinicon wind farms to transmit their full generating capacity to the system.

8. Required Permits and Approvals

Construction of the Project would require a High Voltage Transmission Line (HVTL) permit from the Commission (Minn. Stat. 216E.03, subd. 2). Additional potentially required permits and approvals are listed in Table 8-1 below. The table also includes applicable regulations that may guide regulating agencies in the permit or approval process.

Table 8-1: Potentially Required Permits and Approvals

Regulation/Policy	Citation	Description – As Relevant to Project
Federal Regulations and Permits		
Archaeological Resources Protection Act	16 U.S.C. 470	The Act requires a permit for the excavation or removal of archaeological resources from publicly held lands, if necessary. Permitted excavations must further archaeological knowledge and the resources removed are to remain the property of the United States.
Clean Air Act	42 U.S.C. 7401	The Act establishes NAAQS for certain pervasive pollutants. The Act establishes limitations on SO_2 and NO_x emissions and sets permitting requirements. Authority for implementation of the permitting program is delegated to the MPCA.
Clean Water Act, as amended in 1972	33 U.S.C. 1251	The Act contains standards to address the causes of pollution and poor water quality, including municipal and industrial wastewater discharges, polluted runoff from urban and rural areas, and habitat destruction. National Pollutant Discharge Elimination System (NPDES) Permit - Requires sources to obtain permits to discharge effluents and stormwaters to surface waters. The NPDES permit would be issued by the State of Minnesota. Section 401 – Water Quality Certification for Wetlands. Depending on the Project's proximity to impaired waters, a Section 401 Water Quality Certification or waiver from the MPCA to verify compliance with water quality standards may be required. Section 404 — Permits for Dredged or Fill Material. Regulates the discharge of dredged or fill material in the jurisdictional wetlands and waters of the United States. Permits are issued by the USACE.
Determination of No Hazard to Air Navigation	14 CFR 77	The FAA must confirm that construction of the Project does not constitute a hazard to air navigation if the Project is sited within certain distances to airports and heliports.
Emergency Planning and Community Right-to-Know Act of 1986	42 U.S.C. 11001 et seq.	The Act requires that the Applicant maintains an inventory of specific chemicals used or stored on-site and annually report quantities present or used over applicable threshold.
Endangered Species Act of 1973 and Amendments of 1982	16 U.S.C. 1531 et seq.	The Act requires any federal agency authorizing, funding, or carrying out any action to ensure that the action is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of critical habitat of such species. If the Project is determined to be an activity that might incidentally harm (or "take") endangered or threatened species, the Applicant

		would be required to obtain an incidental take permit from the USFWS. In addition to obtaining the permit, the Applicant would be required to develop a Habitat Conservation Plan.
Migratory Bird Treaty Act	16 U.S.C. 703 et seq.	The Act protects birds that have common migration patterns between the United States and Canada.
National Historic Preservation Act	16 U.S.C. 470 et seq.	Under Section 106 of the Act, prior to the approval of the expenditure of any federal funds on the Project or prior to the issuance of any license, the federal agency must take into account the effect of the Project on any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register. The federal agency shall afford the Advisory Council on Historic Preservation established under Title II of the Act a reasonable opportunity to comment with regard to such undertaking.
Noise Control Act	42 U.S.C. 4901-4918	The Act directs federal agencies to carry out programs in their jurisdictions "to the fullest extent within their authority" and in a manner that furthers a national policy of promoting an environment free from noise that jeopardizes health and welfare. The Minnesota noise regulations are administered by the MPCA under Minnesota Statute 116.07 subds 2 and 4 and Minnesota Rule 7030.0050.
Occupational Safety and Health Act of 1970	29 U.S.C. 651 et seq.	The Act established regulations for the protection of worker health and safety. The Applicant would be subject to OSHA general industry standards and OSHA construction standards.
Pollution Prevention Act of 1990	42 U.S.C. 13101 et seq.	The Act establishes a national policy for waste management and pollution control.
Resource Conservation & Recovery Act	42 U.S.C. 6901	The Act regulates the treatment, storage, and disposal of hazardous wastes. The Applicant would be required to manage hazardous wastes generated during construction or operation of the Project in accordance with the Act.
State Regulations and Permits		
Aboveground Storage Tank Registration	Minn. R. ch. 7001 and 7151	The rule requires that aboveground storage tanks larger than 110 gallons of oil or petroleum products be registered with the state.
Access Permit	Minn. R. 8810.0050	The rule requires the Applicant to obtain an access permit from Mn/DOT if access is needed from established Mn/DOT ROWs.
Cultural Resources Review	36 CFR Part 800	The federal regulation requires state review under the National Historic Preservation Act.
Drainage Permit	Minn. R. 8810.3200-8810.3600	The rule requires a permit for the repair of utility or rebuilding of structures already in place (e.g., manholes, catch basins).
Electrical Inspection	Minn. R. ch. 3800	The rule requires the Project to conform to all applicable electrical codes, enforced by the state.
Environmental Laboratory Certification	Minn. R. 4740.2010-4740.2120	The rule states that if sampling is required under state or federal permits (e.g., NPDES), environmental laboratory certification would be required.
Hazardous Waste Generator License	Minn. R. 7045.0225	The rule requires that if the Project generates greater than 10 gallons of hazardous waste in a calendar year, the Applicant must obtain a license.
License to Cross Public Lands and Waters	Minn. R. ch. 6135	The rule requires a license if utility services are to cross public waters or lands administered by the MnDNR.
Minnesota Endangered Species Law and Permit	Minn. R. ch. 6134 and Minn. Stat. 84.0895	The statute requires MnDNR to adopt rules designating species meeting the statutory definitions of endangered, threatened, or species of special concern. The resulting list of Endangered, Threatened, and Special Concern Species is codified as Minn. R. ch. 6134.

		If the Project is determined to be an activity that including picking, digging, or destroying a threatened or endangered plant species, the Applicant would be required to obtain a permit from the MnDNR.
NPDES General Construction Stormwater Permit	40 CFR 122.26; Minn. R. 7001.1035	The federal regulation authorizes the state environmental agency to regulate NPDES general stormwater permits. Coverage under the state general permit is required for construction projects disturbing greater than 1 acre of land.
NPDES/SDS Permit	Minn. R. 7001.0020	The rule requires a permit if wastewater generated from the Project is to be discharged to waters of the U.S.
Oversized/Overweight Vehicle Permit	Minn. Statutes 169.80	Vehicle size and weight limits are defined by Minnesota Statute. Exceptions to the limits can be granted by Mn/DOT in the form of an oversized/overweight vehicle permit.
Public Waters Work Permit (Protected Waters Permit)	Minn. R. 6115.0160-6115.0280	The rule requires a permit for work activities that would change or diminish the course, current, or cross section of public waters within the state. Winter construction in public waters would require this permit.
Utility Permit on Trunk Highway ROW	Minn. R. 8810.3100-8810.3600	The rule requires a permit to install or move existing utilities on existing trunk highway ROWs.
Water Appropriation Permit	Minn. R. 6115.0600-6115.0810; 6115.0010	The rule requires a general notification to the MnDNR if groundwater is withdrawn for construction dewatering, landscaping, or hydrostatic testing. A Water Appropriations Permit would be required if groundwater is withdrawn at a rate greater than 10,000 gallons per day or one million gallons per year.
Wetland Conservation Act	Minn. R. 8420.0100-8420.0935	The Act requires anyone proposing to drain, fill, or excavate a wetland to first try to avoid disturbance; second, try to minimize the impact; and third, replace any lost wetland acres, functions, and values. The Act is administered by local government entities, except in cases of state land, for which the act is administered by the MnDNR.
County Permits		
Utility Permit		Utility permits are required for work proposed in Dodge and Olmsted County highway rights-of-way, including installation and repair of telephone cables, power lines, gas lines, storm sewers, sanitary sewers, water mains, ditching grading, and culvert installation.
Access Permit		Access permits are required for any changes proposed to driveway access or driveway widening along country highways, including field driveways, residential driveways, commercial driveways and public street access in Olmsted, Dodge, and Mower counties.
Oversize/Overweight Vehicle Permit		Permits are required on all Olmsted County highways for oversized and overload vehicles.
Moving Permit (Hauling)		Moving Permits are required whenever legal dimensions and/or axle weights are exceeded per Dodge and Mower County regulations.
Culvert Extension/Connection Permit		Permit required if extending/connecting culverts in Dodge County.
Working in the Right-Of-Way Permit		A permit is required if the Project is constructed on, across, or under the right-of-way of a Dodge County highway.

In addition to the permits and approvals described above, county and city construction and building permits would be required for the Project.

9. References

Bonneville Power Administration (BPA). 2002. Bonneville Power Transmission/Grand Coulee, Bell 500 kV Transmission line Project. Appendix B-1 Grand Coulee-Bell 500-kV Transmission Line Project - Electrical Effects. Electronic Resource accessed September 13, 2010, at: http://nepa.energy.gov/nepa_documents/docs/deis/eis0344/AppxB1_electromag.pdf

California Electric and Magnetic Fields Program. 2000. "Electric and Magnetic Fields measurements and possible effect on human health – what we know and what we don't know in 2000." Electronic version accessed May 17, 2010 at: http://www.ehib.org/emf/longfactsheet.PDF.

Carpenter, David O. 2010. Testimony in the matter of the route permit application by Great River Energy and Xcel Energy for a 345 kV line from Brookings County, South Dakota to Hampton, Minnesota.

Carpenter, David O. and Cindy Sage. 2008. "Setting Prudent Public Health Policy for Electromagnetic Field Exposures." *Reviews on Environmental Health.* Vol. 23, No. 2.

Chalmers, James A. and Frank A. Voorvaart. 2009. High-Voltage Transmission Lines: Proximity, Visibility, and Encumbrance Effects. The Appraisal Journal (Summer, 2009). Electronic Resource accessed August 26, 2010, at: http://www.analysisgroup.com/uploadedFiles/Publishing/Articles/2009_HVTLs_and_Property_Values.pdf.

Chapman, Dean. 2005. "Transmission Lines and Industrial Property Value." Right of Way November/December 2005: 20-27. Electronic Resource accessed August 26, 2010, at: http://www.irwaonline.org/EWEB/upload/ROW%20Archives%207-05%20thru%207-06/1105/Transmission%20Lines%20&%20Industrial%20Property%20Value.pdf.

City of Byron, n.d. City Code. Electronic Resource accessed August 25, 2010, at: http://www.byronmn.com/index.asp?Type=B_BASIC&SEC={426E4183-29C8-4883-BFEE-6DCD1817B9F2}&DE={13D7BD31-653A-49CE-B4D8-0E402483763D}.

Colwell, Peter F. 1990. Power Lines and Land Value. The Journal of Real Estate Research (Spring 1990) Vol. 5 #1, pp. 117-127. Electronic Resource accessed August 26, 2010, at: http://aux.zicklin.baruch.cuny.edu/jrer/papers/pdf/past/vol05n01/v05p117.pdf.

Dodge County Trail Association (DCTA), nd. Electronic resource accessed August 24, 2010 at: http://www.mndcta.net/index.html

Dodge County Zoning Ordinance. 2006. Electronic Resource accessed August 25, 2010, at: http://www.co.dodge.mn.us/pdf/Dodge_County_Zoning_Ordinance_2006.pdf

Dunton, Eric. 2010. Spring 2010 Wild Turkey Harvest Report. Minnesota Department of Natural Resources. Electronic resource accessed August 25, 2010 at: http://files.dnr.state.mn.us/recreation/hunting/turkey/springturkey2010_harvest.pdf

Electric Power Research Institute, Inc. (EPRI). 2003. "EPRI Comments on the IEEE Standard for Safety Levels with Respect to Human Exposure to Electromagnetic Fields, 0 to 3 kHz (2002)." Electronic document accessed on May 17, 2010 at: http://www.osha.gov/SLTC/elfradiation/epri-ieee1-03d.pdf.

Empetus Close Corporation. 2006. Electric and magnetic Fields from Overhead Power Lines – A Summary of Technical and Biological Aspects. Electronic resource accessed September 2, 2010 at: http://www.scribd.com/doc/15954241/Electric-and-Magnetic-Fields-from-Overhead-Power-Lines

Federal Communications Commission (FCC). 2010. Audio Division and Database. Electronic resource accessed September 10, 2010 at: http://www.fcc.gov/mb/audio/

Federal Emergency Management Agency (FEMA). 2010. Flood Insurance Rate Maps (FIRMs). Website Accessed September 8, 2010 at http://www.fema.gov/hazard/map/firm.shtm

Gronhovd, Amanda. 2008. *Phase 1a Background Research for the RIGO Project in Dodge, Fillmore, Mower, and Olmsted Counties Near Rochester Minnesota.* 10,000 Lakes Archaeology, Inc., South St. Paul, Minnesota. Submitted to Barr Engineering, Minneapolis, Minnesota.

Hamilton, Stanley W. and Gregory M. Schwann. 1995. "Do High Voltage Electric Transmission Lines Affect Property Value?" *Land Economics,* 71(4), pp. 436-444. November.

Holisko, Gary. 2008. "Developing Near Transmission Lines?" Right of Way July/August 2008: 32-36. Electronic Resource accessed August 26, 2010, at: http://www.irwaonline.org/EWEB/upload/0708d.pdf.

Kroll, Cynthia and Thomas Priestley. 2003. The Effects of Overhead Transmission Lines on Property Values. Report Prepared for the Edison Electric Institute Siting and Environmental Planning Task Force. Original publication 1992. Electronic Version 2003. Electronic Resource accessed September 7, 2010, at: http://staff.haas.berkeley.edu/kroll/pubs/tranline.pdf.

Land Management Information Center (LMIC) at Minnesota Planning. 1999. Dodge County Land Use and Cover. Electronic Resource accessed September 7, 2010, at: http://www.gda.state.mn.us/maps/LandUse/lu_dodg.pdf.

Mayo Clinic. 2010. Helicopter – Mayo One. Electronic Resource accessed October 2, 2010 at: http://www.mayoclinic.org/medical-transport/mayoone.html

"Mayo One: More than a fast ride." 2008. Heart Prints. Immanuel St. Joseph's Foundation. Summer. Electronic Resource accessed October 2, 2010 at: http://www.mayohealthsystem.org/mhs/live/contribute/isj/documents/heartprintssummer08.pdf

Midwest ISO (MISO). 2007. "Interconnection System Impact Study Report." August 29.

Minnesota Department of Agriculture (MDA). 2010a. Profiles and Identification of Invasive Species (Birdsfoot trefoil). Website accessed on October 1, 2010 at: http://www.mda.state.mn.us/plants/pestmanagement/misac/profiles.aspx

Minnesota Department of Agriculture (MDA). 2010b. Canada Thistle Profile. Website accessed on October 1, 2010 at: http://www.mda.state.mn.us/plants/badplants/noxiouslist/canadathistle.aspx

Minnesota Department of Employment and Economic Development. 2010. County Unemployment Rates. Electronic resource accessed October 4, 2010 at: http://www.positivelyminnesota.com/Data_Publications/Data/Current_Economic_Highlights/County_Unemployment_Rates.aspx

Minnesota Department of Natural Resources (MnDNR). 1998. Mineral Industries of Minnesota. Electronic resource accessed August 27, 2010 at: http://images.dnr.state.mn.us/education_safety/education/geology/digging/minmap.gif

Minnesota Department of Natural Resources (MnDNR). 2002. Significant Aggregate Resource Deposits. Dodge County, MN. Electronic resource accessed August 27, 2010 at: http://files.dnr.state.mn.us/lands_minerals/do_plate1.pdf

Minnesota Department of Natural Resources (MnDNR). 2009. 2009 Minnesota Deer Harvest Report. Electronic resource accessed August 25, 2010 at: http://files.dnr.state.mn.us/outdoor_activities/hunting/deer/2009_harvest.pdf

Minnesota Department of Natural Resources (MnDNR). 2009a. Water Year Data Summary 2007-2008. Website accessed on September 8, 2010 at: http://files.dnr.state.mn.us/waters/groundwater_section/sustainability/whereisGW.pdf

Minnesota Department of Natural Resources (MnDNR). 2010a. Prairie Bush Clover Species Profile. Website accessed on September 7, 2010 at: http://www.dnr.state.mn.us/rsg/profile.html?action=elementDetail&selectedElement=PDFAB27090

Minnesota Department of Natural Resources (MnDNR). 2010b. Glade Mallow Species Profile. Website accessed on September 7, 2010 at: http://www.dnr.state.mn.us/rsg/profile.html?action=elementDetail&selectedElement=PDMAL0X010

Minnesota Department of Natural Resources (MnDNR). 2010c. Valerian Species Profile. Website accessed on September 7, 2010 at: http://www.dnr.state.mn.us/rsg/profile.html?action=elementDetail&selectedElement=PDVAL03073

Minnesota Department of Natural Resources (MnDNR). 2010d. American Ginseng Species Profile. Website accessed on September 7, 2010 at: http://www.dnr.state.mn.us/rsg/profile.html?action=elementDetail&selectedElement=PDARA09010

Minnesota Department of Natural Resources (MnDNR). 2010e. Northern Cricket Frog Species Profile. Website accessed on September 7, 2010 at: http://www.dnr.state.mn.us/rsg/profile.html?action=elementDetail&selectedElement=AAABC01010

Minnesota Department of Natural Resources (MnDNR). 2010f. Wood Turtle Species Profile. Website accessed on September 7, 2010 at: http://www.dnr.state.mn.us/rsg/profile.html?action=elementDetail&selectedElement=ARAAD02020

Minnesota Department of Natural Resources (MnDNR). 2010g. Loggerhead Shrike Species Profile. Website accessed on September 7, 2010 at: http://www.dnr.state.mn.us/rsg/profile.html?action=elementDetail&selectedElement=ABPBR01030

Minnesota Department of Natural Resources (MnDNR). 2010h. Timber Rattlesnake Species Profile. Website accessed on September 7, 2010 at: http://www.dnr.state.mn.us/rsg/profile.html?action=elementDetail&selectedElement=ARADE02040

Minnesota Department of Natural Resources (MnDNR). 2010i. Ozark Minnow Species Profile. Website accessed on September 7, 2010 at: http://www.dnr.state.mn.us/rsg/profile.html?action=elementDetail&selectedElement=AFCJB28680

Minnesota Department of Natural Resources (MnDNR). 2010j. Northern Brook Lamprey Species Profile. Website accessed on September 7, 2010 at: http://www.dnr.state.mn.us/rsg/profile.html?action=elementDetail&selectedElement=AFBAA01030

Minnesota Department of Natural Resources (MnDNR). 2010k. Ellipse Species Profile. Website accessed on September 7, 2010 at: http://www.dnr.state.mn.us/rsg/profile.html?action=elementDetail&selectedElement=IMBIVA4010

Minnesota Department of Natural Resources (MnDNR). 2010l. Creek Heelsplitter Species Profile. Website accessed on September 7, 2010 at: http://www.dnr.state.mn.us/rsg/profile.html?action=elementDetail&selectedElement=IMBIV22020

Minnesota Department of Natural Resources (MnDNR). 2010m. AniMap: an interactive mapping tool. Accessed August 27, 2010 at: http://www.dnr.state.mn.us/maps/animap/index.html

Minnesota Department of Natural Resources (MnDNR). 2010n. WMA Detail Report for Tri-cooperative WMA. Website accessed on August 27, 2010 at: http://www.dnr.state.mn.us/wmas/detail_report.html?map=COMPASS_MAPFILE&mode=itemquery&qlayer=bdry_adwma2py3_query&qitem=uniqueid&qstring=WMA0157400

Minnesota Department of Natural Resources (MnDNR). 2010o. WMA Detail Report for South Fork Zumbro River WMA. Website accessed on August 27, 2010 at: http://www.dnr.state.mn.us/wmas/detail_report.html?map=COMPASS_MAPFILE&mode=itemquery&qlayer=bdry_adwma2py3_query&qitem=uniqueid&qstring=WMA0157400

Minnesota Department of Natural Resources (MnDNR). 2010p. WMA Detail Report for Rock Dell WMA. Website accessed on August 27, 2010 at: http://www.dnr.state.mn.us/wmas/detail_report.html?map=COMPASS_MAPFILE&mode=itemquery&qlayer=bdry_adwma2py3_query&qitem=uniqueid&qstring=WMA0184800

Minnesota Department of Natural Resources (MnDNR). 2010q. Eastern Broadleaf Forest Provence. Website accessed on September 2, 2010 at: http://www.dnr.state.mn.us/ecs/222/index.html

Minnesota Department of Natural Resources (MnDNR). 2010r. Minnesota Department of Natural Resources (MnDNR). 2010b. Palezoic Plateau Section. Accessed August 30 at: http://www.dnr.state.mn.us/ecs/222L/index.html

Minnesota Department of Natural Resources (MnDNR). 2010s. Birdsfoot trefoil Invasive Terrestrial Plant Profile. Website accessed on September 2, 2010 at: http://www.dnr.state.mn.us/invasives/terrestrialplants/herbaceous/birdsfoottrefoil.html

Minnesota Department of Natural Resources (MnDNR). 2010t. Canada Thistle Invasive Terrestrial Plant Profile. Website accessed on September 2, 2010 at: http://www.dnr.state.mn.us/invasives/terrestrialplants/herbaceous/canadathistle.html

Minnesota Department of Natural Resources (MnDNR), 2010u. Aggregate Resources Sand and Gravel Potential. Olmsted County, MN. May 2010. Electronic resource accessed August 27, 2010 at: http://files.dnr.state.mn.us/lands_minerals/plate_a_olmsted_sandandgravel_potential.pdf

Minnesota Department of Natural Resources (MnDNR). 2010v. Public Water Inventory (PWI) Maps. Website accessed on September 8, 2010 at: http://www.dnr.state.mn.us/waters/watermgmt_section/pwi/maps.html

Minnesota Department of Natural Resources (MnDNR). 2010w. Rochester Plateau Subsection. Accessed August 30 at: http://www.dnr.state.mn.us/ecs/222Lf/index.html

Minnesota Department of Natural Resources (MnDNR). 2010x. Palezoic Plateau Section. Accessed August 30 at: http://www.dnr.state.mn.us/ecs/222L/index.html

Minnesota Department of Natural Resources (MnDNR). 2010y. A Water Trail Guide to the Root River. Electronic resource accessed August 25, 2010 at: http://files.dnr.state.mn.us/maps/canoe_routes/root.pdf

Minnesota Department of Natural Resources (MnDNR). 2010z. Fishing. Electronic resource accessed August 24, 2010 at: http://www.dnr.state.mn.us/fishing/index.html

Minnesota Department of Natural Resources (MnDNR). 2010aa. Minnesota Fishing Regulations 2010. Electronic resource accessed August 24, 2010 at: http://files.dnr.state.mn.us/rlp/regulations/fishing/fishing2010.pdf

Minnesota Department of Natural Resources (MnDNR). 2010bb. Snowmobile Trail Maps. Map 4. Electronic resource accessed August 25, 2010 at: http://www.dnr.state.mn.us/snowmobiling/maps.html

Minnesota Department of Natural Resources (MnDNR). 2010cc. Wildlife Management Areas. Electronic resource accessed August 24, 2010 at: http://www.dnr.state.mn.us/wmas/index.html

Minnesota Department of Transportation (Mn/DOT). 2004. "Trunk Highway 14 West Subarea Study, Final Report." September 30.

Minnesota Department of Transportation (Mn/DOT). 2006. Olmsted County Traffic Volume Map. Accessed electronically on September 17, 2010 at: http://www.dot.state.mn.us/traffic/data/maps/trunkhighway/2006/counties/olmsted.pdf

Minnesota Department of Transportation (Mn/DOT). 2008. Mower County Traffic Volume Map. Accessed electronically on September 17, 2010 at: http://www.dot.state.mn.us/traffic/data/maps/trafficvolume/2008/counties/mower.pdf

Minnesota Department of Transportation (Mn/DOT). 2009. Dodge County Traffic Volume Map. Accessed electronically on September 17, 2010 at: http://www.dot.state.mn.us/traffic/data/maps/trafficvolume/2009/counties/dodge.pdf

Minnesota House of Representatives, House Research Department. 2006. Primer on Minnesota's Property Taxation of Electric Utilities. Electronic Resource accessed August 26, 2010, at: http://www.house.leg.state.mn.us/hrd/pubs/pruttax.pdf

Minnesota Office of Enterprise Technology (MnOET). 2010. Codes for the Identification of River Reaches and Watercourses in Minnesota. Website accessed on October 1, 2010 at: http://www.state.mn.us/portal/mn/jsp/content.do?id=-536891917&subchannel=null&sc2=null&sc3=null&contentid=536916430&contenttype=EDITORIAL&programid=536911234&agency=OETweb

Minnesota Pollution Control Agency (MPCA). 2008. A Guide to Noise Control in Minnesota.

Minnesota Pollution Control Agency (MPCA). 2010. *Annual Air Monitoring Network for the State of Minnesota*. Website accessed July 2009 at: http://www.pca.state.mn.us/index.php/air/air-monitoring-and-reporting/air-emissions-and-monitoring/air-monitoring-network-plan.html/aq10-05[1].pdf

Minnesota Pollution Control Agency (MPCA). 2010a. Minnesota's Impaired Waters and TMDLs. Website accessed on September 8, 2010 at: http://www.pca.state.mn.us/index.php/water/water-types-and-programs/minnesotas-impaired-waters-and-tmdls/assessment-and-listing/303d-list-of-impaired-waters.html?menuid=&missing=0&redirect=1

Minnesota Pollution Control Agency (MPCA). 2010b. Basins and Watersheds in Minnesota. Website accessed on October 1, 2010 at: http://www.pca.state.mn.us/index.php/water/water-types-and-programs/surface-water/basins-and-watersheds/basins-and-watersheds-in-minnesota.html

Minnesota State Demographic Center (MSDC). 2005. 2005 Income Estimates. Electronic Resource accessed August 26, 2010, at: http://www.demography.state.mn.us/

Minnesota State Demographic Center (MSDC). 2009. 2009 Population Estimates. Electronic Resource accessed August 26, 2010, at: http://www.lmic.state.mn.us/datanetweb/php/census2000/estimate/report.php.

The Minnesota State Interagency Working Group on EMF Issues (MSIWG). 2002. A White Paper on Electric and Magnetic Field Policy and Mitigation Options. Website accessed on November 9, 2009 at: http://www.capx2020.com/Images/EMFWhitePaper2002.pdf.

Minnkota Power Cooperative, Inc., n.d. Center to Grand Forks Project. Radio, Television, Cell Phone, and GPS Interference Facts. Electronic Resource accessed September 10, 2010, at: http://www.minnkotacgf.com/Documents/PostScoping/CGF_Minnkota_Interference_factsheet_02252010.pdf.

Monosmith, Jana. 2010. Personal telephone communication between Jana Monosmith, City of Byron Planning Coordinator and Meghan Sweeney, ERM. September 14.

Mower County. 2002. Mower County Comprehensive Plan. Electronic Resource accessed August 25, 2010, at: http://www.co.mower.mn.us/Planning-Zoning-Environmental-Services.htm.

Mower County Zoning Ordinance. 2003. Electronic Resource accessed August 25, 2010, at: http://www.co.mower.mn.us/files/PZES/ZoningOrdinance/Mower%20County%20Zoning%20Ordinance%2011%204%2009.pdf.

National Agricultural Aviation Association (NAAA). 2010. Electronic resource accessed August 31, 2010 at: http://www.agaviation.org/

National Institute of Environmental Health Sciences (NIESH). 1999. NIEHS Report on Health Effects from Exposure to Power-line Frequency Electric and Magnetic Fields. Website accessed on November 9, 2009 at: http://www.niehs.nih.gov/health/docs/niehs-report.pdf.

Natural Resources Conservation Service (NRCS). 2010a. Rapid Watershed Assessment Resource Profile, Zumbro River Watershed. Accessed September 1, 2010 at: http://www.mn.nrcs.usda.gov/technical/rwa/Assessments/reports/zumbro.pdf

New York Regional Interconnect, Inc. (NYRI). 2008. New York Regional Interconnection. Exhibit E-5, Effect on Communications. February 2008. Electronic Resource accessed September 13, 2010, at: http://www.nyri.us/pdfs/Article7/Exhibit%20E-5_FINAL_01-28-08.pdf.

Office of Energy Security (OES). 2010. Environmental Impact Statement Scoping Decision. PUC Docket Nos. E002/TL-09-1315 and CN-08-992. July 9.

Olmsted County. 2006. Olmsted County General Land Use Plan. Original Dated November 14, 1995. Updated June 14, 2006. Electronic Resource accessed August 25, 2010, at: http://www.co.olmsted.mn.us/planning/docs/CountyGLUP_20060614.pdf.

Olmsted County Zoning Ordinance. 2010. Electronic Resource accessed August 25, 2010, at: http://www.co.olmsted.mn.us/ordinances/docs/Planning/County/OC_Zoning_Ordinance_April_15_2010.pdf

Overhults, Douglas G. Applicator Training Manual for Aerial Application of Pesticides. University of Kentucky. Electronic resource accessed August 31, 2010 at: http://www.uky.edu/Ag/PAT/cat11/cat11.htm#operations

Pacific Gas and Electric Company (PG and E). 2005. PG and E Delta Distribution Planning Area Capacity Increase Substation Project. August 2005. Proponent's Environmental Assessment. Electronic Resource accessed September 10, 2010, at: http://www.cpuc.ca.gov/environment/info/aspen/deltasub/pea/16_corona_and_induced_currents.pdf.

Pleasant Valley Wind, LLC. 2009. Application for Large Wind Energy Conversion System Site Permit. PUC Docket No. IP 6828/WS-09-1197. November 23.

Public Service Commission of Wisconsin (PSCW). 2000. Property Values. Final Environmental Impact Statement. Arrowhead—Weston Electric Transmission Line Project, Volume 1, Public Service Commission of Wisconsin Docket 05-CE-113. Issued October 2000.

Public Service Commission of Wisconsin (PSCW). 2001. PSC Overview Series EMF – Electric & Magnetic Fields. June 2001.

Public Service Commission of Wisconsin (PSCW). 2010. Environmental Impacts of Transmission Lines. Website accessed on September 7, 2010 at: http://psc.wi.gov/thelibrary/publications/electric/electric10.pdf.

Rau and Wooten. 1980. Environmental Impact Analysis Handbook.

Reinemann, Douglas J., Ph.D. 2008. Literature Review and Synthesis of Research Findings on the Impacts of Stray Voltage on Farm Operations. March 31. Electronic resource accessed September 2, 2010 at: http://www.uwex.edu/uwmril/pdf/08%20OEB%20SV%20Research%20Report_Reinemann_20080530.pdf

Reinemann, Douglas J., Ph.D. 2009. What do we know about stray voltage? University of Wisconsin – Madison. April. Electronic resource accessed September 2, 2010 at: http://www.uwex.edu/uwmril/pdf/09%20What%20do%20we%20know%20about%20Stray%20Voltage.pdf

Rochester-Olmsted County of Governments (ROCOG). 2005. ROCOG 2035 Long Range Transportation Plan. Electronic Resource accessed September 1, 2010, at: http://www.co.olmsted.mn.us/planning/rocog_2035_long_range_transportation_plan_(last_updated_september_2005).asp.

Schoenfelder, Mark. 2010. Personal telephone communication between Mark Schoenfelder, Minnesota Department of Transportation and Meghan Sweeney, ERM. September 21.

Straumann, Ueli and Jianbin Fan. 2009. Audible Noise from AC-UHV Transmission Lines – Theoretical Comparison of Broadband and Tonal Components. Electronic Resource accessed September 13, 2010, at: http://www.eeh.ee.ethz.ch/uploads/tx_ethpublications/UHV09_StraumannFan_April09__2_.pdf.

Township Cooperative Planning Association (TCPA), n.d. Township Cooperative Planning Association. Electronic Resource accessed August 31, 2010, at: http://tcpamn.org/default.htm.

Tweite's Pumpkin Patch, 2010. Electronic resource accessed August 26, 2010 at: http://tweitepumpkins.com/index.htm

Tweite, Tom. 2010. Written correspondence to Matthew Langan, OES, during scoping period.

Union of the Electric Industry – EUROELECTRIC. Environmental and Society Working Group. 2003. "EMF Exposure Standards Applicable in Europe and Elsewhere." May.

United States Census Bureau. 2000a. DP-1. Profile of General Demographic Characteristics: 2000. Data Set: Census 2000 Summary File 1 (SF 1) 100-Percent Data. Geographic Area: Byron City, Minnesota. Electronic Resource accessed August 25, 2010, at: http://factfinder.census.gov.

United States Census Bureau. 2000b. DP-1. Profile of General Demographic Characteristics: 2000. Data Set: Census 2000 Summary File 1 (SF 1) 100-Percent Data. Geographic Area: Dodge County, Minnesota. Electronic Resource accessed August 25, 2010, at: http://factfinder.census.gov.

United States Census Bureau. 2000c. DP-1. Profile of General Demographic Characteristics: 2000. Data Set: Census 2000 Summary File 1 (SF 1) 100-Percent Data. Geographic Area: Mower County, Minnesota. Electronic Resource accessed August 25, 2010, at: http://factfinder.census.gov.

United States Census Bureau. 2000d. DP-1. Profile of General Demographic Characteristics: 2000. Data Set: Census 2000 Summary File 1 (SF 1) 100-Percent Data. Geographic Area: Olmsted County, Minnesota. Electronic Resource accessed August 25, 2010, at: http://factfinder.census.gov.

United States Census Bureau. 2000e. DP-1. Profile of General Demographic Characteristics: 2000. Data Set: Census 2000 Summary File 1 (SF 1) 100-Percent Data. Geographic Area: State of Minnesota. Electronic Resource accessed August 25, 2010, at: http://factfinder.census.gov.

United States Census Bureau. 2000f. DP-3. Profile of Selected Economic Characteristics: 2000. Data Set: Census 2000 Summary File 3 (SF 3) - Sample Data. Geographic Area: Byron City, Minnesota. Electronic Resource accessed August 25, 2010, at: http://factfinder.census.gov.

United States Census Bureau. 2000g. DP-3. Profile of Selected Economic Characteristics: 2000. Data Set: Census 2000 Summary File 3 (SF 3) - Sample Data. Geographic Area: Dodge County, Minnesota. Electronic Resource accessed August 25, 2010, at: http://factfinder.census.gov.

United States Census Bureau. 2000h. DP-3. Profile of Selected Economic Characteristics: 2000. Data Set: Census 2000 Summary File 3 (SF 3) - Sample Data. Geographic Area: Mower County, Minnesota. Electronic Resource accessed August 25, 2010, at: http://factfinder.census.gov.

United States Census Bureau. 2000i. DP-3. Profile of Selected Economic Characteristics: 2000. Data Set: Census 2000 Summary File 3 (SF 3) - Sample Data. Geographic

Area: Olmsted County, Minnesota. Electronic Resource accessed August 25, 2010, at: http://factfinder.census.gov.

United States Census Bureau. 2000j. DP-3. Profile of Selected Economic Characteristics: 2000. Data Set: Census 2000 Summary File 3 (SF 3) - Sample Data. Geographic Area: State of Minnesota. Electronic Resource accessed August 25, 2010, at: http://factfinder.census.gov.

United States Census Bureau. 2008. Data Set: 2008 American Community Survey 1-Year Estimates. Survey: American Community Survey. Selected Geographies: Minnesota and Olmsted County. Electronic Resource accessed August 26, 2010, at: http://factfinder.census.gov.

United States Department of Agriculture (USDA). 2007. 2007 Census of Agriculture. Table 1 County Summary Highlights: 2007. Electronic resource accessed September 2, 2010 at http://www.agcensus.usda.gov/Publications/2007/index.asp

United States Department of Transportation (USDOT). 1997. Final "Department of Transportation Order to Address Environmental Justice in Minority Populations and Low-Income Populations,"[subsequent to draft in Federal Register, Vol. 60, No. 125, June 29,1995, pp.33899-33903.] signed by Secretary Pena on February 3, 1997; published in Federal Register, Vol. 62, No. 72, pp. 18377-18381. Officially formatted into DOT Order 5610.2. April 15.

United States Environmental Protection Agency (USEPA). 2010. Electric and Magnetic Fields (EMF) Radiation from Power Lines. Website accessed on September 7, 2010 at http://www.epa.gov/radtown/power-lines.html.

United States Environmental Protection Agency (USEPA). 2010a. National Ambient Air Quality Standards. Website accessed August 2010 at: http://www.epa.gov/air/criteria.html.

United States Fish and Wildlife Service (USFWS). 2010. Upper Mississippi River Refuge. Website accessed August 27, 2010 at: http://www.fws.gov/midwest/UpperMississippiRiver/

Wenck Associates, Inc. 2010. Essar Steel 230 kV HVTL. Final Environmental Impact Statement. PUC Docket #E280/TL-09-512. Office of Energy Security. May 2010.

World Health Organization (WHO). 2005. Electromagnetic Fields and Public Health. Effects of EMF on the Environment. Electronic resource accessed September 2, 2010 at: http://www.who.int/peh-emf/publications/facts/envimpactemf_infosheet.pdf

World Health Organization (WHO). 2010. Electromagnetic Fields: Research. Website accessed on September 7, 2010 at: http://www.who.int/peh-emf/research/en/.

Wyoming Medical Center (WMC), 2010. Helicopter Landing Zone Guidelines. Electronic resource accessed October 1, 2010 at http://www.wmcnet.org/wlf/landing.php

Xcel Energy. 2008. "Regional Incremental Generation Outlet (RIGO) Study." August 19.

Xcel Energy. 2009a. "Application to the Minnesota Public Utilities Commission for a Route Permit for the Pleasant Valley to Byron 161 kV Transmission Line." MPUC Docket No. E002/TL-09-1315. December 3.

Xcel Energy. 2009b. "Northern States Power Company Application to the Minnesota Public Utilities Commission for a Certificate of Need for a 161 kV Transmission Line Between Pleasant Valley Substation and Byron Substation." MPUC Docket No. E002/CN-08-992. December 3.

Xcel Energy. 2010. "Pleasant Valley to Bryon 161 kV Transmission Project, Commentary on Reliability of Two Transmission Circuits on Adjacent Rights-of-Way." September 21.

Zhuikov, Marie. Medical Helicopter Care and Transport: State of Science. Mayo Clinic. Electronic resource accessed October 1, 2010 at http://discoverysedge.mayo.edu/mayo-one-medical-helicopter