CapX2020 North Rochester to Chester 161kV Transmission Line Project Environmental Assessment

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Cover photo provided by Xcel Energy

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Abstract

Pursuant to the provisions of Minnesota Statutes, chapter 216E, Xcel Energy (Applicant) filed a high-voltage transmission line route permit application with the Minnesota Public Utilities Commission (Commission) on September 19, 2011, for a proposed 161 kilovolt (kV) transmission line and modifications to the existing Chester substation (Project).

The Project consists of two segments: 1) An east-west segment, in which the Applicant proposes to place the Chester 161kV line on the same poles as the Hampton-Rochester-La Crosse 345kV line for a distance of 13 to 19 miles; and 2) A north-south segment that leaves the 345kV transmission right-of-way east of the Zumbro River and travels south for 11 to 16 miles to the Chester Substation. The north-south segment would consist of portions of single-circuit 161 kV line and portions of double-circuited 161/69 kV transmission line.

Minnesota Department of Commerce Energy Facilities Permitting (EFP) is tasked with conducting environmental review of the applications for transmission line route permits. The intent of this environmental assessment document and the environmental review process is to inform the public, the Applicant, and decision-makers of the potential impacts from the proposed Project and possible mitigations for those impacts.

Persons interested in these matters can register their names on the project contact list at http://energyfacilities.puc.state.mn.us/Docket.html?Id=32260 or by contacting: Matthew Langan, Energy Facility Permitting, 85 7th Place East, Suite 500, St. Paul, Minnesota, 55101, phone: (651)-296-2096, email: matthew.langan@state.mn.us.

Documents related to this Project can be found at the above website or also by going to: https://www.edockets.state.mn.us/EFiling/search.jsp and entering “11” for Year and “800” for Number, under search criteria.

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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
EA	environmental assessment
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
MW	megawatt
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
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

1. Introduction

Xcel Energy (Applicant) has made application to the Minnesota Public Utilities Commission (Commission) for a route permit under the alternative permitting process of the Power Plant Siting Act (Minnesota Statute 216E). The route permit application is for the construction of a new 161 kilovolt (kV) transmission line in Goodhue, Olmsted and Wabasha counties in southeastern Minnesota (Project). The approximately 30-mile transmission line would connect the North Rochester and Chester Substations. Equipment modifications at the Chester substation would be included in the Project.

The Project consists of two segments: 1) An east-west segment, in which the Applicant proposes to place the Chester 161kV line on the same poles as the Hampton-Rochester-La Crosse 345kV line for a distance of 13 to 19 miles; and 2) A north-south segment that leaves the 345kV transmission right-of-way east of the Zumbro River and travels south for 11 to 16 miles to the Chester Substation. The north-south segment would consist of portions of single-circuit 161 kV line and portions of double-circuited 161/69 kV transmission line.

The Applicant is requesting a 600-foot route width for the north-south segment. The typical right-of-way for a 161 kV line is 80 feet, the typical span between poles is 400 to 700 feet, and poles range in height from 70 to 120 feet. For the east-west segment, the Applicant is requesting the same route width (1,000 feet) described in the Route Permit application for the Hampton-Rochester-La Crosse 345kV project. The 345 kV poles range from 130 to 175 feet tall, with spans of 600 to 1,000 feet between poles. The typical right-of-way for 345 kV lines is 150 feet. The transmission line and modifications at the Chester substation would cost between $23.8 and $25.3 million in 2011 dollars depending on which route is selected for the 345 kV line.

Energy Facility Permitting (EFP) staff is tasked with conducting environmental review of applications for high-voltage transmission line route permits. The intent of the environmental review process is to inform the public, the applicant, and decision-makers about potential impacts and possible mitigation measures for a proposed high-voltage transmission line project.

This environmental assessment (EA) covers the environmental review requirements in accordance with the Scoping Decision Document for this EA, and as outlined in Minnesota Rules 7850, for the proposed project and route permit application as follows:

Section 1.0 - Introduction

Section 2.0 – Describes the regulatory framework associated with the Project, which includes information on the certificate of need criteria, route permit requirements, and the alternative permitting processes.

Section 3.0 – Provides a detailed description of the Project as proposed by Xcel Energy and Route Segment Alternative A.

Section 4.0 – Describes the methods used when constructing the transmission line, clean-up and restoration, maintenance procedures, and utility rights-of-way acquisition.

Section 5.0 – Details the potential impacts of the proposed Project to human and natural environments and identifies measures that could be implemented to avoid, minimize or mitigate any potential adverse impacts.

Section 6.0 – Lists additional permits that may be required for the proposed Project.

Section 7.0 – Provides a comparison of the routes analyzed in this EA.

Section 8.0 – References

Much of the information used in this EA is derived from documents prepared by Xcel Energy. These include Xcel Energy's *Route Permit Application for the North Rochester to Chester 161 kV Transmission Line Project*, September 19, 2011 along with emails and requests for information. Discussion of electromagnetic field issues came primarily from the white paper developed by the Interagency Task Force led by the Minnesota department of Health (MDH), the National Institute for Environmental Health Sciences (NIEHS), and the World Health Organization (WHO). Additional information comes from earlier EFP environmental review documents in similar dockets, other state agencies such as the Minnesota Department of Natural Resources (MnDNR) and the Minnesota Pollution Control Agency (MPCA). Section 8.0 provides a listing of additional references used in the preparation of this EA.

2. Regulatory Framework

In Minnesota, no person may construct a high-voltage transmission line without a route permit from the Public Utilities Commission under Minnesota Statute 216E.03, subdivision 2. A high-voltage transmission line is defined as a conductor of electric energy and associated facilities designed for and capable of operation at a nominal voltage of 100 kV or more and is greater than 1,500 feet in length. Associated facilities of the transmission line include buildings, equipment, and other physical structures that are necessary to the operation of a high-voltage transmission line.

2.1. Alternative Permitting Process

The proposed project is eligible for consideration under the alternative permitting process (Minnesota Rule 7850.2800) of the Power Plant Siting Act (Minnesota Statute 216E.04). The alternative permitting process is shorter than the full permitting procedures and does not require the applicant to propose alternative sites or routes to the preferred site or route, but does require the applicant to disclose rejected route alternatives and an explanation of why they were rejected.

2.2. Certificate of Need

Pursuant to Minnesota Statute 216B.243, subdivision 2, "No large energy facility shall be sited or constructed in Minnesota without the issuance of a certificate of need by the Commission." In the case of a high-voltage transmission line, a large energy facility is defined as, (1) any high-voltage transmission line with a capacity of 200 kV or more and greater than 1,500 feet in length, and (2) any high-voltage transmission line with a capacity of 100 kV or more with more than ten miles of its length in Minnesota or that crosses a state line.

The Commission issued an Order on May 22, 2009, granting a Certificate of Need (CON) for the North Rochester-Chester 161kV Project, as one of three components of the Hampton-Rochester-La Crosse 345 kV transmission line project. The other two components granted in the CON (CN-06-115) are the Hampton-Rochester-La Crosse 345kV transmission line and the North Rochester-Northern Hills 161kV transmission line, which were filed in a separate route permit application (TL-09-1448) on January 19, 2010. The CON stated this Project was needed to improve regional reliability of the transmission system, to improve community reliability of the transmission system in specified communities, and to increase generator outlet.

2.3. Route Permit Application

The applicant filed a route permit application with the Commission for the Project on September 19, 2011. The Commission accepted the application as complete in an order issued on October 24, 2011. Under the alternative permitting process, the Commission has six months to issue a route permit from the date a route permit application is deemed complete. The Commission may extend this time limit for up to three months for just cause or upon agreement of the applicant.

2.4. Public Information and Scoping Meeting

EFP staff held a public information and environmental assessment scoping meeting on November 29, 2011, at the Oronoco Community Center in Oronoco, Minnesota, as required by Minnesota Rule 7850.3500. The meeting provided the public an opportunity to learn about the proposed project and the state's high-voltage transmission line route permitting process, review the applicant's route permit application, ask questions, and submit comments.

A court reporter was present at the public meeting and transcribed questions asked and comments made by the public, as well as responses from EFP staff and the Applicant. Approximately 30 members of the public attended the meeting.

A public comment period, ending on December 8, 2011, provided the public an opportunity to submit comments to EFP staff on issues and alternative routes and alignments for consideration for the scope of the EA. EFP staff received 17 comment letters by the close of the comment period. After consideration of the public comments the deputy commissioner of the Department of Commerce issued the scope of the EA on December 21, 2011. The EA scoping decision document is included in Appendix B. Included in the scope of the EA were the Applicant's proposed route and an alternative route segment proposed by the public, known as Route Segment Alterative A.

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

- No-build alternative
- Issues related to project need, size, type, or timing
- Any route or substation alternatives not specifically identified in the scoping decision document.
- Policy issues surrounding whether utilities or local-government should be liable for the cost to relocate utility poles when roadways are widened
- The manner in which land owners are paid for transmission rights-of-way easements, as that is outside the jurisdiction of the Commission.

2.5. Environmental Assessment

An EA must be prepared for all high-voltage transmission projects being reviewed under the alternative permitting process. The procedures EFP staff must follow in preparing the EA are described in Minnesota Rule 7850.3700. The EA contains information on the human and environmental impacts of the proposed project as identified in the scoping decision document. It also addresses required methods to mitigate such impacts for all routes considered. The EA is the only state environmental review document required to be prepared for this project.

Upon completion of the EA, continuing procedural steps include: providing notice on the availability of the EA, scheduling and providing notice of a public hearing in the area where the project is located, and bringing the matter to the Commission for a final

decision. An example of a route permit issued by the Commission for a high-voltage transmission line is provided in Appendix C.

Copies of the route permit application and other documents relevant to the process are available for viewing and downloading on the Commission website at: http://energyfacilities.puc.state.mn.us/Docket.html?Id=32260 or the eDockets website at: https://www.edockets.state.mn.us/EFiling/search.jsp, enter "11" for Year and "800" for Number, under search criteria.

3. Proposed Project

The Project consists of two segments: 1) An east-west segment, in which the Applicant proposes to place the Chester 161kV line on the same poles as the Hampton-Rochester-La Crosse 345kV line for a distance of 13 to 19 miles; and 2) A north-south segment that leaves the 345kV transmission right-of-way east of the Zumbro River and travels south for 11 to 16 miles to the Chester Substation. The north-south segment would consist of portions of single-circuit 161 kV line and portions of double-circuited 161/69 kV transmission line.

The Applicant requested a 600-foot route width for the north-south segment. The typical right-of-way for a 161 kV line is 80 feet, the typical span between poles is 400 to 700 feet, and poles range in height from 70 to 120 feet. For the east-west segment, the Applicant requested the same route width (1,000 feet) described in the Route Permit application for the Hampton-Rochester-La Crosse 345kV project. The 345 kV poles range from 130 to 175 feet tall, with spans of 600 to 1,000 feet between poles. The typical right-of-way for 345 kV lines is 150 feet.

Modifications to the Chester Substation would consist of addition of a 161 kV circuit breaker, switches, line termination and expanded box structure, electrical bus and associated equipment. The substation yard will be expanded by approximately one acre to accommodate the added equipment.

Upon issuance of a route permit by the Commission, the Applicant would begin ROW acquisition. Construction on the west-east portion of the Project is expected to begin in Spring of 2013. Construction on the north-south segment is expected to begin in late 2014. The estimated in-service date of the Project is Spring 2015.

3.1. Purpose of the Project

The stated need of the Project is to improve regional reliability of the transmission system, to improve community reliability of the transmission system in specified communities and to increase generator outlet. The Project is part of the Hampton – Rochester – La Crosse 345 kV Transmission Project. The Commission granted a Certificate of Need (CON) in May 2009 approving construction of the Hampton – Rochester – La Crosse 345 kV Transmission Project, including the North Rochester – Chester 161 kV Line proposed by the Applicant, and reviewed in this EA. The Hampton – Rochester – La Crosse 345 kV Transmission Project will terminate in the La Crosse, Wisconsin, area. As part of the CON order, the Commission directed that the 345 kV structures in Minnesota be constructed as “double circuit capable” to accommodate a future 345 kV line when conditions warrant.

A route permit application (RPA) for the Hampton – Rochester – La Crosse 345 kV transmission line was filed with the Commission in January 2010 (PUC Docket No. E002/TL-09-1448). A decision from the Commission is anticipated in the second quarter of 2012. The equipment required to connect the Chester Line at North Rochester Substation is included in the 345 kV routing docket.

3.2. Project Location

The Project would be located in Goodhue, Olmsted and Wabasha counties in southeastern Minnesota (Figure 1.) The approximately 30-mile transmission line would extend east from the North Rochester Substation, and then turn south at a point east of the Zumbro River to the Chester Substation. The counties and township crossed by the proposed transmission line are shown in Table 3.1 below. The proposed Project is shown in Figure 2.

Table 3.1: Project Location

County	Township	Township and Range	Sections
Goodhue County	Pine Island	Township 109W Range 15N	19, 20, 21, 25, 26, 27, 28, 29, 30, and 36
Olmsted	Farmington	Township 108W Range 13N	3, 4, 5, 8, 9, 10, 15, 16, 21, 22, 27, 28, 33 and 34
Olmsted	Haverhill	Township 107W Range 13N	3, 4, 9, 10, 15, 16, 21, 22, 27, 28, 33 and 34
Olmsted	Marion	Township 106W Range 13N	3 and 4
Olmsted	Oronoco	Township 108W Range 14N	6, 7, 8, 9, 10, 11, and 12
Wabasha	Hyde Park	Township 109W Range 13N	19, 29, 30, 31 and 32
Wabasha	Mazeppa	Township 109W Range 14N	13, 14, 15, 16, 17, 18, 24, 25, 26, 27, 28, 29, and 30

The proposed transmission line project consists of two segments:

- An east-west segment in which the Applicant proposes to place the Chester Line on the same poles as the Hampton – Rochester – La Crosse 345 kV Transmission Project (345 kV Project).

- A north-south segment in which the Applicant proposes a new route consisting of portions with single circuit 161 kV construction and portions with 161/69 kV double circuit construction.

These two segments are discussed further below, and are illustrated in detail in the Figure 9 Map Sheets in Appendix A.

Figure 1: Project Overview

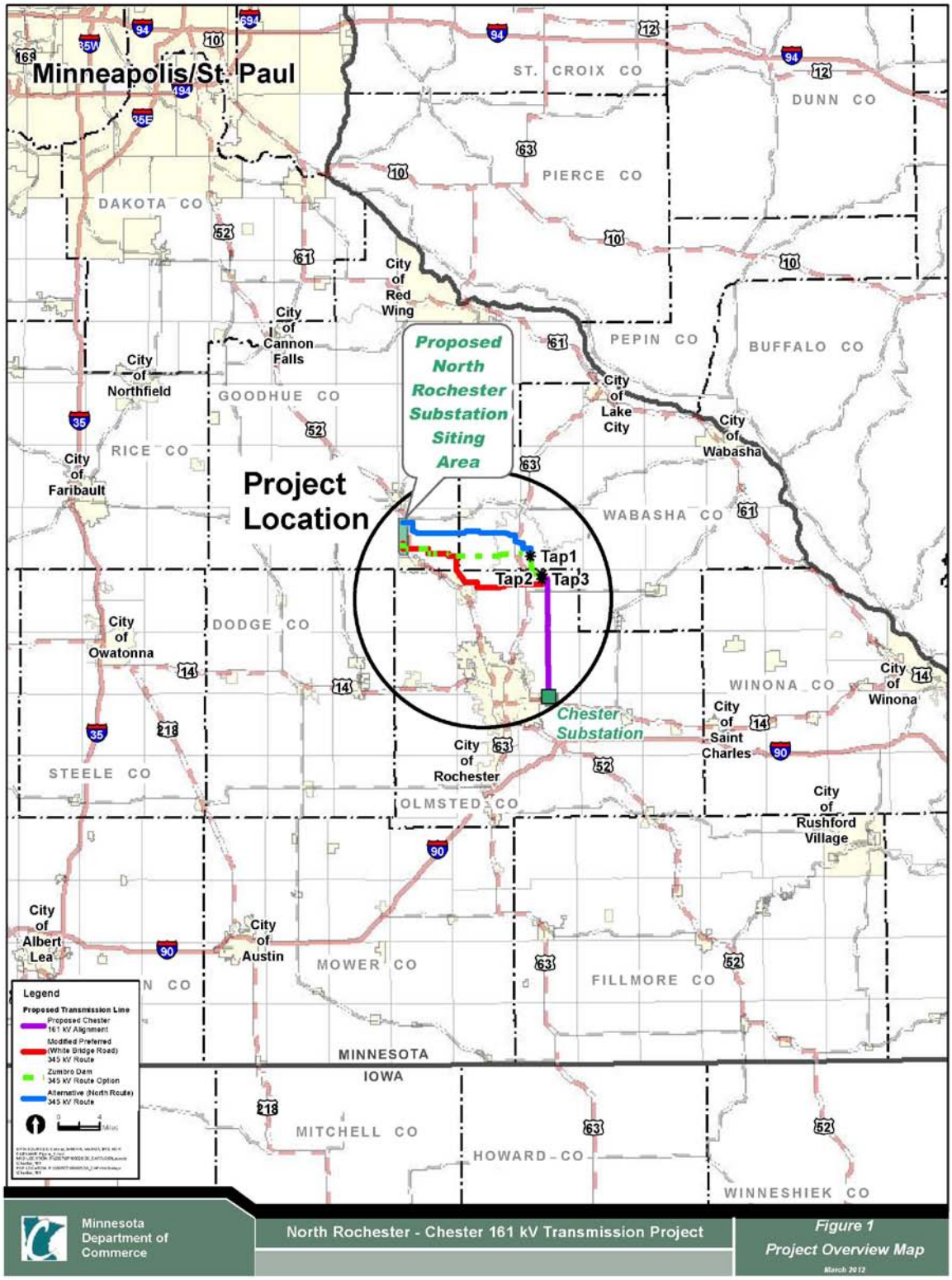
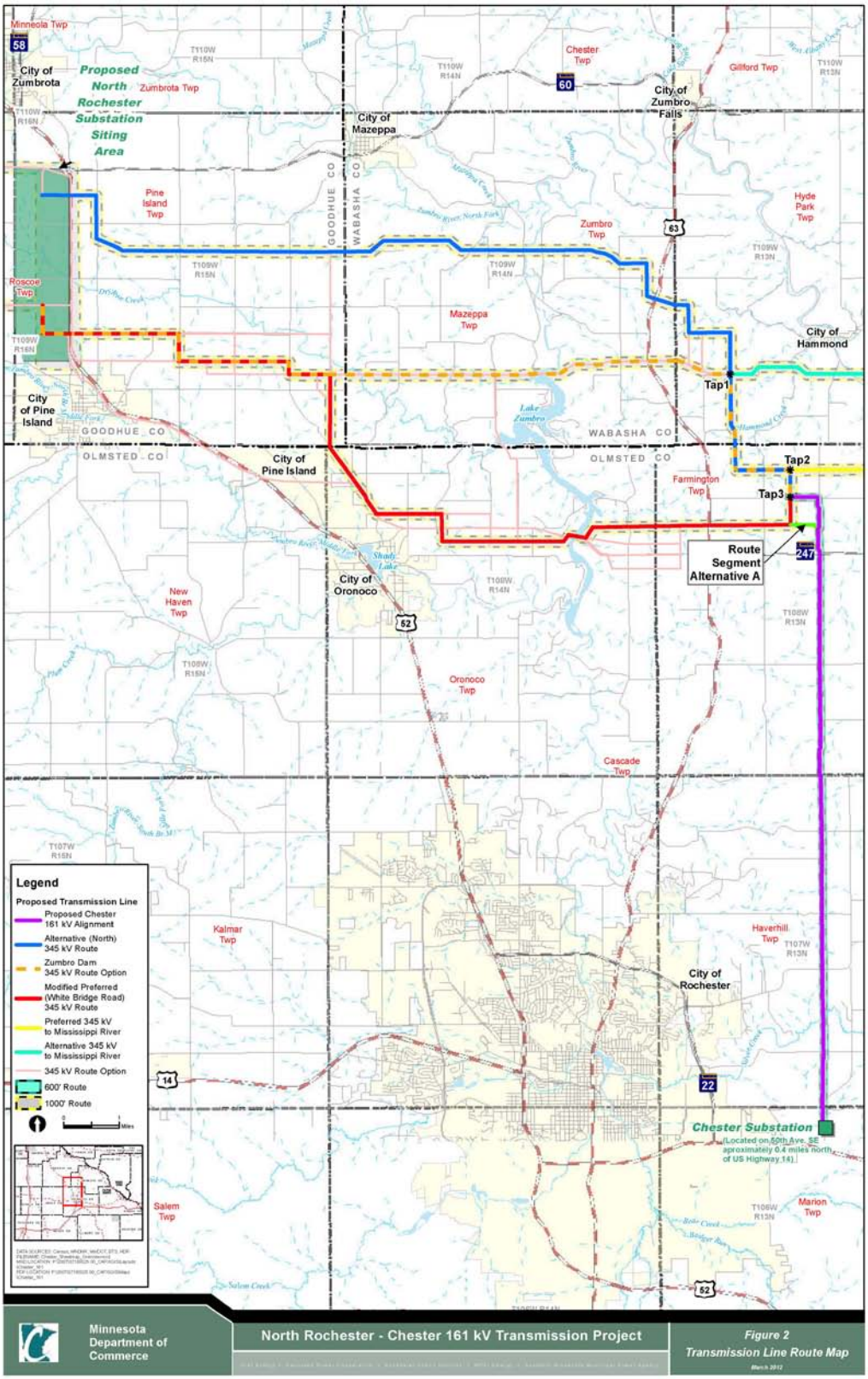


Figure 2: Transmission Line Route Map



East-West Segment

The Applicant proposes to place the Chester Line on the same structures as the 345 kV Project for approximately 13 to 19 miles from the North Rochester Substation to east of the Zumbro River. The route for the 345 kV Project has yet to be determined and is being evaluated in the environmental impact statement (EIS) in docket no. E002/TL-09-1448. In the pending route permit proceeding, there are two primary route alternatives and one route option under consideration for the segment of the 345 kV Project that would be double-circuited with the Chester Lin. The two route alternatives under consideration are the Modified Preferred 345 kV Route and the Alternative 345 kV Route. There is also an alternative segment for crossing the Zumbro River, the Zumbro Dam Route Option, used with either route.

The Chester Line is proposed to be co-located on the 345 kV transmission line from the North Rochester Substation to a point west near the city of Hammond that is dependent on the 345 kV route selected. The three corner, or "tap" points, are identified as Tap 1, Tap 2 and Tap 3 (See Figure 9).

Because the 161 kV circuit would be strung on the same poles as the 345 kV circuit, no additional right-of-way would be required. This double circuit would be built as a 345kV/345kV double-circuit, but would be energized as a 345 kV/161 kV double-circuit.

The single pole, self weathering steel 345 kV double-circuit structures are typically 130 to 175 feet tall and placed 600 to 1,000 feet apart. The typical ROW for the double-circuit 345 kV transmission line design is 150 feet.

North-South Segment

The north-south segment of the Chester Line would begin at the end at one of the tap points dependent on the 345 kV route selected.

Depending upon the 345 kV Route selected by the Commission, one of the three following scenarios would occur.

Scenario 1 - If the Commission selects either the Zumbro Dam Route Option (13.7 miles) or Alternative Route (15.3 miles) for the 345 kV Project in combination with the north 345 kV Route to Alma:

- The east-west segment of the Chester 161 kV line would be double-circuited with the 345 kV line from the North Rochester Substation to Tap 1.
- The Chester 161 kV line would then continue 3.2 miles south and east from Tap 1 as 161 single-circuit to 125th Street NE. From there the Chester Line would continue approximately 0.5 miles east along 125th Street NE as a double-circuit with the Peoples Cooperative 69 kV line.
- The Chester Line would then turn south and continue along 50th Avenue NE as a 161 single-circuit line for approximately 5 miles to 75th Street NE.

- From 75th Street NE for approximately 6.5 miles south to the Chester Substation, the Chester Line would be double-circuited with the Peoples Cooperative 69 kV line.

Scenario 2 - If the Commission selects either the Zumbro Dam Route Option (16.5 miles) or Alternative Route (18.0 miles) for the 345 kV Project in combination with the south 345 kV Route to Alma:

- The east-west segment of the Chester Line would be double-circuited with the 345 kV line from the North Rochester Substation to Tap 2.

- The Chester Line would then continue 0.5 miles south from Tap 2 as 161 single –circuit to 125th Street NE. From there the Chester Line would be identical to that described under Scenario 1.

Scenario 3 - If the Commission selects the Modified Preferred Route (17.8 miles)for the 345 kV Project:

- The east-west segment of the Chester Line would be double-circuited with the 345 kV line from the North Rochester Substation to Tap 3.

- From Tap 3, the Chester Line would continue approximately 0.5 miles east along 125th Street NE as a double-circuit with the Peoples Cooperative 69 kV line. From there the Chester Line would be identical to that described under Scenario 1.

For the North-South segment, the Applicant proposes to use:

- Single-pole self-weathering steel, double-circuit structures for the 0.5 miles from Tap 3 along 125th Ave NE to 50th Ave NE. Single-pole self-weathering steel, single-circuit structures for approximately 5 miles south along 50th Avenue NE from 125th Street NE to 75th Street NE.

- Single-pole self-weathering steel, double-circuit structures for the remaining 6.4 miles of the to the Chester Substation.

The 161 kV single circuit structures are typically 70 to 105 feet tall and the double circuit 161/69 kV structures are typically 85 to 120 feet tall, both would be spaced approximately 400 to 700 feet apart with a ROW of 80 feet. Portions of the route would require existing Peoples Cooperative distribution to be attached in an underbuilt position. In this situation a mid-span pole would be required to support the distribution circuit.

3.3. Alternative Route

During the public EA scoping process, three commenters suggested a route segment alternative be included in the scope of the EA. This route segment alternative is in Section 9 of Farmington Township, Olmsted County. As is represented in Figure 2, this alternative would continue east from the point (NW ¼ of the NW ¼) that the CapX Hampton to La Crosse Modified Preferred Route turns north toward 125th Street NE, and Tap 3. The route segment alternate joins the Applicant's proposed route at 50th Ave NE. Route segment alternative A has the same width as the Applicant's proposed route (600 feet.)

3.4. Substation Modifications

The North Rochester Substation is being permitted in the 345 kV Project docket (E002/TL-09-1448). Equipment specifically assigned in the 345 kV Project include one 161 kV circuit breaker and associated switches, bus work, line termination and controls necessary for the Chester Line interconnection.

The existing Chester Substation, owned by Rochester Public Utilities, would be expanded on existing property to include an additional 161 kV circuit breaker and associated switches, bus work and controls. The expanded area is anticipated to be approximately one acre.

3.5. Route Width and Rights-of-Way Requirements

The Applicant is requesting a 600-foot route width for the north-south segment. The typical right-of-way for a 161 kV line is 80 feet, the typical span between poles is 400 to 700 feet, and poles range in height from 70 to 120 feet. For the east-west segment, the Applicant is requesting the same route width (1,000 feet) described in the Route Permit application for the Hampton-Rochester-La Crosse 345kV project. The 345 kV poles range from 130 to 175 feet tall, with spans of 600 to 1,000 feet between poles. The typical right-of-way for 345 kV lines is 150 feet.

3.6. Project Costs

The transmission line and modifications at the Chester substation would cost between $23.8 and $25.3 million in 2011 dollars depending on which route is selected for the 345 kV line. Operating and maintenance costs for the Project would be minimal for several years, since the line would be new and minimal vegetation management would be required. Typical annual operating and maintenance costs for 161 kV transmission lines across the Applicant’s Upper Midwest system area are approximately $300 to $500 per mile of transmission ROW. The principal operating and maintenance cost would include inspections, which are usually done by fixed-wing aircraft and by helicopter on a regular basis. The Applicant performs periodic inspections of substations and equipment. The type and frequency of inspection varies depending on the type of equipment. Typical inspection intervals are semiannual or annual. Maintenance and repair are performed on an as-needed basis and therefore the cost varies from substation to substation.

4. Facility 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.

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.

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. 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. 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.

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.

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.

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. 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.

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 landowner and Applicant cannot reach an agreement, prior to commencing the condemnation process, the Applicant would be required to obtain an appraisal for the property, which would be shared with the landowner. If the land owner does not agree with the easement value offered by the ROW agent, the land owner may have a second appraisal made. Reimbursement for the cost of the appraisal, up to pre-specified amounts that vary depending on the type of property, could be awarded by the court-appointed Commissioner in the condemnation process, as stipulated in Minnesota Statutes, section 117.036.

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. Transmission Line Structures

For the east-west segment, the Applicant proposes to place the proposed Chester Line on double circuit structures with the Hampton-Rochester-La Crosse 345 kV Project. Double circuit structures vary from 130 to 175 feet tall. Spans between structures can vary from 600 to 1,000 feet with a ROW of 150 feet.

For north-south segment, the Applicant proposes to use a combination of single-pole, self-weathering steel, single-circuit and double-circuit structures. The Applicant proposes to use:

- Single-pole self-weathering steel, double-circuit structures for the 0.5 miles from Tap 3 along 125th Street NE to 50th Avenue NE.

- Single-pole self-weathering steel, single-circuit structures for approximately 5 miles south along 50th Avenue NE from 125th Street NE to 75th Street NE.

- Single-pole self-weathering steel, double-circuit structures for the remaining 6.4 miles of the to the Chester substation.

The 161 kV single circuit structures are typically 70 to 105 feet tall and the double circuit 161/69 kV structures are typically 85 to 120 feet tall, both would be spaced approximately 400 to 700 feet apart with a ROW of 80 feet. Portions of the route would require existing Peoples Cooperative distribution to be attached in an underbuilt position. In this situation a mid-span pole would be required to support the distribution circuit.

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 proposes to locate the poles as close to property division lines as reasonably possible. When the transmission line parallels other existing infrastructure ROW such as roads or other utilities, the 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. The ROW acquisition process is discussed in detail in Section 4.1

Table 4.1 summarizes the structure design for the line. Pictures of the proposed structure types are shown below in Figures 3 through 5. Figure 6 shows the ROW requirements for the proposed structures.

Table 4.1: Transmission Structure Design.

Line Type	Structure Type	Structure Material	ROW Width (feet)	Structure Height (feet)	Foundation	Foundation Diameter (feet)	Span Between Structures (feet)
161 kV Single Circuit	Single pole, davit arm	Weathering steel	80	70-105	Direct embedded for tangents and self-supporting for angle/ dead-end structures	5-8	400 to 700
161/69 kV Double Circuit	Single pole, davit arm	Weathering steel	80	85-120	Direct embedded for tangents and self-supporting for angle/ dead-end structures	5-8	400 to 700
345 kV/345 Double Circuit (energized at 345/161 kV)	Single pole, davit arm	Weathering Steel	150	130-175	Drilled pier concrete foundations	6-12	600 to 1,000

Figure 3: Typical Double-Circuit 345/345 kV Single-Pole Structure (Davit Arm)

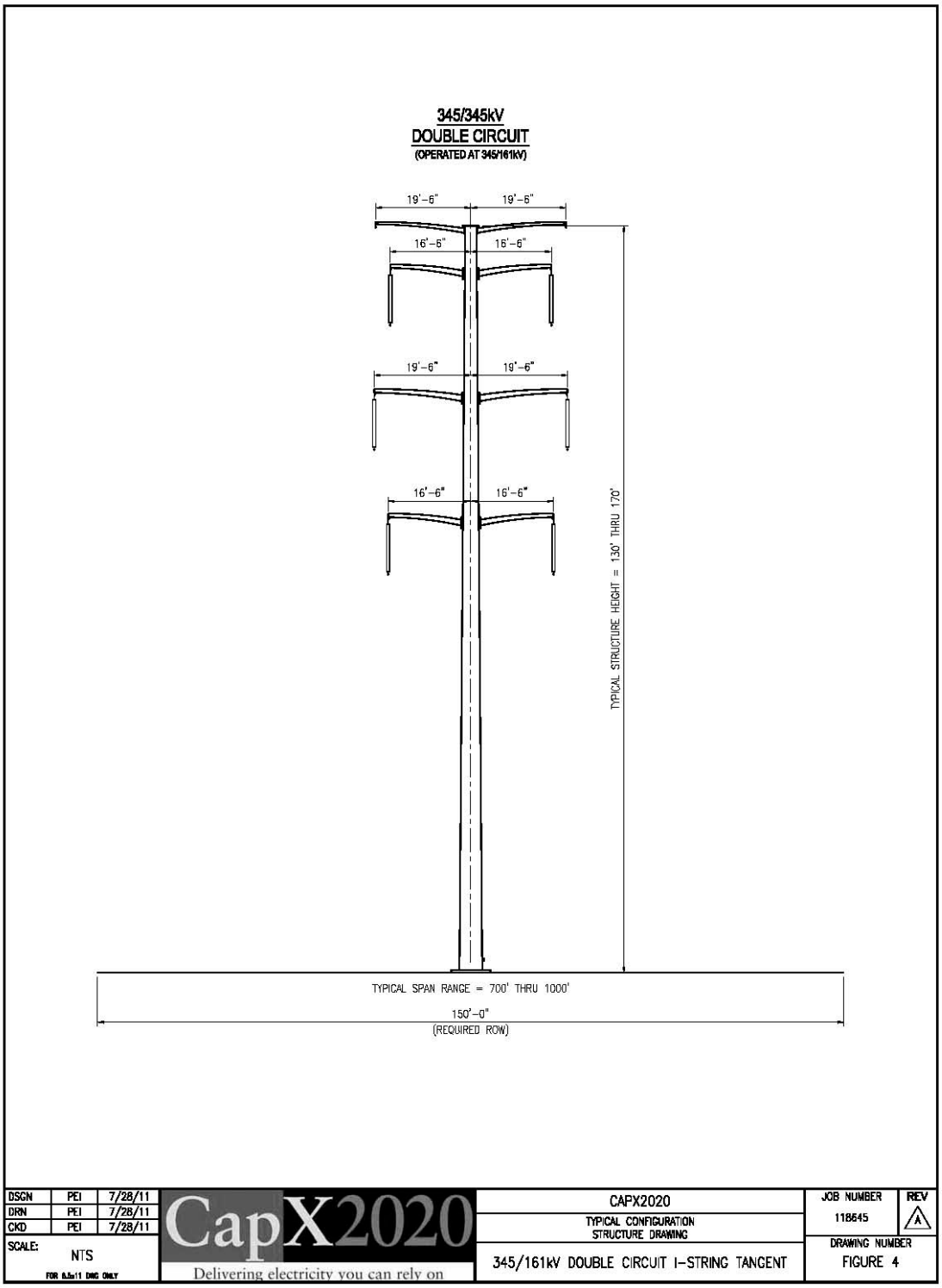


Figure 4: Typical Double-Circuit 161/69 kV Single-Pole Structure (Davit Arm)

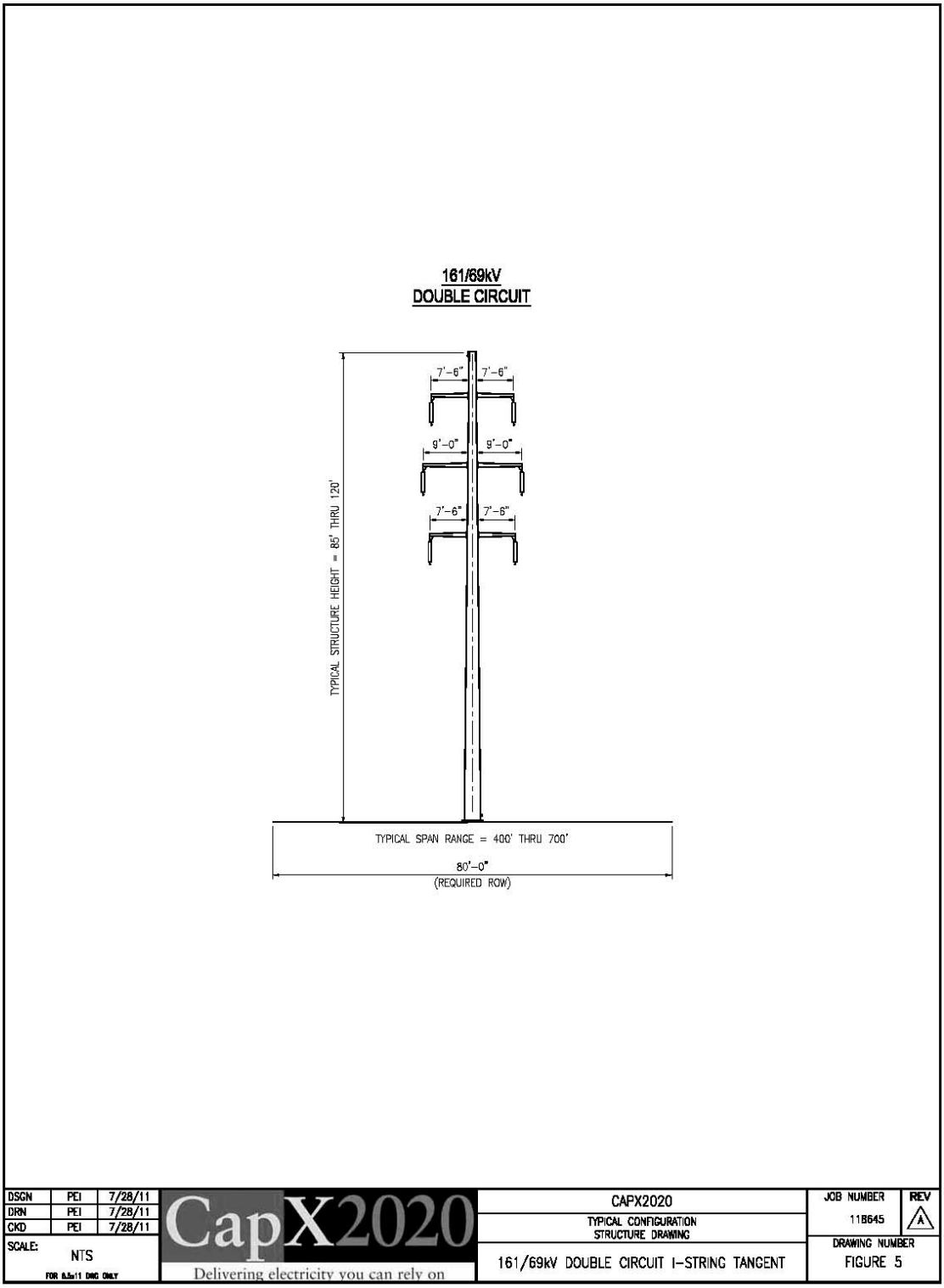


Figure 5: Typical Double-Circuit 161/69 kV Single-Pole Structure (Davit Arm)

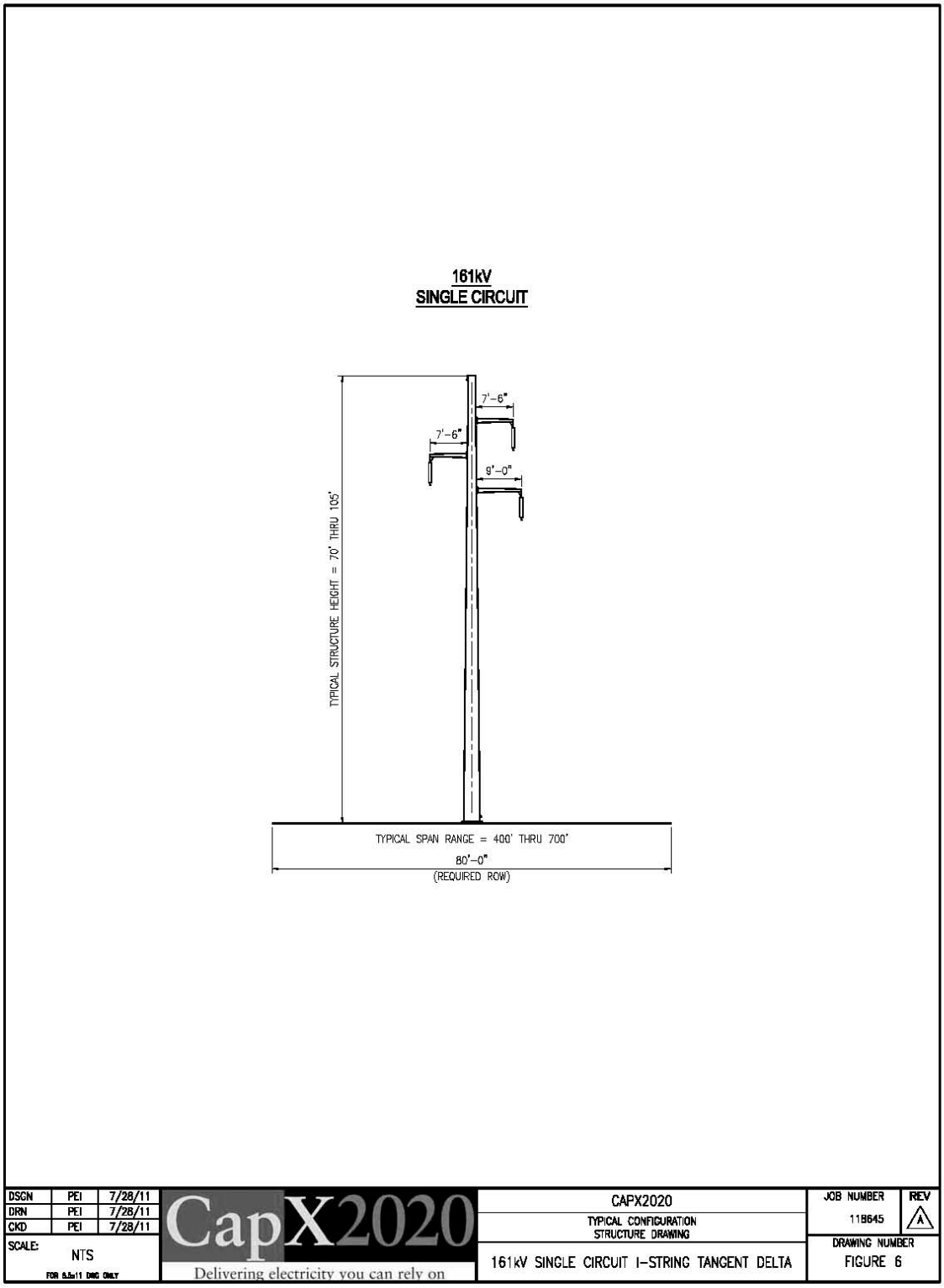
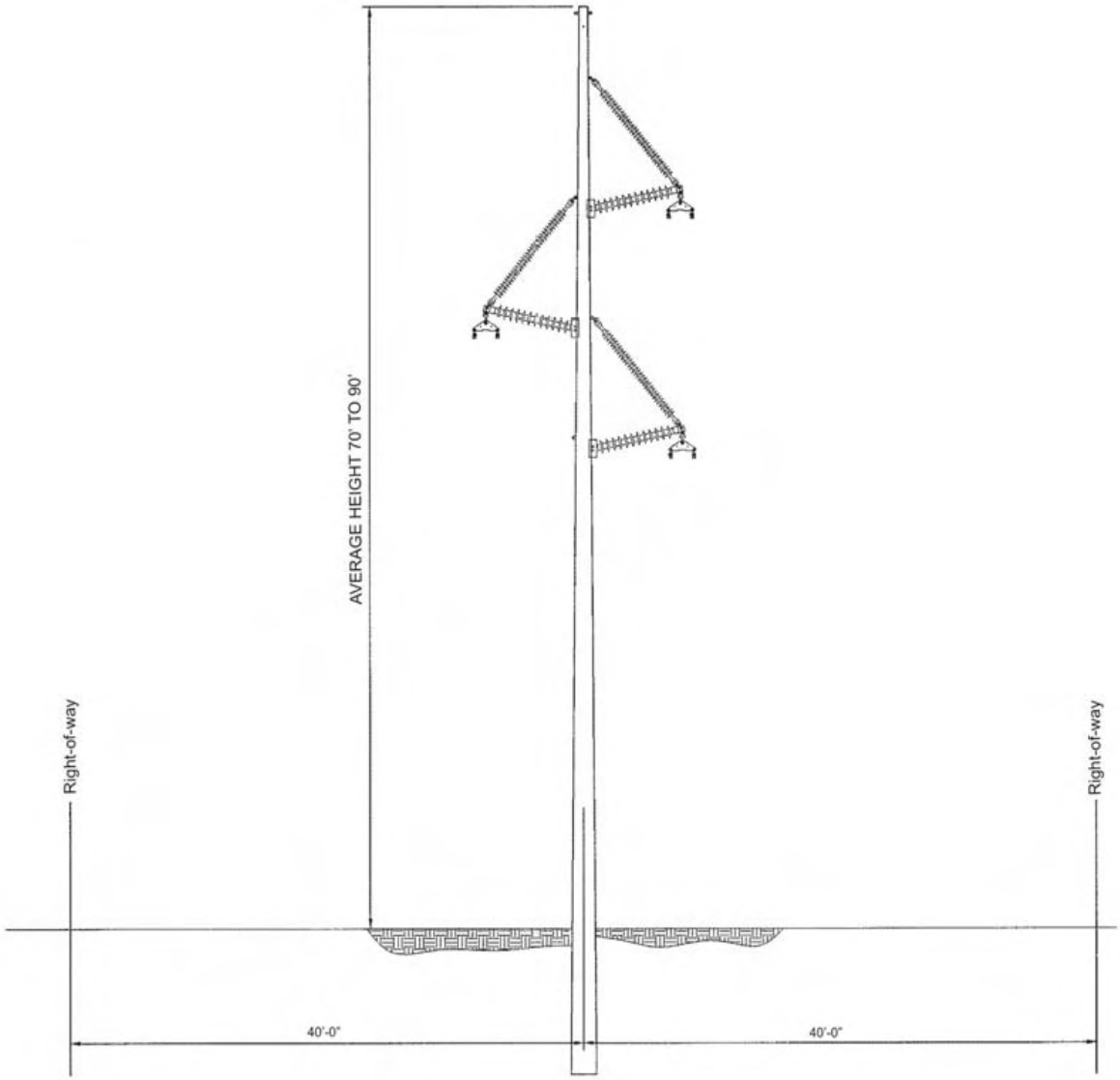


Figure 6: Right-of-Way Requirements



161kV Line Typical Structure
80' Typical Total Right-of-Way

4.3. Transmission Line Conductors

The 161 kV conductor proposed for the West-East Segment (on 345 kV poles) will be 345 kV conductor and insulators energized at 161 kV to support the future double-circuit capable design. This includes two 954 kcmil 54/7 Aluminum Core Steel Supported ("ACSS") conductors or conductors of comparable capacity. This design does not increase the capacity of the 345 kV circuit. The second circuit will be installed at the same time as the first 345 kV circuit.

The 161 kV conductor proposed for the North-South Segment will be 795 kcmil 26/7 or Aluminum Core Steel Supported – Trapezoidal Wound ("ACSS-TW") for the 161 kV circuit and 477 kcmil conductors for portions double-circuited with the Peoples Cooperative 69 kV circuit. One or two shield wires would be used to protect the conductors from lightening strikes. One of these shield wires would incorporate fiber optic to facilitate relay control communications between substations and utility offices such as control centers. Fiber optics would be used only for utility purposes.

4.4. Cleanup and Restoration

The HVTL route permit will 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.

4.5. 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.

4.6. Maintenance

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. 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.

4.7. Undergrounding Transmission Line Facilities

It is common to see lower voltage distribution lines that connect to homes and businesses buried directly in the ground using less invasive construction methods. In these cases, undergrounding offers aesthetic and environmental benefits while posing relatively few construction, maintenance, and operational challenges. Undergrounding of transmission lines at higher voltages, however, can become progressively more complex. A number of factors are involved in the consideration of undergrounding a HVTL, including: construction, cost, and maintenance. Because of these challenges, placing high-voltage transmission lines, like the line proposed for this Project, underground is a practice generally used as a mitigative measure only when there is no viable overhead corridor and for very limited distances to address specific constraints.

Underground transmission lines would be placed in a concrete duct system. The underground line would require a concrete duct bank containing two 6-inch PVC conduits for transmission circuits and one 2-inch PVC conduits for ground continuity and communication needs. The trench design is dependent on physical limitations of the route selected, including existing subsurface features and available ROW. Manholes placed along the route would be used to pull conductors through the duct system.

Open cut trenching is the most commonly used construction technique to install underground duct systems. Depending on the natural features in the Study Area, it may be necessary to shore up the trench for worker safety, dewater the trench due to the presence of shallow groundwater, and backfill the trench with selective fill material to improve heat transfer. Installation generally includes direct burial in backfilled trenches and concrete trenches with covers or concrete ductbanks. Constructing the trench for the underground transmission line would likely result in greater temporary construction impacts than the proposed overhead line.

In general, construction of underground transmission lines takes longer than construction of overhead transmission lines. A typical progression rate for underground construction would be 200-feet of transmission line per day.

Background research and engineering and design considerations are required before construction of underground transmission lines. Prior to construction of underground transmission lines, the Applicant would conduct soil sampling and testing to determine the thermal conductivity of the earth and ability to trench and bore in the ROW.

An underground transmission line is expected to cost five times more per mile compared to construction of an overhead transmission line, due to time, materials, process, and the use of specialized labor. An underground transmission line must also be routed to avoid other underground installations such as water, gas, and sewer lines. Unstable slopes, hazardous material sites, wetlands, and bedrock must be avoided. Going under a road, highway, or river requires construction techniques, such as directional boring, that are more expensive than overhead installations.

Although failure of underground transmission lines is rare, a disadvantage of building underground transmission lines is the difficulty of finding and repairing failures. Overhead failures can usually be found through visual inspection. The time and cost to repair an underground transmission line would be greater than those anticipated for an overhead transmission line. While overhead transmission lines fail, on average, once every 17.8 years, underground transmission lines fail once every 50.5 years. In addition, the average time to resolve a failure on an overhead transmission line is nine hours. The average time to resolve a failure on an underground transmission line is three weeks.

No routine maintenance or operation costs are anticipated for underground transmission lines. Visual inspections of underground transmission lines are not possible and will not be conducted. Unlike overhead transmission lines that are susceptible to a number of sources of outages (e.g., weather, birds, vehicle impacts), underground transmission lines are susceptible to only two outage causes: cable fault due to overloading of the system and failure of the cable or splices. If a fault is sensed on the transmission system, the underground transmission line will need to be accessed.

5. Affected Environment, Impacts, and Mitigation

The construction of a transmission facility involves both short- and long-term impacts. An impact is a change to the pre-construction environment as a direct or indirect result of the proposed action and may be positive or negative. Direct impacts are caused by the action and occur at the same time and place. Indirect impacts are caused by the action and occur later in time, but are still reasonably foreseeable.

This section describes the potential impacts on resources and the possible mitigation measures intended to avoid, minimize, or mitigate impacts caused by the construction and future operation and maintenance of the proposed transmission facility.

Because the west-east segment of this Project was extensively reviewed in the CapX Hampton-Rochester-La Crosse Environmental Impact Statement, and whichever route the Commission permits under that docket will be the route used for the east-west segment of the Chester transmission line, this section focuses only on the north-south segment of this Project. The Study Area is defined as the 600-foot route width for the proposed route and segment alternative A. The mitigation discussions include Applicant-proposed and additional mitigation strategies to reduce or avoid impacts of the Project.

5.1. Human Settlement

The Project has the potential to affect various resources related to human settlement. 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.

5.1.1. Proximity to Residential Structures

Residences and farmsteads are located along the roads and property lines paralleled by the proposed route and route segment A. To compare the Route Alternatives, residences in the study area were identified, and the number of residences within 40 feet, 41-150 feet, and 151-300 feet of the proposed alignment for each Route and Segment Alternative was tabulated. This information is presented in Table 5.1.

Table 5.1 Number of Residences within 300 Feet of the Proposed North-South Segment Alignments

Resource Category	Chester Route	Route Segment Alternative A
Number of Residences 0-40 feet from route alignment	0	0
Number of Residences 41-150 feet from route alignment	8	7
Number of Residences 151-300 feet from route alignment	11	12
Total number of residences within 300 feet of route alignment	19	19

As shown in Table 5.1, a total of 19 residences are within 300 feet of both the proposed route, and the route that includes the segment alternative. Under either scenario, no homes are located within the transmission line ROW (0-40 feet of Project centerline). An alignment that incorporates route segment alternative A places the alignment approximately 165 feet from one home (see Figure 9 – Map Sheet 5) rather than 120 feet from the proposed alignment.

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. 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.

Mitigation – Proximity to Residential Structures

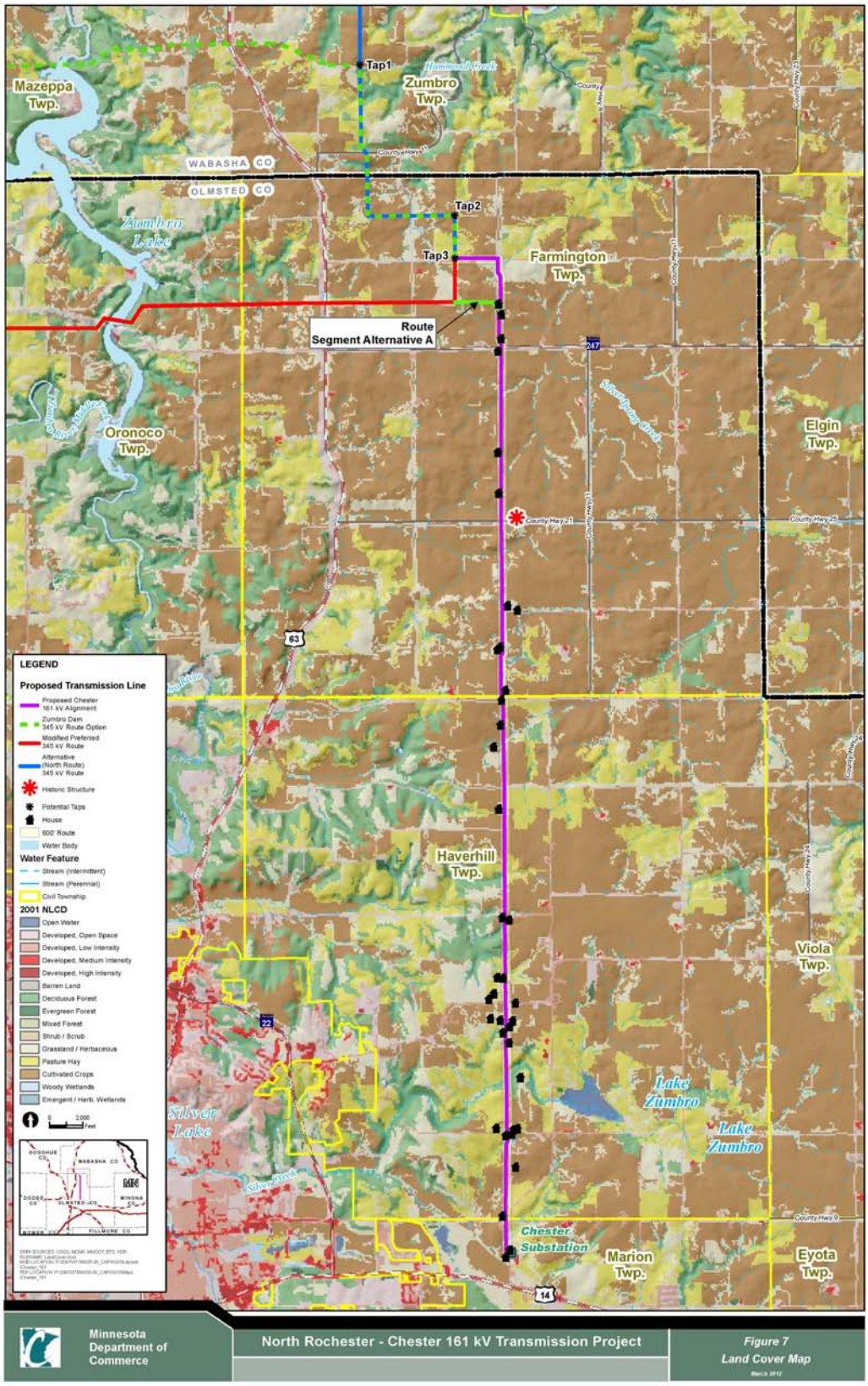
In order to mitigate effects to structures located near or within the Project ROW, the Applicant refined the routes to avoid the following to the extent possible:

- 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.

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. Proper safeguards also would be implemented for construction and operation of the facility. The Project would be designed in compliance with local, state, and NESC standards for clearance to ground, crossing utilities and buildings, strength of materials, and ROW widths.

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. The protective equipment would de-energize the transmission line.

Figure 7: Land Use Map



5.1.2. 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 Goodhue, Olmsted, and Wabasha counties. Many of the comprehensive and land use plans for these communities focus on maintaining these qualities and balancing agricultural conservation and new development. Land use within the Project Area is predominantly agricultural. Topography in the Study Area is relatively flat with some gently rolling hills. The visual landscape consists primarily of agricultural fields, farmsteads, shelterbelts (wooded wind breaks) and State and County roadways. Neither of the route options parallels or crosses any designated National Scenic Byways. The transmission line structures will contribute to changing the views throughout the Study Area.
While much of the Study Area is located on agricultural lands, the area also is crossed by transportation and utility corridors. 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.

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 Chester substation. Activities associated with the modifications would be consistent with the overall industrial atmosphere, albeit noticeable to some existing users.

Trees in the Study Area are generally found in windbreaks associated with residences. 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.

Mitigation - Aesthetics
Although the line will be a contrast to some surrounding land uses, the Applicant has stated it designed the route to utilize existing corridors and avoid homes to the extent

possible, although the transmission lines would be visible to residents located near the Project ROW. 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. The Applicant has stated it will work with landowners to identify and address concerns related to the transmission line pole types and location and/or substation aesthetics.

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).

5.1.3. 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 5.2 provides the approximate decibel levels for some common noise sources. Existing background noise levels in urban residential areas 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 5.2: 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 5.3 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 5.3: 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

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 the proposed route, and a route incorporating route segment alternative A. As such, the effects discussed apply equally to either scenario.

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. 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.

A minimal increase in operational noise could occur at the Chester Substation with the addition of transformer equipment. A residence is located 94 feet to the north of the Chester Substation.

Mitigation - Noise

The MPCA regulates noise limits in the state of Minnesota. Utilities must conform to the standards of these noise limits. The Applicant has stated that the substation substation modifications will be designed to emit noise levels that will attenuate to levels lower than the MPCA noise limits at the nearest receptors. Transmission line noise levels are not predicted to exceed the MPCA noise standards outside the right-of-way for all noise area classifications. Substation noise will not exceed applicable limits, including the MPCA noise limits.

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.

5.1.4. Interference with Utility Systems and Public Services

Under certain circumstances, corona from transmission line conductors can generate electromagnetic "noise" at the same frequencies that radio and television signals are transmitted. This noise can cause interference with the reception of these signals depending on the frequency and strength of the radio and television signal. Television interference is rare, but may occur when a large transmission structure is aligned between the receiver and a weak distant signal, creating a shadow effect. Loose and/or damaged hardware may also cause television interference. Tightening loose hardware on the transmission line usually resolves the interference issue.

If radio interference from transmission line corona does occur, satisfactory reception from AM radio stations presently providing good reception can be obtained by adjusting the receiving antenna. Moreover, AM radio frequency interference typically only occurs immediately under a transmission line and dissipates rapidly within the right-of-way to either side. FM radio receivers usually do not pick up interference from transmission lines because corona generated radio frequency noise currents decrease in magnitude with increasing frequency and are quite small in the FM broadcast band (88-108 Megahertz). Also, the excellent interference rejection properties inherent in FM radio systems make them virtually immune to amplitude type disturbances.

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

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.

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 600-foot wide route width for the proposed Route and Segment Alternative. GPS units and two-way communication devices may also be used by residents, visitors, and emergency personnel in the Study Area.

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

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).

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. 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.

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. 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.

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.).

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.

Mitigation - Interference with Utility Systems and Public Services

The Project would be constructed to comply with NESC standards. No large scale adverse effects of the Project on utility systems are expected.

If radio or television interference occurs because of the transmission line, the Applicant will work with the affected landowner to mitigate the problems so that reception is restored. If television or radio interference is caused by or from the operation of the proposed facilities in those areas where good reception is presently obtained, The Applicant will inspect and repair any loose or damaged hardware in the transmission line,

or take other necessary action to restore reception to the pre-Project level, including the appropriate modification of receiving antenna systems if necessary.

Any planned service disruptions to electric utility services that are necessary during construction activities would 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. Utility repair crews would be present or on-call during construction activities to respond to any unplanned incidents that may result in an interruption to electric service.

5.1.5. Archaeological and Historic Resources

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). 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 1 mile of the Project.

Table 5.4: Archaeological and Historic Sites

Resource Category	Chester Route (North-South Segment)
Archaeological (one mile)	1
Historic/Architectural (one mile)	
National Register of Historic Places (NRHP)	1
Historic/Architectural	10

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 the project 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. During construction, noise and dust in the vicinity of historic properties could temporarily alter

the experience of visitors. 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 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. The Applicant has proposed to conduct Phase I or Phase II surveys if a potentially eligible artifact is discovered and cannot be spanned.

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, in consultation with SHPO, 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.

5.1.6. 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 EA: Electric and Magnetic Fields (EMFs); Interference with Implantable Medical Devices; Stray Voltage; 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 5.5.

Table 5.5: 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 5.6.

Table 5.6: 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).

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 5.7. Estimates of the anticipated strength of the magnetic field associated with the Project routes are displayed in Table 5.8.

The maximum electric field associated with the Project (1.83 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 14.03 mG. The Commission does not impose permit conditions that limit magnetic field strength.

Table 5.7: Calculated Electric Fields (kV/m) for the Project (1 meter above ground)

Structure Type	Maximum Operating Voltage (kV)	-300'	-200'	-100'	-75'	-50'	0'	50'	75'	100'	200'	300'
Single Pole Davit Arm 161 kV Single-Circuit	169	0.02	0.04	0.21	0.39	0.8	1.64	0.76	0.32	0.18	0.04	0.02
Single Pole Davit Arm 161/69 kV Double-Circuit	169/72.5	0.02	0.04	0.08	0.07	0.46	1.83	0.16	0.03	0.06	0.04	0.02

Table 5.8: Calculated Magnetic Flux Density (milligauss) for the Project (1m above ground)

Segment	System Condition	Current (Amps)	-300'	-200'	-100'	-75'	-50'	0'	50'	75'	100'	200'	300'
Single Pole Davit Arm 161kV Single Circuit.	Peak	93.24	0.19	0.42	1.47	2.38	4.31	14.03	5.31	2.74	1.62	0.41	0.18
	Average	56	0.12	0.25	0.88	1.43	2.59	8.42	3.19	1.65	0.97	0.25	0.11
Single Pole Davit Arm 161kV/69kV Double Circuit	Peak	93.24/92	0.32	0.69	2.48	3.96	6.76	11.11	6.72	3.94	2.47	0.69	0.32
	Average	56/55.22	0.19	0.41	1.49	2.37	4.05	6.66	4.03	2.36	1.48	0.41	0.19

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).

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 1.83 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 is an extraneous voltage that appears on grounded surfaces in buildings, barns, and other structures. Stray voltage and its impact is normally an issue associated with electric distribution lines and is a condition that can exist between the neutral wire of a service entrance and grounded objects in buildings. The source of stray voltage is a voltage that is developed on the grounded neutral wiring network of a building and/or the electric power distribution system. Stray voltage can result from damaged, corroded, or poorly connected wiring or damages insulation. Transmission lines do not, by themselves, create stray voltage because they do not connect to businesses or residences. The Project would have no direct electrical connection to conductors originating in another system; it would not connect with the local distribution system. Transmission lines, however, can induce stray voltage on a distribution circuit that is parallel and immediately under the transmission line. Induced voltage between a transmission line and distribution circuit only occurs in the immediate vicinity of the distribution circuit and does not travel along the transmission or distribution line.

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. Induced voltage between a transmission line and distribution circuit only occurs in the immediate vicinity of the distribution circuit and does not travel along the transmission or distribution line. 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. 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 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.

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).

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 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. 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.

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. 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 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.

5.2. Environmental Setting

The Chester 161 kV Route is located entirely in the Rochester Plateau Subsection of the Paleozoic Plateau Section. The Study Area is characterized by rolling till plains transitioning to the dissected landscape of the adjoining Blufflands Subsection. The Study Area has a well-developed branched drainage system with few lakes. Prior to settlement, the landscape was characterized by tall grass prairie and burr oak savanna. Current land use in this subsection is predominantly cropland, pasture, upland forest and wetland.

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.

5.2.1. Air Quality

Air quality emissions directly related to high-voltage transmission lines are negligible amounts of ozone and oxides of nitrogen caused by the corona effect. The other potential air quality issues are associated with construction activities, such as fugitive dust and exhaust emissions from construction equipment.

Corona discharge is energy loss that physically creates very small amounts of sound, radio noise, heat, and chemical reactions of the air near a conductor, and is a phenomenon associated with all transmission lines. Under certain conditions, the localized electric field near an energized conductor can become strong enough to produce a tiny electric discharge that can ionize air close to the conductors. Several factors contribute to corona discharge, including conductor voltage, shape and diameter, and surface irregularities that can affect a conductor's electrical surface gradient such as scratches, nicks, dust, or water drops. In the case of air quality, this partial discharge of electrical energy can produce very tiny amounts of ozone and nitrogen oxide with ozone being the primary oxidant.

Ozone also forms naturally in the Earth's lower atmosphere from lightning discharges and from reactions between solar ultraviolet radiation and air pollutants such as hydrocarbons from auto emissions. Typical rural ambient levels are around 10 to 30 parts per billion (ppb) at night with peaks of 100 ppb and higher (EPRI, 1982). In urban areas, concentrations greater than 100 ppb are common.

The natural production rate of ozone is directly proportional to temperature and sunlight and inversely proportional to humidity. Therefore, humidity, the same factor that increases corona discharges from transmission lines, inhibits the production of ozone. Ozone is a very reactive form of oxygen and combines readily with other elements and compounds in the atmosphere. Because of its high reactivity, ozone is relatively short-lived. The state and federal government both have regulations regarding permissible concentrations of ozone and oxides of nitrogen: Minnesota sets an ozone limit of 0.08 parts per million (ppm) as the highest eight hour average (Minnesota Rule, part

7009.0800), and the federal limit is 0.075 ppm as the fourth-highest eight hour daily maximum average (40 CFR, Part 50).

Calculations according to the BPA Corona and Field Effects Program Version 3 for a standard single-circuit 115 kV project predicted a maximum concentration of 0.006 ppm near the conductor and 0.002 ppm at one meter above ground during foul weather or worst case conditions with rain at one inch per hour. During a mist (rain at 0.01 inch per hour) the maximum concentrations decreased to 0.0002 ppm near the conductor and 0.0001 ppm at one meter above ground level. (United States Department of Energy, BPA)For both cases, the ozone levels are below federal standards. Studies designed to monitor the production of ozone under transmission lines have been unable to detect any increase attributable to the transmission line facility.

There would be limited emissions from vehicles and other construction equipment and fugitive dust from right-of-way clearing during construction of the Project. Temporary air quality impacts are expected to occur during this phase of activity. The magnitude of emissions is influenced heavily by weather conditions and the specific construction activity taking place. Exhaust emissions from primarily diesel equipment would vary according to the phase of construction but would be minimal and temporary. Adverse impacts to the surrounding environment would be minimal because of the short and intermittent nature of the emission and dust-producing construction phases. The Project is not anticipated to result in any permanent impacts on air quality.

Mitigation Measures – Air Quality
As a standard HVTL Permit condition, construction activities must follow best management practices (BMPs) to control air emissions (fugitive dust). Petroleum based dust suppressants may not be used. Construction vehicles with excess tailpipe emissions would not be operated until repairs to the vehicle could be made. The disturbed area for each route would be minimized.

As there are no significant impacts to air quality anticipated, no mitigation beyond these BMPs are proposed.

5.2.2. Soils and Geology

The Study Area is characterized by rolling till plains transitioning to the dissected landscape of the adjoining Blufflands Subsection. It has a well-developed branched drainage system with few lakes. Prior to settlement, the landscape was characterized by tall grass prairie and burr oak savanna. Existing streams and surface water drainage patterns are shown generally in Figure 8.

The surface elevation varies between 1,100 feet mean sea level (MSL) to 1,300 feet MSL in rolling topography. Surface water in the Study Area generally flows into intermittent tributaries to the Zumbro River from where it then flows north and east toward the Mississippi River.

The surficial geology of the Study Area include loess deposits over glacial till and bedrock and deposits of alluvium, hillslope colluvium (weathered bedrock fragments and loess) and sandy outwash near the Zumbro River. Erratic rocks may occur in the glacial till. Bedrock in the area consists primarily of the Shakopee Formation (Prairie du Chien Group) dolomite with other bedrock formations present dependent on the presence of bedrock valleys. Bedrock outcrops are common in the area. The bedrock is generally within 50 feet of the ground surface. Karst bedrock exists in the area. Soils in the area formed in 5 to 10 feet of loess (wind-blown silt) and consist of silt loam to silty clay loam textures. One karst feature was identified within the 600-foot route corridor.

Due to the surficial 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.

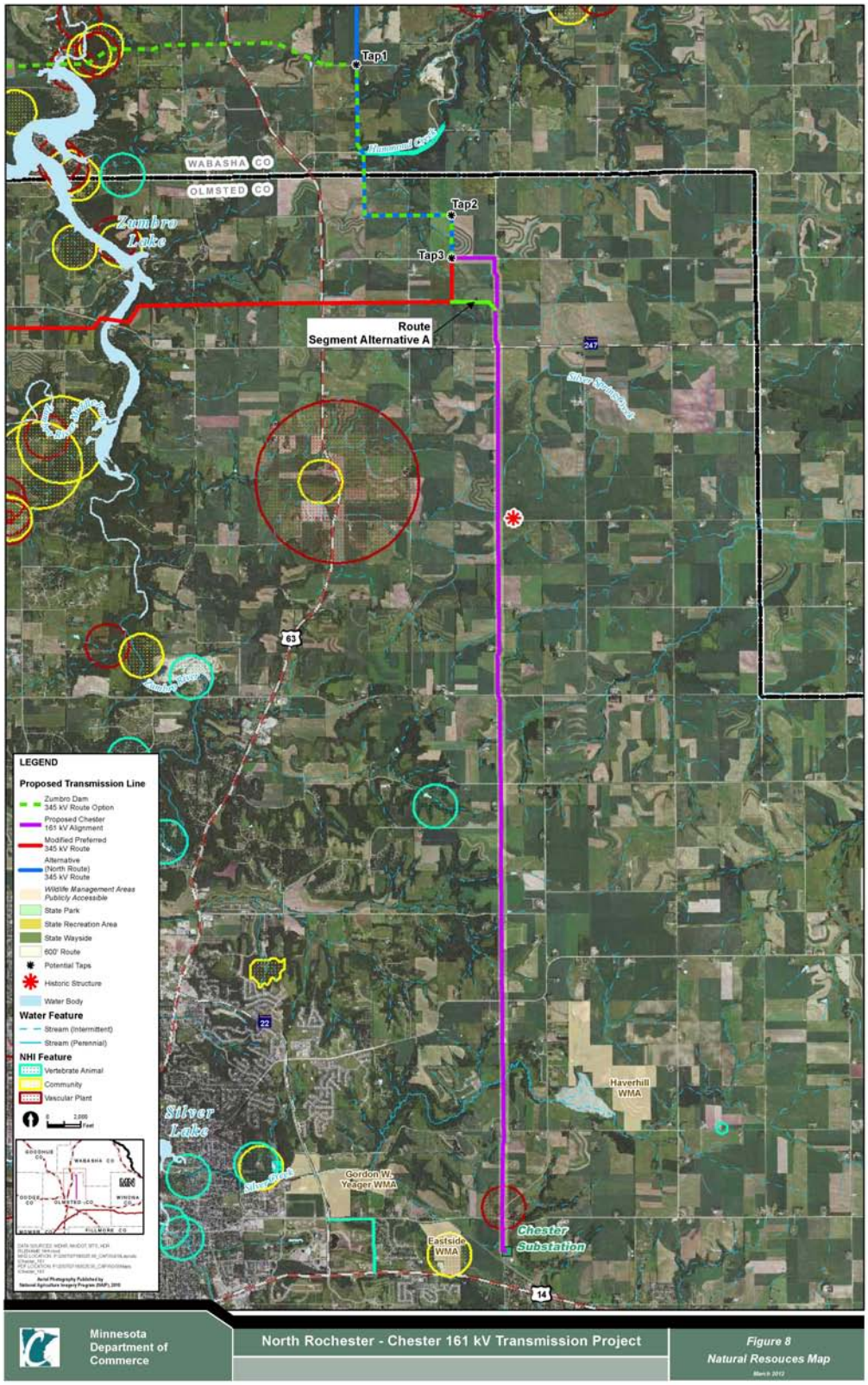
Long-term displacement of soils would result from the placement of Project structures. Assuming a maximum foundation diameter of 8 feet, each Project structure would displace up to approximately 50 square feet of soil.

Mitigation – Soils and Geology

The Applicant has stated it will restore areas disturbed during construction to their original condition to the extent practicable and to limit ground disturbance wherever possible. 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.

Figure 8: Project Area Resources Map



5.2.3. Water Resources

Several perennial and intermittent streams and ditches are crossed by the Chester 161 kV Route. One stream, Silver Creek is designated as a Public Water and listed in the Public Water Inventory (PWI) by the State of Minnesota and is under the regulatory jurisdiction of the MnDNR. Wetlands within the palustrine system were the only ones identified within the Chester 161 kV Route. Palustrine refers to smaller (less than 20 acres), shallow (less than 6.5 feet) wetlands. Silver Creek and several unnamed tributaries to Silver Creek are listed as impaired waters by the MPCA. There are no FEMA 100-year floodplains crossed by the Route or segment alternative. There are no USFWS Waterfowl Production Areas within the corridor. The closest Waterfowl Production Area, Steele County Waterfowl Production Area, is approximately 33 miles to the west in Steele County.

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).

Several perennial and intermittent streams and ditches are crossed by the Chester 161 kV Route. One stream, Silver Creek is designated as a Public Water and listed in the Public Water Inventory (PWI) by the State of Minnesota and is under the regulatory jurisdiction of the MnDNR. The statutory definition of the PWI can be found in Minn. Stat. §03G.005, Subd. 15 and 15a. A permit from the MnDNR is required to cross this feature. No lakes would be crossed by the Route or segment alternative, although wetlands are found throughout the Route (Figure 8).

The National Wetland Inventory (NWI) was reviewed to identify wetland areas that may occur along the Chester 161 kV Route. The NWI is a comprehensive mapping systems of wetland locations and types across the United States produced based on aerial photographs and the Natural Resource Conservation Service (NRCS) soils surveys starting in the 1970s. Wetlands identified on the NWI may be inconsistent with current wetland conditions; however, the NWI is the most accurate and readily available database of wetland resources within corridor area. Wetland impacts resulting from construction have been initially assessed using mapping on the NWI. A number of wetland classification systems have been developed, but the Cowardin et al. (1979) classification methods described by the USFWS are the most widely recognized system and have been used for wetland classification within the regional area. Of the five wetland systems described by Cowardin et al., wetlands within the palustrine system were the only ones identified within the Chester 161 kV Route. Palustrine refers to smaller (less than 20 acres), shallow (less than 6.5 feet) wetlands.

Pursuant to Section 404 of the CWA, the USACE defines wetlands in 33 CFR 328.3b as those areas that are "inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." Jurisdictional wetlands must possess three essential characteristics: "(1) a dominance by

hydrophytic vegetation, (2) hydric soils, and (3) wetland hydrology" (USACE 1987, 2008). For an area to be classified as a jurisdictional wetland under the federal guidelines, all of the above criteria must be met, and the wetland must have a hydrologic connection to waters of the U.S.

In Minnesota, both jurisdictional and non-jurisdictional wetlands are protected under Minn. R. ch. 8420, the Wetland Conservation Act (WCA). Although the Board of Water and Soil Resources (BWSR) administers the WCA on a statewide basis, local government units (LGUs) implement the WCA locally. Wetlands may also be regulated by the MnDNR if they are listed as PWI wetlands. The WCA regulates wetland draining and filling activities on all wetlands not covered by the MnDNR Public Waters Work Permit Program. The MnDNR requires a permit to cross or change or diminish the course, current, or cross section of public waters by any means, including filling, excavating, or placing of materials in or on the beds of public waters. LGUs may also have their own wetland ordinances.

Section 303(d) of the federal Clean Water Act (CWA) requires states to publish, every two years, a list of streams and lakes that are not meeting their designated uses because of excess pollutants (impaired waters). The list, known as the 303(d) list, is based on violations of water quality standards. In Minnesota, the MPCA has jurisdiction over determining 303(d) waters, which are described as "impaired." Reasons for impairment include turbidity, polychlorinated biphenyls, mercury, fecal coliform, perfluorooctane sulfonate, and acetochlor. Silver Creek and several unnamed tributaries to Silver Creek are listed as impaired waters by the MPCA.

The Federal Emergency Management Agency (FEMA) designates areas that are likely to experience flooding in a 100-year rainfall event. There are no FEMA 100-year floodplains crossed by the Route or segment alternative.

There are no USFWS Waterfowl Production Areas within the corridor. The closest Waterfowl Production Area, Steele County Waterfowl Production Area, is approximately 33 miles to the west in Steele County.

During construction there is the possibility of sediment reaching surface waters as the ground is disturbed by excavation, grading, and construction traffic. Once the construction is complete it should have no long-term impact on surface water quality, as all disturbed areas will be re-vegetated. Twelve wetland areas were mapped on the NWI within the Chester 161 kV Route corridor, including two Palustrine Unconsolidated Bottom, Intermittently Exposed, Impounded (PUBGh) wetlands; nine Palustrine Emergent, Seasonally Flooded (PEMC) wetlands, and; one Palustrine Emergent, Saturated (PEMB) wetland. The NWI review did not show the presence of any forested or shrub-scrub wetlands within the Route or segment alternative ROW. The Route crosses 15 intermittent and perennial streams. These waterways are all unnamed except for Silver Creek and are all tributaries of the Zumbro River or Dry Creek. Permanent, direct impacts to the surface water resources are not anticipated.

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.

During construction there is a possibility of sediment reaching surface waters as the ground is disturbed by excavation, grading and construction traffic. Silver Creek and its tributaries are already impaired by sediment and turbidity, so any sediment reaching these streams has the potential to compound adverse water quality in these impaired waters. A National Pollutant Discharge Elimination System (NPDES) permit from the MPCA is required for stormwater discharges associated with ground-disturbing construction activities equal to or greater than 1 acre. A requirement of the permit is to develop and implement a Stormwater Pollution Prevention Plan (SWPPP), which includes implementation of construction Best Management Practices (BMPs) intended to establish sediment and erosion control and minimize discharge of pollutants. If an NPDES permit is required, the Applicant would prepare a SWPPP and submit an application to MPCA to obtain permit coverage under General Permit No. MN R100001 prior to beginning construction activities. If an NPDES permit is not required, the Applicant will follow standard erosion control measures identified in the applicable Stormwater Best Management Practices Manual such as using silt fences to minimize the potential for erosion and sedimentation into water bodies within the route corridors. The Applicant will be required through the NPDES permit and SWPPP to maintain sound water and soil conservation practices during construction and operation of the transmission line to protect topsoil and adjacent water resources and minimize soil erosion. Practices may include containing excavated material, protecting exposed soil, and stabilizing restored soil. With implementation of BMPs the Project is not expected to affect water quality (*i.e.*, fecal coliform or TSS levels) within the watershed.

To avoid direct impacts, the Applicant has stated that construction will incorporate spacing of structures to span wetlands and streams. Temporary impacts to wetlands may occur if the wetlands need to be crossed during construction of the transmission line. Staging or stringing setup areas would be placed outside of water resources wherever possible. The Applicant would avoid major disturbance of individual wetlands and drainage systems during construction by spanning wetlands and drainage systems, where possible. The Applicant has stated wetland vegetation would be restored following construction.

In order to minimize wetland impacts, the Applicant has stated that construction will be scheduled during the winter months when the ground is frozen, as feasible. The Applicant has stated that crews will attempt to access a wetland using the shortest possible route resulting in the least amount of physical impact to the wetland. As feasible, the Applicant has stated that structures will be assembled on upland areas before they are brought to the site for installation and when construction during winter is not possible, construction

mats will be used to minimize wetland impacts. Additionally, the Applicant has access to an all-terrain construction vehicle, which is designed to minimize soil compaction and damage in damp areas. Temporarily impacted wetlands will be restored as required by the USACE, the MnDNR, and the BWSR.

5.2.4. Flora

The majority of the land adjacent to the Project is in row crops, pasture, and hay lands. Row crops in the area include corn and soybeans. Scattered areas of shrub lands and fragmented deciduous forests are located throughout or adjacent to the Route corridor. According to the MnDNR Ecological Classification System (ECS), ecological land classifications are used to identify, describe, and map progressively smaller areas of land with increasingly uniform ecological features. The Chester 161 kV Route is located entirely in the Rochester Plateau Subsection of the Paleozoic Plateau Section.

Historically, the Paleozoic Plateau Section was influenced by slope, aspect, flooding, and fire frequency, which influenced the distribution and condition of the dominant vegetation communities associated with the related subsection. The Rochester Plateau Subsection was historically characterized by two dominant vegetation communities: tallgrass prairie and bur oak savanna. Today, agriculture dominates the landscape, with 69 percent in cropland and 21 percent in pasture (Minnesota Department of Natural Resources, 2006.*Tomorrow's Habitat for the Wild and Rare: An Action Plan for Minnesota Wildlife*, Comprehensive Wildlife Conservation Strategy. Division of Ecological Services, Minnesota Department of Natural Resources). Water quality is a concern in the subsection because of agricultural and urban development.

Surrogate grasslands are common in this region of Minnesota. According to Minnesota Comprehensive Wildlife Conservation Strategy, these are grasslands that have developed as a result of human activities since settlement dominated by non-native, cool-season grasses. Surrogate grasslands include old fields, hayfields, pastures, and roadside grasslands (Sample and Mossman 1997). Dominant non-native grasses include smooth brome (*Bromus inermis*), quackgrass (*Agropyron repens*), redtop (*Agrostis stolonifera*), timothy (*Phleum pratense*), and Kentucky bluegrass (*Poa pratensis*). Reed canary grass (*Phalaris arundinacea*), a non-native invasive species, dominates this habitat on wetter sites. Non-native forbs include species of legumes such as yellow sweet clover (*Melilotus officinalis*), white sweet clover (*M. alba*), alfalfa (*Medicago sativa*), bird's-foot trefoil (*Lotus corniculatus*), and Canada thistle (*Cirsium arvense*) and native forbs include goldenrods, milkweeds, and asters. When left unmanaged these habitats are typically invaded by non-native species such as Siberian elm (*Ulmus pumila*) and Russian olive (*Elaeagnus angustifolia*), and by natives such as green ash (*Fraxinus pennsylvanica*), cottonwood (*Populus deltoides*), and sumacs (*Rhus* spp), reducing the value of these communities for grassland species (Minnesota Department of Natural Resources, 2006.*Tomorrow's Habitat for the Wild and Rare: An Action Plan for Minnesota Wildlife*, Comprehensive Wildlife Conservation Strategy. Division of Ecological Services, Minnesota Department of Natural Resources).

Wetland habitats in the corridor are primarily wet meadow and marsh communities. Wet meadows are graminoid, forb, or shrub-dominated communities located near a marsh or open water. Species may include arrow-leaved tearthumb (*Polygonum sagittatum*), fen wiregrass sedge (*Carex lasiocarpa*), prairie sedge (*Carex prairea*), and tussock sedge (*Carex stricta*). Marshes are emergent herbaceous communities and can be heavily dominated by cattails (*Typha* spp.), bulrushes (*Scirpus* spp.), and sedges.

There are six Conservation Reserve Program (CRP) properties located in the Route ROW currently depicted within the Route corridor. CRP is a federal program administered by the NRCS that converts highly erodible or marginal farmland to native grassland habitats. Easements last 10 to 15 years and are intended to reduce erosion and improve water quality.

The majority of the Route corridor runs through cultivated cropland and pasture, with scattered areas of shrub land and deciduous forest. Row crops such as corn, as well as other agricultural crops such as soybeans and alfalfa are anticipated to dominate the landscape. Grassland areas are expected to be dominated by grasses such as smooth brome, quackgrass, redtop, timothy, and Kentucky bluegrass, and forbs including clover, trefoils, and alfalfa.

The total area of forested upland (deciduous and evergreen) within the route cooridor is approximately 42.4 acres (1,846,944 ft^2). The area of forested upland (deciduous and evergreen) that will be impacted by the ROW is approximately 5.99 acres (260,924 ft^2). A width of 40 feet will be cleared on either side of the centerline for the 161 kV transmission line ROW in areas where trees are present. Forested wetlands are not anticipated to be impacted by construction.

Mitigation – Flora

The HVTL permit would 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.

The Applicant would 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.

The Applicant has stated it will work with the MnDNR and the USFWS to minimize and avoid impacts to sensitive flora along the route. The Applicant will attempt to avoid, minimize, and/or mitigate impacts to any areas known to support native vegetation or special status species, as practicable. When native vegetation communities cannot feasibly be spanned, the Applicant will work to minimize the number of structures within these communities.

As an additional mitigation/conservation measures, the Applicant would comply with Minnesota noxious weed laws as described in the Minn. R. ch. 1505 and would observe county weed lists, where appropriate. The Applicant would provide for weed control associated with substation and switch locations in a manner that would reduce the spread of weeds onto adjacent agricultural land during operation of the transmission line.

5.2.5. 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.

In general, wildlife near the Route consists of birds, mammals, fish, reptiles, amphibians, mussels, and insects, both resident and migratory, which use the existing habitat for foraging, shelter, breeding, and/or stopover sites during migration. Wildlife management areas (WMA's) are located throughout Olmsted County and are open for public hunting at various times of the year. The closest WMA is the Eastside WMA located approximately 0.5 miles west of the south end of the route. Game animals open to hunting at WMA's in Olmsted county include deer, small game (rabbits and squirrels), forest birds, pheasants, waterfowl, turkey, and dove (http://www.dnr.state.mn.us/hunting/index.html). Coyotes would also be expected to frequent the area.

The MnDNR online AniMap (http://www.dnr.state.mn.us/maps/animap/mapper.html) provides lists of species by county where mammals, breeding birds, and reptiles and amphibians have been surveyed. For Olmsted County, data was provided for rodents and breeding birds.

Construction of new transmission lines can affect fauna through temporary impacts, permanent impacts, and avian-specific impacts. Temporary impacts include displacement and habitat alteration caused by temporary disturbances and noise associated with construction activities. Such impacts are most likely to affect fauna at the proposed structure locations where activity would be most intense. Approximately 20,000 square feet (<0.5 acre) of temporary impact is anticipated at each new structure or 1.0 acre of temporary impact per span. Similarly, staging and stringing areas also have the potential to temporarily impact fauna within the Project construction area. Grading previously undisturbed sites for staging areas and clearing for access roads has the potential to temporarily impact wildlife by altering habitat. Clearing for access roads would be limited as much as practicable and should only require a maximum width of 16

feet. Such activities have the potential to impact small birds (e.g., eggs or nestlings) and small mammals that may be unable to avoid equipment. Many wildlife species would likely avoid the immediate area during construction. The distance that animals would be displaced is dependent on the species and the tolerance level of each individual. Based on the availability and suitability of other unaffected and similar habitat within and near the Project area, the potential temporary impacts to wildlife are not expected to cause a change in listing status or a detectable change in local populations. The Applicant will make all attempts to schedule construction within forested communities outside of prime bird breeding and nesting seasons.

In addition to temporary and permanent construction impacts to fauna, transmission lines also have the potential to impact birds through electrocution and collision after construction is complete. Electrocution risk is addressed in structure design elements that provide adequate clearance for perching birds.

Mitigation – Fauna

Avian protection standards that minimize the risk of bird electrocution are well documented in the following resources: the Avian Power Line Interaction Committee's (APLIC's) *Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006* (APLIC 2006), APLIC's *Mitigating Bird Collisions with Power Lines: The State of the Art in 1994* (APLIC 1994), and APLIC's and USFWS' *Avian Protection Plan (APP) Guidelines* (APLIC and USFWS 2005). The structure designs used for this Project are consistent with the recommendations of these resources in that they provide adequate clearance from energized conductors to grounded surfaces and to other conductors. As such, avian electrocution risk is considered minimal and is not addressed in further detail. Conversely, avian collisions with new transmission lines are possible, and risk is assessed through an analysis of line span locations relative to surrounding habitats and bird movement. Risk is characterized on a site-specific basis by evaluating surrounding habitat, reviewing bird concentration and movement patterns, and examining structure configurations. Habitats are characterized by identifying historical and active nest sites, bird concentration areas, foraging areas, roost sites, and rookeries. Potential collision risk is highest at spans or structures located in rural areas with native vegetation where the line crosses habitats typically used by area birds (e.g., rivers and wetlands) and human influence in the immediate vicinity is limited. The Route is located between the Steele County Waterfowl Production Area and the Mississippi River and waterfowl may cross over the route corridors during migration.

Several mitigation strategies and measures can be used to minimize temporary, permanent, and avian impacts. To mitigate potential impacts to wildlife the transmission line would span designated habitat, conservation areas, or other sensitive habitats wherever practical. In areas where complete spanning is not possible, the Applicant would minimize the number of structures placed in high quality wildlife habitat and would work with the MnDNR and USFWS to come up with appropriate mitigation. Additionally, the Applicant has proposed to use construction mats to avoid soil compaction where appropriate (e.g., in wetland habitats). Areas temporarily disturbed by construction activities may be restored to pre-construction contours and allowed to re-

vegetate naturally, subject to landowner approval. The DNR encourages wildlife friendly erosion control mesh to be used during and following construction activities. Plastic mesh, particularly when placed where there are known locations of reptiles or amphibians, may be detrimental or even fatal to wildlife.

The Applicant will address avian issues by working with MnDNR and USFWS to identify areas that may require marking transmission line shield wires and/or the use of alternative structures to reduce the likelihood of collisions. If necessary, field surveys to obtain more route specific wildlife data will be completed once a route has been permitted in order to help minimize and mitigate potential impacts.

Adjacent suitable habitat in the vicinity of the Study Area would reduce displacement impacts to terrestrial wildlife species from the Project.

5.2.6. 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.

The Minnesota Comprehensive Wildlife Conservation Strategy (Minnesota Department of Natural Resources, 2006.*Tomorrow's Habitat for the Wild and Rare: An Action Plan for Minnesota Wildlife*, Comprehensive Wildlife Conservation Strategy. Division of Ecological Services, MnDNR) breaks the state of Minnesota into 25 Ecological Classification System (ECS) subsection profiles. These subsection profiles are used to identify the presence and patterns of occurrence for species of greatest conservation need (SGCN), as well as key habitats, and priority conservation actions across the state. The Route corridor runs through the Rochester Plateau, which comprises the majority of Olmsted County.

The Minnesota Natural Heritage Inventory System (NHIS) was consulted for known occurrences of sensitive species and other rare or unique natural resources within one mile of the Route centerline. The Minnesota NHIS provides information on Minnesota's rare plants, animals, native plant communities, and other rare features. The NHIS database is continually updated as new information becomes available, and is the most

complete source of data on Minnesota's rare or otherwise significant species, native plant communities, and other natural features. The NHIS contains historical data on rare species occurrences from museum collections and published records, as well as more current data obtained from MnDNR's MCBS work. All animal species that are listed as federally endangered or threatened (except the gray wolf) are tracked, as well as all birds, small mammals, reptiles, amphibians, mussels, and butterflies that are listed as state endangered, threatened or special concern. Several rare species which currently have no legal status but need further monitoring to determine their status also are tracked in the NHIS database (MnDNR 2009). Threatened species and species identified as special concern, as well as a rare natural community, were identified within a 1-mile radius of the route.

The MnDNR NHIS was consulted for known occurrences of sensitive species and other rare or unique natural resources with the potential to occur near the proposed route and segment alternative. Two special concern plant species, White Wild Indigo (*Baptisia alba*) and Rattlesnake-master (*Eryngium yuccifolium*), and two threatened reptile species, Blanding's Turtle (*Emydoidea blandingii*) and were documented within 1-mile of the Route centerline. Three occurrences were recorded for Blanding's Turtle.

A sedge meadow was also identified within 1-mile of the proposed route centerline. This wetland community was identified as a large meadow dominated mostly by *Carex lacustris* and *Calamagrostis Canadensis* with areas dominated by *Carex stricta* and *Typha* species. This community was identified as having a moderate species diversity with associate species of various *Carex*, *Polygonum*, *Lathyrus*, *Eleocharis*, *Erythronium*, and *Galium* species.

Mitigation – Rare and Unique Natural Resources/Critical Habitat

The majority of the land use surrounding both route options is cultivated cropland and pasture and impacts to rare species are unlikely. To reduce and minimize impacts to rare and unique natural resources the Applicant would, to the maximum extent practicable, span areas of potential habitat for these species. If construction activities are proposed to disturb known endangered or threatened species habitat, surveys would be conducted to determine species presence, as well as to plan avoidance and mitigation strategies, per MnDNR permit requirements. Adjustments to structure configuration and careful pole siting would be used to minimize impacts in sensitive areas. The Applicant would be required to maintain sound water and soil conservation practices during construction of the Project to protect topsoil and adjacent water resources and minimize soil erosion and sedimentation. The MnDNR encourages wildlife friendly erosion control mesh to be used during and following construction activities. Plastic mesh, particularly when placed where there are known locations of reptiles or amphibians, may be detrimental or even fatal to wildlife. Upon receipt of a permitted route the Applicant will coordinate with the appropriate agencies (e.g., USFWS, USACE, and MnDNR) to determine species-specific survey and wetland delineation needs, as well as additional avoidance and mitigation measures. As the Study Area is known to provide habitat for the Blanding's turtle, the MnDNR has provided the Applicant with information sheets on recommended BMPs to reduce the potential or avoid for impacts to this species. Surveys for state listed

endangered and threatened species would be conducted in suitable habitat within the permitted route corridor as directed by the agencies.

5.3. Socioeconomics

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.

5.3.1. Socioeconomic Setting

For the analysis of socioeconomic resources, the Study Area is expanded from the Route Alternatives to include all of Goodhue, Olmsted, and Wabasha counties. In general, data were obtained from the United States Census Bureau decennial census.

This Project would be constructed in conjunction with the 345 kV project. Approximately eight to twelve workers will be required by the Applicant for the construction of the 161 kV Project. The transmission crews are expected to spend approximately six months constructing the transmission line. During construction, it is expected there will be a small positive impact on the community due to the expenditures by the construction crews in the local community such as increased spending for lodging, meals and other consumer goods and services. It is not anticipated that the Project will create new permanent jobs.

Once the Project is operational, its socioeconomic effects are generally positive because of their impacts on the local tax base. Long-term beneficial impacts from the new transmission lines, include an increase to the tax base of local governmental units resulting with incremental increase in revenue from utility property taxes. In rural areas with relatively small tax bases, the added valuation resulting from transmission lines can be significant. Also, indirect impacts may occur through the increased capability of the electric system to supply energy to commercial and industrial users, which will contribute to the economic growth of the region. The availability of reliable power in the area will have a positive effect on local businesses and residents.

The population and economic characteristics based on the 2010 U.S. Census are presented in Table 5.10.

Table 5.10: Population and Economic Characteristics

Location	Population	Minority Population (Percent)	Caucasian Population (Percent)	Per Capita Income	Percentage of Population Below Poverty Level
State Of Minnesota	5,303,925	15.0%	83.1%	$29,431	10.9%
Goodhue County	46,183	5.7%	93.2%	$26,873	7.5%

Olmsted County	144,248	14.6%	83.4%	$32,716	7.6%
Wabasha County	21,676	3.7%	95.6%	$26,040	8.3%

As reported in the 2010 U.S. Census, the population densities of Goodhue, Olmsted and Wabasha counties are 60.9, 220.9, and 41.3 people per square mile, respectively. As shown in the table above the Minorities and persons living in poverty in the Project Area are less than the state as a whole. The Project is not expected to displace low-income or minority populations as the Study Area does not contain disproportionately high minority populations or low-income populations.

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.

5.3.2. 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.

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.

Mitigation – Property Values

Direct impacts to property values would be mitigated through landowner compensation for the use of their land through easement payments. 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.

5.3.3. Land-Based Economies

Land-based economies in Goodhue, Olmsted and Wabasha counties include agriculture (i.e., farming, livestock, and agri-business and tourism), mining, and forestry-based economies. No impacts are anticipated for mining or forestry operations as a result of this Project, therefore no mitigation measures are proposed.

Mining

Gravel pits, quarries, and commercial aggregate sources are located within Goodhue, Olmsted, and Wabasha counties. Aggregate (sand, gravel and crushed stone) operations

occur in the vicinity of the proposed Project. The route options do not cross active aggregate mining operations.

One documented aggregate mine exists approximately 1,200 feet from the edge of the route corridor south of Viola Road NE. The mine is not active.

High potential for aggregate material exists in two locations along the route corridor. The total area of high potential aggregate is approximately 163 acres. The location of the aggregate is approximately 0.3 miles from the centerline of the proposed corridor. There are no other high potential areas for aggregate along the corridor.

Forestry

Due to the abundance of farmland in the Study Area, there are few wooded areas located along the route options and minimal impacts are anticipated.

There are no significant lumber mills (>2,000 cords annual production) located in the Study Area, which are an important factor in determining markets for wood. There are no acres of forestry stand within the 600-foot route width of either route option. Therefore, the Project would not result in forestry-related economic impacts.

Agriculture

The U.S. Department of Agriculture ("USDA") 2007 Census of Agriculture found that Goodhue, Olmstead and Wabasha Counties have 81.9%, 70.8% and 78.4% of land area in farms, respectively. The predominant acreage in cultivation was corn, soybean and forage as shown in Table 5.11. Cattle and hogs are the predominant livestock operations.

Table 5.11: Land under Agricultural Cultivation and Production (in acres)

County	Total Cropland (acres)	Corn for Grain Production (acres)	Soybean Production (acres)	Forage Production (acres)
Goodhue	322,809	162,973	89,765	31,686
Olmstead	227,550	114,567	57,449	21,311
Wabasha	181,667	79,369	31,515	32,915

Source: USDA, 2007

Although the majority of lands the proposed route crosses consist of agricultural lands, agricultural land will be minimally impacted because the proposed route is located within or adjacent to existing utility, roadway or other public ROW, minimizing the impacts to agricultural operations. Agricultural impacts would be limited to the footprint of poles located within agricultural areas.

Table 5.13 provides a summary of prime farmland, farmland of statewide and local importance within the corridor and ROW. It also presents the length of agricultural land crossed and acres within the corridor.

Table 5.12: Summary of Farmland Types and Impacts

Resource Category	Chester Route (North-South Segment)
Prime farmland within 600 -foot corridor *	489.7 acres
Prime Farmland within ROW*	65.3 acres
% ROW within all areas of prime farmland*	56%
Prime Farmland if drained within 600-foot corridor*	0 acres
Prime Farmland if drained within ROW*	0 acres
% of ROW within Prime Farmland if Drained*	0%
% ROW within Farmland of State wide Importance*	0.41 acres
% ROW within Farmland of State wide Importance*	0.004%
Farmland of Local Importance within 600-foot corridor	0
% of ROW with in Farmland of Local Importance	0
Total Agricultural Land Impacts	
Length crossed**	5.2 miles
Acres within 600-foot corridor**	417.6acres

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

i) one or more of the fence insulators can be shorted out to ground with a wire when the charger is disconnected; or

ii) an electric filter can be instilled that grounds out charges induced from a power line while still allowing the charger to be effective.

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

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

Buildings are permitted near transmission lines but are generally prohibited within the ROW itself because a structure under a line may interfere with safe operation of the transmission facilities. For example, a fire in a building on the ROW could damage a transmission line. As a result, NESC guidelines establish clear zones for transmission facilities. Metal buildings may have unique issues. For example, metal buildings near power lines of 200 kV or greater must be properly grounded. Any person with questions about a new or existing metal structure can contact the Company for further information about proper grounding requirements.

If a customer suspects that stray voltage/NEV is a concern on their property, they can call the Company stray voltage hotline. The customer can contact an Xcel Energy technician or engineer and discuss the situation. If an on-farm investigation is warranted it will be scheduled. On the day of the investigation, the Xcel Energy team will arrive and conduct an investigation of the utility system serving the farm and the farm wiring. The team will discuss the preliminary results with the customer before leaving the farm. In most instances, recording volt meters will be set to measure activity over several days. A few days later these will be retrieved and taken to the Company for analysis. Upon completing the analysis, an Xcel Energy engineer or technician will call the farmer to discuss the results.

Mitigation – Agriculture

Landowners will be compensated for the use of their land through easement payments. Additionally, to minimize loss of farmland and to ensure reasonable access to the land near the poles, the Applicant intends to place the poles on private property near the public roadway right-of-way. When possible, the Applicant will attempt to construct the transmission line before crops are planted or following harvest. The Applicant will compensate landowners for crop damage and soil compaction that occurs as a result of the Project. Soil compaction will be addressed by compensating the farmer to repair the ground or by using contractors to chisel-plow the site. Normally, a declining scale of payments is set up over a period of a few years. Where possible, the Company avoids spring time construction. If construction during spring time is necessary, disturbance to farm soil from access to each structure location will be minimized by using the shortest access route. This may require construction of temporary driveways between the roadway and the structure, but would limit traffic on fields between structures. Construction mats may also be used to minimize impacts on the access paths and in construction areas.

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. 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. Induced voltage between a transmission line and distribution circuit only occurs in the immediate vicinity of the distribution circuit and does not travel along the transmission or distribution line. 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 directly under the transmission line and distribution circuit, which may result in reduced food and water intake (if the exposure occurs at those locations), and difficulty in handling or moving the animals. However, animals are typically fed near agricultural buildings, which would be prohibited within the ROW. As such, it is unlikely that animals would routinely intake food or water within the managed easement, and potential impacts from exposure would be less likely. 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).

5.3.4. Zoning and Compatibility with Planning

The Project would be located in Goodhue, Olmsted, and Wabasha counties. 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. Zoning designations indicate acceptable land uses and provide insight into the possible impacts of the Project on future development plans.

The Goodhue County Zoning Ordinance includes protections from development or encumbrance for aggregate resources, agricultural land, bluff lands, and shore lands.

The Olmsted County General Land Use Plan states in a section titled Communications Towers and Utilities that "(t)he location of communication towers, high voltage power transmission lines, petroleum/natural gas pipelines, and other similar special uses should be controlled to the extent allowable to minimize potential aesthetic and other public health or welfare impacts including property impacts."

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 either route option, 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. Landowners also would be compensated for the use of their land through easement payments.

5.3.5. Recreation

No regional parks, national scenic byways, state bike trails or state wildlife management areas (WMAs) are crossed by either route option (Figure 8).

The Chester Route does not cross any Richard J Dorer (RJD) Memorial Hardwood State Forest land. The RJD Memorial Hardwood Forest was created in 1961 as a memorial to the state's pioneers and veterans. In addition to the recreational and aesthetic opportunities of all state forests, the founders of the RJD Memorial Hardwood Forest set out additional goals. Improved wildlife habitat, prevention of erosion, stability of streams and timber production were set out as specific conservation goals for the forest. The RJD Memorial Hardwood Forest is unique in that the state does not own most of the land. In fact, the state only owns 45,000 acres out of the 1 million acres covered by the forest. Also not all of the land is forested at present. The forest also represents what used to be forested land. RJD Memorial Hardwood Forest is also the only forest where the use of mountain bikes, horses, OHVs, and ATVs is restricted to designated trails only.

No lands purchased by the Land and Water Conservation (LAWCON) fund are crossed by the Route. There are no parks or public lands with improvements funded by LAWCON crossed by the Route.

Mitigation – Recreation

The Project route does not cross any recreational resources.

5.3.6. Transportation

The Study Area is accessible by a system of local, collector, and arterial roads. 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.

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.

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. 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.

Construction of the Project could result in temporary construction-related detours and road closures. 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.

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.

6. 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 6.1 below.

Table 6.1: Potentially Required Permits and Approvals

Permit Description	Jurisdiction
Federal Approvals	
Section 404 Permit, Clean Water Act (Local/State/Federal Application for Water/Wetland Projects, for discharge of fill due to placement of poles in wetlands) Section 106 review	USACE
Part 7460 review (to ensure compliance with CFR Title 14 Part 77)	FAA
Spill Prevention, Control and Countermeasure (SPCC) Plan (North Rochester and Chester Substations)	EPA
Federal Environmental Impact Statement (EIS)	RUS
Minnesota State Approvals	
Route Permit Hampton Rochester-La Crosse 345 kV Transmisison Project (to provide double-curcuiting opportunity)	MPUC
License to Cross Public Waters or State Lands	DNR – Lands and Minerals
Utlitiy Permit (Road Crossing Permits to cross or occupy state trunk highway road ROW)	MnDOT
NPDES Permit (for line construction and substation construction and expansion)	MPCA
Minnesota Local Approvals	
Land Permits, including road crossing/ROWpermits (may be required)	County, Township
Minnesota Wetland Conservation Act Exemption	County
Road Crossing Permits	County, Township
Overwidth Loads Permit	County, Township
Driveway/Access Permits	County, Township

Federal Permits

A Section 404 Permit for the Clean Water Act would be required for the discharge of water from areas filled with soil due to the placement of poles or other structures in a wetland. A Section 106 Review for the Tribal Water Pollution Control Grant program will be conducted to determine if the proposed Project would impact a Tribal funded project.

The Part 7460 review determines if the proposed Project would create a vertical obstruction to navigable airspace in the vicinity of a public use or military airport. A Spill Prevention Control and Countermeasure Plan (SPCC) is required to prevent discharge of oil or other chemicals into navigable waters, wetlands, or adjoining shorelines.

Other State Permits

A License to Cross Public Waters or State Lands is required if the proposed Route crosses public waters or state lands. The permit would be submitted to the Minnesota Department of Natural Resources (MnDNR) and would identify the specific resource crossed, potential impacts to the natural resources and identify mitigative measures.

A Utility Permit is required by MnDOT to occupy or cross a state-maintained road or highway by an aerial line. The permit provides MnDOT review for the installation of poles, guy wires and anchors, placing temporary obstriutions in the road right of way, and vegetation removal. A traffic management plan may be required by MnDOT if there is the potential of obstruction of traffic.

A NPDES permit would be required for construction of the Project. Permits would be required because more than one acre of disturbance will occur during the construction of the transmission line and modification of the Chester Substation. The NPDES permit for industrial discharge would not be required because the transmission line and substation would not generate wastewater that would be discharged off-site.

County Permits

The Chester 161 kV Project is located in Olmsted County. The Rochester-Olmsted County Planning Division oversees planning and permitting in Marion Township. If the poles would be placed in a floodplain, a Certificate of Compliance with Floodplain provisions would be required. A Certificate from an Environmental Specialist is required to confirm that the Project will not use public water or generate wastewater.

Local Permits

Several townships in Olmsted County created the Township Cooperative Planning Association (TCPA) in 1997 to implement individual strategic land use planning and zoning in townships and issues related to it. TCPA performs daily activities related to the filing of land use actions and provides a central repository of information for member

townships. Farmington is an associate member of TCPA and Haverhill is a full member of TCPA. Marion Township is not a member of the TCPA and their planning and permitting is performed by the Rochester-Olmsted County Planning Division.

A road permit would be required for the use of heavy equipment and machinery on township roads during Project construction. A township construction permit would be required if any part of a township road ROW is occupied during Project construction.

Road and ROW permits for use of township roads would be authorized by the township road authority. A temporary construction permit is required if the duration of construction is less than ninety days. A conditional use permit is required if the duration of construction is greater than ninety days. An overweight/overwidth permit is required for construction equipment on township roads. A traffic management plan, including signage and traffic control devices, is required by the township as a part of the ROW use permit.

A road permit would be required from Marion Township for the use of heavy equipment and machinery.

7. Route Comparison

There are two routing scenarios presented in the scope of this environmental assessment, previously described as the Applicant's proposed route, and the Applicant's proposed route incorporating route segment alternative A. These routes are described in Chapter 1 of this EA, and on all Figures contained in this document. Table 7.1 compares the potential impacts associated with the two routing scenarios.

Table 7.1: Route Comparison

Resource Category	Applicant's Proposed Route (North-South Segment)	Proposed Route with Segment Alternative A (North-South Segment)
Residences		
Number of Residences 0-40 feet from route centerline	0	0
Number of Residences 41-150 feet from route centerline	8	7
Number of Residences 151-300 feet from route centerline	11	12
Use or Paralleling of Existing ROW (transportation, and electrical transmission systems) and property lines		
Total length of route (miles)	11.9	11.4
Length following Transmission Line (miles)	6.9	6.9
Length following road but not Transmission Line (mi.)	5.0	4.0
Length following property line but not transmission line or roads (mi.)	0.0	0.4
Total length following transmission line, roads, or property lines (mi.)	11.9	11.8
Length not following transmission line, roads or property lines (miles)	0.0	0.1
Archaeological and Historic Resources within 1-mile of Route Centerline		
Archaeological	1	1
National Register of Historic Places	1	1
Historic/Architectural	10	10
Natural Environment		
Wetlands Crossed by 600-foot Route width	12	11
Wetland Areas crossed by the Proposed Route Centerline	2	2
Potential Tree Clearing in Wetlands (acres)	0	0
Stream Crossings	15	14
Trout Streams (number crossed)	0	0
Permanent Impacts to Floodplains (acres)	0	0
Flora - Land Cover (Acres within 600-foot Route)		
Percent Developed	15 %	15%
Percent Cropland	47.8%	47.8%
Percent Grassland	18.7%	18.7%

Percent Pasture/Hay	13.7%	13.7%
Percent Shrubland	0%	0%
Percent Deciduous Forest	4.1%	4.1%
Percent Coniferous Forest	0.7%	0.7%
Flora - Land Cover (Acres within 80-foot ROW)		
Percent Developed	16%	16%
Percent Cropland	44.5%	44.5%
Percent Grassland	21.7%	21.7%
Percent Pasture/Hay	12.6%	12.6%
Percent Shrubland	0%	0%
Percent Deciduous Forest	4.1%	4.1%
Percent Coniferous Forest	1.1%	1.1%
Fauna		
Conservation Reserve Program Lands Crossed (# of properties)	6	6
Conservation Reserve Enhancement Program Lands Crossed (# of properties)	0	0
Length of Important Bird Areas Crossed (miles)	0	0
Length of Grassland Bird Conservation Areas Crossed (miles)	0	0
Number of Federal Rare and Unique Species Known to Occur within 1-mile of Route Centerline		
Threatened	0	0
Endangered	0	0
Candidate	0	0
Number of State Rare and Unique Species Known to Occur within 1-mile of Route Centerline		
Threatened	3	3
Endangered	0	0
Species of Special Concern	2	2
DNR Rare Native Communities	1	1
Length of Outstanding Biodiversity Sites Crossed (miles)	0	0
Length of High Biodiversity Sites Crossed (miles)	0	0
Length of Moderate Biodiversity Sites Crossed (miles)	0.2	0.2
DNR Rare Native Communities Crossed	0.2	0.2
DNR R.R. ROW Prairies within 1-mile	0	0
Estimated Costs		
Cost (in millions)	13.8	13.3

In relative terms, as Table 7.1 shows, there are not major differences between the proposed route, and a proposed route that incorporates route segment alternative A. The route segment A scenario is 0.5 miles shorter than the proposed route, and therefore less expensive. The shorter route follows a property line instead of a roadway. One house along 50th Avenue NE, Farmington township, Olmsted County would be affected by either routing scenario. Route segment A would be 165 feet from the house, while the

proposed route would be 120 feet away, and on the other side of 50th Avenue (see Appendix A – Map Sheet 5.)

The routing scenario incorporating route segment alternative A would make one less stream crossing than the proposed route.

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