Public Utilities Commission
Site Permit Amendment Application for a Large Wind Energy Conversion System

Northern States Power Company

Nobles County, Minnesota

Docket No. IP-6646/WS-09-584

February 2021

414 Nicollet Mall

Minneapolis, MN 55401

Project Name:	Nobles Wind Farm Repower Project
Project Location:	Nobles County
Applicant:	Northern States Power Company
Authorized Representative	Matt Langan, Principal Agent

Signature: 

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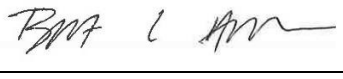
Signature: 

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ACRONYM LIST

Acronym	Definition
AADT	Annual Average Daily Traffic
ACS	American Community Survey
Act	Minnesota Wind Siting Act
ADLS	Aircraft Detection Lighting System
AMA	Aquatic Management Area
Applicant	Xcel Energy
Application	Site Permit Amendment Application
Application Guidance	Application Guidance for Site Permitting of Large Wind Energy Conversion Systems in Minnesota (Revised July 2019)
AWWI	American Wind Wildlife Institute
BBCS	Bird and Bat Conservation Strategy
BLM	Bureau of Land Management
BMP	best management practice
BWSR	Board of Water and Soil Resources
Commission	Minnesota Public Utilities Commission
CN	Certificate of Need
CREP	Conservation Reserve Enhancement Program
CRP	Conservation Reserve Program
CWA	Clean Water Act
dB	decibels
dB(A)	decibels using the A-weighted scale
DOC-EERA	Minnesota Department of Commerce – Energy Environmental Review and Analysis
DoD	U.S. Department of Defense
EMF	electromagnetic field
EPA	U.S. Environmental Protection Agency
FAA	Federal Aviation Administration
FCC	Federal Communications Commission
FEMA	Federal Emergency Management Agency
FRS	Facility Registry Service
GE	General Electric
GIA	Generator Interconnection Agreement
Hz	hertz
IAV	inter-annual variability
IBA	Important Bird Area
IPaC	Information for Planning and Consultation

Acronym	Definition
kV	kilovolt
L_{10}	ten percent of an hour
L_{50}	fifty percent of an hour
LGU	Local Government Unit
LNTE	low-noise trailing edges
LTA	land type associations
LWECS	Large Wind Energy Conversion System
m/s	meters per second
MBS	Minnesota Biological Survey
Mbps	megabytes per second
MDH	Minnesota Department of Health
Merjent	Merjent, Inc.
met	meteorological
MGS	Minnesota Geological Survey
MISO	Midcontinent Independent System Operator
MN DEED	Minnesota Department of Employment and Economic Development
MNDNR	Minnesota Department of Natural Resources
MNDOT	Minnesota Department of Transportation
MPCA	Minnesota Pollution Control Agency
MPUC	Minnesota Public Utilities Commission
MVA	Mega Volt Amp
MVTIC	Minnesota Valley Television Improvement Corporation
MW	megawatt
MWFRA	Migratory Waterfowl Feeding and Resting Area
NAC	Noise Area Classification
NHIS	Natural Heritage Information System
NIEHS	National Institute of Environmental Health Sciences
NLEB	northern long-eared bat
NOAA	National Oceanic and Atmospheric Administration
NPC	native plant community
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resource Conservation Service
NRHP	National Register of Historic Places
NRO	Noise Reduction Operations
NSP	Northern States Power Company
NTIA	National Telecommunications and Information Administration
NWI	National Wetlands Inventory

Acronym	Definition
O&M building	operations and maintenance building
OSA	Office of the State Archaeologist
Phase I ESA	Phase I Environmental Site Assessment
POI	Point of Interconnection
Project	Nobles Wind Farm Repower Project
Project Area	The area within the Project boundary identified in Figure 1 of this Application
Project Location	Project boundaries identified in Figure 1 and in Table 4.1-1
PWI	Public Waters Inventory
RCRA	Resource Conservation and Recovery Act
RD	rotor diameter
Repower	Replacing existing 77 meter rotor diameter with either 91 meter or 97 meter rotor diameter rotors and upgrading associated equipment on 133 GE turbines and replacing one GE 1.5 sle with a Vestas V136 turbine
RIM	Reinvest in Minnesota
SCADA	Supervisory Control and Data Acquisition
SHPO	State Historic Preservation Office
SNA	Scientific and Natural Area
SOBS	Sites of Biodiversity Significance
STE	serrated trailing edge
SWPPP	Stormwater Pollution Prevention Plan
TI	Turbulence Intensity
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
USFWS	U.S. Fish and Wildlife Service
WCA	Wetland Conservation Act
WEST	Western EcoSystems Technology, Inc
WIMN	MPCA's *What's in My Neighborhood* Database
WMA	Wildlife Management Area
WNS	white-nose syndrome
WPA	Waterfowl Production Area
WRP	Wetland Reserve Program

Minnesota Rule Chapter 7854.0500 Site Permit Application Contents		
Minnesota Rule	**Required Information**	**Application Section(s)**
Subpart 1	**Applicant.** An applicant for a site permit must provide the following background information regarding the applicant:	
A.	A letter of transmittal signed by an authorized representative or agent of the applicant;	Included with filing
B.	The complete name, address, and telephone number of the applicant and any authorized representative;	See Cover Page
C.	The signature of the preparer of the application if prepared by an agent or consultant of the applicant;	See Cover Page
D.	The role of the permit applicant in the construction and operation of the LWECS;	1.1, 1.7
E.	The identity of any other LWECS located in Minnesota in which the applicant, or a principal of the applicant, has an ownership or other financial interest;	1.1
F.	The operator of the LWECS if different from the applicant; and	1.7
G.	The name of the person or persons to be the permittees if a site permit is issued.	1.0
Subpart 2	**Certificate of need or other commitment.**	
A.	The applicant shall state in the application whether a certificate of need for the system is required from the commission and, if so, the anticipated schedule for obtaining the certificate of need. The commission shall not issue a site permit for an LWECS for which a certificate of need is required until the applicant obtains the certificate, although the commission may process the application while the certificate of need request is pending before the commission.	2.0
B.	The commission may determine if a certificate of need is required for a particular LWECS for which the commission has received a site permit application.	2.0
C.	If a certificate of need is not required from the commission, the applicant shall include with the application a discussion of what the applicant intends to do with the power that is generated. If the applicant has a power purchase agreement or some other enforceable mechanism for sale of the power to be generated by the LWECS, the applicant shall, upon the request of the commission, provide the commission with a copy of the document.	2.0
Subpart 3	**State Policy.** The applicant shall describe in the application how the proposed LWECS project furthers state policy to site such projects in an orderly manner compatible with environmental preservation, sustainable development, and the efficient use of resources.	3.0

Minnesota Rule Chapter 7854.0500 Site Permit Application Contents		
Minnesota Rule	**Required Information**	**Application Section(s)**
Subpart 4	**Proposed Site.** The applicant shall include the following information about the site proposed for the LWECS and any associated facilities:	
A.	The boundaries of the site proposed for the LWECS, which must be delineated on a United States Geological Survey Map or other map as appropriate;	4.1, 4.2, Figure 1
B.	The following characteristics of the wind at the proposed site: (1) interannual variation; (2) seasonal variation; (3) diurnal conditions; (4) atmospheric stability, to the extent available; (5) turbulence, to the extent available; (6) extreme conditions; (7) speed frequency distribution; (8) variation with height; (9) spatial variations; and (10) wind rose, in eight or more directions;	9.1
C.	Other meteorological conditions at the proposed site, including the temperature, rainfall, snowfall, and extreme weather conditions; and	9.1.11
D.	The location of other wind turbines in the general area of the proposed LWECS.	9.2
Subpart 5	**Wind Rights.** The applicant shall include in the application information describing the applicant's wind rights within the boundaries of the proposed site.	7.0
Subpart 6	**Design of Project.** The applicant shall provide the following information regarding the design of the proposed project:	
A.	A project layout, including a map showing a proposed array spacing of the turbines;	5.0, 6.0, Figures 2 and 4
B.	A description of the turbines and towers and other equipment to be used in the project, including the name of the manufacturers of the equipment;	5.2
C.	A description of the LWECS electrical system, including transformers at both low voltage and medium voltage; and	5.4
D.	A description and location of associated facilities.	6.0
Subpart 7	**Environmental Impacts.** An applicant for a site permit shall include with the application an analysis of the potential impacts of the project, proposed mitigative measures, and any adverse environmental effects that cannot be avoided, in the following areas:	
A.	Demographics, including people, homes, and businesses;	8.1

Minnesota Rule Chapter 7854.0500 Site Permit Application Contents		
Minnesota Rule	**Required Information**	**Application Section(s)**
B.	Noise;	8.4
C.	Visual impacts;	8.5
D.	Public services and infrastructure;	8.6
E.	Cultural and archaeological impacts;	8.7
F.	Recreational resources;	8.8
G.	Public health and safety, including air traffic, electromagnetic fields, and security and traffic;	8.9
H.	Hazardous materials;	8.10
I.	Land-based economics, including agriculture, forestry, and mining;	8.11
J.	Tourism and community benefits;	8.12
K.	Topography;	8.14
L.	Soils;	8.15
M.	Geologic and groundwater resources;	8.16
N.	Surface water and floodplain resources;	8.17
O.	Wetlands;	8.18
P.	Vegetation;	8.19
Q.	Wildlife; and	8.20
R.	Rare and unique natural resources.	8.21
Subpart 8	**Construction of Project.** The applicant shall describe the manner in which the project, including associated facilities, will be constructed.	10.1-10.5
Subpart 9	**Operation of Project.** The applicant shall describe how the project will be operated and maintained after construction, including a maintenance schedule.	10.6
Subpart 10	**Costs.** The applicant shall describe the estimated costs of design and construction of the project and the expected operating costs.	10.7
Subpart 11	**Schedule.** The applicant shall include an anticipated schedule for completion of the project, including the time periods for land acquisition, obtaining a site permit, obtaining financing, procuring equipment, and completing construction. The applicant shall identify the expected date of commercial operation.	10.8
Subpart 12	**Energy Projections.** The applicant shall identify the energy expected to be generated by the project.	10.9
Subpart 13	**Decommissioning and restoration.** The applicant shall include the following information regarding decommissioning of the project and restoring the site:	
A.	The anticipated life of the project;	11.1
B.	The estimated decommissioning costs in dollars;	11.2

Minnesota Rule Chapter 7854.0500 Site Permit Application Contents		
Minnesota Rule	**Required Information**	**Application Section(s)**
C.	The method and schedule for updating the costs of decommissioning and restoration;	11.4
D.	The method of ensuring that funds will be available for decommissioning and restoration; and	11.3
E.	The anticipated manner in which the project will be decommissioned and the site restored.	11.5
Subpart 14	**Identification of Other Permits.** The applicant shall include in the application a list of all known federal, state, and local agencies or authorities, and titles of the permits they issue that are required for the proposed LWECS.	12.0

1.0 APPLICANT INFORMATION AND PROJECT BACKGROUND

1.1 APPLICANT DESCRIPTION

Northern States Power Company (NSP), a Minnesota corporation, doing business as Xcel Energy (the Applicant), respectfully submits this Site Permit Amendment Application (Application) to the Minnesota Public Utilities Commission (MPUC or Commission) for a site permit amendment for the currently operating 201 megawatt (MW) Nobles Wind Farm (Project). The Project is a large wind energy conversion system (LWECS), as defined in the Wind Siting Act, Minnesota Statutes Chapter 216F. The Project is located in Nobles County in southwestern Minnesota, five miles northwest of Worthington, Minnesota.

Northern States Power Company, doing business as Xcel Energy (Xcel Energy), is a Minnesota corporation headquartered in Minneapolis, Minnesota, that is engaged in the business of generating, transmitting, distributing, and selling electric power and energy and related services in the states of Minnesota, North Dakota, and South Dakota. In Minnesota, Xcel Energy provides electric service to 1.3 million customers. Xcel Energy is a wholly-owned utility operating company subsidiary of Xcel Energy Inc. and operates its transmission and generation system as a single integrated system with its sister company, Northern States Power Company, a Wisconsin corporation, together known as the NSP Companies. The NSP Companies are vertically integrated transmission-owning members of Midcontinent Independent System Operator (MISO). In Minnesota, North Dakota, and South Dakota, Xcel Energy currently has over 3,000 MW of wind generation through commercial owned facilities or power purchase agreements. In addition, Xcel Energy has announced specific plans to add 12 new wind farms totaling 1,970 MW of renewable energy in Minnesota, Wisconsin, Michigan, North Dakota, and South Dakota. Of Xcel Energy's currently owned and operating wind farms or wind projects under construction, over 1,300 MW are in Minnesota, including Blazing Star I, Blazing Star II, Lake Benton II, Nobles, Community Wind North, Jeffers, Pleasant Valley, Grand Meadow, Freeborn, and Mower Wind Projects.

1.2 PROJECT BACKGROUND, PURPOSE, AND NEED

On December 11, 2009, the Commission issued an order approving a site permit to enXco Development corporation to construct the Nobles Wind Farm (the 2009 Site Permit). The Commission order also approved the transfer of the Site Permit from enXco to NSP, effective upon notification to the Commission. On August 9, 2010, NSP and enXco notified the Commission of the transfer of the 2009 Site Permit to NSP pursuant to the December 11, 2009 Order. On August 25, 2010, the Commission issued an order transferring and reissuing the site permit to NSP (the 2009 Site Permit, as amended).

The 2009 Site Permit allowed construction of up to a 201 MW LWECS and associated facilities known as the Nobles Wind Farm. The Project is an LWECS, as defined in the Wind Siting Act, Minnesota Statutes Chapter 216F, and is located in Nobles County in southwestern Minnesota near the city of Worthington (Figures 1 and 2). In accordance with the issued 2009 Site Permit, Xcel Energy installed 134, General Electric (GE) 1.5 sle wind turbines within leased land areas and has owned and operated the Project for the past 10 years. The Project was commissioned in December 2010 and has a Generator Interconnection Agreement (GIA) with MISO. The Project did not require a Certificate of Need (CN) because the Commission granted an exemption from the CN

process on June 10, 2009 in Docket 08-1437. The issued 2009 Site Permit expires on December 31, 2040; a copy is provided in Appendix A – Original Site Permit Order for reference.

Xcel Energy is seeking an amendment of the Site Permit to allow Xcel Energy to repower all 134 turbines (Repower), which will increase energy production from the facility, improve overall reliability, and extend the service life of the turbines. The current turbines are otherwise operating as planned. In 2010 when the GE 1.5 sle turbines were installed, the rotor size was 77 meters (252.6 feet) in diameter; Xcel Energy proposes to repower 111 turbines with 97-meter rotors and 22 turbines with 91-meter rotors and replace one GE 1.5 sle turbine with a Vestas V136 turbine (see Section 1.3).

Via this petition (the Application), Xcel Energy is requesting an amendment to the Site Permit to accommodate the Nobles Repower and is providing information to the Commission in support of this request. Xcel Energy submits that the minor changes discussed within this Petition do not substantively change the findings of the 2009 Site Permit as amended. Xcel Energy has reviewed the 2009 Site Permit and provided supplemental information where warranted. With this submission, Xcel Energy respectfully requests Commission approval for an amended Site Permit to support the repowering process with several modifications that are discussed in detail within this Petition.

Xcel Energy plans to repower 133 GE 1.5 sle turbines by installing larger rotors, upgraded gear boxes, and associated components. The previously permitted locations of turbines, access roads, collection lines, and other supporting infrastructure will remain the same. The Repower may require reinforcement of the tower foundations. A large crane, as described further in Section 6.4, will be used to remove the current rotors and nacelles, requiring a temporary crane path roughly up to 100 feet wide to each turbine. Some minor upgrading of public roadways and intersections will likely be required to allow for delivery of the replacement rotors and repower nacelles to each turbine location. Current components will either be recycled or properly disposed of. Additionally, Turbine 47 will be replaced with a Vestas V136 turbine. Xcel Energy will decommission the existing GE 1.5 sle turbine and replace it with a V136 approximately one hundred feet east of the current turbine location. This new turbine will require a turbine pad approximately 50 feet in diameter and a new 16-foot wide access road that is 36 feet long from the existing access road. Together, the combined permanent impact for the V136 turbine is less than 0.1 acre.

Xcel Energy would like to complete the work during the 2022 construction season and is currently targeting the second quarter of 2022 for construction start. The work is anticipated to take 6-7 months, with commercial operation by December 31, 2022.

The purpose of the repowering project is to improve turbine technology, maximize energy yield, and extend service life of the turbines. New blades provide an increase in the rotor swept area, which, when coupled with the upgraded generators, results in a corresponding increase in the nominal production capacity of the Project from 201 MW to roughly 217 MW, a 7.7 percent increase. The Repower does not constitute a material modification and can therefore proceed under the original GIA so long as the energy delivered to the Point of Interconnection (POI) does not exceed 201 MW, the amount in the original GIA. In accordance with the GIA, control equipment will be installed that will limit the injection at the POI to the 201 MW service granted in the GIA.

1.3 XCEL ENERGY REPOWER CONTEXT

The Nobles Windfarm Repower project was among a suite of Re-power projects originally proposed in an Xcel Energy Report, responding to the Commission's May 20, 2020, Notice of Reporting Required by Utilities (Docket No. E,G999/CI-20-492.) Following that filing with the Commission, the Company filed a Wind Repower Petition (E002/M-20-620) on September 23, 2020, which was reviewed publicly and approved by the Commission on December 23, 2020. In that petition, although Xcel sought approval of a portfolio of projects that included the Nobles Windfarm Repower project with a 60 percent Production Tax Credit (PTC), the Company discussed pursuing the opportunity to obtain an 80 percent PTC, based on incorporating a safe-harbor component, which is the V136 turbine incorporated into this project design. The Company's next step toward project approval is to apply for an amendment to its existing LWECS Site Permit. Statutes and Rules governing the State's public review process for Site Permit Amendments are described in Section 3.0 of this application.

1.4 ISSUED SITE PERMIT AND CHANGES REQUESTED

In addition to evaluating the Repower Project against current *Application Guidance for Site Permitting of Large Wind Energy Conversion Systems in Minnesota*, which includes a chapter on Repowering (Application Guidance; DOC-EERA, 2019), the 2009 Site Permit was evaluated for existing permit conditions, and conditions that might need to be modified. Appendix B provides a comprehensive summary of the 2009 Site Permit conditions, and whether they can be satisfied by the repowering project or require modification. While the majority of the 2009 Site Permit requirements can be satisfied under the Repower Project, Xcel Energy is respectfully requesting that the Commission consider the following modifications within the amended Site Permit:

1. Cover: The Applicant requests that the nameplate capacity of the wind farm be updated to 217 megawatts (MW) and update the expiration date for the permit be changed to 25 years following the date of amended Site Permit issuance.

2. Section I: Update the nameplate capacity of the wind farm to 217 MW and update the acreage of the Project boundary to 23,912 acres.

3. Section II: Update the nameplate capacity of the wind farm to 217 MW and individual turbine capacity.

4. Wind Access Buffer C.1: The Applicant requests the Commission waive the wind access buffer setback for 63 turbines, including turbines 1-2, 8-16, 18, 20-21, 25-26, 30-31, 34, 37, 50-51, 54-56, 58, 61, 63, 66-67, 69-70, 82-86, 89, 92-93, 95-99, 101-102, 105, 108-109, 116-117, 119, 122, 125-128, and 130-134.

5. Noise Studies F.2: The Applicant requests the language be updated consistent with other recent projects *"The Permittee shall file a proposed methodology for the conduct of a post-construction noise study at least 14 days prior to the pre-construction meeting. The Permittee shall develop the post-construction noise study methodology in consultation with the Department of Commerce. The study must incorporate the Department of Commerce Noise Study Protocol to determine the operating LWECS*

noise levels at different frequencies and at various distances from the turbines at various wind directions and speeds. The Permittee must conduct the postconstruction noise study and file with the Commission the completed post-construction noise study within 18 months of completion of the repowering project."

6. Project Energy Projection Reporting H.1: The Applicant requests the language be updated consistent with other recent projects *"The Permittee shall, by February 1st following each complete or partial year of project operation, file a report with the Commission on the monthly energy production of the project including:*

    a. the installed nameplate capacity of the permitted project;

    b. the total monthly energy generated by the project in MW hours;

    c. the monthly capacity factor of the project;

    d. yearly energy production and capacity factor for the project;

    e. the operational status of the project and any major outages, major repairs, or turbine performance improvements occurring in the previous year; and

    f. any other information reasonably requested by the Commission.

    This information shall be considered public and must be filed electronically."

7. Wind Resource Use Reporting H.2: The Applicant requests the language be updated consistent with other recent projects *"The Permittee shall, by February 1st following each complete or partial calendar year of operation, file with the Commission the average monthly and average annual wind speed collected at one permanent meteorological tower during the preceding year or partial year of operation. This information shall be considered public and must be filed electronically."*

8. Extraordinary Events Reporting H.3: The Applicant requests the language be updated consistent with other recent projects *"Within 24 hours of discovery of an occurrence, the Permittee shall notify the Commission of any extraordinary event. Extraordinary events include but shall not be limited to: fires, tower collapse, thrown blade, acts of sabotage, and injured worker or private person. The Permittee shall, within 30 days of the occurrence, file a report with the Commission describing the cause of the occurrence and the steps taken to avoid future occurrences."*

9. Final Boundaries I.2: The Applicant requests that the Commission approve a smaller project boundary. The proposed boundary more closely aligns with parcels containing project infrastructure and with Section E.6. of the 2009 permit, Footprint Minimization. The requested boundary is reflected throughout this Application and is specifically defined in Table 4.1-1.

10. Site Permit Section III.L: The Applicant requests that the expiration date for the permit be changed to 25 years following the date of amended Site Permit issuance.

11. Aircraft Detection Lighting System (ADLS) M.4: The Applicant requests the language be updated consistent with other recent projects *"Lighting installed pursuant to Condition E4 of the permit shall comply with Aircraft Detection Lighting System standards specified in FAA Circular AC 70/7460-IL CHG 1 Chapter 14. Permittee may install an FAA approved lighting system without ADLS if the Permittee demonstrates that despite its reasonable efforts to secure FAA approval for an ADLS, one of the following conditions exists: 1) The FAA denies the Permittee's application for an ADLS system, 2) Permittee is unable to secure FAA approval in a timely manner, 3) ADLS installation costs exceed $2 million."*

1.5 DESCRIPTION OF REPOWERING PROCESS

The general sequence of construction to repower the Project is as follows:

1. The use of existing access roads, Project substation and interconnection facilities, operations and maintenance (O&M) building, and collection line easements will continue.

2. Existing on-site roads, small radius curves, and narrow gravel road sections will be widened to accommodate truck deliveries and crane staging.

3. If structural work is required, turbine foundations will be retrofitted with new concrete collars (see Section 5.2.1 and 10.4.1) at the base of the foundation.

4. Wind turbine components will be delivered and off-loaded at the turbine pads and laydown yard on Xcel Energy property.

5. Wind turbine generators will be de-energized to maintain non-operational condition by back-up power or other means during construction. Underground cables will not be removed.

6. Crane crews will remove and place the existing blades, hub, and drive train on the ground. Cranes will stay at the turbine site for demolition and installation tasks then continue moving to the next turbine in the sequence after the tasks are completed. Previously utilized crane paths easements and new crane paths will be used where possible and may be rerouted to accommodate landowner comments.

7. The blades and other components will have zero scrap value. Xcel Energy is coordinating with the equipment supplier on disposal options either at a landfill or recycling facility for the blades. The remaining materials will be reduced to transportable size and removed from the site for disposal. Materials will be disposed in a suitable facility.

8. The gearbox, main shaft, main bearing, and associated subassemblies in the nacelle will be replaced with new upgraded equipment.

9. Once all upgrades are made, the hub, and new blades will be reinstalled on the tower by crane.

10. The turbine will be inspected and tested prior to returning to operation.

11. Areas disturbed by repowering activities will be restored.

12. Unexcavated areas compacted by equipment used during construction may be tilled in a manner adequate to restore the topsoil and subgrade material to a density consistent with the surrounding areas.

It is expected to take approximately 2-3 days per turbine to complete the repowering process, including the foundation repower activities, with some repowering occurring simultaneously.

As part of the repower, Xcel Energy will decommission existing Turbine 47, a GE 1.5 sle. Components will be recycled (tower segments) or disposed of in a suitable facility (blades, hub, other components). With approval from the MPCA, the existing turbine foundation and gravel pad will also be removed to four feet below grade and restored. Gravel from the existing Turbine 47 pad may be used for the new Vestas Turbine 47 pad or associated access road. Existing Turbine 47 is located immediately adjacent to an access road that serves other turbines on the string; there is not an independent portion of the access road that will require removal for the existing Turbine 47. Lastly, Turbine 47 is located at the end of a turbine string. The new Turbine 47 is sited to the interior of the string. As a result, the collection line for this turbine string will be shorter; Xcel Energy will remove a short segment of collection line as a result of decommissioning the GE Turbine 47 and replacing it with a V136.

1.6 ROLE OF APPLICANT IN CONSTRUCTION AND OPERATION

Xcel Energy will construct, own, and operate the repowered project.

1.7 OWNERSHIP STATEMENT

Xcel Energy will construct, own, and operate the repowered project.

1.8 COMPLIANCE STATUS OF PROJECT

Prior to submittal of this Petition, Xcel Energy completed an internal audit of its compliance with the 2009 Site Permit. Xcel Energy has complied with all 2009 Site Permit conditions. Xcel Energy is committed to ensuring ongoing compliance with the Site Permit.

1.9 COMPLIANCE WITH PROJECT COMPLAINTS AND RESOLUTION

Xcel Energy reviewed the summary of complaint reports as filed with the MPUC, and the log of all complaints between 2010 and 2020. Xcel Energy received two complaints in 2010 related to the siting of facilities; those were resolved within a couple months. There were no complaints filed between 2011-2019. Xcel Energy received two complaints in 2020: one related to road damage and one related to crop damage from a chemical treatment to an access road. Both complaints were investigated, coordinated with the landowner, and are resolved.

1.10 CONSIDERATION OF EXISTING WIND FARMS

There are 18 existing wind turbines associated with four "wind farms" within approximately one mile of the Nobles Wind Farm. These include 15 Community Wind South turbines located immediately adjacent to the central portion of the Nobles Project Area, and one turbine associated with each of the Don Sneve Wind Farm, Arnold Wind Farm, and Wilmont Hills Wind Farm. These three, single turbine "wind farms" are all located north of the northwest corner of the Nobles Project Area. Additionally, Xcel Energy understands Community Wind South is considering a repower. In consideration of potential cumulative effects related to the Repower Project, Xcel Energy incorporated these existing wind farms and the potential Community Wind South repower in its analyses of wind rights (see Section 7.0), noise (see Section 8.4), and shadow flicker (see Section 8.5.5).

2.0 CERTIFICATE OF NEED

The Nobles repowering is exempt from the CN requirement. Minn. Stat. § 216B.243, subd. 8 (8) exempts LWECS repowering projects such as this one from CN requirements.

3.0 STATE POLICY

Pursuant to Minnesota Statutes § 216F.03, the Applicant will further state policy by repowering and operating the Nobles Repower in an orderly manner compatible with environmental preservation and sustainable development to more efficiently utilize the site's wind resources. The Applicant plans to repower turbines to maximize wind energy development while minimizing impacts on land resources. By repowering the Project, the Applicant is also extending the life of the Project, which avoids decommissioning and completely rebuilding a new project.

The Wind Siting Act (Minnesota Statutes Chapter 216F) requires an application for a site permit for an LWECS, and subsequent amendments, to meet the substantive criteria set forth in Minnesota Statutes § 216E.03, subd. 7. This Application provides information necessary to comply with these criteria and Minnesota Rules Chapter 7854.

The Wind Siting Rules (Minnesota Rules Chapter 7854) govern the content and treatment of applications for an LWECS site permit under the Wind Siting Act. To the extent available, the Applicant has presented information required by the Wind Siting Rules. In addition, sufficient project design, wind resource, and technical information have been provided for a thorough evaluation of the reasonableness of the proposed project repowering.

This Application has been prepared following the Minnesota Department of Commerce, Energy Environmental Review and Analysis' (DOC-EERA) Application Guidance.

4.0 PROJECT DESCRIPTION AND OVERVIEW

4.1 PROJECT DESCRIPTION AND LOCATION

Xcel Energy is requesting modification of the project boundary permitted in 2009, which contains approximately 25,525 acres. The Applicant is seeking footprint minimization as described in Section E.6 of the 2009 Site Permit, as amended. The Repower Project infrastructure is physically located on approximately 23,912 acres of privately owned and mostly leased land in Nobles County (Table 4.1-1), generally north of Interstate 90 and west of Highway 25 (Figure 3 – Project Boundary Modification). All of these acres are located within the previously evaluated, and permitted, project boundary. Approximately 1,615 acres of the 2009 permitted boundary contains a portion of the Community Wind South Wind Farm and its infrastructure, not Nobles Wind Farm infrastructure, and has therefore been eliminated from the Repower Project Area for permit amendment purposes. Typical landscapes within the reduced Wind Farm area consist largely of agricultural fields and wind energy infrastructure.

Table 4.1-1
Project Location

County Name	Township Name	Township	Range	Sections
Nobles	Dewald	102N	41W	2-10 and 15-18
	Olney	102N	42W	1-2 and 11-12
	Summit Lake	103N	41W	15-17, 20-23, 25-28, and 31-35
	Larkin	103N	42W	10-15, 22-26, and 34-36

The wind turbines will be mounted on steel tubular towers and have steel reinforced foundations. Associated facilities include electrical collection and communications lines, an electrical substation, permanent meteorological (met) tower and gravel access roads.

Xcel Energy has an executed GIA with MISO. The Repower Project has negotiated an amended GIA to reflect repowered turbines. The overall capacity at the point of interconnection will remain the same. In accordance with the GIA, control equipment will be installed that will limit the injection at the POI to the 201 MW service granted in the GIA.

Because the delivered power will be capped at the original 201 MW, only minor facilities and systems upgrades will be required by the Repower. As such, Xcel Energy will focus on operational compliance with the GIA. The Nobles Repower will have all of the needed equipment and software to comply with the requirements of the GIA and operate inside the parameters specified by both the original GIA and the amended GIA. This includes all equipment and software needed to comply with low voltage ride through and generation cap requirements.

4.2 SIZE OF THE PROJECT AREA IN ACRES

The Repower Project boundary has been reduced to 23,912 acres in this Application. The 2009 Site Permit area was roughly 25,525 acres. Xcel Energy is negotiating with additional landowners for wind rights-only leases to accommodate the 3RD x 5RD Wind Access Buffer setback for the

longer blades. Figure 4 (Wind Access Buffer Setbacks) shows the existing wind easements and the parcels Xcel Energy is acquiring wind rights only leases for.

4.3 RATED CAPACITY

Rotor replacements provide an increase in the rotor swept area, which results in a corresponding increase in the nominal production capacity of the Project from 201MWs to 216.4 MWs, a 7.7 percent increase. The GIA will remain at 201 MW.

4.4 NUMBER OF TURBINE SITES

Xcel Energy is actively pursuing repowering approval from the Commission for all 134 of the currently operating turbines.

5.0 PROJECT DESIGN

5.1 DESCRIPTION OF PROJECT LAYOUT AND SETBACK REQUIREMENTS

The repowered turbines will involve increasing the rotor diameter (RD) from 77 meters (252.6 feet) to either 91 meters (298.6 feet) or 97 meters (318.2 feet) for 133 GE turbines and replacing one GE turbine with a Vestas V136 turbine, which has a RD of 136 meters (446.2 feet). Xcel Energy has reviewed the effects of adding larger rotors upon the permitted and current setback standards for wind projects as shown on Figure 4. The following Table 5.1-1 summarizes the setbacks that: a) were approved in the 2009 Site Permit, as amended, b) are specified under current MPUC standards (MPUC Order Establishing General Wind Permit Standards; Docket No. E,G-999/M-07-1102), and c) that are possible under the proposed repower. Xcel Energy has executed and recorded full lease agreements for approximately 18,185 acres of private land within the Project Area. In addition, Xcel Energy is currently in the process of seeking an additional 7,050 acres of wind rights-only leases (64 landowners) to add to the periphery of the project for the larger wind access buffers (Figure 4). For turbines that will be repowered to a 91-meter RD, the 3RD setback is 273 meters or 895.7 feet and the 5RD setback is 455 meters or 1,492.8 feet. For turbines that will be repowered to a 97-meter RD, the 3RD setback is 291 meters or 954.7 feet and the 5RD setback is 485 meters or 1,591.2 feet. The V136 turbine has a 3RD setback of 408 meters (1,338.6 feet) and a 5 RD setback of 680 meters (2,231.0 feet).

In addition to the MPUC setbacks, the 2009 Site Permit, as amended, included two special conditions related to setbacks: 1) provide a minimum setback of 1,000 feet for all turbines to any residence, regardless of whether that landowners is a participating or non-participating landowner, and 2) incorporation of Nobles County Setbacks - turbines and meteorological towers will incorporate the Nobles county Wind Energy Conversion System Regulations 729.4 setback requirements of 600 feet from publicly owned (county, state, and federal) conservation lands and Types III, IV, and V wetlands.

Figure 5 shows the Project layout in relation to setback requirements and other constraints.

Table 5.1-1
Wind Turbine Setback Requirements for the Project

Setback	2009 Site Permit, as amended	Current MPUC Guidance	Possible with Repowering
Wind Access Buffer	3RD on non-prevailing wind direction and 5RD on prevailing wind direction from non-participating property lines.	3RD on the non-prevailing wind axis and 5RD on prevailing wind axis from non-participating property lines.	Xcel Energy is currently seeking additional wind rights only leases for new parcels that overlap the larger wind access buffers.
Occupied Residential Dwellings	1,000 feet from occupied residences (Condition M.1)	500 feet and sufficient distance to meet state noise standard.	Turbines are at least 1,000 feet from occupied residences.
Meteorological Towers	250 feet from the edge of road right-of-	250 feet from the edge of road right-of-way and	Any new towers will be 250 feet from the edge

Table 5.1-1
Wind Turbine Setback Requirements for the Project

Setback	2009 Site Permit, as amended	Current MPUC Guidance	Possible with Repowering
	way and boundaries of developer's site control.	boundaries of developer's site control.	of the road right-of-way and boundaries of developer's site control.
Other Structures	None specified.	None specified.	None specified.
Public Roads	250 feet from the edge of the nearest public road right-of-way.	250 feet from the edge of the nearest public road right-of-way.	Turbines are sited at least 250 feet from public road rights-of-way.
Recreational Trails	Not specified.	250 feet from the edge of public trails, but on a case-by-case basis.	Turbines are sited at least 250 feet from public trails (i.e., snowmobile trails)
Public Lands	3RD on non-prevailing wind direction and 5RD on prevailing wind direction from non-participating property lines.	3RD on the non-prevailing wind axis and 5RD on prevailing wind axis from non-participating property lines.	The larger wind access buffers comply with this setback; no larger wind access buffers overlap public lands, including Bluebird Prairie WMA within the Project Area.
Wetlands, Streams, and Ditches	Condition M.2. includes a setback of 600 feet from Types III, IV, and V wetlands.	No turbines, towers, or associated facilities allowed. Electric collector and feeder lines may cross or be placed subject to DNR, USFWS, and/or Corps permit.	Based on the 2009 wetland delineation, turbines are sited at least 600 feet from Type III wetlands (there are no Types IV or V in the Project Area).
Internal Turbine Spacing	3RD on non-prevailing wind direction and 5RD on prevailing wind direction from non-participating property lines. Twenty percent can exceed threshold.	3RD on the non-prevailing wind axis and 5RD on prevailing wind axis from non-participating property lines. Twenty percent can exceed threshold.	The Repower Project's internal spacing is 16 percent, below the 20 percent threshold.
Public Conservation Lands	Condition M.2. includes a setback of 600 feet from publicly owned (county, state, federal) conservation lands	Avoid infrastructure; non-participating property line setback.	All turbines are sited at least 1,200 feet from public conservation lands, including Bluebird Prairie WMA within the Project Area.

Table 5.1-1
Wind Turbine Setback Requirements for the Project

Setback	2009 Site Permit, as amended	Current MPUC Guidance	Possible with Repowering
Native Prairies	Turbines and associated facilities shall not be placed in native prairies, unless addressed in a native prairie protection plan.	Turbines and associated facilities shall not be placed in native prairies, unless addressed in a native prairie protection plan.	Native prairies are avoided by turbines and associated facilities. However, Xcel Energy will prepare a Prairie Protection and Management Plan in consultation with the DNR, as native prairie, as defined in Minn. Stat. § 84.02, subd. 5, occurs within the Project Area.
Sand and Gravel Operations	Turbines and associated facilities shall not be placed in active sand and gravel operations, unless negotiated with the owner.	Turbines and associated facilities shall not be placed in active sand and gravel operations, unless negotiated with the owner.	Sand and gravel operations are avoided by turbines and associated facilities.
Aviation	None specified.	Turbines and associated facilities shall not be located so as to create an obstruction to navigable airspace of public and private airports.	Turbines and associated facilities have been sited to avoid obstruction to navigable airspace of public and private airports.
Note: The intent of Nobles County's Wind Energy Conversion System Regulations is for projects of less than five MWs.			

5.1.1 Balance of Plant Reliability and Upgrades

The Project has been operating reliably since late 2010. To date, no issues have arisen that call into question the ability of the plant to continue operating through the end the current 2009 Site Permit, as amended, term. The balance of plant equipment and improvements, including the foundations, electrical system, and roads, continue to perform as designed. The proposed repower is driven by the improved project economics that result from the repower rather than by issues with plant reliability.

Additionally, testing and inspection of the balance of plant equipment and facilities have been undertaken to ensure the turbine towers, foundations and electrical system can accommodate the repower hub and rotors. GE is estimating a 25 year post-repower useful life.

5.2 DESCRIPTION OF TURBINES AND TOWERS

A horizontal axis wind turbine consists of a hub, nacelle, blades, tower, and foundation. Enclosed within the nacelle is the gear box, low- and high-speed shaft, generator, controller, transformer, and brake. The hub and blades together form the rotor. The tower supports the nacelle, hub, and blades, and is made from tubular steel. Additionally, a control panel inside each turbine houses communication and electronic circuitry.

Xcel Energy is proposing to repower 133 of the 134 existing GE 1.5 sle turbines with GE 1.6 sle turbines; 111 of these turbines will have 97-meter rotors and 22 will have 91-meter rotors. All GE repowered turbines will have a 1.6 MW generating capacity and will maintain the current hub height of 80 meters (262 feet). The repower involves installing rotors with longer blades and replacing components of existing nacelles. The Project nameplate capacity, existing turbine towers, and foundations will remain the same, with the potential for new concrete collars fitted around the existing base. Additionally, Xcel Energy will replace one GE 1.5 sle turbine with a Vestas V136 turbine. This turbine will have a 3.6 MW generating capacity and 82-meter hub height and be located within approximately one hundred feet of the existing GE 1.5 sle turbine that will be decommissioned. The repower was developed specifically to upgrade existing turbines to a more efficient configuration, facilitate quick upgrading, and extend turbine service life. Table 5.2-1 provides a comparison of the existing and proposed wind turbine characteristics.

Table 5.2-1
Wind Turbine Characteristics Comparison

Design Feature	Existing GE 1.5 sle Wind Turbines	Repowered GE 1.6 sle Wind Turbines		Vestas V136-3.6 MW Wind Turbine
Nameplate Capacity	1,500 kW	1,600 kW		3,600 kW
Hub Height	80 m (262.5 ft)	80 m (262.5 ft)		82 m (270 ft)
Total Height	118.5 m (389 ft)	125.5m (411.7 ft)	128.5 m (421.6 ft)	150 m (492.1 ft)
Rotor Diameter	77 m (252.6 ft)	91 m (298.6 ft)	97 m (318.2 ft)	136 m (446.2 ft)
Turbine Positions	134	22 (91 m rotor diameter)	111 (97 m rotor diameter)	1
Design Life	Minimum 20 years	Minimum 20 years		Minimum 20 years
Cut in Wind Speed	6.7 mph (3 m/s)	6.7 mph (3 m/s)		6.7 mph (3 m/s)
Power Regulation	The rotor utilized blade pitch regulation and variable speed operation to achieve optimum power output at all wind speeds. Unit is also equipped with low	The rotor utilized blade pitch regulation and variable speed operation to achieve optimum power output at all wind speeds. Unit is also equipped with low voltage ride through technology for demanding reliability standards.		The wind turbine family utilizes the OptiTip® concept and a power system based on an induction generator and full-scale converter. With these features, the wind

Table 5.2-1
Wind Turbine Characteristics Comparison

Design Feature	Existing GE 1.5 sle Wind Turbines	Repowered GE 1.6 sle Wind Turbines	Vestas V136-3.6 MW Wind Turbine
	voltage ride through technology for demanding reliability standards.		turbine is able to operate the rotor at variable speed and thereby maintain the power output at or near rated power even in high wind speed. At low wind speed, the OptiTip® concept and the power system work together to maximize the power output by operating at the optimal rotor speed and pitch angle.
Generation	1.5 MW per turbine	1.6 MW per turbine	3.6 MW per turbine
Tower	Multi-coated, conical tubular steel with safety ladder to the nacelle	Multi-coated, conical tubular steel with safety ladder to the nacelle	Multi-coated, conical tubular steel with safety ladder to the nacelle
Nacelle Bedplate	2 part – cast iron front part; girder structure rear part	2 part – cast iron front part; girder structure rear part	2 part – cast iron front part; girder structure rear part
Main Bearings	Spherical roller bearings	Spherical roller bearings	Double-row spherical roller bearing
Supervisory Control and Data Acquisition (SCADA)	Each turbine is equipped with SCADA controller hardware, software, and database storage capability	Each turbine is equipped with SCADA controller hardware, software, and database storage capability	Each turbine is equipped with SCADA controller hardware, software, and database storage capability
FAA Lighting	Standard FAA lighting with the potential for ADLS technology	Standard FAA lighting with the potential for ADLS technology	Standard FAA lighting with the potential for ADLS technology

The turbine model contains emergency power supplies to allow operation of the control systems, braking systems, yaw systems, and blade pitch systems, and to shut the turbine down safely if grid power is lost. Mechanical and/or ultrasonic anemometers and weather vanes, located on the turbine nacelle, continuously collect real-time wind speed and direction data. Based on the data collected, the turbine yaw system constantly rotates the hub, blades, and nacelle into the wind, while the blade pitch system continuously adjusts the pitch of the blades to optimize the output of the generator. The pitch system also protects the turbine from over-speed events in high winds by pitching the blades perpendicular to the wind and aero-braking the turbine to a stop in normal shutdown conditions. The mechanical braking system, located within the nacelle, is used to stop

the turbine's rotation in the event of a storm or turbine fault. The mechanical brake and lock-out system is used to lock the blade rotor to prevent the blades from spinning during maintenance periods or when the turbine is out of service. The gear box adjusts shaft speeds to maintain generator speed in low and high wind speeds. Electrical energy produced by the generator is transmitted through insulated cables in the power rail to a safety switch and then to a transformer located internally in the tower or externally on the base of the tower.

The Project's design includes safety and control mechanisms. These mechanisms are generally monitored using a Supervisory Control and Data Acquisition (SCADA) system. Each turbine is connected to the SCADA system via fiber-optic cable, which allows the turbines to be monitored in real time by the operation and maintenance staff. The SCADA system also allows the Project to be remotely monitored, thus increasing Project oversight as well as the performance and reliability of the turbines. A SCADA upgrade is planned that will help implement feathering up to cut in speed measure and potential noise reduction operations. Both the local operation and maintenance office and a 24/7 remote operations facility will have control of the individual turbines. These two teams will coordinate to ensure that the wind turbines operate safely and efficiently.

A third mechanism for safety and control is the turbine. Each turbine monitors the wind speed and direction to ensure that its current position is most efficient to produce electricity. This data is also used for feathering the blades, applying the brakes in the event of high wind speeds or ice build-up on the blades, and to tell the turbine when the wind is strong enough to begin turning the generator and produce electricity at the "cut-in" wind speed.

Operations, maintenance, and service arrangements between the turbine manufacturer and Xcel Energy will be structured to continue providing timely and efficient operation and maintenance. The computerized data network will provide detailed operating and performance information for each wind turbine. Xcel Energy will maintain a computer program and database to track each wind turbine's operational history. Certain turbine data is monitored for abnormalities at an Xcel Energy Maintenance and Diagnostic Center in Denver, Colorado.

5.3 TURBINE FOUNDATIONS

Structural assessments of the existing foundations are currently being completed by Barr Engineering to determine if the existing foundation design can accommodate the GE 1.6 sle turbine with either 91-meter or 97-meter blades and meet 2020 industry design standards. Based on the preliminary desktop and field assessment work that's been completed, Xcel Energy understands the current foundation design may need additional structural support based on bearing fatigue and anchorage fatigue strength. To address this potential issue, the foundations may need additional structural support, including a reinforced concrete collar around the base of the foundation or engineered soil designed for the intended repowering duration of 25 years based on 2020 standards. The new V136 turbine will have a new turbine foundation; the V136 will not replace the existing GE 1.5 sle turbine in its existing location.

Construction of the collars will begin after the turbine is de-energized and the existing platform pad is demolished. Soils will be excavated to a depth of approximately 4 feet (1.2 meters) to access the existing foundation. Topsoil will be separated and used for site restoration while the remaining soils are placed in a designated area for backfill. Grounding wires and other conduit will be located

and protected or re-routed during the foundation upgrade. Existing reinforcement, anchor bolts, and no-drill zones will be identified to avoid damage while drilling horizonal and vertical dowel holes. Following the installation of the dowels and reinforcement, the grounding wires and conduits will be reinstalled and concrete will be placed. The 3-foot (0.91-meter) concrete collar will add an additional 6 feet (1.8 meters) to the existing pedestal for a total circumference of 24 feet (7.3 meters) at the base of each tower. Excavated areas will be backfilled, compacted, and graded to prevent water from ponding over the foundation while maintaining at least the minimum depth of fill required.

5.4 DESCRIPTION OF ELECTRICAL SYSTEM

The electrical system is the same as permitted in 2009. However, decommissioning one GE 1.5 sle turbine and replacing it with a V136 will require a minor modification to the electrical system as a result of the turbine change. The V136 turbine position is proposed on the interior side of the turbine string and associated electrical system that connects the turbines. As such, the collection system will decrease in length by up to 100 feet. This short segment of the collection line will be removed. Each turbine has its own individual step-up transformer located outside at the base of each unit that increases the voltage at the turbine terminals to the medium voltage level (34.5 kilovolt [kV]) of the buried collector circuits that transmit the power from the turbines to the project substation. At the project substation, the power from the collector circuits is then combined into feeder circuits that then run underground approximately 500 feet to the adjacent Nobles County Substation where the power is stepped up to 345 kV. The Nobles County Substation is immediately adjacent to and connected to the Split Rock to Lakefield Junction 345 kV transmission line.

6.0 DESCRIPTION AND LOCATION OF ASSOCIATED FACILITIES

Associated facilities exist in the locations previously permitted and constructed to support the operation of the wind turbines and facilitate the delivery of the electricity to consumers. The previously permitted locations of permanent associated facilities such as access roads, collection lines, substation, and O&M facilities will remain the same.

6.1 TRANSMISSION AND PROJECT SUBSTATION

The Repower Project does not require a new transmission line, and the Wind Farm will continue to connect with the existing Xcel Energy Nobles County Substation via the separate project substation.

The existing project substation is located in the northeast corner of the Project Area, approximately 0.4 mile north of Reading, Minnesota along McCall Avenue. Collection lines transmit the power from the turbines to the project substation. At the project substation, the power from the collector circuits is then combined into feeder circuits that then run underground approximately 500 feet to the adjacent Nobles County Substation where the power is stepped up to 345 kV and onto the transmission grid. No changes will occur to the project substation outside of the existing footprint.

The project substation is monitored by a SCADA system capable of monitoring and controlling most aspects of the substation facility. The project substation is monitored for abnormalities at an Xcel Energy Maintenance and Diagnostic Center in Denver, Colorado.

The project substation has a small building provided within the fenced substation that houses the control and relaying equipment, station batteries, and SCADA system. The entire substation is enclosed by a looped chain link fence.

6.2 COLLECTOR LINES AND FEEDER LINES

The following equipment is existing and will continue to be used with the repower. Power from each turbine generator is converted, controlled, and fed inside the tower from the generator down and through the power conditioning equipment and breaker panel. The turbine output voltage is stepped up to the collector system voltage of 34.5 kV by means of an individual step-up transformer located in a separate locked room in the back of the nacelle. Each transformer is connected to the project substation through underground collector lines.

The collector lines combine the electrical output of the wind turbines through separate 34.5 kV underground collector circuits. The project substation steps up voltage from these 34.5 kV collector lines to 345 kV and delivers the power to the grid.

6.3 ADDITIONAL ASSOCIATED FACILITIES

6.3.1 O&M Facility

There will be no upgrades to the existing O&M facility. This building serves as a center for the Project's O&M efforts, provides Project access and storage, and houses the SCADA system. The facility has an existing footprint of approximately 2.7 acres and includes a parking lot and O&M

building. The O&M building is approximately 5,000 square feet and houses Project equipment. The O&M Facility is located in the northeast corner of the Project Area (Figure 2 – Project Area and Facilities).

6.3.2 Permanent Meteorological Towers

The Wind Farm currently has a single, permanent, free-standing, 80 m (262.5 feet) tall met tower that meets Federal Aviation Administration (FAA) and local requirements for lighting and marking. This permanent met tower is located near the O&M Facility in the northeast corner of the Project Area (Figure 2 -Project Area and Facilities). Xcel Energy is not currently planning to construct any new permanent met towers.

6.3.3 Aircraft Detection Lighting System

Xcel Energy will coordinate with the FAA on potential implementation of an Aircraft Detection Lighting System (ADLS) radar. The location of the radar unit(s) will be determined based on participating landowners, environmental conditions, an analysis of radar coverage from an ADLS technology vendor, and, ultimately, a review and approval by the FAA and Federal Communications Commission (FCC). The ADLS tower(s) will be similar to a meteorological tower; they will be free-standing, and they will require a temporary workspace of approximately 75 feet by 75 feet.

6.4 REPOWERING CONSTRUCTION REQUIREMENTS

Previously permitted turbine access roads for the Wind Farm will remain in the same locations and temporarily be widened to up to 150 feet. A large construction crane will be used to remove the old rotors and nacelles, and to re-install the longer rotors and upgraded nacelles, generally requiring a temporary 400-foot radius workspace around each turbine and an approximately 100-foot wide crane path between turbines. Xcel Energy has closely worked with landowners on the routing of crane paths to minimize impacts to agricultural fields. In response to landowner concerns about drain tile, Xcel Energy will use construction matting along the crane paths to minimize compaction and potential impacts to drain tile. Tracked vehicles, similar to a bobcat or skid steer, will move with the crane continually placing matting as the crane moves forward. Additionally, Xcel Energy and the construction contractor, with input from landowners, have designed crane paths to maximize routing along existing access roads to turbines, field edges and parcel lines for participating landowners without a turbine, and to be as direct and efficient as possible while avoiding and minimizing crossings of environmentally sensitive features such as federally listed Topeka shiner streams and Minnesota Department of Natural Resources (MNDNR) native prairie, native plant communities (NPCs), and Sites of Biodiversity Significance (SOBS).

The Repower Project will also require grading of a temporary laydown area located on Xcel Energy property near the Project Substation. Xcel Energy will coordinate with Nobles County on permitting this laydown area. .

7.0 WIND RIGHTS

7.1 STATUS OF WIND RIGHTS AND MODIFICATIONS

All current Project facilities are located on leased land and were sited to accommodate the facilities, required setbacks, and turbine placement flexibility needed to avoid natural resources, homes, and other sensitive features. Given the larger rotor diameter of the proposed repower turbines, the Project is working with landowners to secure sufficient land lease and wind easements/setback easement agreements necessary to repower, operate, and maintain the Project. The overall area within the Project boundary consists of approximately 23,912 acres. Within the 23,912-acre Project Area, approximately 18,185 acres (76 percent) of land has been leased, but negotiations continue for an additional 7,050 acres of wind rights only leases with 64 landowners (78 parcels) located both within and outside of the previously permitted project boundary as shown on Figure 4. The 7,050 acres of new wind rights only leases are being pursued for landowners who fall within the larger 3RD x 5RD wind access buffer. Xcel Energy notes that the 7,050 acres of additional wind rights is representative of the entire parcel. However, Xcel Energy is acquiring additional wind rights only for a subset of the area within these parcels, as only the portion of the parcel within the larger 3RD x 5RD will be acquired (e.g., the quarter-quarter section).

In August 2020, the Project's acquisition team met with several existing participating landowners to explain the proposed project and gather input from the owners on what they thought the Project needed to do in order to gain community support and ultimately a successful repower. The overall feedback was supportive. From that point forward the Project began its acquisition process, which included the following steps:

- Researching current title on all parcels with existing wind easement agreements, as well as those required for the larger 3RD x 5RD wind access buffer.
- Sending a mailer to all landowners in the area with an overview of the proposed project, which included a request for current contact information and a notice that a Project representative would be reaching out to them later in 2020.
- The Project began outreach in late November to all impacted landowners. This outreach included: direct phone calls, in person site meetings, emails, door hangers, and letters. The outreach and acquisition activities are ongoing.
- In December, the Project held a virtual open house for the public to describe the proposed project and answer questions.
- To date the Project has been in contact with 100 percent of the impacted landowners and have secured approximately 21 of the needed wind rights parcels. The Project team is also continuing to sign wind easement amendments with current participating landowners to extend the term of those easements for the entire life of the repowered project. Additional information is provided in Appendix C. The Project's acquisition team will continue to negotiate and obtain necessary wind rights over the coming months.
- If Xcel Energy's good faith negotiations for wind rights only leases are unsuccessful, Xcel Energy will request landowners sign a declaration acknowledging the landowner does not wish to enter into an agreement but has no objection to the Commission granting a waiver to the wind access buffer setback.

- For remaining turbines where Xcel Energy is unable to reach agreement or obtain a no-objection declaration, Xcel Energy will seek a waiver from the Commission from the wind access buffer setback, consistent with the Commission's actions in other wind repower dockets.

During acquisition efforts, the Project has also been coordinating closely with the nearby Community Wind South project. Several parcels are impacted by both projects, and Xcel Energy is working with Community Wind South to document a junior wind right granted to the Project that provides the necessary setback wind rights. A mutual consent agreement will be entered into by both parties that confirms the two projects are not in conflict with one another.

As shown in Appendix C, based on the current status of wind rights negotiations, Xcel Energy is requesting the Commission waive the wind access buffer setback for 63 turbines. As the permitting process and wind rights negotiations proceed, Xcel Energy expects the necessary number of setback waivers to decrease significantly. Xcel Energy will periodically update the Commission on the status of its efforts to obtain wind rights agreements with the newly affected landowners within the larger wind access buffer setbacks of the repowered turbines.

8.0 ENVIRONMENTAL IMPACTS

In accordance with Minn. R. Ch.7854, Xcel Energy provides the following description of the environmental conditions of the Repower Project Area. Because this is an operating project, Xcel Energy has focused on addressing substantive changes and/or updates rather than a complete revisit of items and resources previously addressed in the 2009 Site Permit Application and with respect to the 2009 Site Permit, as amended.

On November 2, 2020, Xcel Energy sent electronic letters to individuals representing local, state, and federal entities requesting comment. Some of those agencies included the U.S. Fish and Wildlife Service (USFWS), the U.S. Army Corps of Engineers (USACE), the State Historic Preservation Office (SHPO), MNDNR, Minnesota Department of Transportation (MNDOT), Minnesota Department of Health (MDH), Nobles County, and the Tribal Historic Preservation Officer (THPO) of eleven tribes. To date, comments have been received from USFWS, MNDNR, MNDOT, SHPO, Nobles County, and Shakopee Mdewakanton Sioux Community. Responses have been incorporated into this Application, where appropriate. Agencies contacted and comments received are provided in Appendix D. Lastly, Xcel Energy met with DOC-EERA staff on October 19 and December 9, 2020 to discuss Xcel Energy's approach to the Repower Project, the community and landowner outreach, and the anticipated schedule.

As described in Section 6.4, construction of the Repower Project will require the following temporary workspaces:

- Generally, 400-foot radius around turbines,
- Up to 150-foot-wide access roads, and
- Up to 100-foot-wide crane paths.

These temporary workspaces are used for the environmental impact analysis throughout Section 8. Additionally, the V136 turbine will require less than 0.1 acre of permanent impact associated with a 25-foot radius turbine pad and 16-foot wide access road approximately 36 feet in length. As described in Section 6.3.3, Xcel Energy is coordinating with the FAA on implementing ADLS radar unit(s). Because the number and location of these unit(s) is not yet known, impacts associated with ADLS are described generally in applicable sections (i.e., visual resources). Xcel Energy anticipates impacts associated with ADLS will be similar to a met tower, requiring a workspace of approximately 75 feet by 75 feet (less than 0.1 acre) each.

8.1 DEMOGRAPHICS

Demographic information for Minnesota and Nobles County is based on the U.S. Census Bureau 2010 Census and the 2018: American Community Survey (ACS) 5-year Estimates Data Profiles, available on Explore Census Data and QuickFacts websites. Demographic information is summarized in table 8.1-1.

Table 8.1-1
Demographics in the Project Area

Counties and Townships	Population, Census, April 1, 2010[1]	ACS Population Estimates July 1, 2019[1]	Percent Change 2010 - 2019[1]	Population Density, 2010[1, 2]	2018 Estimated Total Housing Units[3]	2018 Estimated Total Vacant Housing Units[3]
Minnesota	5,303,925	5,639,632	6.3	66.6	2,420,473	252,672
Nobles County	21,378	21,629	1.2	29.9	8,650	753

1 U.S. Census Bureau, 2019a

2 In response to the application requirements in the DOC-EERA *Application Guidance for Site Permitting of Large Wind Energy Conversion Systems* (2019) Section 8.1 (Demographics), the area within five miles of the Project boundary falls entirely within Nobles County; therefore, population density is provided for Nobles County only.

3 U.S. Census Bureau, 2018a

The Project is located within a lightly populated rural area in southwestern Minnesota in Dewald, Summit Lake, Larkin, and Olney Townships in Nobles County. The nearest municipalities to the Project Area are Reading (directly adjacent to the eastern boundary), Wilmont (one mile north), Rushmore (one mile south), Adrian (3.3 miles southwest), and Worthington (5 miles east/southeast). Demographics in the Project Area are largely similar to what was presented in the original Site Permit Application for the wind farm in 2009 (Docket No. IP-6646/WS-09-584).

The 2018: ACS 5-year Estimates Data Profiles, the total number of housing units in Nobles County is estimated to be 8,650 (U.S. Census Bureau, 2018a). The 2010 U.S. Census data shows that the population density in Nobles County is 29.9 persons per square mile, which is significantly lower than the state level but consistent with the more rural nature of the Project Area (U.S. Census Bureau, 2019a). Note that the population density is provided for the 2010 census data because that data has been verified, whereas the 2019 data is an estimate. Regardless, based on the 2019 population estimate, 2019 population density in Nobles County is expected to be similar to the confirmed 2010 data (29.9 persons per square mile). Based on review of 2019 aerial photography, there are 84 residences within the Project Area (Figure 2).

According to the U.S. Census Bureau's Explore Census Data Selection Map, the total minority population in Nobles County, that is the total population minus the percent of the population that identifies as White alone, not Hispanic or Latino, is 20.9 percent, which is slightly higher than the state level of 17.9 percent (U.S. Census Bureau, 2018b and 2019b). However, within the Project Area the total minority population ranges from 1.3 percent in Dewald Township to 5.7 percent in Larkin Township (U.S. Census Bureau, 2019c). The largest minority group in Nobles County, at 27.2 percent of the population, is comprised of persons who identify as Hispanic or Latino (U.S. Census Bureau, 2019c).

The Application Guidance suggests an applicant include an environmental justice analysis in the application. Based on review of the Minnesota Pollution Control Agency's (MPCA's)

Understanding Environmental Justice website, there are no environmental justice populations within the Project Area (MPCA, n.d.). The U.S. Census Bureau data provided above further supports the argument that environmental justice populations are not present within the Project Area, as the data does not indicate that any minority or low-income population is concentrated in any one area of the Project Area.

8.1.1 Impacts

The Project would not have a significant or long-term impact on the existing demographics in Nobles County. Construction of the Project will not displace residents and is expected to have a minimal, temporary impact on the demographics of the Project Area. Approximately 150 construction personnel will be required for construction of the Project. Xcel Energy will use union labor for the Repower Project. The influx of 150 construction personnel would equate to a total population increase of approximately 0.7 percent in Nobles County over 2010 census numbers. This would represent a minimal, temporary increase in the total population of Nobles County.

Temporary housing for construction personnel is available in the form of motels and hotels in municipalities near the Project Area such as Worthington, Windom, Luverne, and Jackson, all of which are within 5 to 30 miles of the Project Area. According to the website Hotels.com, there are six hotels in Worthington, three hotels in Windom, three hotels in Luverne, and three hotels in Jackson (Hotels.com, 2020). If necessary, construction personnel could also travel to Sioux Falls, South Dakota which is a larger municipality approximately 40 miles from the Project Area. In addition, as shown in Table 8.1-1, 753 vacant housing units are available in Nobles County (U.S. Census Bureau, 2018a). Overall, the demand for temporary housing for construction personnel would represent a minimal, temporary impact on the availability of temporary housing in Nobles County.

Operations and maintenance of the existing Nobles Wind Farm currently requires 11 full-time site staff. After repowering of the turbines is complete, Xcel Energy anticipates that the same number of staff will be required to operate and maintain the facility; no additional permanent full-time staff will be required. Operation of the repowered facility will not affect the demographics of the Project Area.

The Project will not affect environmental justice communities. Minority populations make up a relatively small percentage (generally, 5 percent or less) of the total population in the townships within the Project Area.

8.1.1 Mitigative Measures

The Project is not expected to impact the demographics in the Project Area; therefore, no mitigation measures are proposed.

8.2 LAND USE AND ZONING

The primary regulatory approval required for the construction and operation of the Repower Project is a Site Permit amendment issued by the Commission. Pursuant to the Minnesota Wind Siting Act (Act), the Commission has been given the responsibility and authority to accept,

evaluate and grant permits for wind projects in Minnesota. The Act provides that "No person may construct an LWECS without a site permit issued by the Public Utilities Commission" (Minn. Stat. § 216F.04(a)). The Act defines an LWECS as any combination of wind turbines and associated facilities with a nameplate rating equal to or greater than 5,000 kW. Furthermore, Minn. Stat. § 216F.07 states that, "A permit under this chapter is the only site approval required for the location of an LWECS. The site permit supersedes and preempts all zoning, building, or land use rules, regulations, or ordinances adopted by regional, county, local and special purpose government."

8.2.1 Local Zoning and Comprehensive Plans

A comprehensive plan is a land-use and community-planning tool used to guide the direction and intent of growth for a county or municipality. Generally, comprehensive plans discuss existing and future land uses, population and housing trends, economic development goals and opportunities, and environmental characteristics of the county or municipality.

The Nobles County Comprehensive Plan (2001) states that, similar to other counties in southwestern Minnesota, agricultural production will continue to be the predominant industry in the county. However, the plan lists a number of opportunities for industry diversification that would contribute to future economic growth, including wind energy development. Specifically, the plan discusses opportunities related to wind power, biomass, and ethanol along with expanding agricultural coops to increase the amount of value-added processing within the county.

8.2.2 Current and Future Zoning

In preparing this Application, Xcel Energy also reviewed the Nobles County Zoning Ordinance (2006). The Project Area is primarily located within the Agricultural Preservation District, and commercial wind energy conversion developments are conditionally permitted in this district (refer to Section 729 of the Nobles County Zoning Ordinance). Some smaller pockets of the Project Area are zoned as Rural Residential; these areas are located near the Town of Reading, in the northeastern portion of the Project Area. Commercial wind energy conversion developments are not permitted in the Rural Residential district; however, the existing wind turbines are not located in this district, and based on design of the temporary workspaces, no construction work would occur in these areas.

The ordinance does not specifically address repowering of an existing commercial wind energy conversion system, but does contain provisions intended to protect existing roadways and other infrastructure, regulate waste disposal, minimize, or mitigate interference with electromagnetic communication, and ensure all commercial wind energy conversion systems comply with Minnesota state noise standards.

Xcel Energy is coordinating with Nobles County and Dewald, Summit Lake, Larkin, and Olney Townships to confirm that the Project is in alignment with applicable current and future zoning and to obtain any required permits or approvals. Additionally, Xcel Energy is also coordinating with Nobles County and the townships on a road use agreement to protect local roads. Lastly, the Nobles County Planning and Zoning administrator indicated a Conditional Use Permit will be required for the staging/laydown areas. Xcel Energy is coordinating with Nobles County to permit these temporary facilities locally.

8.2.3 Impacts

Repowering of the existing Nobles Wind Farm will not significantly affect existing land uses in Nobles County. Agricultural production in the immediate Project vicinity may experience minor short-term impacts from the use of crane paths during construction, but these impacts would resolve when construction is complete. The V136 turbine would be constructed in agricultural land adjacent to the existing turbine pad for T47 and the access road to the V136 turbine would require a new short segment (36 feet) of the access road to T47. The combined permanent impact from the V136 turbine pad and access road is less than 0.1 acre. Xcel Energy will fully decommission the existing GE 1.5 sle turbine at T47, removing the turbine pad (approximately .05 acre), which will allow use of this area for agricultural production. No impacts to county zoning designations will occur as a result of the Project.

Operation of the repowered wind farm will continue to have a positive impact by supporting Nobles County's goals for industry diversification, as stated in the Nobles County Comprehensive Plan (2001).

8.2.4 Mitigative Measures

The Project is generally consistent with the comprehensive plan and zoning requirements of Nobles County. Accordingly, no mitigative measures are proposed.

8.3 CONSERVATION EASEMENTS

The U.S. Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) holds an easement in the Project Area for a 50-acre Wetland Reserve Program (WRP) parcel (see Figure 6 – Public Lands and Recreation). The WRP program is intended to protect, restore, and enhance wetlands that have been farmed by removing them from agricultural production and working with the landowner to improve wetland functionality and enhance wildlife habitat (USDA NRCS, n.d.). Enrollment in the WRP program is voluntary.

The Conservation Reserve Enhancement Program (CREP) is an offshoot of the Conservation Reserve Program (CRP) which is a land conservation program established by the USDA and administered by the Farm Service Agency that pays farmers a yearly rental fee for agreeing to take environmentally sensitive land out of agricultural production in an effort to improve environmental health and quality (USDA, n.d.). Minnesota implemented the CREP to target state-identified, high-priority conservation resources by offering payments to farmers and agricultural landowners to retire environmentally sensitive land using the Reinvest in Minnesota (RIM) Program (BWSR, 2019). The RIM Program also includes a WRP that protects and restores previously drained wetlands and adjacent native grasslands. Enrollment in the conservation easement programs is voluntary. Based on publicly available data, there are no CRP or CREP easements and one 50.5-acre RIM-WRP easement in the central portion of the Project Area and associated with the East Branch of Kanaranzi Creek.

8.3.1 Impacts

Based on the publicly available information, the temporary construction workspaces at turbine pads, crane paths, and access roads required for repowering will be sited outside of known conservation easement areas. Additionally, the V136 turbine has been sited to avoid conservation easements.

8.3.2 Mitigative Measures

The Project is not anticipated to impact conservation easements. Xcel Energy is actively completing a title search for all Project participants that will also identify any other conservation easements in the Project Area. If additional conservation easements are identified, Xcel Energy will coordinate with landowner and the agency that administers the conservation easements to identify their trust resources and address any potential impacts. Additionally, Xcel Energy is coordinating with the NRCS, Board of Water and Soil Resources (BWSR), and MNDNR on the accuracy of the publicly available easement data.

8.4 NOISE

Sound level is measured in units of dB on a logarithmic scale. It may be made up of a variety of sounds of different magnitudes, across the entire frequency spectrum. The human ear is not equally sensitive to sound at all frequencies and magnitudes. Some frequencies, despite being the same dB level (that is, magnitude), seem louder than others. For example, a 500 hertz (Hz) tone at 80 dB will sound louder than a 63 Hz tone at the same level. In addition, the relative loudness of these tones will change with magnitude. For example, the perceived difference in loudness between those two tones is less when both are at 110 dB than when they are at 40 dB.

To account for the difference in the perceived loudness of a sound by frequency and magnitude, acousticians apply frequency weightings to sound levels. The most common weighting scale used in environmental noise analysis is the "A-weighting," which represents the sensitivity of the human ear at low to moderate sound pressure levels. The A-weighting is the most appropriate weighting when overall sound pressure levels are relatively low (up to about 70 dB(A)). The A-weighting de-emphasizes sounds at lower and very high frequencies since the human ear is less sensitive to sound at these frequencies at low magnitude.

The A-weighting is the most appropriate weighting for wind turbine sound for two reasons. The first is that sound pressure levels due to wind turbine sound are typically in the appropriate range for the A-weighting at typical receiver distances (50 dB(A) or less). The second is that various studies of wind turbine acoustics have shown that the potential effects of wind turbine noise on people are correlated with A-weighted sound level (Pedersen and Waye, 2008) as well as to the perceived loudness of wind turbine sound. Other researchers found that 51 percent of the energy making up a C-weighted measurement of wind turbine sound is not audible. Thus, it is more difficult to relate the level of C-weighted sound to human perception. That is, two sounds may be perceived exactly alike, but there could be significant variations in the C-weighted sound level depending on the content of inaudible sound in each.

Higher sound levels typically exist near roadways and near areas that experience greater human activities such as farming. Agricultural/rural areas with higher wind resources generally experience higher sound levels compared to agricultural/rural areas with lower wind resources. Different communities can experience a wide variety of sound levels within their given ambient acoustic environments, and the variability of sound sources creates their respective spectral content. A comparison of typical noise generators is outlined below in Table 8.4-1.

Table 8.4-1
Decibel Levels of Common Noise Sources

Sound Pressure Level (dB(A))	Noise Source
140	Jet Engine (at 25 m)
130	Jet Aircraft (at 100 m)
120	Rock and Roll Concert
110	Pneumatic Chipper
100	Jointer/Planer
90	Chainsaw
80	Heavy Truck Traffic (at 15 m)
70	Business Office
60	Conversational Speech
50	Library
40	Bedroom
30	Secluded Woods
20	Whisper
Source: MPCA, 2008	

The MPCA has the authority to adopt noise standards pursuant to Minn. Stat. § 116.07, subd. 2. The adopted standards are set forth in Minn. R. Ch. 7030. The MPCA standards require A-weighted noise measurements. Different standards are specified for daytime (7:00 AM – 10:00 PM) and nighttime (10:00 PM – 7:00 AM) hours. The noise standards specify the maximum allowable noise levels that may not be exceeded for more than 10 percent of an hour (L_{10}) and 50 percent of an hour (L_{50}), respectively. Household units, including farmhouses, are included in Land Use Noise Area Classification (NAC) 1. Table 8.4-2 shows the MPCA State noise standards. All the land within the Project Area is considered Land Use NAC 1.

Table 8.4-2
MPCA State Noise Standards – Hourly A-Weighted Decibels

Land Use	Code	Day (7:00am – 10:00pm) dB(A)		Night (10:00pm – 7:00am) dB(A)	
		L_{10}	L_{50}	L_{10}	L_{50}
Residential	NAC-1	65	60	55	50
Commercial	NAC-2	70	65	70	65
Industrial	NAC-3	80	75	80	75

8.4.1 Impacts

The proposed Repower Project consists of increasing the RD from 77 meters to 91 meters at 13 turbine locations and 97 meters at 121 turbine locations, as well as upgrading gear boxes and associated components; the hub height will remain at 80 meters. The number and location of the wind turbines would not be changed by the Repower Project. The Nobles Wind Project has been in continuous commercial operation since late 2010. There have been no noise complaints filed with the Commission during its operational history.

Acoustical modeling was completed by RSG on behalf of Xcel Energy for the Repower Project; a description of the modeling assumptions is included in Appendix E.

Because noise modeling, industry best practices and regulatory guidance has evolved since the Project was initially permitted in 2009, RSG modeled the predicted noise levels of the Project, with the existing GE 1.5 sle turbines with 77 m rotors prior to modeling the Repower Project with the proposed GE 1.6 sle turbines and the V136 turbine. Modeling the existing Project provided a baseline noise level that assisted Xcel Energy in evaluating modeled noise levels for the Repower Project, especially since no background sound monitoring or post-construction noise monitoring exists at this site.

Based on RSG's noise modeling, the existing Project has a maximum turbine-only noise level of 49 dBA. Given that the rated sound level of the proposed Repower Project's GE 1.6 sle wind turbines with low-noise trailing edges (LNTE) blades is 2 dBA more than that of the existing GE 1.5 sle wind turbines, Xcel Energy conducted a series of analyses looking at feasible noise mitigation strategies for the Repower Project After engaging in these analyses, Xcel Energy designed the Repower Project to include a combination of 97 and 91 meter blades, LNTE blades at all turbine locations, and operation of a number of turbines with Noise Reduction Operations (NRO) modes at night (see Figure 7 – Sound/Noise). Additionally, the V136 turbine includes serrated trailing edge (STE) blades. Xcel Energy notes that LNTE and STE blades refer to the same blade technology; the difference is simply in name for different turbine manufacturers.

Based on the proposed design, the maximum predicted Repower Project sound level at any receptor is 47 dBA. The following table (Table 8.4-3) compares the predicted turbine-only sound levels at residences before and after the Repower Project.

Table 8.4-3
Modeled Turbine-Only Sound Levels at Residences before and after the Repower Project

Modeled Sound Pressure Level db(A)	Number of Residences			
	Existing Project[1]		Repowered Project[2]	
	Participant	Non-Participant	Participant	Non-Participant
<40	1	112	1	112
≤ 45 and ≥ 40	19	44	16	44
46	9	8	9	8
47	15	6	26	6
48	5	0	0	0

Table 8.4-3
Modeled Turbine-Only Sound Levels at Residences before and after the Repower Project

Modeled Sound Pressure Level db(A)	Number of Residences			
	Existing Project[1]		Repowered Project[2]	
	Participant	Non-Participant	Participant	Non-Participant
49	3	0	0	0
50	0	0	0	0

[1] 134 GE 1.5 sle turbines with 77 m rotor and 80 m hub height.
[2] 133 GE 1.6 sle turbines with LNTE blades - 111 turbines with 97 m rotors and 22 turbines with 91 m rotors, one Vestas V136 with STE blades, and 83 turbines with NRO.

Minor, temporary construction noise will be generated by repowering from typical construction equipment such as cranes, component delivery trucks, dump trucks and graders. In general, construction noise will be less than experienced during project construction as access roads, turbine pads, towers and collection lines will remain in place. Machinery will be properly muffled, as required by law, and hours of operation will be consistent with State standards for similar construction projects. Because of the rural nature of the Project Location, construction-related noise is expected to be typical of farming operations during the height of planting and harvest seasons.

8.4.2 Mitigative Measures

As discussed in Section 8.4.1, the Project has been in continuous commercial operation since late 2010 and there have been no noise complaints filed with the Commission during its operational history. For the Repower, Xcel Energy has significantly modified is project design to incorporate noise mitigation measures. First, all turbines will be equipped with LNTE/STE blades. The LNTE/STE blades lower the predicted sound power level of the turbines by approximately 2 decibels. Second, Xcel Energy has incorporated a combination of GE 1.6 sle turbines with 91-meter or 97-meter rotors. Turbines with the 91-meter blades have an estimated sound power level approximately 2 decibels lower than the turbine with the 97-meter blades. While the 91-meter blades have lower expected energy production as compared to the 97-meter blades, the 91-meter blades were strategically sited at 22 turbine locations to minimize expected sound levels at nearby residences. Additionally, the V136 turbine was also strategically sited to minimize expected sound levels at nearby residences. Finally, Xcel Energy will operate a number of both the 91- and 97-meter blade turbines in NRO modes such that all residences have a predicted sound level of 47 dBA; the V136 turbine will not be operated in NRO mode. The modeling assumptions related to these sound mitigation measures are discussed in Appendix E.

8.5 VISUAL RESOURCES

The topography of the Project Area is glaciated, gently rolling plains with elevations ranging from 1,572 to 1,757 feet (479 to 536 m) above sea level. Elevations are highest in the northwest corner of the Project Area and lowest around the East Branch Kanaranzi Creek. Agricultural fields, farmsteads, and gently rolling topography visually dominate the Project Area. The landscape can be classified as rural open space. Figure 8 (Topographic Map) shows the general topography within the Project Area.

Viewsheds in this area are generally broad and uninterrupted, with only small scattered areas where they are interrupted by trees or topography. The settlements in the vicinity are residences and farm buildings (inhabited and uninhabited farmsteads) scattered along rural county roads. The area is also shaped by a built environment. Horizontal elements, such as highways and county roads, are consistent with the long and open viewsheds in the area. Vertical elements such as wind turbines and 345 kV transmission lines are visible from considerable distances and are the tallest and often the most dominant visual feature on the landscape. Additionally, numerous electrical distribution lines parallel some unpaved and paved roads that contribute to the existing visual elements.

There are eight wind farms that are visible within ten miles of the Project Area, including the following:

- Community Wind South (15 turbines) in Nobles County
- Nobles 2 Wind Farm (74 turbines) in Nobles County
- Wilmont Hills Wind Farm (1 turbine) in Nobles County
- Wolf Wind Project (5 turbines) in Nobles County
- Missouri River Energy Services Wind Farm (6 turbines) in Nobles County
- Don Sneve Wind Farm (1 turbine) in Nobles County
- Arnold Wind Farm (1 turbine) in Nobles County
- Fenton Wind Farm (50 turbines) in Nobles and Murray Counties

The Community Wind South wind farm is immediately adjacent to and surrounded on three sides by the Nobles Wind Farm (see Figure 18 – Existing Wind Facilities). Community Wind South and the seven other existing wind facilities contain turbines of various heights and RDs and contribute to the aesthetics of the area. Generally, wind energy conversion systems adjacent to the Project Area contain slightly smaller sized turbine models than those proposed for this Project, with total heights ranging from approximately 315 feet to approximately 483 feet (96 meters to approximately 147 meters).

8.5.1 Impacts

Visual impacts can be defined as the human response to visual contrasts resulting from introduction of elements into a viewshed. Such visual contrasts interact with viewer perceptions of the landscape and may cause a negative, positive, or neutral response to the changes in the viewed landscape. Those likely to be viewing the Project include permanent observers (residents) and temporary observers (motorists, tourists, or recreationalists passing by or using the area intermittently). Residents within and in the vicinity of the Project Area are expected to have a higher sensitivity to the potential aesthetic impacts than temporary observers because they will look at the Project more frequently than those individuals periodically passing through the area. The magnitude of visual impacts associated with wind facilities typically depend on several factors, including:

- distance of the Project facilities from viewers;
- duration of views (highway travelers vs. permanent residents);
- weather and lighting conditions;
- the presence and arrangements of lights on the turbines and other structures; and

- viewer attitudes toward renewable energy and wind power.

Overall, the Project will not be introducing any significant features to the landscape because the wind turbines are already present. The addition of longer blades will be the only visible permanent change. The FAA requires obstruction lighting or marking of structures over 200 feet (61 meters) above mean sea level because they have the potential to obstruct air navigation. Xcel Energy will coordinate with the FAA on a lighting plan that is compliant with FAA requirements. Additionally, Xcel Energy will include ADLS (if approved by the FAA) to mitigate the impact of nighttime lights by deploying a radar-based system for the Project, turning lights on only when low-flying aircraft are detected nearby, pending FAA approval. This assists in maintaining safe conditions for pilots while reducing the effect to the surrounding communities.

Wind turbines are prevalent within and in the vicinity of the Project Area. These structures could produce visual contrast by virtue of the design attributes of form, color, and line; however, the GE 1.6 sle turbines will be similar in appearance to the existing GE 1.5 sle turbines with three blades, a hub, and a monopole. The V136 turbine will be larger than the repowered GE turbines. However, its location near the center of the Project may help it blend in with surrounding turbines than if it were sited on the periphery of the Project.

Temporary impacts related to construction activities are associated with equipment staging and laydown areas adjacent to turbines, access roads, and crane paths. These activities will be short-term and converted back to cropland or replanted with grasses and vegetation native to the area following the completion of construction. Visual impacts from an increase in traffic and human activity within the Project Area associated with Project construction will also be short-term. Permanent impacts related to repowering the Project may include the installation of new collars around the base of the turbines and the addition the ADLS unit(s). The new turbine foundation collars would be installed at the base of the existing turbines and will not increase the existing 25-foot diameter gravel area surrounding each turbine. The location and number of ADLS radar towers will be determined in coordination with the FAA but are expected to be similar in appearance to a met tower. Overall, the long-term operation of the Project is not anticipated to increase visual impacts associated with new structures, operations lighting, human activity, or traffic within the Project Area.

8.5.2 Visual Impacts on Public Resources

While wind turbines will impact the visual surroundings of a wind facility, the degree of visual impact vary based on personal preferences. There are no USFWS national parks or refuges, USFWS Waterfowl Production Areas (WPAs), MNDNR Aquatic Management Areas (AMAs), or other MNDNR-managed lands within the Project Area; there is, however, one MNDNR Wildlife Management Area (WMA), the Bluebird Prairie WMA, and one snowmobile trail in the Project Area. Additionally, there are several public recreation and wildlife areas within 10 miles of the Project Area (see Figure 6 and Section 8.8).

Replacing the existing turbines with larger blades within the viewsheds of these public lands will only minimally change the natural quality and the experience of the persons utilizing those areas. The Project will not be introducing a new feature type to the landscape, and therefore will not significantly affect public resources because existing wind turbines are prevalent within and in the

vicinity of the Project Area. Additionally, the V136 turbine is nearly one mile west of the Bluebird Prairie WMA and there are several existing turbines between it and the WMA. As such, the visual impacts of a larger turbine are anticipated to be similar to the rest of the Repower.

8.5.3 Visual Impacts on Private Lands and Homes

Nearby viewers include the rural residences dispersed throughout the Project Area, recreational and public land users, and motorists (primarily those using Interstate 90 and other local roads). The municipalities of Reading, Rushmore, Adrian, Lismore, and Wilmont are located within 5 miles (8 kilometers) from the nearest existing turbine locations. For nearby viewers, the large size and strong geometric lines of both the individual turbines themselves, and the array of turbines, could dominate views. However, these impacts are assumed to be minor since existing wind turbines have been prevalent within and in the vicinity of the Project Area for more than 10 years. In addition, the operation of the Project will not generate an increase in traffic or noticeable increase in day-to-day human activity; therefore, the Project Area will retain its existing characteristics and the rural sense.

8.5.4 Mitigative Measures

Xcel Energy will work to avoid or minimize visual impacts related to the Repowering Project. Xcel Energy proposes the following mitigation measures:

1. Repowered turbine parts will be uniform in color.
2. Turbines will be illuminated only as necessary to meet the minimum FAA requirements for obstruction lighting (e.g., reduce number of lights on turbines and synchronized red flashing lights).
3. Temporarily disturbed areas will be converted back to cropland or otherwise reseeded with native seed mixes appropriate for the region.

8.5.5 Shadow Flicker

Shadow flicker caused by wind turbines is defined as alternating changes in light intensity at a given stationary location (or "receptor"), such as the window of a home. In order for shadow flicker to occur, three conditions must be met: (1) the sun must be shining with no clouds to obscure it; (2) the rotor blades must be spinning and must be located between the receptor and the sun; and (3) the receptor must be sufficiently close to the turbine to be able to distinguish a shadow created by it (generally less than 1,500 feet because if the shadow is at this distance, the shadow is sufficiently diffuse that the shadow is not seen as a solid obstruction). Shadow flicker intensity and frequency at a given receptor are determined by a number of interacting factors:

- **Sun angle and sun path**: As the sun moves across the sky on a given day, shadows are longest during periods nearest sunrise and sunset, and shortest near midday. They are longer in winter than in summer. On the longest day of the year (the summer solstice), the sun's path tracks much farther to the north and much higher in the sky than on the shortest day of the day (the winter solstice). As a result, the duration of shadow flicker at a given receptor will change significantly from one season to the next.

- **Turbine and receptor locations**: The frequency of shadow flicker at a given receptor tends to decrease with greater distance between the turbine and receptor. The frequency of occurrence is also affected by the sightline direction between turbine and receptor. A turbine placed due east of a given receptor will cause shadow flicker at the receptor at some point during the year, while a turbine placed due north of the same receptor at the same distance will not, due to the path of the sun at the Project's latitude.

- **Cloud cover and degree of visibility**: As noted above, shadow flicker will not occur when the sun is obscured by clouds. A clear day has more opportunity for shadow flicker than a cloudy day. Likewise, smoke, fog, haze, or other phenomena limiting visibility would reduce the intensity of the shadow flicker.

- **Wind direction**: The size of the area affected by shadow flicker caused by a single wind turbine is based on the direction that the turbine is facing in relation to the sun and location of the receptor. The turbine is designed to rotate to face into the wind, and as a result, turbine direction is determined by wind direction. Shadow flicker will affect a larger area if the wind is blowing from a direction such that the turbine rotor is near perpendicular to the sun-receptor view line. Similarly, shadow flicker will affect a smaller area if the wind is blowing from a direction such that the turbine rotor is near parallel to the sun-receptor view line.

- **Wind speed**: Shadow flicker can only occur if the turbine is in operation. Turbines are designed to operate within a specific range of wind speeds. If the wind speed is too low or too high, the turbine will not operate, eliminating shadow flicker.

- **Obstacles**: Obstacles, such as trees or buildings, can have a screening effect and reduce or eliminate the occurrence of shadow flicker if they lie between the wind turbine and the receptor.

- **Contrast**: Because shadow flicker is defined as a change in light intensity, the effects of shadow flicker can be reduced by increasing the amount of light within a home or room experiencing shadowing flicker.

- **Local topography**: Changes in elevation between the turbine location and the receptor can either reduce or increase frequency of occurrence of shadow flicker, compared to flat terrain.

Shadow flicker modeling for the Repower Project incorporated average long-term sunshine probability from the Minneapolis-St. Paul and Des Moines weather stations between 1981-2010 (Table 8.5-1). The Minneapolis-St. Paul weather station is closer to the Repower Project in latitude but Des Moines is more similar to southwest Minnesota in solar resource. Therefore, the average was used. Wind speed and direction is displayed in Chart 9.1-3 Nobles Wind Farm Wind Rose in Section 9.1.10.

Table 8.5-1
Average of Minneapolis-St. Paul and Des Moines Average Sunshine (hours/month)[1]

Month	Minneapolis-St. Paul	Des Moines, Iowa	Average
January	140	158	149
February	166	163	165
March	200	204	202
April	231	222	227
May	272	275	274
June	302	312	307
July	343	337	340
August	296	297	297
September	237	240	239
October	193	210	202
November	115	138	127
December	112	130	121

[1] Data gathered from National Climatic Data Center for Minneapolis, Minnesota, the closest, most representative station (1981-2010).

8.5.5.1 Shadow Flicker Impacts

Shadow flicker modeling was completed by ReGenerate for 222 residences (receptors) with WindPRO for the Repower Project. These receptors are those within the Project Area and one-mile buffer that could receive shadow flicker. As expected with slightly taller turbines and longer blades, shadow flicker is anticipated to increase at some receptors. There are 16 residences modeled to have more than 30 hours of shadow flicker per year, 12 of which are participants and three are non-participants. Figure 9 - Shadow Flicker provides a visual representation of shadow flicker across the Nobles Repower Project; Appendix F shows results of the shadow flicker assessment at the Project.

WindPRO calculates the number of hours per year as well as the maximum minutes per day during which a given receptor could realistically expect to be exposed to shadow flicker from nearby wind turbines. The maximum shadow flicker (hours per year) for each non-participants is 75.3 hours per year and 60.3 hours per year for participants.

The shadow flicker modeling is conservative and does not take into consideration several factors including:

- availability of the turbines (i.e., whether they are operating or not based on meteorological conditions and/or maintenance);
- turbines not operating below cut-in and above cut-out wind speeds;
- obstacles (like trees or buildings) obstructing shadow flicker from a receptor; and
- dust or aerosols in the air which reduce the impact of shadow flicker.

For example, the participating and non-participating residences modeled to receive the maximum amount of shadow flicker has turbines to the east, west, and north, but the residence has dense vegetative screening on each in each of those same directions that is not accounted for by the model. These trees provide an obstruction to shadows from nearby turbines.

At a distance of 1,000 feet or greater (the Project minimum setback for residences), receptors will typically experience shadow flicker only when the sun is low in the sky, and when certain meteorological and operational factors are present. If a receptor does experience shadow flicker, it most likely will be only during a few days per year from a given turbine, and for a total of only a fraction (typically less than one percent) of annual daylight hours.

Shadow flicker from the proposed turbines is not harmful to the health of photosensitive individuals, including those with epilepsy. The Epilepsy Foundation has determined that generally, the frequency of flashing lights most likely to trigger seizures is between five and 30 flashes per second (Epilepsy Foundation, 2013).The frequency of shadow flicker due to wind turbines is a function of the rotor speed and number of blades, and it is generally no greater than approximately 1.5 Hz (i.e., 1.5 flashes per second). Because the frequency of wind turbine shadow flicker is so much lower than the frequency range that can trigger seizures, there is no potential for causing seizures.

8.5.5.2 Shadow Flicker Mitigative Measures

Nobles Wind Farm has been in continuous commercial operation since 2010. There have been no shadow flicker complaints filed with the Commission during its operational history.

Xcel Energy will evaluate any comments received regarding flicker. In coordination with the affected party, Xcel Energy will evaluate potential flicker minimization options in the unlikely event more flicker is present than was modeled.

Additional mitigation options Xcel Energy may consider providing, where appropriate and reasonable, include exterior screening such as trees, shrubs and awnings, and interior screening such as curtains or blinds for windows.

Xcel Energy can also provide materials about shadow flicker to landowners that can help minimize the effect of shadow flicker such as turning on lights and using a different room for a short period of time.

8.6 PUBLIC SERVICES AND INFRASTRUCTURE

Xcel Energy conducted online research to identify emergency services, existing utilities, roads and railroads, and communication systems within the Project Area. The results of this review and a discussion of potential impacts to these services from construction and operation of the Project is presented below.

8.6.1 Emergency Services

The Project is located in a rural area in southwestern Minnesota (Figure 1 – Project Location). Within the Project Area, local law enforcement and emergency response agencies are available in

Nobles County and nearby communities. Nobles County has a sheriff department that provides services, and the cities of Worthington, Adrian, Bigelow, Round Lake, Lismore, Ellsworth, and Edgerton have local police departments. Fire services near the Project Area are provided by city and community fire departments, including Worthington, Adrian, Rushmore, Wilmont, Brewster, Lismore, Ellsworth, and Bigelow (Fire-Departments.org, 2019.)

Ambulance response is provided by regional and local ambulance services including Worthington Ambulance Service which provides response services within Nobles County including the cities of Bigelow, Brewster, Dundee, Kinbrae, Rushmore, Round Lake, and Worthington. The communities of Adrian and Windom Local also provide ambulance services (Minnesota Emergency Medical Services Regulatory Board, 2020).

Hospitals near the Project Area include the Sanford Worthington Medical Center in Worthington, Windom Area Health in Windom, and Sanford Luverne Medical Center in Luverne. Smaller medical clinics or medical centers in the area include the Sanford Worthington Clinic in Worthington and the Sanford Health Adrian Clinic in Adrian.

8.6.1.1 Impacts

Construction and operation of the Project is not expected to impact the availability of emergency services. Repowering of the existing wind farm will be of much lower intensity and extent than building a new wind project of similar size, because new construction of permanent access roads to turbine pads, turbine foundations, towers, underground electrical systems, transmission interconnections, data communication lines, O&M building, etc. will not occur. In addition, the duration of construction will be approximately one-third of the time required to construct a new project, or roughly 6-7 months. After the repowering work is completed, O&M activity and use of public services and infrastructure would not increase from levels needed prior to the repower.

Xcel Energy will coordinate with emergency services providers to determine appropriate safety precautions and standards and develop measures to address these precautions and standards. If emergency services are required during constriction or operation of the Project, the numerous law enforcement, fire departments, ambulance services, and hospitals near the Project Area would be adequate to address Project-related emergency service needs without negatively impacting the availability of these services for the local populace.

8.6.1.2 Mitigation Measures

Because no impacts to emergency services are anticipated, no mitigation measures are proposed.

8.6.2 Existing Utility Infrastructure

The location of existing utilities is an important factor to be considered when siting an LWECS project. Turbines should be sited at least 1.1x the turbine height from existing overhead utilities to avoid potential impacts to existing infrastructure.

Electrical service in the Project Area is provided by Nobles Cooperative Electric (Minnesota Geospatial Commons, 2020). Minnesota Energy Resources and CenterPoint Energy provide

natural gas service in the Project Area (Minnesota Energy Resources, 2020; CenterPoint Energy, 2020). Water to rural residences within the Project Area is supplied by private wells.

There is a 345 kV transmission line (Split Rock to Lakefield Junction) running east-west along the north side of Interstate 90 where the Project Area parallels the interstate, then turning north-south just east of Lais Avenue and crossing through the northeastern portion of the Project Area. No oil or gas transmission lines are known to exist in the Project Area. Infrastructure within the Project Area including existing transmission lines is shown on Figure 2.

8.6.2.1 Impacts

Xcel Energy will avoid impacting underground utilities during construction the Project by designing temporary construction workspaces to avoid these features. Xcel Energy has designed the crane paths to minimize crossings of the existing 345 kV transmission line within the northeast portion of the Project Area. Crane path crossings of the existing 345 kV transmission line will likely require crane breakdown. The V136 turbine is not sited near existing utility infrastructure.

After repowering of the existing turbines with longer blades is complete, the turbines will remain sited to the industry best practice of 1.1x turbine tip height from all high-voltage transmission lines.

8.6.2.2 Mitigation Measures

Xcel Energy will conduct a Gopher One Call prior to and during construction to identify the locations of any buried utilities and safety concerns and to prevent possible structural conflicts.

8.6.3 Roads and Railroads

In general, the existing roadway infrastructure in and around the Project Area is characterized by state, county, and township roads that generally follow section lines. Various county and township roads and private gravel access roads provide access to turbines throughout the Project Area. Roadway infrastructure throughout the Project Area also includes two-lane paved and gravel roads. In agricultural areas, many landowners use private, single-lane farm roads and driveways on their property.

The MNDOT conducts traffic counts on roads in Minnesota. The functional capacity of a two-lane paved rural highway is in excess of 5,000 vehicles per day, or Annual Average Daily Traffic (AADT). While not located within the Project Area, Interstate 90 is located just south of the Project Area, and 2019 data indicates that the AADT of the interstate is 11,700 vehicles per day. Within the Project Area AADTs range from 60 vehicles per day along County Road 68 to 1,150 vehicles per day along County State Aid Highway 25 (MNDOT, 2020). Traffic counts are generally higher in proximity to nearby cities and towns.

No railroads are located within the Project Area. The nearest railroad to the Project Area is the Minnesota Southern Railway, which runs through the towns of Adrian and Rushmore about 1.25 miles south of the Project Area.

8.6.3.1 Impacts

During the construction phase, temporary impacts are anticipated on some public roads within the Project Area. However, construction traffic for the repowering of the existing turbines would be considerably less than those experienced for construction of a new wind farm facility. Roads will be affected by the transportation of equipment to and from the Project Area and turbine sites. Some roads may also be expanded along specific routes as necessary to facilitate the movement of equipment. Construction traffic will use the existing county, state, and federal roadway system, and existing private turbine access roads to reach the Project Area and deliver construction materials and personnel.

Construction activities will increase the amount of traffic using local roadways, and may temporarily affect traffic numbers in the area, but such use is not anticipated to result in adverse traffic impacts. During the construction phase, several types of light, medium, and heavy-duty construction vehicles will travel to and from the Project Area, as well as private vehicles used by construction personnel. Trucks accessing the Project Area would likely use CSAHs 25, 15. 13, and 14 within the Project Area. Specific additional truck routes will be dictated by the location required for delivery.

Xcel Energy estimates that there will be 84 large truck trips per day and up to 840 small-vehicle (pickups and automobiles) trips per day in the area during peak construction periods. The functional capacity of a two-lane paved rural highway is in excess of 5,000 vehicles per day. Currently, the heaviest traffic is on CSAH 25 located immediately west of Reading at 1,150 AADT. Since many of the area roadways have AADTs that are currently well below capacity, the addition of 925 vehicle trips during peak construction would be perceptible, but similar to seasonal variations such as spring planting or autumn harvest.

After construction is complete, traffic impacts during the operations phase of the Repower Project will be minimal and similar to traffic levels for the currently operating wind farm. Operation and maintenance activities will not noticeably increase traffic in the Project Area, as these activities tend to be sporadic and spread out through the Project Area. A small maintenance crew driving through the area in pickup trucks on a regular basis will monitor and maintain the wind turbines as needed. There would be a slight increase in traffic for occasional turbine and substation repair, but traffic function will not be impacted as a result.

8.6.3.2 Mitigative Measures

Xcel Energy is coordinating with Nobles County and townships within the Project Area on the development and execution of a single, cooperative Development, Road Use, and Drainage Agreement to minimize and mitigate impacts on existing roadways. Xcel Energy will ensure that the general contractor communicates with the road authorities throughout the construction process, particularly regarding the movement of equipment on roads and the terms of the development agreement.

In addition, Xcel Energy is coordinating with MNDOT to identify any additional operating permits required for the Project. In response to Xcel Energy's November 2020 project introduction letter, MNDOT staff requested information on any planned upgrades to state highway intersections.

MNDOT staff also noted a planned improvement project for State Highway 91 in 2021 that may affect deliveries to the Project Area during construction if the two projects were to occur at the same time. Xcel Energy proposes to begin construction of the Project in spring 2022; therefore, the planned highway improvement project and the repowering Project will not overlap. MNDOT also reviewed preliminary crane path design and provided feedback regarding the location of crane paths near the intersection of County Road 13 and Interstate 90. MNDOT requested increased distance between the Interstate 90 ramp terminals onto County Road 13; Xcel Energy incorporated this request into the crane path design and the crane paths are now about one-half mile from the Interstate 90 ramp terminals. Potential permits identified by MNDOT include authorizations for sign removal or relocation, temporary widenings, or other modifications of any MNDOT trunk highways, and oversize/overweight permits.

If roadways are impacted by the use of heavy construction equipment, they will be restored per the Development, Road Use, and Drainage Agreement. Additional operating permits will be obtained for over-sized truck movements after supply routes have been finalized.

No impacts are anticipated from operation of the Project; therefore, no mitigation measures are proposed for this phase of the Project.

8.6.4 Communication Systems

Xcel Energy commissioned a communication tower study by Comsearch, which identified two communication tower structures and eight communication antennas in the Project Area (Appendix G). These two tower structures are registered with the Federal Communications Commission (FCC). The eight antennas may be located on a variety of structure types such as guyed towers, monopoles, silos, rooftops, or portable structures. Additionally, six of the eight antennas are located on the two of the communications towers in the Project Area; some towers host multiple antennas. A summary of the types of communication systems in the Project Area are listed in Table 8.6-1. Each of the communication system types are described in more detail below; land mobile towers (cell towers) are described in Section 8.6.6.

Table 8.6-1
Communication Towers and Antennas in the Project Area

Communication System Type		Number of Towers
Antenna[1]	Microwave	2
	Land Mobile	5
	CBRS (point-to-multi-point Citizen Band Radio Service)	1
Tower	Communication	2

[1] There are six antennas on the two tower locations in the Project Area; there are four unique tower and antenna locations. Some towers hold multiple antennas.

Source: Comsearch (Appendix G)

On November 10, 2020, Comsearch contacted the National Telecommunications and Information Administration (NTIA) in regard to the Repower Project. The NTIA provided plans to the federal agencies represented in the Interdepartment Radio Advisory Committee for the Repower Project. After a 45 plus day period of review, no federal agencies, including the U.S. Department of

Defense (DoD), identified any concerns regarding blockage of their radio frequency transmissions, or construction of turbines on this site. A copy of the letter from the NTIA is provided in Appendix D – Agency Correspondence.

Microwave Beam Paths

The Repower Project has undertaken an assessment of microwave beam pathways to ensure that the project does not interfere with microwave paths (Fresnel zones) that have been established for communications systems in the vicinity of the project. Xcel Energy commissioned a microwave beam path study from Capital Airspace Group. Capital Airspace Group identified 22 microwave beam paths associated with seven unique microwave links/signals in the Project Area (some paths contain multiple links/signals; Appendix G and Figure 10). Since the Project became operational in 2010, Minnesota Valley Television Improvement Corporation (MVTIC) and MNDOT have "developed" beam path signals (Fresnel zones) through the Project Area that are close to or intersect the rotor swept area of existing turbines. Therefore, Capital Airspace Group conducted three-dimensional analysis of the new beam paths relative to the existing and proposed RDs.

The MVTIC has two new signals in the Project Area: one between the Rushmore tower in the northwest portion of the Project Area northwest to the Chandler tower outside the Project Area, and one from the Rushmore tower southeast to Worthington. Three-dimensional analysis indicates that the Fresnel zone between the Rushmore and Chandler towers is currently immediately below the rotor-swept area of existing Turbines 1 and 3. Similarly, between the Rushmore tower and Worthington, the MVTIC Fresnel zone either currently intercepts or is immediately adjacent to the rotor-swept area of Turbines 24, 108, 117, and 131.

MNDOT also has signals between the Rushmore tower and Worthington. Three-dimensional analysis indicates the two signals are "stacked" one above the other and the Fresnel zone intercepts or is immediately adjacent to the rotor-swept area of Turbines 21, 24, 108, 131, and 133.

AM/FM Radio

Comsearch also provided a report on AM and FM Radio broadcast stations in the Project vicinity whose service could potentially be affected by the Project (Appendix G). The closest AM and FM stations to the Project is 5.2 km (3.2 mi) southeast of the Nobles Wind Farm (located on the same tower). There are no AM or FM Radio station towers in the Project Area. Xcel Energy has received no complaints of AM or FM radio interference in 10 years of operation.

8.6.4.1 Impacts

Microwave Beam Paths

Based on Capital Airspace Group's interference analysis, MVTIC and MNDOT have "developed" microwave signals since the Project became operational in 2010. Xcel Energy has not received any complaints of interference from any operators during the 10 years of project operation. Based on the three-dimensional analysis, it's clear that both companies considered signal reliability in their signals: both are generally on the periphery of the existing rotor-swept area and the MNDOT signal is intentionally "stacked" to increase signal reliability. On behalf of Xcel Energy, Capital

Airspace Group coordinated with both MVTIC and MNDOT on the Repower Project and the potential signal interruptions from longer rotors and a larger rotor-swept area. MNDOT confirmed the state agency developed the beam paths after the project became operational, and, because of this, including diversity links (stacked signals) as redundancy. MNDOT also indicated repowering with longer blades may cause some disruption to the signal, but signal degradation will not be severe enough to cause signal interference due to the diversity link redundancy. MVTIC is in the process of reviewing the Repower Project; similar to the MNDOT beam path, the longer rotors may cause signal disruption but are not anticipated to cause signal degradation.

AM/FM Radio

Turbines sited within three kilometers (1.9 miles) of an AM broadcast station can cause impacts to AM broadcast coverage. The closest AM station to the Repower Project is 5.2 kilometers (3.2 miles) from the closest turbine in the Project Area. Therefore, impacts to AM broadcast stations are not anticipated. The coverage of FM stations is generally not susceptible to interference caused by wind turbines. However, at distances less than 450 meters, radiation patter distortion can become a factor. The closest FM station to the Repower Wind Project is also 5.2 kilometers (3.2 miles); therefore, impacts to FM stations are not anticipated. Repowering the Project will not cause radio interference contrary to FCC regulations or other law.

In addition, Xcel Energy is not aware of any radio signal interference during the past 10 years of facility operation. A change in coverage of radio stations associated with wind turbine repowering is unlikely due to the nature of the repower changes, which do not increase radio interference.

8.6.4.2 Mitigative Measures

Because the Wind Farm has been operating for 10 years with no complaints, interference with communications systems is not expected. Should the addition of larger rotors trigger interference issues not previously experienced, Xcel Energy will work with those landowners to rectify the issue through the use of high-gain antennas, a low noise amplifier, a monetary contribution toward comparable satellite television services, or another mutually agreeable solution.

Microwave Beam Paths

Based on coordination with MNDOT and MVTIC, Xcel Energy does not anticipate impacts to microwave beam path signals as a result of the Repower Project. Both beam path owners developed the beam paths through the Project Area after the project became operational in 2010. While the signals may have minor disruption depending on the orientation of the turbine relative to the beam path, the disruption is not anticipated to cause signal degradation. Furthermore, MNDOT has implemented signal redundancy measures to mitigate any potential impacts and ensure microwave signals are not degraded. As discussed above, MVTIC is reviewing the Repower Project; Xcel Energy will work with MVTIC to address unanticipated impacts.

AM/FM Radio

Xcel Energy is not aware of any conflicts with AM/FM Radio transmission or reception caused by the Project's operation. Should issues arise as a result of repowering, Xcel Energy will work closely with area stations on potential mitigation options.

8.6.5 Television

Comsearch conducted an off-air television report that identified 157 off-air television stations within 150 kilometers (93.2 miles) of the Project Area (Appendix G). TV stations at a distance of 150 kilometers or less are the most likely to provide off-air coverage to the Project Area and neighboring communities. Of these 157 stations, only 107 are currently licensed and operating; the other 50 stations are either in construction or have applied for a construction permit. Of the 107 licensed and operating stations, 90 are low-power stations or translators. Translator stations are low-power stations that receive signals from distance broadcasters and retransmit the signal to a local audience. These stations serve local audiences and have limited range, which is a function of their transmit power and the height of their transmit antenna. The other 17 licensed and operating stations are digital television broadcast stations.

8.6.5.1 Impacts

The rotating blades of a wind turbine have the potential to disrupt over-the-air broadcast TV reception within a few miles of the turbine, especially when the direct path from the viewer's residence is obstructed by terrain. Based on the Comsearch analysis of licensed television stations within 150 kilometers of the Nobles Wind Farm Project Area, twelve full-power digital stations and four low-power digital stations currently serve the Project Area; these stations may experience reception disruptions related to the Project. The areas primarily affected by such a disruption would include the Project Area and extend to 10 kilometers beyond the Project Area; however, the full-power and low-power signals themselves have a broadcast range that extends from 5 to 122 kilometers beyond the Project Area.

The Comsearch TV Coverage Impact Study concluded that since the project is a repower of an existing wind project at the same tower locations with marginal height increases (up to 10 m), it is expected that the impact due to these changes will be minimal. Television reception at residences relying on cable or satellite television service will not be impacted by the Repower Project. Additionally, Xcel Energy has not had any complaints related to television interference in its 10 year operational history of the Project.

8.6.5.2 Mitigative Measures

If interference to a residence's or business's television service is reported to Xcel Energy, Xcel Energy will work with affected parties to determine the cause of interference and, when necessary, reestablish television reception and service.

Xcel Energy plans to address any post-construction television interference concerns on a case-by-case basis. If television interference is reported to Xcel Energy, Project representatives will:

- Log the contact in Xcel Energy's complaint database to track resolution efforts.
- Review results of the report to assess whether impacts are likely Project related.
- Meet with the landowner and a local communication technician to determine the current status of their television reception infrastructure.
- Discuss with the landowner the option of (1) installing a combination of high gain antenna and/or a low noise amplifier, or (2) entering into an agreement to provide a monetary contribution (equal to the cost of installing the recommended equipment) toward comparable satellite television services at the residence.
- At the landowner's election, Xcel Energy will either install the necessary equipment or enter into an agreement to reimburse the landowner for the cost of comparable satellite television services.
- If the landowner chooses satellite service, Xcel Energy will consider the matter closed upon installation of the satellite dish.
- If the landowner chooses to have the antenna and/or amplifier installed and later complains of continued interference issues, Xcel Energy will send a technician to the site to assess whether the equipment is working properly and fix the equipment as needed and evaluate the reported interference issues.
- If Project-related interference remains an issue, Xcel Energy will propose an agreement that reimburses the landowner for the costs of comparable satellite television services and will remove the antenna and amplifier equipment, unless it was initially installed to serve multiple households.
- If Xcel Energy and the landowner are unable to reach an agreement to resolve interference-related issues, Xcel Energy will report the concern as an unresolved complaint and follow the Commission's dispute resolution process to resolve the matter.

8.6.6 Cell Towers and Broadband Interference

As noted in the Land Mobile and Emergency Services and Mobile Phone Carrier reports (Appendix G), cellular services in the Project Area are provided by many carriers including AT&T, DISH network, Sprint, Standing Rock Telecommunications, TerreStar, T-Mobile, and Verizon. Similarly, as described in Section 8.6.4 (Communication Systems) there are five land mobile antennas in the Project Area (these five antennas occur on two unique towers; some towers host multiple antennae). Additionally, Comsearch conducted a specific study on land mobile and emergency services for the Project Area (Appendix G). The study identified the same five land mobile antennas in the Project Area as the Communication Tower Study.

Minnesota is prioritizing border-to-border high-speed internet access throughout the state. The Border to Border Broadband Development Grant Program was created in Minn. Stat. § 116J.395 in 2014. The legislative focus of this grant program is to provide state resources that help make the financial case for new and existing providers to invest in building broadband infrastructure to

unserved and underserved areas of the state. Based on data from the Minnesota Department of Employment and Economic Development (MN DEED), the majority of the Project Area is identified as an Unserved Area (no wireline broadband of at least 25 megabytes per second (Mbps) download and 3 Mbps upload [25M/3M]). A small portion of the Project Area near Reading is identified as Underserved Area (wireline broadband of at least 25M/3M but less than 100M/20M) (MN DEED, 2020).

8.6.6.1 Impacts

Xcel Energy does not anticipate any impacts to cellular services as a result of the Repowering Project. Each of the cellular-provider networks in the Project Area is designed to operate reliably in a non-line-of-sight environment. Many land mobile systems are designed with multiple base transmitter stations covering a large geographic area with overlap between adjacent transmitter sites in order to provide handoff between cells. Therefore, any line-of-sight signal blockage caused by placement of the proposed wind turbines would not materially degrade the reception because the end user is likely receiving signals from multiple transmitter locations.

Xcel Energy also does not anticipate any impacts to land mobile communication systems. Per FCC interference emissions from electrical devices in the land mobile frequency bands, turbines within 77.5 m of land mobile fixed-base stations can cause impacts. The closest turbine to a land mobile tower/antenna is over 800 meters, well beyond the recommended FCC interference setback.

Based on data from the MN DEED, the Project Area is considered an Unserved Area for broadband. As such, impacts to broadband service are not likely or anticipated. Additionally, Xcel Energy is unaware of potential interference or disruptions to broadband service that could be caused by operation of wind turbines.

Xcel Energy is not aware of complaints regarding telephone, internet, or cellular phone service during the past 10 years of project operation.

8.6.6.2 Mitigative Measures

If cell tower signal or broadband interference is identified during or after construction of the Project, Xcel Energy will address the interference on a case-by-case basis. Xcel Energy does not propose mitigative measures at this time.

8.7 CULTURAL AND ARCHAEOLOGICAL RESOURCES

On behalf of Xcel Energy, Merjent, Inc. (Merjent) conducted background research on known cultural resources in November 2020 by requesting information from the Minnesota Office of the State Archaeologist (OSA) and the SHPO. Data regarding known cultural resources information resulting from previous professional cultural resources surveys and reported archaeological sites and historic architectural resources was received from the agencies and reviewed. In addition, the Phase Ia background literature review and the Phase I archaeological survey reports prepared for the Nobles Wind Farm in 2009 and 2010 were reviewed (Basting and Rand, 2009; Wilcox, 2009a, 2009b; Doperalski, 2010). In addition to the background research, Merjent also reviewed information from 19th century General Land Office maps and notes on file with the Bureau of

Land Management (BLM, 2020) and aerial photographs from 1938 and 1954 file with the Minnesota OSA.

The background literature review identified archaeological and historic architectural resources within one mile of the Project Area. This information was used to understand the types of archaeological sites that may be encountered and landforms or geographic features that have a higher potential for containing significant cultural resources. A copy of the background literature review, including a cultural and historic overview of the Project Area, is provided in Appendix H.

8.7.1 Previous Investigations

The Phase Ia literature review for the Project identified six previous reports of archaeological inventories or evaluations within the Project Area. Four of the reports provide the results of the Phase Ia background literature review and the Phase I archaeological inventory conducted for the Nobles Wind Farm in 2009 and 2010 (Basting and Rand, 2009; Wilcox, 2009a, 2009b; Doperalski, 2010). The remaining two reports provide the results of an archaeological survey of Nobles, Pipestone, and Rock Counties conducted in 1980 (Gibbon, 1980) and a Phase I archaeological inventory of the Community Wind South LWECS Project conducted in 2012 (Blondo, 2012).

8.7.2 Previously Recorded Archaeological and Historic Architectural Resources

Table 8.7-1 summarizes previously recorded archaeological sites and historic architectural resources that were identified within the Project Area or within one mile of the Project Area. Information regarding National Register of Historic Places (NRHP) eligibility of the previously recorded sites was also reviewed. These resources are displayed on Figure 11 (Rare and Unique Features).

Table 8.7-1
Previously Recorded Cultural Resources within the Project Area and within 1-mile Buffer

Resource Type	Project Area	1-mile Buffer
Archaeological Sites	15	5
Total Listed in or Eligible for Listing in NRHP[1]	0	0
Historic Architectural Resources	41	33
Total Listed in or Eligible for Listing in NRHP[1]	0	1
Total Previously Recorded Cultural Resources	**56**	**38**
Total Listed in or Eligible for Listing in NRHP[1]	**0**	**1**

[1] The number of NRHP-eligible resources shown is a subset of the total number of archaeological sites or historic architectural resources in each category.

Fifteen previously recorded archaeological sites were identified within the Project Area. Of the 15 previously recorded sites, two are Precontact artifact scatters, five are Precontact lithic scatters, seven are Precontact isolated finds, and one is a Euro-American artifact scatter. Ten of the previously recorded archaeological sites within the Project Area have been evaluated for listing in the NRHP and determined to be not eligible for listing. The remaining five previously recorded archaeological sites have not been evaluated for listing in the NRHP.

The Phase Ia identified five previously recorded archaeological sites within one mile of the Project Area. Of the five previously recorded archaeological sites within the one-mile buffer of the Project Area, three are precontact lithic scatters and two are site leads (one precontact and one Euro-American). None of the previously recorded archaeological sites within one mile of the Project Area have been evaluated for listing in the NRHP.

A total of 41 previously recorded historic architectural resources were identified within the Project Area. These historic architectural resources are all farmsteads. None of these previously recorded historic architectural resources have been evaluated for listing in the NRHP.

A total of 33 previously recorded historic architectural resources were identified within one mile of the Project Area. These resources consist of four bridges, 27 farmsteads, the Larkin Township Hall, and the Lismore Water Tower. Of the previously recorded historic architectural resources, 32 have not been evaluated for listing in the NRHP. The Lismore Water Tower is considered eligible for listing in the NRHP; however, the water tower is not listed in the NRHP.

The Phase Ia review also identified a segment of the Chicago, Rock Island and Pacific Railroad grade (Larking Township segment). However, location information for the former railroad was not included in the records reviewed and the exact location of this resource is not known. For this reason, the railroad grade is not included in Table 8.7-1.

8.7.3 Agency and Tribal Coordination

As part of public outreach for the Project, Xcel Energy sent project introduction letters to the Minnesota SHPO, the Minnesota OSA, and twelve Native American Tribes with known interest in the Project Area. Xcel Energy received a response from the Director of Cultural Resources for the Shakopee Mdewakanton Sioux Community stating that they have no concerns with the Project. In a letter dated December 11, 2020 the Minnesota SHPO responded to Xcel Energy's project introduction letter and recommended that a Phase Ia literature review be conducted for the Project, and a Phase I archaeological survey be conducted if the results of the literature review indicate potential for architectural and archaeological resources to be present within the Project Area. To date, no additional responses have been received.

8.7.4 Impacts

Construction of the Project has the potential to affect archaeological and historic architectural resources within the Project Area. However, as noted in Table 8.7-1, ten of the previously recorded archaeological sites within the Project Area have been determined to be not eligible for listing in the NRHP and the remaining five have not been evaluated for listing; none of the 41 previously recorded historic architectural resources have been evaluated for listing in the NRHP. Many of the previously recorded archaeological and historic architectural resources within the Project Area were recorded in 2009 and 2010 as part of the original cultural resources investigations for the Nobles Wind Farm; therefore, these resources were considered and avoided to the extent practicable during the original design of the wind farm.

Temporary construction workspaces for the Project (i.e., workspaces at turbine pads, crane paths, staging areas, and widened access roads) are sited away from existing structures and would not

affect previously recorded historic architectural resources. Workspaces may affect previously recorded archaeological sites, but as none of the sites are listed in or determined eligible for listing in the NRHP avoidance of these previously recorded archaeological sites is not required. Also, because temporary construction workspaces for the Project are located in areas currently used for agricultural production, any disturbance to previously recorded sites during construction of the Project would be similar to current land uses.

8.7.5 Mitigative Measures

During Spring/Summer 2021 and in consideration of previous investigations within the Project Area, literature search results, and future coordination with SHPO, Merjent will conduct field surveys in areas of planned disturbance that have not previously been surveyed, including the V136 turbine location. The Phase 1 field survey will meet the standards established in the SHPO Manual for Archaeological Projects in Minnesota. This investigation will be conducted by a professional archaeologist meeting the Secretary of the Interior's Standards for Archaeology as published in Title 36 Code of Federal Regulations Part 6. The survey protocol and report will be coordinated with and approved by SHPO. If archaeological or historic architectural resources are identified as a result of field surveys, Xcel Energy will work with SHPO to identify measures to avoid or mitigate any effects to these resources. Additionally, Xcel Energy will reconfigure the placement of construction workspaces to avoid impacts to newly identified archaeological and historic architectural resources that are eligible for listing in the NRHP. Avoidance of resources may include minor adjustments to the Project design and designation of environmentally sensitive areas to be left undisturbed during construction.

If archaeological resources are discovered during construction, ground disturbing activity would be halted in that location, the SHPO would be notified, and measures will be developed in conjunction with SHPO to assess and protect the resource. Additionally, if unanticipated human remains are discovered during construction, they will be reported to the State Archaeologist per Minn. Stat. § 307.08 and construction will cease in that area until adequate mitigation measures have been developed between Xcel Energy and the State Archaeologist.

8.8 RECREATION

Recreational opportunities near the Project Area include hiking, fishing, snowmobiling, hunting, camping, golfing, and nature viewing. Figure 6 depicts the locations of WMAs, WPAs, Scientific and Natural Areas (SNAs), state-managed game refuges, golf courses, and snowmobile trails within 10 miles of the Project Area.

Minnesota WMAs are managed to provide wildlife habitat, improve wildlife production, and provide public hunting and trapping opportunities. These MNDNR lands were acquired and developed primarily with hunting license fees. WMAs are closed to all-terrain vehicles and horses because of potential detrimental effects on wildlife habitat. One WMA (Bluebird Prairie) is located within the Project Area, one is directly adjacent to the western edge of the Project Area (Van Drie Ridge), and one WMA (Herlein-Boote) is located 0.4 mile east of the eastern edge of the Project Area. There are 25 additional WMAs within 10 miles of the Project Area, as shown in Table 8.8-1, most of which are northeast or southeast of the Project Area.

Table 8.8-1
Wildlife Management Areas within Ten Miles of the Project Area

Distance from Project Area Boundary (miles)	WMA Name	General Location Relative to Project Area	WMA Area (acres)
Within	Bluebird Prairie WMA	Within	77.5
Adjacent	Van Drie Ridge WMA	Adjacent (West)	83.9
0.4	Herlein-Boote WMA	East	561.1
2.0	Lambert Prairie WMA (multiple parcels)	Southeast	85.9
2.0	Groth WMA (multiple parcels)	North	171.2
3.2	Dewald WMA	South	16.3
3.6	Einck WMA	North	49.7
4.6	Stable Banks WMA	Northeast	45.4
4.8	Swessinger WMA	North	713.1
5.0	Ransom Ridge WMA	South	82.2
5.8	Windy Acres WMA	Northwest	159.9
6.5	Fenmont WMA	North	516.7
6.5	Pheasant Run WMA	Northeast	30.9
6.6	Lone Tree WMA (multiple parcels)	Northeast	482.5
7.1	Champepedan WMA	Northwest	81.3
7.2	Scheuring WMA (multiple parcels)	North	58.0
7.3	County Line WMA (multiple parcels)	North	322.8
8.0	Cleanwater WMA	North	37.8
8.1	Peterson WMA (multiple parcels)	Southeast	308.1
8.5	John Erickson WMA	Southeast	121.2
8.7	James Willey WMA	Southeast	138.1
8.7	Bigelow WMA	Southeast	82.3
8.7	Lambert Heikes WMA	Southwest	31.2
8.8	Sherwood WMA	Southwest	82.4
9.1	Lake Bella WMA: North West Unit	Southeast	148.1
9.4	Wachter WMA (multiple parcels)	Southeast	197.0
9.6	Schoeberl WMA	North	149.7
9.8	Fulda WMA	Northeast	157.1

WPAs are managed by USFWS to protect breeding, forage, shelter, and migratory habitat for waterfowl or wading birds, such as ducks, geese, herons, and egrets. WPAs provide opportunities for viewing wildlife and intact ecosystems. There are no WPAs within the Project Area and five

WPAs located within 10 miles of the Project boundary, as shown in Table 8.8-2 below and Figure 6 – Public Land Ownership and Recreation.

Table 8.8-2
Waterfowl Production Areas within Ten Miles of the Project Area

Distance from Project Area Boundary (miles)	WPA Name	General Location Relative to the Project Area	WPA Area (acres)
4.4	Bloom	North	159.6
7.8	Worthington	Southeast	42.7
9.1	Jack Creek	Northeast	123.0
9.5	Graham Lake	Northeast	163.5
9.7	Lake Bella	Southeast	36.7

SNAs are areas designated to protect rare and endangered species habitat, unique plant communities, and significant geologic features that possess exceptional scientific or educational values. There are no SNAs within the Project Area and one SNA located within 10 miles of the Project Area,. The Compass Prairie SNA is, located approximately 4.3 miles south of the Project Area (Figure 6 – Public Land Ownership and Recreation).

One state-managed game refuge, Lake Ocheda Game Refuge, is located 9.2 miles southeast of the Project boundary. This refuge is open to small game hunting, trapping, and goose and deer hunting, with restrictions.

A section of the Nobles County Snowmobile Trail (Frosty Riders Snowmobile Trail Number 179) runs parallel to and bisects a small portion of the eastern side of the Project Area. The trail follows the east side of McCall Avenue for approximately 2 miles before it enters the Project Area for about 0.8 mile before continuing north into the Town of Reading. It then runs northwest out of Reading and back into the Project Area through agricultural fields for approximately 3.3 miles until it reaches the north side of 180th Street and continues to run north, away from the Project Area.

There are no National Wildlife Refuges, AMAs, Designated Wildlife Lakes, state parks, state trails, or state water trails within 10 miles of the Project Boundary.

8.8.1 Impacts

Repowering will avoid direct impacts to recreational resources. Xcel Energy has designed the temporary construction workspaces to avoid the Bluebird Prairie WMA and Nobles County Snowmobile Trails; no crane paths or construction workspace will intersect these resources. The longer blades will result in an increase in height of up to 10 meters or about 33 feet for 133 turbines; the V136 turbine will be approximately 30 meters or 100 feet taller than the existing GE turbines. Potential visual impacts to recreational resources within and around the Repower Project Area related to adding larger rotors to the turbines will be minimal and are discussed further in Section 8.5.2.

8.8.2 Mitigative Measures

No direct impacts to recreational resources are anticipated as a result of repowering the project, and therefore no mitigation is proposed.

8.9 PUBLIC HEALTH AND SAFETY

8.9.1 Electromagnetic Fields and Stray Voltage

Electromagnetic fields (EMF(s)) arise from the movement of an electrical charge on a conductor such as transmission lines, power collection (feeder) lines, substation transformers, house wiring, and electrical appliances (NIEHS, 2002). The intensity of the electric portion of EMF is related to the potential, or voltage, of the charge on a conductor, and the intensity of the magnetic portion of the EMF is related to the flow of charge, or current, through a conductor. EMF is commonly associated with power lines, but they occur only at close range because the magnetic field rapidly dissipates as the distance from the line increases (EPA, 2020a).

8.9.1.1 Impacts

The National Institute of Environmental Health Sciences has conducted extensive research on EMF (NIEHS, 1999). While there is no conclusive research evidence that EMFs from power lines and wind turbines pose a significant health impact, the turbines were originally installed beyond the minimum allowable distances from occupied residences (1,000-foot minimum setback), where EMF is expected to be at background levels unrelated to wind project proximity. EMFs from underground electrical collection and feeder lines dissipate very quickly and relatively close to the source because they are installed below ground to a depth of approximately 48 inches and are heavily insulated and shielded. Consequently, the electrical fields that emanate from buried lines and transformers are generally considered negligible, and magnetic fields often decrease significantly within approximately three feet of stronger EMF sources (such as transmission lines and transformers) (NIEHS, 2002). No changes to the Xcel Energy electrical system will occur except limited conductor size increases, testing of the system, and repairs to any deficient conductors. Consequently, no significant increase in EMF impact is expected from the repowering or operation of the project. Xcel Energy is not aware of any complaints or claims of impact from EMFs since the project became operational.

8.9.1.2 Mitigative Measures

Based upon current research regarding EMFs and the separation distances being maintained between transformers, turbines and collector lines from public access and occupied homes, EMFs associated with the Repower Project are not expected to have an impact on public health and safety. Because no changes to the electrical system with the repowering that could increase EMF are expected, no significant mitigations related to EMF are planned. Xcel Energy is committed to inspecting and maintaining the electrical infrastructure. Xcel Energy is committed to installing facilities in a manner that minimizes the potential for EMFs.

8.9.2 Air Traffic

There is one public airport within 10 miles of the Project Area: the Worthington Municipal Airport located 6.3 miles east of the Repower Project (AirNav, 2020). This airport has two asphalt runways, one oriented north-south, the other oriented southeast-northwest.

In addition to air traffic to and from Worthington Municipal Airport, air traffic may also be present near the Project Area for crop dusting of agricultural fields. Crop dusting is typically carried out during the day by highly maneuverable airplanes or helicopters.

The Tyler Common Air Surveillance Radar (Tyler Radar facility) is located in Lincoln County, Minnesota. The DoD operates the Tyler Radar facility. The proposed Project is within line of sight of this facility.

8.9.2.1 Impacts

The closest public airport to the proposed Project is located approximately 6.3 miles from the Project Area and outside the six-mile buffer from public use airports. Existing turbines to be repowered and the V136 turbine have been sited to avoid any impacts to restricted airspace.

The installation of wind turbine towers in active croplands will create a potential for collisions with crop-dusting aircraft. However, the turbines would be visible from a distance. Xcel Energy will notify local airports about the Project including location of the new turbine and potential ADLS towers in the area to minimize impacts and reduce potential risks to crop dusters.

The DoD has identified wind turbines located within line of sight of the Tyler Radar facility as a potential cause of "over saturation" of the radar system, which has the potential to interfere with the radar's performance.

8.9.2.2 Mitigative Measures

Xcel Energy will coordinate with the Worthington Municipal Airport, the FAA, and MNDOT prior to construction to understand potential impacts. Xcel Energy submitted 7460-1 forms to initiate the FAA review of the Repower Project. The FAA will review the repower turbines and issue a "Determination of No Hazard." Further, Xcel Energy will appropriately mark and light the turbines to comply with FAA requirements and, as mentioned in Section 8.5.1, Xcel Energy is coordinating with the FAA on implementing an ADLS. Xcel Energy will notify local airports about the Project to reduce the risk to crop dusters and Xcel Energy will coordinate with landowners within and adjacent to the Project regarding crop-dusting activities. A potential impact to the operation of the Tyler Radar facility has been identified by the DoD. Xcel Energy is working with the DoD on a mitigation and voluntary contribution agreement for the Tyler radar facility.

8.10 HAZARDOUS MATERIALS

The land within the Project Area is primarily rural and used for agriculture. Potential hazardous materials within the Project Area are associated with agricultural activities, and include petroleum products (fuel and lubricants), pesticides, and herbicides. Older farmsteads may also have lead-

based paint, asbestos shingles, and polychlorinated biphenyls in transformers. Trash and farm equipment dumps are common in rural settings.

Xcel Energy reviewed the U.S. Environmental Protection Agency's (EPA) Facility Registry Service (FRS) to identify sites that are listed on the Comprehensive Environmental Response, Compensation, and Liability Information System (also known as Superfund sites); Resource Conservation and Recovery Act (RCRA) Treatment, Storage, and Disposal; RCRA hazardous waste generators; the Assessment, Cleanup, and Redevelopment Exchange System; Minnesota Permitting, Compliance, and Enforcement Information Management System; and the Leaking Underground Storage Tank—American Recovery and Reinvestment Act database (EPA, 2020b). Xcel Energy also reviewed the MPCA's *What's in my Neighborhood* (WIMN) database to identify any potential contaminated sites in the Project Area (MPCA, 2020a).

Review of the FRS and WIMN databases identified 52 licensed feedlots (5 of which are inactive), two aboveground storage tanks, one underground storage tank, one licensed septic installer, one hazardous waste, minimal quantity generator site (the existing Nobles Wind Farm), and one solid waste landfill site (Nobles County Sanitary Landfill) in the Project Area. A number of inactive sites were also noted including one inactive environmental review, three inactive construction stormwater permits, and one inactive industrial stormwater permit. No Superfund sites were identified within the Project Area.

In addition to the research described above, an ASTM-conforming Phase I Environmental Site Assessment (Phase I ESA) will be conducted for all parcels the Project Area that require a new lease agreement; parcels already under lease agreements for the Project that are receiving a lease extension will not be included in the Phase I ESA. The Phase I ESA will identify known recognized environmental conditions or historical recognized environmental conditions that may require additional action prior to or during construction.

8.10.1 Impacts

Construction of the Project will not impact known contaminated sites. Xcel Energy has designed the Project to avoid known contaminated sites within the Project Area. None of the existing turbines are located within the Nobles County Sanitary Landfill site and no crane paths would cross this area. Xcel Energy also will conduct a Phase I ESA of all newly leased parcels prior to construction to locate any additional contaminated sites in the Project Area that require avoidance.

Spill-related impacts from construction are primarily associated with fuel storage, equipment refueling, and equipment maintenance. To avoid spill-related impacts during construction, Xcel Energy will develop a Spill Prevention, Control, and Countermeasures Plan that will outline measures to be implemented to prevent accidental releases of fuels and other hazardous substances and describe the required response, containment, and cleanup procedures to be used in the event of a spill.

During operation of the Project, three types of petroleum-product fluids will be used for turbine operation:

- Gear box oil – synthetic or mineral depending on application (approximately 300 liters)
- Hydraulic fluid
- Gear grease

Turbine hydraulic oils and lubricants will be contained within the wind turbine nacelle, or in the case of car, truck, and equipment fuel and lubricants, within the vehicle. Transformer oil will be contained within the transformer. Fluids will be monitored during maintenance at each turbine and transformer. A small amount of hydraulic oil, lube oil, grease, and cleaning solvent will be stored in the O&M facility. When fluids are replaced, the waste products will be handled according to regulations and disposed of through an approved waste disposal firm in compliance with the requirements of applicable laws and regulations.

8.10.2 Mitigative Measures

Because any potentially hazardous waste sites identified through online research or the Phase I ESA of the Project Area will be avoided, no mitigative measures are necessary. If any wastes, fluids, or pollutants are generated during any phase of construction or operation of the Project, they will be handled, processed, treated, stored, and disposed of in accordance with Minn. R. Ch. 7045.

8.11 LAND-BASED ECONOMIES

8.11.1 Agriculture/Farming

The majority of land use in the Project Area is cultivated crop land (approximately 20,673.1 acres or 86.5 percent), as shown in Figure 12 (Land Cover) and discussed in Section 8.19. Pasture/hay lands comprise approximately 317.7 acres (1.3 percent) of the Project Area. As shown in Table 8.15-1 and discussed further in Section 8.15, 89.6 percent of the soils in the Project Area are classified as prime farmland, including those soils identified as prime farmland if the limiting factor is mitigated.

According to the USDA's 2017 Census of Agriculture, the average farm size in Nobles County is 468 acres, and is generally larger than the average size of all Minnesota farms, 371 acres. Livestock sales account for a larger percentage of total market value of agricultural products compared to crop sales in Nobles County ($313 million vs. $206 million, annually). Hogs and pigs, cattle, and sheep and lambs are the dominant livestock raised and corn, soybeans, and wheat for grain are the dominant agricultural crops by acreage in Nobles County.

Specialty crops typically include nurseries, vineyards, orchards, citrus groves, dairies, aquaculture, and tree farms; to date, no farmland engaged in specialty crop production has been identified in the Project Area. Xcel Energy will continue to work with individual landowners through the easement process to identify any specialty crops or livestock operations that may be impacted by the Project. If any specialty crops or livestock operations are identified, Xcel Energy will work with landowners to determine measures to avoid and minimize impacts to these resources.

As discussed in Section 8.3, Conservation Easements, there are no CRP or CREP easements within the Project Area (*see* also Figure 6 – Public Land Ownership and Recreation).

8.11.1.1 Impacts

Construction of the Project could cause minimal, temporary impacts to farmland from soil compaction and rutting, accelerated soil erosion, crop damage, temporary disruption to normal farming activities, drain tile damage, and introduction of noxious weeds to the soil surface. Because this is a repowering project, impacts to agricultural land will be limited to workspaces around turbine pads, crane paths, staging areas, and access road widening. However, these impacts would be temporary and would resolve with the completion of the repower work. Furthermore, as discussed in Section 6.4, Xcel Energy will use construction matting along the crane paths to minimize compaction and potential impacts to drain tile. Tracked vehicles, similar to a bobcat or skid steer, will move with the crane continually placing matting as the crane moves forward. Additionally, Xcel Energy and the construction contractor, with input from landowners, have designed crane paths to maximize routing along existing access roads to turbines, field edges and parcel lines.

Operation of the repowered wind farm would not impact agricultural production; with the exception of the V136 turbine, no new turbines or other permanent facilities are proposed. The V136 turbine would be constructed adjacent to the existing turbine pad for T47. In addition, the access road to the V136 turbine would require a new short segment of access road from the existing access road to T47. In total, the turbine pad and access road for the V136 turbine would result in less than 0.1 acre of new permanent impact on agricultural land. Xcel Energy will fully decommission the GE 1.5 sle T47, removing the turbine pad (approximately .05 acre), which will allow use of this area for agricultural production.

As demonstrated by other wind energy projects in the Midwest, agricultural practices continue during construction. After construction, continued operation of the wind farm would not impact agricultural production in the Project Area.

8.11.1.2 Mitigative Measures

Construction of the Repower Project would result in short term, minimal impacts to agricultural production within the Project Area. The use of temporary workspaces around turbine pads, crane paths, staging area, and access roads is not expected to significantly impact agricultural production. After the repower work is completed, Xcel Energy will restore disturbed areas as close as practicable to their original condition. Post-construction restoration methods may vary depending upon the vegetation (or lack thereof) and the soil types at each location.

Construction equipment used in the erection of wind turbine components is designed with wide tires and tracks to distribute the weight over a larger area, providing stability and reducing soil compaction. In addition, Xcel Energy plans to use timber matting along crane paths to further minimize the potential for soil compaction and impacts on existing drain tile systems. After the repowering work is complete, Xcel Energy will assess disturbed areas to determine whether corrective action (e.g., tilling or other decompaction methods) is needed. The temporary workspaces around turbine pads, areas where access roads are widened, and staging areas typically experience a higher volume of construction vehicle traffic and will likely require de-compacting before being returned to agricultural use.

Xcel Energy will coordinate with property owners to identify features on their property, including drain tile to avoid impacting these features. While avoidance of drain tile is planned, Xcel Energy recognizes that excavation and heavy equipment operation during construction has the potential to cause damage to known or unknown drain tiles. In the event that there is damage to drain tile as a result of construction activities or operation of the Project, Xcel Energy will work with affected property owners to repair the damaged drain tile in accordance with the lease agreements between Xcel Energy and the landowner.

As discussed in Section 8.3.1, if CRP, CREP, or additional RIM easements are identified during the title search or in consultation with the BWSR, and impacts to such conservation easements are unavoidable, Xcel Energy will work with easement holders to obtain all necessary consents to construct and operate the Project.

8.11.2 Forestry

Economically important forestry resources are not found in this region of Minnesota. Forested areas are primarily associated with homes in the form of woodlots, shelterbelts, and along the margin of waterbodies within the Project Area.

8.11.2.1 Impacts

No impacts to forestry resources would occur from construction or operation of the Project.

8.11.2.2 Mitigative Measures

No impacts to forestry resources would occur; therefore, no mitigation will be necessary.

8.11.3 Mining

Mining does not comprise a major industry in Nobles County. Many of the gravel operations found in Nobles County are inactive, abandoned, or their use is limited to the landowner. Because land uses can change over time, and keeping up with these changes can be challenging, Xcel Energy reviewed MNDOT's Aggregate Source Information System data (MNDOT, 2018), the Nobles County Pit Map (MNDOT, 2003), and several years of aerial photography to identify mining operations in the Project Area.

While the Nobles County Pit Map (2003) shows two active gravel mines and one inactive gravel mine within the Project Area, and the ASIS data (2018) shows four gravel mines with the same portion of the Project Area, review of aerial photography dating from 1991 to 2020 indicates that one of the gravel mines (ID 53049) is the site of the Nobles County Sanitary Landfill (refer to section 8.10; EPA, 2020b) and the remaining gravel mines are now cultivated cropland (see Figure 14 –Geology).

8.11.3.1 Impacts

Xcel Energy has designed the temporary crane paths, workspaces at turbine pads, and new V136 turbine to avoid mining resources; therefore, no impacts to mining resources or operations are anticipated as a result of the Project.

8.11.3.2 Mitigative Measures

No impacts to mining resources would occur and, as such, no mitigation will be necessary.

8.12 TOURISM

Tourism in the vicinity of the Project centers around various festivals and activities hosted by the cities near the Project Area, such as Worthington, and outdoor recreational opportunities described in Section 8.8.

The Nobles County Fair is held at the Nobles County Fairgrounds in Worthington each year during the month of August. Fair activities include a carnival, grandstand events, and 4-H craft and livestock competitions (Worthington Chamber of Commerce, 2020). Other festivals hosted by the City of Worthington during the summer months include International Festival and the Windsurfing Regatta and Music Festival.

The City of Worthington also hosts King Turkey Day in September (Worthington Chamber of Commerce, 2020). The celebration includes a pancake breakfast, a live turkey racing event, a parade, a carnival, and a 10k race. In January, Worthington hosts Winterfest, which includes the Southwest Minnesota Fishing Club's Ice Fishing Tournament, a Deep Freeze Dip, a chili cookoff, puzzle tournament, broomball, and pond hockey. Proceeds from the Deep Freeze Dip and the chili cookoff benefit local charities.

Pioneer Village, Minnesota's largest historic village, is adjacent to the Nobles County Fairgrounds in Worthington and is open to visitors from Memorial Day through Labor Day each year (Worthington Chamber of Commerce, 2020; Nobles County Historical Society, n.d.). The village includes 40 restored buildings including a rail depot, blacksmith shop, a saloon, and a museum of vintage farming equipment. Public tours are also available by reservation.

Outside of municipal events, residents and tourists enjoy recreational opportunities at the WPAs, SNAs, WMAs, and snowmobile trails in Nobles County. See Section 8.8 for more details on public recreation opportunities in the Project Area.

8.12.1 Impacts

Construction of the Project will have a minimal impact on tourism opportunities in the Project vicinity. Construction impacts would mostly be related to increased traffic due to construction activities that may be perceptible to persons traveling through the Project Area to visit tourist destinations in Worthington or nearby recreation lands. These impacts will be minimal, temporary, and isolated to specific areas throughout the Project Area.

8.12.2 Mitigative Measures

The Project is not expected to impact tourism opportunities in the Project vicinity; therefore, no mitigation measures are proposed.

8.13 LOCAL ECONOMIES AND COMMUNITY BENEFITS

Socioeconomic information is provided at the county level to characterize the socioeconomic conditions in the Project Area and at the state level for the purpose of comparison. Table 8.13-1 summarizes the existing socioeconomic conditions in the Project Area.

Table 8.13-1
Existing Economic Conditions in the Project Area

	Per Capita Income Level (U.S. dollars)	Unemployment Rate (%)	Persons Living Below the Poverty Level (%)	Top 3 Industries[1]
Minnesota	36,245	3.9	10.1	E (25.2%), M (13.4%), R (11.0%)
Nobles County	25,554	5.1	14.3	M (28.3%), E (18.7%), R (11.7%)

Source: U.S. Census Bureau, 2018c

[1] Industries are defined under the 2012 North American Industry Classification System and abbreviated as follows: E = Educational, Health and Social Services; M = Manufacturing; R = Retail Trade.

The top three industries of employment in the State of Minnesota are "education, health, and social services" at 25.0 percent, "manufacturing" at 13.5 percent, and "retail trade" at 11.1 percent. The top three industries of employment in Nobles County vary slightly from the state level, with "manufacturing" playing a larger role than "education, health, and social services" in this area of southwestern Minnesota (U.S. Census Bureau, 2018c).

Per capita income in Nobles is about $10,000 less than per capita income at the state level, which is $36,245 (see Table 8.13-1). The unemployment rate in Nobles County, 5.1 percent, is higher than the state level and the percentage of persons living below the poverty level in Nobles County is three percentage points higher than the state level of 10.1 percent.

8.13.1 Impacts

The overall impact of the Project on the local economy and communities of Nobles County will be positive in both the short term and long term. Community benefits associated with the Project closely correspond with the stated economic development goals of the county comprehensive plan. Repowering of the existing wind farm supports diversification of economic development in the agricultural sector and promotes efforts to attract additional employment opportunities and tax revenues while retaining and growing the existing business base. Repowering is expected to extend life of the Nobles Wind Farm, thereby extending the economic benefits for an additional seven years beyond the term of the current easement agreements.

Because most of the land within the Project Area is used for agricultural production, Xcel Energy anticipates that some land will be temporarily removed from agricultural production for less than a year while the repowering work is completed. Landowners will be compensated for crop loss under the terms of their landowner agreements. Participating landowners will also benefit

economically from continued long-term lease payments for the anticipated life of the repower Project.

Approximately 150 construction personnel will be required for the construction phase of the Project. Xcel Energy and its construction contractor will use union labor for construction of the Repower Project. Total wages and salaries paid to construction personnel in Nobles County will contribute positively to the total personal income of the region. Additional personal income will be generated for residents in the county and state by circulation and recirculation of dollars paid out by the Applicant for business expenditures and for state and local taxes. Expenditures made for equipment, fuel, operating supplies, construction personnel lodging, and other products and services benefit businesses in the counties and the state.

Operations and maintenance of the existing Nobles Wind Farm currently requires 11 full-time site staff. After repowering of the turbines is complete, Xcel Energy anticipates that the same number of staff will be required to operate and maintain the facility; no additional permanent full-time staff will be required.

Long-term beneficial impacts to the tax base of Nobles County, as a result of the construction and operation of the Project, will have an additional positive impact on the local economy in this area of Minnesota. In addition to the creation of jobs and personal income, Nobles Wind Farm pays a Wind Energy Production Tax to the local units of government of $0.0012 per kilowatt hour of electricity produced, resulting in annual Wind Energy Production tax revenue from approximately $1 million annually, and approximately $25 million over the anticipated life of the Project.

8.13.2 Mitigative Measures

Socioeconomic impacts associated with the Project will be positive with an influx of wages and expenditures made at local businesses during Project construction and continued operation of the wind farm for an additional 25 years from site permit amendment order will contribute to the county tax base. Because the impacts of the Project would be primarily positive, no mitigation measures are proposed.

8.14 TOPOGRAPHY

The Project is located in the Coteau Moraines subsection of the MNDNR's Ecological Classification System (MNDNR, 2000). Subsection boundaries delineate a significant regional change in geology, topography, and vegetation. The Coteau Moraines subsection consists of a high glacial landform occupying portions of southwestern Minnesota and extending into southeastern South Dakota and northwestern Iowa. The highest elevation is at Buffalo Ridge in northern Pipestone County, situated 1,995 feet above sea level. The maximum elevation is the result of thick deposits of pre-Wisconsin-age till which can range to upwards of 800 feet in thickness.

In the Project Area, elevations range from 1,572 to 1,757 feet (479 to 536 meters) above sea level. This elevation change is gradual; there are not areas of significant elevation change in the Project Area. A topographic map of the Project Area is shown in Figure 8 (Topographic Map).

8.14.1 Impacts

Nearly all of the workspaces utilized for the Repower Project will be temporary except for the less than 0.1 acre of permanent impact associated with the V136 turbine. Therefore, no impacts to topography are anticipated from repowering the existing turbines and construction of the new V136 turbine.

8.14.2 Mitigative Measures

No impacts on the topography of the Project Area are anticipated; therefore, no mitigative measures are proposed.

8.15 SOILS

Soil series, as established by the NRCS, are soils that are grouped together based on similar soil chemistry and physical properties. Each soil series is delineated as a single map unit and represents the dominant soil patterns or characteristics (Soil Survey Staff, 2020). Mapped soil series within the Project Area were identified from the NRCS soil surveys of Nobles County, Minnesota.

In addition to the soil series, the USDA, NRCS identifies areas that are important to agricultural use, such as prime farmland and farmland of statewide importance. Prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. Prime farmland can be cultivated land, pastureland, forestland, or other land. Important farmlands consist of prime farmland, unique farmland, and farmland of statewide or local importance (Soil Survey Staff, 2020). As shown in Table 8.15-1, 90.8 percent of the soils in the Project Area are classified as prime farmland, including those soils identified as prime farmland if the limiting factor is mitigated. Soils are mapped on Figure 13 (Soils).

Table 8.15-1
Prime Farmland Within the Project Area (acres)

Prime Farmland Classification	Acres	Percent of Project Area
Prime Farmland[1]	21,724.1	90.8%
Farmland of Statewide Importance	1,504.6	6.3%
Not Prime Farmland	684.0	2.9%
Total	**23,912.8**	**100%**

[1] This includes soils classified as prime farmland or prime farmland if the limiting factor is mitigated.

8.15.1 Impacts

Repowering the project will likely result in minor short-term impacts to soils within the Repower Project Area, as workspaces utilized for the repowering the existing turbines and constructing the new V136 turbine and associated access road will be temporary. The new V136 turbine pad and access road would result in less than 0.1 acre of new permanent impact on soils. Xcel Energy will fully decommission the existing GE 1.5 sle T47, removing the turbine pad (approximately .05

acre) and restoring the area. This will partially offset the permanent impacts from the new V136 turbine and associated access road.

No additional impacts are expected from continued operation of the Repower Project.

8.15.2 Mitigative Measures

Within construction work areas, topsoil will be separated form subsoils, protected from erosion and runoff using mulch, and then re-spread over disturbed areas once work is completed. Erosion control measures will also be implemented during construction to avoid or minimize soil erosion and off-site deposition. Erosion and sedimentation will be reduced by implementation of best management practices (BMPs) such as mulching, hydroseeding, wildlife-friendly erosion control blankets, silt fence installation, jute matting, revegetation, and/or interim reclamation (see Section 10.5). After repowering is completed, soils will be planted with crops or revegetated to stabilize them long term. Based on the implementation of these recommended and required mitigation measures, no adverse impacts on soil resources are expected as a result of the Project.

8.16 GEOLOGIC AND GROUNDWATER RESOURCES

Surficial Geology

Surficial geology of the Project Area consists of glacial deposits associated with the Des Moines Lobe. This Project Area is part of a high glacial landform occupying Southwestern Minnesota topped by Buffalo Ridge (1995 feet above sea level) in northern Pipestone County. The high elevation is caused by thick deposits of pre-Wisconsin age glacial till (up to 800 feet thick). The underlying bedrock is covered by 400 to 800 feet of glacial till, which consists of calcareous loamy sediment (MNDNR, 2020a).

The Altamont moraine makes up the quaternary geology of the Project Area and southcentral Minnesota (MGS, 2019). The Altamont moraine is sufficiently clayey making it good agricultural land.

Bedrock Geology

The bedrock underlying the glacial material in the Project Area consists of conglomerate, sandstone, mudstone, shale, marlstone, siltstone, and minor lignite from the Mesozoic Era and is shown on Figure 14 – Geology (MGS, 2011). This Cretaceous undifferentiated rock consists of largely gray shale and friable sandstone. Most sandstone is quartzose, light gray to pale brown or yellow, and fine-to medium-grained. Dark gray to black, lignitic organic matter is common in both the sandstone and shale.

Aquifers and Wells

Groundwater in the region is supplied by the Cretaceous aquifer. The aquifer consists of thick to thin, discontinuous sandstone beds overlain in places by limestone and shale beds that confine the aquifer. In other places, the aquifer is directly overlain by glacial deposits. In its principal area of use, the Cretaceous aquifer ranges from about 90 to 170 feet in thickness. The water tends to contain large concentrations of dissolved solids; in some areas, wells have small yields of less than

two to 10 gallons per minute. The aquifer is buried by glacial deposits to depths of 700 feet or more near the southern Minnesota border. Although the aquifer contains gypsum, which can increase sulfate concentrations in the groundwater, the aquifer is extensively pumped to supply domestic, small-community, and agricultural needs (Olcott, 1992).

Homes and farms in the Project Area typically use private wells and septic systems for their household needs. According to the Minnesota Department of Health's Minnesota Well Index online database, there are 48 located wells, and an additional 15 unverified well locations within the Project Area and generally associated with residences (Minnesota Department of Health, 2019).

8.16.1 Impacts

Impacts on geologic and groundwater resources from repowering the existing turbines are not anticipated, as there will be only minimal surface disturbance for construction cranes and material staging and potentially around foundations (up to 4-foot depth). Construction of the new V136 turbine and associated access road is not anticipated to impact geologic and groundwater resources as only minimal surface disturbance will occur within the construction workspace and installation of the turbine foundation will range between four to six feet below ground surface, which is above geologic or groundwater resources in the Project Area.

8.16.2 Mitigative Measures

Because impacts on geologic resources are not expected from Project construction and operation, mitigation measures are not anticipated.

8.17 SURFACE WATER AND FLOODPLAIN RESOURCES

Surface water and floodplain resources for the Project Area were identified by reviewing U.S. Geological Survey (USGS) topographic maps, Minnesota Public Waters Inventory (PWI) maps, and other resources. The majority of the Project Area occurs within the Rock River watershed; a small portion on the eastern edge occurs within the Little Sioux River watershed (MNDNR, 2020b; Figure 15 – Surface Waters). Named waterbodies within the Project Boundary include East Branch Kanaranzi Creek, Judicial Ditch No. 113, Little Rock Creek, and County Ditch No. 5.

There are no trout streams within the Project Area or within 10 miles of the Project Area (MNDNR, 2020c). Similarly, none of the waterbodies within the Project Area are identified as Outstanding Resource Value Waters under Minn. R. 7050.0335, subp. 3. Figure 15 (Surface Waters) shows the locations of surface waters, federal Clean Water Act (CWA) 303(d) impaired waters, and Minnesota PWI waters within the Project vicinity, all of which were downloaded from the Minnesota Geospatial Commons.

Streams within the Project Area provide habitat for the federally listed Topeka Shiner, and are designated critical habitat for the species. The crane paths and construction workspaces will not occur within suitable Topeka shiner streams or designated critical habitat. The Topeka shiner is discussed further in Section 8.21.1.

Public waters are all waters that meet the criteria set forth in Minn. Stat. § 103G.005, subd. 15 that are identified on PWI maps authorized by Minn. Stat., § 103G.201 (MNDNR, 1984) and consist of PWI wetlands, PWI basins, and PWI watercourses. These water features are regulated as public waters under the MNDNR's Public Waters Permit Program. PWI wetlands include all type III, type IV, and type V wetlands (as defined in USFWS Circular No. 39, 1971 edition) that are 10 acres or more in size in unincorporated areas or 2.5 acres or more in size in incorporated areas. There are 7 PWI watercourses that are listed as MNDNR PWI public waters within the Project Area; there are no PWI basins or PWI wetlands within the Project Area. The waters shown on the PWI maps and located at least partially within the Project Area are presented in Table 8.17-1.

Table 8.17-1
Public Waters Inventory

PWI Type	PWI Feature Name
PWI Watercourse	East Branch Kanaranzi Creek (I-050-040)
	Unnamed Stream (I-050-040-013)
	Unnamed Stream (I-050-040-016)
	Unnamed Stream (I-050-041)
	Unnamed Stream (I-050-044)
	Unnamed Stream (I-050-047)
	Unnamed Stream (I-050-047-001)

Section 303(d) of the CWA requires each state to review, establish, and revise water quality standards for all surface waters within the state. Waters that do not meet their designated beneficial uses because of water quality standard violations are considered impaired. There is one 303(d) impaired water within the Project Area: East Branch Kanaranzi Creek (see Figure 15). The East Branch Kanaranzi Creek is listed as impaired for benthic macroinvertebrate bioassessments; E. coli; fishes bioassessments; and turbidity (MPCA, 2020b).

8.17.1 Wildlife Lakes in and Adjacent to Project Boundary

The MNDNR commissioner may formally designate lakes for wildlife management under the authority of Minn. Stat. § 97A.101, subd. 2. This designation allows the MNDNR to temporarily lower lake levels periodically to improve wildlife habitat and regulate motorized watercraft and recreational vehicles on the lake. There are no MNDNR designated wildlife lakes in Nobles County (MNDNR, 2016a). As noted above, there are also no state designated trout streams located within 10 miles of the Project boundary (MNDNR, 2020c).

8.17.2 Migratory Waterfowl Feeding and Resting Lakes

Migratory Waterfowl Feeding and Resting Areas (MWFRA) protect waterfowl from disturbance on selected waters of the state by prohibiting motors on these lakes during waterfowl season. These lakes are nominated by a petition process and approved or denied by the MNDNR after public input is received. There are no migratory waterfowl feeding and resting lakes in Nobles County (MNDNR, 2016b).

8.17.3 Federal Emergency Management Agency Floodplains within Project Area

Federal Emergency Management Agency (FEMA)-designated floodplains are digitally available for the Project Area (FEMA, 2020). There are approximately 1,369 acres of 100-year floodplains within the Project Area that are associated with East Branch Kanaranzi Creek, Judicial Ditch No. 113, and County Ditch No. 5, and unnamed tributaries to Kanaranzi Creek (Figure 16– FEMA Floodplain).

8.17.4 Impacts

The new V136 turbine and associated access road will be built in an upland area that avoids surface water resources and FEMA floodplains in the lower elevations. Construction of the new turbine and access road will impact land, and therefore could potentially impact surface water runoff within the Project Area. Ground-disturbing construction activities also have the potential to cause sedimentation. These impacts are expected to be minimal and would only occur during construction.

Due to the presence of watercourses within the Project Area, permits may be required for temporary crane crossings. Potential temporary impacts will be closely coordinated with the MNDNR, USACE, and the Local Government Units (LGUs) administering the Minnesota Wetland Conservation Act (WCA; Nobles County), as appropriate.

Only minimal, if any, impacts to FEMA floodplains are anticipated during the repowering process for the project. It is possible that minor, temporary impacts to FEMA floodplains may occur as a result of crane crossings in areas where it is not possible to avoid.

8.17.5 Mitigative Measures

Temporary impacts to waterbodies associated with crane paths will be minimized. Xcel Energy will obtain MNDNR License to Cross Public Waters for any crane paths that cross PWI watercourses. Xcel Energy has designed the crane paths to avoid crossing Topeka shiner streams.

Because there are impaired waters within the Project Area, the National Pollutant Discharge Elimination System (NPDES) permit and Stormwater Pollution Prevention Plan (SWPPP) will require additional BMPs for potential runoff to these waters. As part of the NPDES permit process, Xcel Energy will design BMPs for the entire Project, including near impaired waters. The MPCA will review the SWPPP prior to finalizing.

Xcel Energy will permit crane path crossings of waterbodies (waters of the U.S.) with the USACE and LGU under the WCA. Access roads will be designed to maintain the waterbody's flow; crane path crossings of waterbodies will be matted.

There will be no permanent impacts to floodplains; therefore, no mitigation is proposed.

8.18 WETLANDS

Wetlands are areas with hydric (wetland) soils, hydrophilic (water-loving) vegetation, and wetland hydrology (inundated or saturated much of the year). Wetlands are part of the foundation of water

resources and are vital to the health of waterways and communities that are downstream. Wetlands detain floodwaters, recharge groundwater supplies, remove pollution, and provide fish and wildlife habitat. Wetlands are also economic drivers because of their key role in fishing, hunting, agriculture, and recreation. Wetland types include marshes, swamps, bogs, and fens. Wetlands vary widely due to differences in soils, topography, climate, hydrology, water chemistry, vegetation, and other factors.

Wetlands within the Project Area were identified using Minnesota's update to the National Wetlands Inventory (NWI). Some of the wetlands are associated with creeks and unnamed intermittent streams within the site and some of the wetlands are isolated basins. The Cowardin Classification System wetland types and their acreage within the Project Area are presented in Table 8.18-1.

Table 8.18-1
National Wetlands Inventory in the Project Area

NWI Wetland Type	Wetland Count	Acres[1]
Freshwater Emergent Wetlands	439	1,330.0
Riverine	38	48.4
Freshwater Pond	38	37.0
Freshwater Forested Wetlands	12	7.8
Freshwater Shrub Wetlands	4	1.6
Wetland Total	**531**	**1,424.8**

[1] Wetland acreage is calculated using Minnesota's Update to NWI data.

There are approximately 1,424.8 acres of NWI-mapped wetlands in the Project Area, which constitutes approximately 3.1 percent of the Project Area. More than 93 percent (1,330 acres) of the NWI wetland acreage is mapped as freshwater emergent wetlands. Riverine wetlands comprise 3.4 percent (48.4 acres) of the NWI wetland acreage. Freshwater pond wetlands comprise 2.6 percent (37.0 acres) of the NWI wetland acreage. Freshwater forested wetland comprises 0.6 percent (7.8 acres) of the NWI wetland acreage. The remaining 0.1 percent are freshwater shrub wetlands (1.6 acres). See Figure 17 (Wetlands Inventory Map) for locations of wetlands within the Project Area.

8.18.1 Impacts

Based on review of NWI data, the new V136 turbine and associated access road will be constructed in an upland area and will not impact wetlands. Furthermore, based on the current crane path layout for the Project, only minimal, if any, impacts to wetlands are anticipated. Minor, temporary impacts to wetlands may occur as a result of construction crane movements.

8.18.2 Mitigative Measures

Formal wetland delineations of the Project Area will be completed prior to construction, and the crane paths may be refined to further avoid and minimize wetland impacts. Temporary placement of construction materials (e.g. timber mats) into any wetland for purposes of temporary crossings

may require coordination with USACE and Nobles County, administering Section 404 of the CWA and the Minnesota Wetland Conservation Act (WCA), respectively. Because all proposed impacts are temporary, project fill placement activities are expected to qualify under a Nationwide or Regional General Permit and be eligible for a "no-loss" determination under the WCA.

The MPCA administers the NPDES permit program in Minnesota and regulates construction activities that disturb more than one acre of land. As part of its NPDES permit application, a SWPPP will identify erosion and sedimentation control measures to prevent adverse water quality impacts to wetlands during and after construction. Mitigation measures included in the SWPPP should be sufficient to ensure that streams and surface waters within the Repower Project Area do not incur adverse construction-related stormwater impacts.

Xcel Energy will mitigate impacts to wetlands during construction and operation by protecting topsoil, minimizing soil erosion, and protecting adjacent wetland resources. Practices may include containing excavated material, use of silt fences, protecting exposed soil, stabilizing restored material, and re-vegetating disturbed areas with non-invasive species.

8.19 VEGETATION

The Project Area is in the Coteau Moraines subsection of the North Central Glaciated Plains Section in the Prairie Parkland Province, as defined by the ECS of Minnesota (MNDNR, 2000). Historically, tallgrass prairie covered most of this area and wet prairies covered a smaller proportion of the landscape. Forest was similarly restricted to floodplains along the Minnesota River and other streams. As a result of settlement in the mid-1800s, the area was converted to farmland, with only a few remnants of pre-settlement vegetation remaining (MNDNR, 2020a).

Based on review of aerial photographs and land use/land cover database information, the majority of the land area in the Project Area is cultivated crops (refer to Table 8.19-1 and Figure 12 – Land Cover). Corn and soybeans are the dominant agricultural crops by acreage in Nobles County (USDA, 2012). The land cover types in the Project Area are shown in Table 8.19-1 (Yang et al., 2018).

Table 8.19-1
Land Cover Types and their Relative Abundance in the Project Area

Land Cover	Acres	Percent of Project Area
Cultivated Crops	20,673.1	86.5
Herbaceous	1,602.0	6.7
Hay/Pasture	317.7	1.3
Developed	916.7	3.8
Emergent Herbaceous Wetlands	268.7	1.1
Open Water	28.5	0.1
Deciduous/Mixed Forest	79.4	0.3
Barren Land	26.7	0.1
Total	**23,912.7**	**100.0**

Table 8.19-1
Land Cover Types and their Relative Abundance in the Project Area

Land Cover	Acres	Percent of Project Area

Source: 2016 National Land Cover Database (Yang et al., 2018)

Forested areas are primarily windbreaks around residences and riparian areas along the East Branch Kanaranzi Creek. Wetlands are generally associated with streams. Hay/Pasture and grassland/herbaceous lands are generally associated with waterbodies and the Bluebird Prairie WMA (refer to Section 8.8). The grassland and wetland areas at the site may contain potential remnant native prairie areas. Native prairie is discussed in Section 8.21.2.

8.19.1 Impacts

Temporary construction workspaces for repowering the existing turbines and constructing the new V136 turbine were designed to occur primarily in cultivated cropland. Impacts to agricultural production are discussed in Section 8.11.1.

The 2009 Site Permit, as amended, required a prairie protection plan to the extent there were prairie impacts (Site Permit Condition C.6). Because there were no impacts to native prairie when the Wind Farm was constructed, a prairie protection plan was not required or prepared. Similarly, impacts to native prairie will be avoided by Xcel Energy during the repowering process and construction of the new V136 turbine. For example, there is MNDNR-mapped native prairie within 400 feet of Turbine 42. In this case, Xcel Energy will utilize an irregular shaped workspace to work only in cultivated cropland and avoid native prairie. Similarly, proposed crane paths have been routed primarily on agricultural lands. The Repower Project will also avoid woodlands, shrublands, grasslands, and water resources to the degree practicable. However, some minor and temporary impacts to wetlands, grasslands and shrubland may occur as a result of crane path construction. It is possible that these areas may contain native vegetation (i.e., plant species living in the area where it is found naturally vs. being introduced). If disturbed, Xcel Energy is committed to restoring and seeding these areas with certified weed-free native mixes appropriate for the region. It is the goal of Xcel Energy to minimize impacts to non-cultivated and NPCs within the Project Area.

8.19.2 Mitigative Measures

Xcel Energy will initiate restoration of disturbed soils and vegetation as soon as possible after construction activities are completed. Xcel Energy will restore areas of disturbed soil in non-cropped areas using weed-free native grasses, forbs, and shrubs. In cropped areas, a temporary cover crop may be planted to stabilize soils depending on the timing of construction completion and the next growing season.

The following measures will be used to avoid and minimize potential impacts to land of the Project Area during siting, construction, and operation to the extent practicable:

- Prioritize siting temporary construction workspaces in cultivated cropland.
- Avoid disturbance of wetlands during construction and operation of the Project. If jurisdictional wetland impacts are proposed, Xcel Energy will obtain applicable wetland permits (see Section 8.18).
- Design the Project to minimize the need to clear existing trees and shrubs.
- Prepare a construction SWPPP and secure a NPDES Permit.
- Use BMPs during construction and operation of the Project to protect topsoil and adjacent resources and to minimize soil erosion. Practices may include containing excavated material, protecting exposed soil and stabilizing restored material, revegetating non-cropland and range areas with wildlife conservation species, and (wherever feasible) planting native tall grass prairie species in cooperation with landowners.

8.20 WILDLIFE

8.20.1 General Wildlife

Wildlife in the Project Area consists of birds, mammals, fish, reptiles, amphibians, and insects, both resident and migratory, that use the Project Area habitat for forage, breeding, and/or shelter. The resident species are representative of Minnesota game and non-game fauna that are associated with farmlands, upland grasslands, and wetland and forested areas. Given that the land cover present in the Project Area is comprised primarily of agricultural lands, available wildlife habitat is limited. The majority of the migratory wildlife species are birds, including waterfowl, raptors, and songbirds. The wildlife in the Project Area are similar to what was presented in the original Site Permit Application for the wind farm in 2009.

The Nobles Wind Farm became operational in 2010, prior to the FWS's issuance of the 2012 Land-Based Wind Energy Guidelines and Eagle Conservation Plan Guidance. In 2016, in response to those guidelines, Xcel Energy developed a Bird and Bat Conservation Strategy (BBCS), which addresses the pre-construction siting and field survey efforts that were completed in order to minimize impacts to wildlife and sensitive habitats; BMPs that were implemented to minimize impacts during construction; and post-construction monitoring/studies/reporting. Xcel Energy has prepared an updated BBCS (Appendix I) for the Repower Project that was reviewed by USFWS, MNDNR, and EERA. .

8.20.2 Important Bird Areas

Important Bird Areas (IBAs) are created under voluntary, non-regulatory, international conservation effort that identifies critically essential habitats for birds, designates these habitats as IBAs, monitors the IBAS for changes in avian distribution and abundance, and conserves IBAs to protect birds in the long-term (MNDNR, 2020d). In Minnesota, the IBA program is led by the MNDNR's Nongame Wildlife Program and Audubon Minnesota. There are no IBAs in Nobles County.

8.20.3 Impacts

Development of the Project, including the construction and operation, is expected to produce a minimal impact to wildlife. Based on studies of existing wind power projects in the United States and Europe, the impact to wildlife would primarily occur to avian and bat populations. It can be expected that, similar to the existing wind farm and at other wind developments, there is a high likelihood that individual bird and bat fatalities will occur at the Project. Repowering the Project with longer rotors will increase in rotor-swept-area, and therefore, may increase collision risk to birds and bats. Similarly, construction activities will introduce risk to primarily birds from construction equipment and vehicles traveling around the Project Area. However, it is unlikely that the Nobles Repower Project will affect species at the population level.

As discussed above, the Nobles Wind Farm became operational prior to implementation of the 2012 USFWS Land Based Wind Energy Guidelines. As such, no post-construction fatality monitoring was completed for the Project. However, based on a docket search, one snow goose incidental fatality has been reported at Nobles Wind Farm since 2010 (2011 fatality). Xcel Energy notes that wildlife fatality reporting has become more prescribed for more recent projects (quarterly incident reporting and immediate incident reporting). In addition to PUC reporting, Xcel Energy trains its operational staff to look for and report avian and bat fatalities during their normal activities and has internal reporting and documentation procedures for avian and bat fatalities. In 2019 on unknown songbird was reported and in 2020, one unknown waterfowl and one unknown bat were reported.

Recent post-construction data are available from the following wind facilities in southern Minnesota with comparable landscapes to Nobles from which to draw correlative inferences about potential impacts on birds and bats from Project operations:

- Odell Wind Farm (Odell) in Cottonwood, Jackson, Martin and Watonwan Counties, Minnesota
- Red Pine Wind Energy Facility (Red Pine) in Lincoln County, Minnesota
- Lakefield Wind Project (Lakefield) in Jackson County, Minnesota
- Elm Creek I Wind Project (Elm Creek I) in Jackson County, Minnesota
- Elm Creek II Wind Project (Elm Creek II), in Jackson and Martin Counties, Minnesota
- Prairie Rose Wind Energy Facility (Prairie Rose) in Rock County, Minnesota
- Big Blue Wind Farm (Big Blue) in Faribault County, Minnesota
- Grand Meadow Wind Farm (Grand Meadow) in Mower County, Minnesota
- Oak Glen Wind Farm (Oak Glen) in Steele County, Minnesota

Data from post-construction avian and bat studies at these facilities suggest the types and levels of impacts that may be occurring at the Project and may be realized at the Repower Project (Table 8.20-1):

Table 8.20-1
Recent Bird and Bat Post-Construction Fatality Estimates at Wind Facilities in Southern Minnesota

Facility	Survey Timeframe (month/year)	Bird (#/MW)	Bat (#/MW)	Comments
Odell[1]	12/2016-12/2017	4.69	6.74	• Most avian fatalities were in September and October • Bat fatalities were primarily July through September • Seasonality suggests most fatalities were fall migrants • Most common bat species was hoary bat
Red Pine[2]	3/2018-11/2018 (cleared plot)	4.47	11.35	• Most common bird species were ruby-crowned kinglet, marsh wren, red-eyed vireo, and sedge wren • Bat species were hoary, big brown, eastern red, and silver-haired
	3/2018 – 11/2018 (road & pad)	2.68	18.74	
Lakefield[3]	4/2012-11/2012	2.75	19.97	• Fifteen species of birds documented • Documented bat species were hoary, big brown, eastern red, and little brown • No fatalities were federal- or state-listed
	6/2014-10/2014	1.07	20.19	• Most of the bat fatalities (65 percent) were solitary tree roosting bats (eastern red bat, hoary bat) • Bat fatalities were during fall migration (last week of July through mid-September)
Elm Creek I	2009-2010	2.32	1.49	• This report is not publicly available
Elm Creek II	2011-2012	8.73	2.81	• This report is not publicly available
Prairie Rose[4]	4/2014-6/2014	0.44	0.41	• Estimates provided are per study period (i.e., 8 weeks during spring migration and 10 weeks during fall migration) • An operational shut-down from August 18 through August 28, 2014 may have affected fatality rates
	8/2014-10/2014			
Big Blue, Grand Meadow, & Oak Glen[5]	7/2013-10/2013	--	3.1-6.3	• Systematic avian surveys were not conducted • Fatality rates are the range for the three facilities • Bat fatalities peaked twice: in late July/early August and in late August/early September.

Table 8.20-1
Recent Bird and Bat Post-Construction Fatality Estimates at Wind Facilities in Southern Minnesota

Facility	Survey Timeframe (month/year)	Bird (#/MW)	Bat (#/MW)	Comments
				• Bat fatalities were primarily tree-roosting bats

1 Chodachek and Gustafson, 2018
2 Trana et al., 2019
3 Westwood Professional Services, 2015
4 Chodachek et. al, 2015
5 Chodachek et al., 2014

Overall, adjusted fatality rates for all bird species vary between three to six birds/MW/year for the majority of post-construction fatality studies nationwide. Fatality estimates are relatively constant across the country except for in the Great Plains, where there appears to be lower avian fatality rates, and the Pacific region, where there may be slightly higher fatality rates. Most avian fatalities due to wind turbines are small passerines, about 60 percent of avian fatalities in publicly available reports in the United States. Fatality rates of migratory passerines increase in the spring and fall during migration (AWWI, 2020). The majority of avian species have a low risk of impacts at the population level (Allison et al., 2019). Based on the post-construction fatality studies outlined above, national averages for post-construction fatalities, and AWWI's conclusions about geographic trends, Xcel Energy anticipates that avian fatalities due to collision will be at or below the national average and may result in limited localized impacts to some groups of birds, such as small passerines.

Potential unavoidable impacts from the Project on bats are expected to be similar to the post-construction fatality rates at the above wind facilities, based on the similar land uses within the Project Area, geographic proximity of the projects, and similarities in species composition. Migratory tree-roosting bats (e.g., hoary bat, silver-haired bat, and eastern red bat), which were detected during the Project's pre-construction studies, may have the highest risk of collision based on previous bat fatality studies (AWWI, 2020). Unlike birds, wind facilities may present a risk to populations of migratory tree-roosting bats; in addition, although impacts from wind facilities on cave-roosting bats are typically low, even a small impact can be a risk to populations already impacted by white-nose syndrome (Allison et al., 2019). Overall, risk of mortality to bats in the Project Area is likely to be greatest on nights during fall migration, when the number of bats moving through the area are the highest. During the fall migration, weather conditions that are most conducive to higher mortality rates occur with warm temperatures (greater than 50 degrees Fahrenheit) and low wind speeds (less than 6.5 m/s or 14 miles per hour) (Baerwald and Barclay, 2009; Arnett et al., 2011; Good et al., 2011; Cryan and Brown, 2007). In addition, risk may be higher on the first night following the passage of a low-pressure system when the prevailing wind shifts from a southerly to a northerly direction (Cryan and Brown, 2007; Good et al., 2011). Additional impacts may include a small reduction in the available habitat that some wildlife uses

for forage or cover; however, operation of the Project will not significantly change the existing land use.

8.20.4 Mitigative Measures

The MNDNR's early coordination response letter dated December 2, 2020 recommended the following in regard to the project: (1) feathering turbine blades below cut-in speeds to minimize impacts to bat species, (2) preparation of an Avian and Bat Protection Plan, and (3) conduct post-construction fatality monitoring.

Xcel Energy will equip operating turbines with software capable of adjusting cut-in speeds and will require that turbines are locked or feathered up to the manufacturer's standard cut-in speed from one-half hour before sunset to one-half hour after sunrise from April 1 to October 31 of each year of operation, per MDNR's recommendation.

Xcel Energy prepared a new BBCS (Appendix I) to document and describe measures to identify, avoid, and manage risks to avian and bat species that may result from wind turbine upgrades, both during construction and operation. Xcel Energy submitted the BBCS to USFWS, MNDNR, and EERA staff on February 5, 2021. , and the BBCS incorporates comments received from these agencies. The BBCS is based on those recommendations provided in the USFWS's Land-Based Wind Energy Guidelines (USFWS, 2012) that apply to a repower project and operational wind farm. The BBCS also describes the protocol that will be used for post-construction avian and bat fatality monitoring, which will be conducted for two years.

In accordance with the Standard Erosion Control and Invasive Species Prevention Best Practices included with the preliminary comments from the MNDNR on the Project (Appendix D), Xcel Energy will utilize wildlife friendly erosion control and invasive species prevention practices to minimize risks to aquatic and terrestrial habitats, as applicable. Examples include utilizing bio-netting or natural netting erosion control blanket types to minimize the risk of entanglement and death of small animals, and cleaning of equipment at a site prior to moving to the next site to prevent invasive species introduction and spread. Lastly, construction staff will be provided with wildlife awareness training on construction and operational BMPs to reduce risks to wildlife and incident reporting.

8.21 RARE AND UNIQUE NATURAL RESOURCES

In a letter dated November 2, 2020, Xcel Energy requested comments on the Project from the MNDNR and USFWS. The MNDNR responded with early coordination comments on the Project in a letter dated December 2, 2020. The MNDNR recommended that a Natural Heritage Information System (NHIS) Review be completed for the Project, and provided comments regarding rare species and habitat protection, which are discussed further below. Xcel Energy submitted a Natural Heritage Review Request to the MNDNR for the Project on February 22, 2021. A copy of this request is included in Appendix H. To date, a response has not been received.

In an e-mail dated December 2, 2020, the USFWS directed Xcel Energy to its Information for Planning and Consultation (IPaC) system for a list of federally listed species and designated critical habitat that may be impacted by the Project; and noted that this list is considered a technical

assistance tool for use in determining if further consultation is required with the USFWS. Xcel Energy's review of the IPaC system is outlined below.

8.21.1 Federal and State Listed Species

The USFWS's IPaC system (USFWS, 2020a) was reviewed for federally listed species, candidate species, and designated or proposed critical habitat that may be present within the Project Area (Table 8.21-1). The MNDNR's NHIS was also reviewed for documented occurrences of federally listed species, state listed species, and state species of concern within one mile of the Project Area (MNDNR, 2020e; Table 8.21-2). The MNDNR maintains the NHIS database through their Natural Heritage Program and Nongame Game Research Program; the NHIS is the most complete source of data on Minnesota's rare, endangered, or otherwise significant plant and animal species, plant communities, and other rare natural features. Although these reviews do not represent a comprehensive survey, they provide information on the potential presence of rare and unique species and habitats. The NHIS information provided here is based on a query of licensed NHIS data (per MNDNR license agreement; MNDNR, 2020e); as noted above, Xcel Energy has submitted an NHIS review request to MNDNR to confirm species' presence.

Table 8.21-1
Federally Listed Species with the Potential to Occur in the Project Area

Species	Federal Status
Northern Long-eared Bat (*Myotis septentrionalis*)	Threatened
Topeka Shiner (*Notropis topeka*)	Endangered [1]
Prairie Bush-Clover (*Lespedeza leptostachya)*	Threatened
Western Prairie Fringed Orchid (*Platanthera praeclara*)	Threatened

[1] Nobles County has designated critical habitat for the Topeka Shiner.

Table 8.21-2
Federal and State Listed Species Documented Within One Mile of the Project Area[1, 2]

Type	Federal Status[3]	State Status[3]	Scientific Name	Common Name	NHIS Records within the Project Area (#)	NHIS Records within one Mile of Project Area Boundary (#)	Year of Most Current Observation
Bird	--	SPC	*Cygnus buccinator*	Trumpeter Swan	0	1	N/A
	--	SPC	*Progne subis*	Purple Martin	0	1	2006
Fish	E	SPC	*Notropis topeka*	Topeka Shiner	2	2	2005

Table 8.21-2
Federal and State Listed Species Documented Within One Mile of the Project Area[1, 2]

Type	Federal Status[3]	State Status[3]	Scientific Name	Common Name	NHIS Records within the Project Area (#)	NHIS Records within one Mile of Project Area Boundary (#)	Year of Most Current Observation
Reptile	--	T	*Emydoidea blandingii*	Blanding's Turtle [2]	--	--	--

[1] MNDNR, 2020e
[2] Blanding's turtle was not documented within one mile of the Project Area; but was identified in preliminary comments from the MNDNR (MNDNR, 2020f)
[3] E=Endangered, T=Threatened, SPC=Species of Special Concern, W=Watchlist

The northern long-eared bat (NLEB) is a medium-sized bat species that occurs across the eastern and central U.S. (Caceres and Barclay, 2000). The annual life history of the NLEB includes an inactive period when the species is hibernating and an active period when the species forages, raises its young, and breeds. Hibernation generally occurs in caves and mines between November 1 and March 31 (USFWS, 2015; USFWS, 2016a). In April, the species emerges from its hibernacula and moves to summer habitat. NLEB typically forage on flies, moths, beetles, caddisflies, and other insects in the understory of wooded areas (USFWS, 2015). Adult females form breeding or maternity colonies that are variable in size, ranging from a few individuals to as many as 60 adults (Caceres and Barclay, 2000; Wisconsin Department of Natural Resources, 2017). During the summer, the species roosts in live and dead trees in cavities and crevices and under bark (Timpone et al., 2010). The NLEB forages primarily in forested areas (USFWS, 2015). The NLEB is currently experiencing a population decline due to a disease that affects hibernating bats called white-nose syndrome (WNS). Records of documented hibernacula and roost trees are maintained in the MNDNR's NHIS. Based on a review of NHIS records, there are no documented NLEB maternity roost trees within 150 feet of the Project Area or hibernacula within 0.25 mile of the Project Area. Although there are no records of NLEB, the species may still be present in the Project Area.

The Topeka Shiner is restricted to small prairie streams that are tributary to the Missouri River in Lincoln, Murray, Nobles, Pipestone, and Rock counties in southwestern Minnesota. Streams in this region lie in an agricultural area used for cultivation and grazing. The USFWS listed the Topeka shiner as endangered in 1998 and designated critical habitat in 2004.

The prairie bush clover is an obligate of tallgrass prairie habitats (USFWS, 2019a). As discussed in Section 8.21.2 below, there are approximately 95.7 acres of MNDNR-mapped native prairie within the Project Area.

The western prairie fringed orchid occurs most often in mesic to wet unplowed tallgrass prairies and meadows but have been found in old fields and roadside ditches (USFWS, 2019b). The USFWS has developed guidance for determining whether western prairie fringed orchid may be

present in a project area (USFWS, 2019c). In Minnesota, the distribution of extant populations of western prairie fringed orchid (*Platanthera praeclara*) corresponds well with that of certain land type associations (LTA). There is one LTA within Nobles County, the Trosky Till Plain LTA, which is located approximately 6.6 miles west of the Project boundary. Per the USFWS guidance, if the project area does not fall within an LTA, western prairie fringed orchid is not likely to be present in the action area.

Based on review of the NHIS, there are two special concern birds recorded within 1 mile of the Project Area: the trumpeter swan and purple martin. During the breeding season, trumpeter swans select small ponds and lakes or bays on larger water bodies with extensive beds of emergent vegetation such as cattails, bulrushes, and sedges. Ideal habitat includes about 328 feet of open water for take-off, stable levels of unpolluted fresh water, emergent marsh vegetation, low levels of human disturbance, and the presence of muskrat houses and beaver lodges for use as nesting platforms (MNDNR, 2018a). There will be no impacts to open water habitats as a result of the Repower Project.

Purple Martins are found foraging for insects over cities, towns, parks, open fields, streams and rivers, and open water habitats including wetlands, marshes, and lakes (Brown and Tarof, 2013). Historically, this species nested in woodpecker-created cavities in dead trees (snags) in small colonies along woodland edges or riparian areas (Brown and Tarof, 2013). Today, nearly all nesting occurs in man-made nesting structures around human settlements, including highly developed cities as well as shorelines of large lakes with healthy insect populations (MNDNR, 2018b). Suitable nesting habitat (i.e., trees or man-made nesting structures) for the purple martin will not be impacted as a result of the Repower Project.

As noted above, although not identified within 1 mile of the Project Area, the MNDNR noted in its early coordination comments that habitat for the state-threatened Blanding's turtle often overlaps with that of the Topeka shiner. Blanding's turtles need both wetland and upland habitats to complete their life cycle. The types of wetlands used include ponds, marshes, shrub swamps, bogs, and ditches and streams with slow-moving water. In Minnesota, Blanding's turtles are primarily marsh and pond inhabitants (MNDNR, 2008). Nesting occurs in open (grassy or brushy) sandy uplands, often some distance from waterbodies. Blanding's turtles overwinter in the muddy bottoms of deeper marshes and ponds, or other waterbodies where they are protected from freezing.

8.21.1.1 Impacts

Prairie Bush-Clover and Western Prairie Fringed Orchid

Xcel Energy has designed the temporary construction workspaces, crane paths, and new V136 turbine site to avoid MNDNR-mapped native prairie. Therefore, suitable habitat for the prairie bush clover and western prairie fringed orchid will not be impacted by the Project.

Northern Long-eared Bat

Construction of the Project will not involve tree clearing, and, as such, will not NLEB. See Section 8.20.3 for a discussion of the Projects operational impacts on bat species, including NLEB.

Topeka shiner

As shown in Table 8.21-2, the NHIS review did identify documented occurrences of Topeka shiner within the Project Area. The crane paths and construction workspaces will not occur within suitable Topeka shiner streams or designated critical habitat; however, indirect impacts could occur as the result of sedimentation from construction activities.

Trumpeter Swan and Purple Martin

Although suitable nesting habitat for the trumpeter swan and purple martin will not be impacted by construction activities, impacts during operation may occur. See Section 8.20.3 for a discussion of the Projects operational impacts on bird species.

Blanding's Turtle

Although suitable aquatic habitat used by the Blanding's turtle will not be directly impacted by the Project, however, indirect impacts could occur as the result of sedimentation from construction activities near waterbodies. In addition, it is possible that Blanding's turtles could pass through the Project Area while traveling between aquatic and nesting habitats in the summer or when the turtles move to and from overwintering sites (spring and fall).

8.21.1.2 Mitigative Measures

Prairie Bush-Clover and Western Prairie Fringed Orchid

Xcel Energy will avoid impacts to suitable habitat for prairie bush clover and western prairie fringed orchid; as such, no mitigative measures are proposed.

Northern Long-eared Bat

No mitigative measures are proposed for construction, as the project will not involve tree clearing and will not impact NLEB. See Section 8.20.4 for a discussion of the mitigative measures that Xcel Energy would employ to protect this and other bat species during operation.

Topeka shiner

In accordance with the USFWS' *Recommendations for Construction Projects Affecting Waters Inhabited by Topeka Shiners in Minnesota (Revised November 18, 2016)* (USFWS, 2016b), Xcel Energy will implement the following measures to prevent sedimentation from entering Topeka shiner habitat:

- Follow all applicable requirements and BMPs for stormwater and erosion control.
- In non-cropland areas, Xcel Energy will mulch areas of disturbed soils and reseed promptly with native species.

- Implement appropriate erosion and sediment prevention measures to the maximum extent practicable. Inspect devices frequently to ensure that they are effective and in good repair, especially after precipitation.

Trumpeter Swan and Purple Martin

No mitigative measures are proposed for construction, as the project will impact not these species. See Section 8.20.4 for a discussion of the mitigative measures that Xcel Energy would employ to protect bird species during operation of the Project.

Blanding's Turtle

Per the MNDNR's recommendations, Xcel Energy will provide workers with the Blanding's Turtle ID and Reporting Fact Sheet; if a Blanding's turtle is observed within the Project Area, Xcel Energy will document its location and contact the MNDNR for further guidance. Xcel Energy will also adhere to the Recommendations for Avoiding and Minimizing Impacts to Blanding's Turtle, provided in the MNDNR's Blanding's Turtle Fact Sheet, as applicable. Further, the mitigation measures discussed above for the Topeka shiner will also be protective of Blanding's turtle aquatic habitat.

8.21.2 Native Prairie

In addition to rare and sensitive species, the MNDNR also maps rare and unique plant communities that may include relatively rare habitats (e.g., prairie) or higher quality or good examples of more common plant communities (e.g., wet meadow). Although most NPCs have no legal protection in Minnesota, these areas may have the potential to contain undocumented populations of rare plant species, which may be protected under Minnesota's state endangered species law (Minn. Stat. § 84.0895). These native prairies and NPCs may also provide essential habitat for rare species of fauna.

Native prairies are typically unplowed plant communities originating on the site and dominated by grass and sedge species, with a rich mix of broad-leaved forbs and a few low shrub species (MNDNR, 2018c). Approximately 250,000 acres of native prairies ranked good to excellent remain in Minnesota (MNDNR, 2017a). MNDNR's native prairie data for the Project Area includes approximately 95.7 acres of dry hill prairie (southern) and wet prairie (southern) (Table 8.21-3). A review of the MNDNR's NHIS did not identify any records of native prairie within 1 mile of the Project Area.

Table 8.21-3
MNDNR-mapped Native Prairie within the Project Area

Native Prairie Type	Acres
Dry Hill Prairie (Southern)	71.0
Wet Prairie (Southern)	24.7
Total	**95.7**

The MNDNR's railroad prairie rights-of-way are native prairie remnants that occur along railroad rights-of-way. The railroad rights-of-way program was instituted in 1997 by the Minnesota legislature in the Prairie Parkland and Eastern Broadleaf Forest ECS Provinces (MNDNR, 2017b). There are no railroad prairie rights-of-way in or adjacent to the Project Area (MNDNR, 2017b).

8.21.2.1 Impacts

Xcel Energy will generally use a 400-foot radius around the existing turbines and the new V136 turbine for a temporary construction workspace unless a sensitive area necessitates avoidance. There is MNDNR-mapped native prairie within 400 feet of Turbine 42. As such, Xcel Energy will use an irregular shaped workspace at this turbine to avoid impacts to MNDNR-mapped native prairie; the temporary workspace will be limited to cultivated cropland. Similarly, as shown in Figure 11 (Rare and Unique Features), Xcel Energy has sited all crane paths to avoid MNDNR-mapped native prairie.

8.21.2.2 Mitigative Measures

As noted above, Xcel Energy has designed crane paths and construction workspaces to avoid impacts to MNDNR-mapped native prairie; therefore, no specific mitigation measures are proposed.

8.21.3 Native Plant Communities and Sites of Biodiversity Significance

The Minnesota Biological Survey (MBS) assesses and maps the distribution and status of the Minnesota's fauna, flora, NPCs, and SOBS.

Native Plant Communities

NPCs are assemblages of native plants that have not been substantially impacted by non-native species or human activities. NPCs are formed and classified by hydrology, soils, landforms, vegetation, and natural disturbance regimes such as floods, wildfires, and droughts. NPCs are named for the characteristic plant species within them or for characteristic environmental features (MNDNR, 2020g). NPCs may include native prairie. The MNDNR has classified NPCs within the state using plant species, soils, and other site-specific data from vegetation plots. The current NPC classification covers most of the wetland and terrestrial vegetation in the state and was completed in 2003. It is a six-level hierarchical classification that accounts for vegetation structure and geology, ecological processes, climate and paleohistory, local environmental conditions, canopy dominants, substrate, and environmental conditions (Aaseng et al., 2011).

Table 8.21-4 presents the MBS's NPCs that occur within the Project Area and the number of acres of each NPC within the Project Area.

Table 8.21-4
Native Plant Communities within the Project Area

Native Plant Community Type	Acres
Dry Hill Prairie (Southern)	71.0
Prairie Meadow/Carr	33.4
Wet Prairie (Southern)	24.7
Total	**129.1**

Sites of Biological Significance

The MBS is an assessment of Minnesota landscapes for NPCs, rare animals, rare plants, and animal communities through desktop review and follow-up field survey. MBS designates and assigns rankings to SOBS, based on landscape context, NPC, and occurrence of rare species populations. The MBS groups and ranks SOBS for each Minnesota's system subsections for the purpose of designating and cataloguing the state's most notable examples of NPCs and rare species. A site's biodiversity rank is based on the presence of rare species populations, the size and condition of NPCs within the site, and the landscape context of the site (MNDNR, 2009; MNDNR, 2020h). Both native prairie and NPCs may also be designated as SOBS. There are four biodiversity significance ranks: outstanding, high, moderate, and below:

- "Outstanding" sites contain the best occurrences of the rarest species, the most outstanding examples of the rarest NPCs, and/or the largest, most ecologically intact or functional landscapes.
- "High" sites contain very good quality occurrences of the rarest species, high-quality examples of rare NPCs, and/or important functional landscapes.
- "Moderate" sites contain occurrences of rare species, moderately disturbed native plan communities, and/or landscapes that have strong potential for recovery of NPCs and characteristic ecological processes.
- "Below" sites lack occurrences of rare species and natural features or do not meet MBS's standards for outstanding, high, or moderate rank. These sites may include areas of conservation value at the local level, such as habitat for native plants and animals, corridors for animal movement, buffers surrounding higher-quality natural areas, areas with high potential for restoration of native habitat, or open space.

There are no MBS SOBS ranked as high or outstanding within the Project Area. Table 8.21-5 presents the MBS's SOBS with rankings of below or moderate that occur within the Project Area and their Biodiversity Significance Rank.

Table 8.21-5
Sites of Biodiversity Significance within the Project Area

Site of Biodiversity Significance Rank	Number of Sites Within Project Area	Acres
Below	2	57.1
Moderate	5	1122.3
Total	**7**	**1179.4**

8.21.3.1 Impacts

Similar to avoidance of MNDNR-mapped native prairie, Xcel Energy will avoid temporary construction impacts to NPCs. Turbine 42 is also within 400 feet of NPC (similarly mapped MNDNR-native prairie), however, Xcel Energy will use an irregular shaped workspace in cropland to avoid impacts to NPCs.

In preliminary comments on the Project, the MNDNR noted concerns with the distance from the crane path between turbines 61 and 62 and the adjacent NPCs and recommended that these resources are avoided by using already established roads or access roads. Xcel Energy has removed the crane path between Turbines 61 and 62 and has designed the updated crane paths to include a buffer between the crane path and any NPCs. Further, in general, Xcel Energy will utilize a 400-foot-radius construction workspace around each turbine; however, where the turbines are in proximity to NPCs, Xcel Energy will utilize an irregular workspace design to avoid impacts to NPCs (i.e., Turbine 42; see Figure 11).

Similar to native prairie and NPCs, Xcel Energy will limit construction workspaces to cultivated cropland where the 400-foot workspace buffer includes SOBS. Irregular workspaces would be utilized at Turbines 3, 11, 42, 50, and 110. Xcel Energy notes that Turbine 110 is sited in cultivated cropland and a portion of a SOB ranked below. As such, the crane path to Turbine 110 will cross approximately 85 feet of one MBS SOBS (ranked "below"); however, the current land use where the crane path intersects this MBS SOBS is actively cultivated agricultural field. Agricultural production in the immediate Project vicinity may experience minor short-term impacts from the use of crane paths during construction, but these impacts would resolve when construction is complete.

8.21.3.2 Mitigative Measures

As noted above, Xcel Energy has designed crane paths and construction workspaces to avoid impacts to NPCs and MBS SOBS sites; therefore, no specific mitigation measures are proposed.

9.0 SITE CHARACTERIZATION

9.1 SITE WIND CHARACTERISTICS

The wind monitoring program at the Nobles project began in August 1999 with masts 3403 and 3404. Five additional masts, designated 2011 (also referenced as 2049), 3401, 3402, 317 and 332, were installed between January 2000 and December 2004. Masts 3401 and 3402 are located within or near the turbine array, and the remaining masts are located to the north-northwest of the project site.

Masts 3401, 3402, 3403 and 3404 were reported to be ZAT 40-m tilt-up towers. Masts 2049 and 317 were guyed, tubular 50-m NRG TallTowers. Mast 332 was a guyed, tubular 60-m NRG TallTower. Table 9.1-1 shows basic information about the masts.

Table 9.1-1
Mast Data for the Nobles Wind Farm

Mast ID	Site UTM Coordinates (WGS84, Zone 14N)		Elev. (m)	Period of Record	Monitoring Heights (m)		
	Easting	Northing			Wind Speed	Wind Direction	Temp
2049	260721	4871880	558	9/27/00-5/1/05	49.2, 30.4, 10.2	49, 30.2	3
3401	276304	4836217	515	1/4/00-7/2/03	40, 27.4, 10	40	-
3402	270960	4842847	526	1/4/00-7/2/03	40, 27.4, 10	40	-
3403	267551	4854274	543	8/11/99-7/2/03	40, 27.4, 10	40	-
3404	267094	4857304	533	8/12/99-7/2/03	40, 27.4, 10	40	-
317	266167	4862493	528	1/7/03-11/5/06	48.7, 29.2, 9.5	48.7, 29.7	4
332	266631	4859223	530	12/2/04-11/4/06	59.9, 50.3, 30.1, 10.5	59, 49.3, 29.3	5

Wind speed and temperature data from the Mast towers was adjusted to align with data from multiple reference sites in the area (r-squared), which are shown in Table 9.1-2. A higher r-squared value indicates a stronger correlation.

Table 9.1-2
Correlation of MET Data with Reference Sites

Reference	r-squared Value
Marshall Ryan, MN	0.76
Worthington, MN	0.76
Pipestone, MN	0.74
Redwood Falls, MN	0.71
Jackson, MN	0.71
Estherville, IA	0.63
Watertown, SD	0.61
Spencer, IA	0.60
Sioux Falls, SD	0.60
Huron, SD	0.49

9.1.1 Interannual Variation

Interannual variation is the variation in wind speed from one year to the next. The inter-annual variability (IAV) of wind speed at the project is estimated to be 5.0 percent by UL (formerly AWS Truepower, an independent consultant serving the wind energy industry). The IAV of 5.0 percent, applied to the project's estimated average hub height wind speed, is 0.43 m/s.

9.1.2 Seasonal Variation

Seasonal variation is represented by the shift in wind speeds from one month to the next. Table 9.1-3 shows the estimated average seasonal variation based on long-term correlations with meteorological data collected in the Project Area. The months of September through May are expected to generally have the highest wind speeds, while the months of July and August are expected to have the lowest wind speeds.

Table 9.1-3
Average Wind Speed at Hub Height of Turbines (80 m)

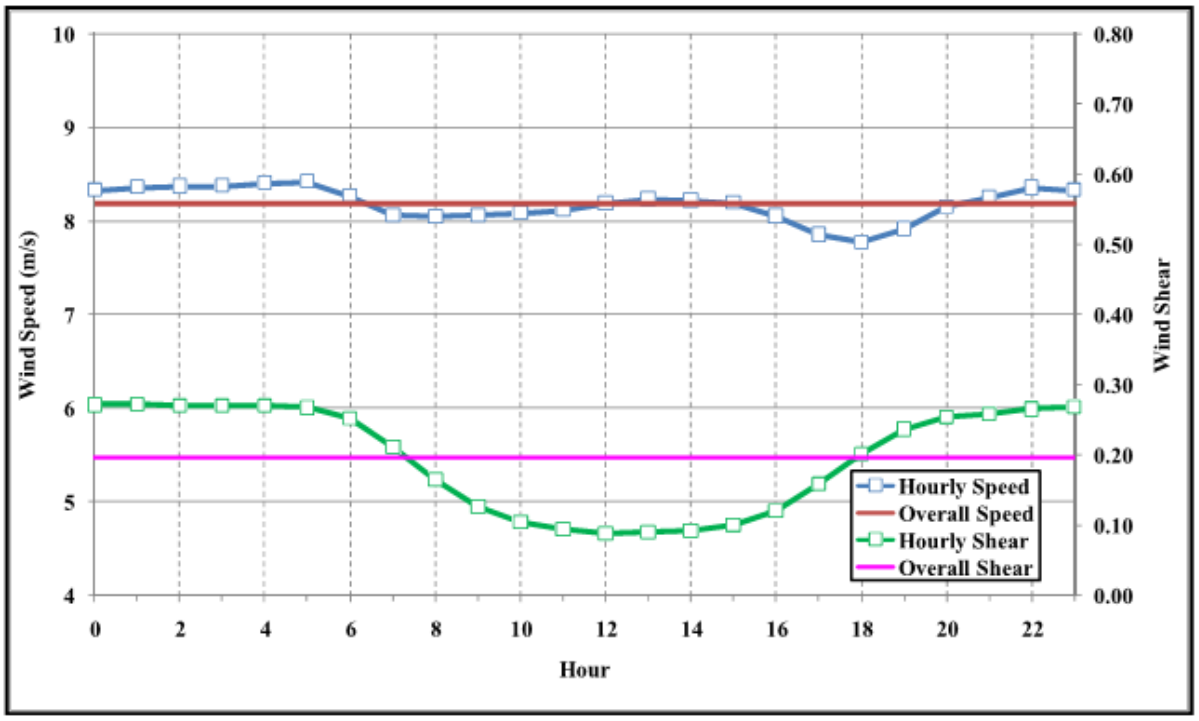
Month	Wind Speed (m/s)
January	8.92
February	9.34
March	8.97
April	9.38
May	8.82
June	7.82
July	7.47

Table 9.1-3 Average Wind Speed at Hub Height of Turbines (80 m)	
Month	**Wind Speed (m/s)**
August	7.17
September	8.74
October	8.61
November	9.67
December	9.47
Annual Average	8.68

9.1.3 Diurnal Conditions

As shown in Chart 9.1-1, the annual daily wind speed pattern at hub height at the project's met tower has an increase in wind speeds during the evening and overnight hours.

Chart 9.1-1: Diurnal Wind Speeds



Mast 2049 Diurnal Wind Speed and Shear Patterns

9.1.4 Atmospheric Stability

The stability of the atmosphere can be calculated when the temperatures at two levels are available. For the Repower Project, temperature sensors at multiple heights were not available. Based on other regional atmospheric data, Xcel Energy expects the approximate atmospheric stability profile to be: Neutral (15 percent), Stable (70 percent), and Unstable (15 percent). These percentages were

confirmed to be appropriate with the NOAA/National Weather Service Station, Chanhassen, Minnesota.

9.1.5 Hub Height Turbulence

Turbulence intensity (TI) is an indicator of the variability of wind speed. Hub height TI at the met tower is on average 10 percent at 15 meters per second (m/s). Overall, the TI at the met tower is considered to be in the moderate range.

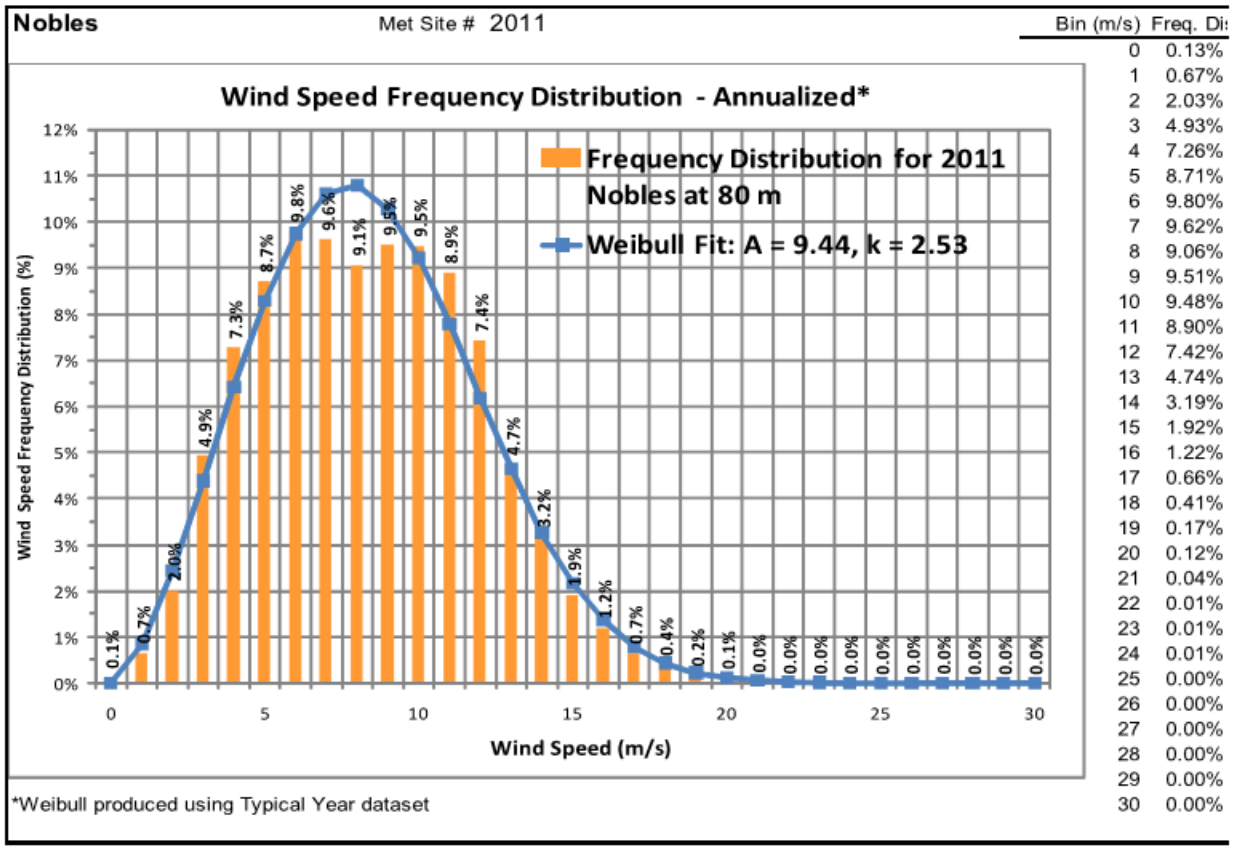
9.1.6 Extreme Wind Conditions

The hub height 50-year extreme 10-minute wind speed for the project area is 39.2 m/s. The extreme wind speed has been estimated by GE for the mechanical loads analysis of the turbine components.

9.1.7 Wind Speed Frequency Distribution

Chart 9.1-2 shows the wind speed frequency distribution at hub height calculated from wind data collected at MET MAST#2011 (#2049). A majority of the winds occur between 3 m/s and 13 m/s. The characteristics of this distribution are consistent with wind regimes observed elsewhere in Minnesota.

Chart 9.1-2: Wind Speed Frequency Distribution



9.1.8 Wind Variation with Height

Data from the MET masts can be seen in Table 9.1-4 shows wind speed at instrument height, wind shear exponent and the extrapolated hub height wind speed.

Table 9.1-4
Mast Data for the Nobles Wind Farm

Mast ID	Monitoring Height (m)	Climate-adjusted Speed (m/s)	Effective Wind Shear Exponent	Extrapolated 80-m Hub Height speed (m/s)
2049	49.2	8.14	0.196	8.95
3401	40.0	7.85	0.199	9.01
3402	40.0	7.38	0.207	8.52
3403	40.0	7.80	0.210	9.03
3404	40.0	7.84	0.157	8.74
317	48.7	7.75	0.187	8.50
332	59.9	8.32	0.195	8.80

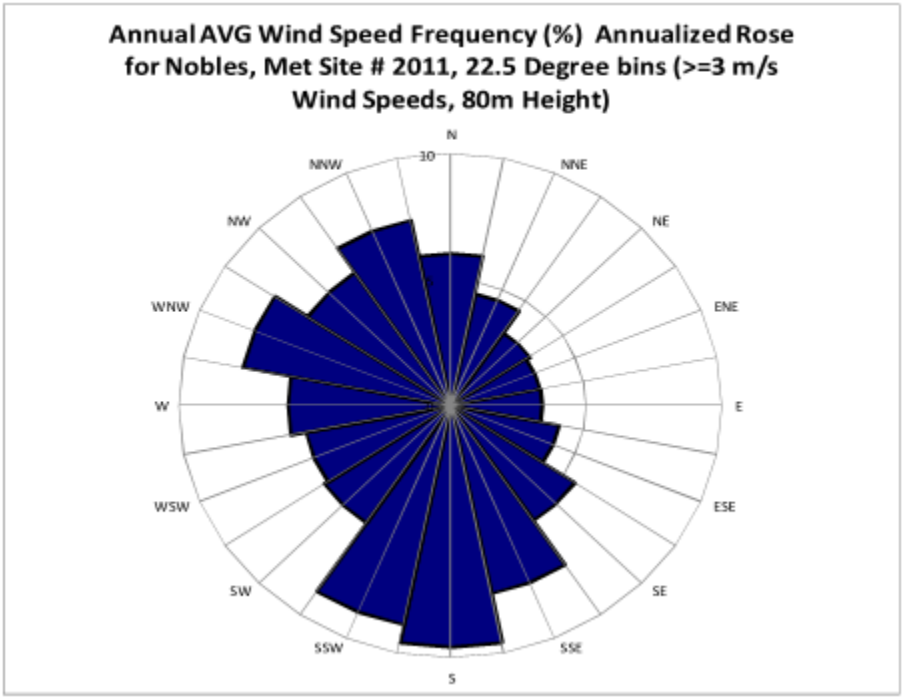
9.1.9 Spatial Wind Variation

AWS/UL has estimated the annual average hub height wind speeds among the project's 134 turbines to range from approximately 8.25 to 9.13 m/s, averaging approximately 8.72 m/s. These estimates result from a combination of mesoscale and microscale wind flow modeling using AWS/UL proprietary software developed using standard industry methodology and formulas.

9.1.10 Wind Rose

A wind rose is a graphical representation of wind speeds based on the direction the wind comes from and the frequency it comes from each direction. Chart 9.1-3 shows the wind rose for the Nobles Repower Project.

Chart 9.1-3: Nobles Wind Farm Wind Rose



9.1.11 Other Meteorological Conditions

Minnesota has a continental-type climate characterized by frequent occurrences of continental polar air throughout the year, with occasional Arctic outbreaks during winter and occasional periods of prolonged heat during the summer, especially in southern Minnesota when warm air moves in from the Gulf of Mexico and southwestern United States. Pacific Ocean air masses moving across the western United States allow for mild and dry weather conditions during all seasons. While the climate within the project area is fairly uniform due to relatively little topographic relief and lack of large water bodies, extreme weather events, such as tornadoes, thunderstorms, high winds, and blizzard conditions, do occur. Extreme weather events in the Repower Project repower area have been recorded by the National Oceanic and Atmospheric Administration (NOAA) (NOAA, 2020) in the U.S. Storm Events Database for the period of time

from January 1950 through August 2020. Extreme weather events during this period include tornadoes, hail, thunderstorm winds, high wind, winter storms, blizzards, extreme cold, heavy snow, excessive heat, dense fog, floods, and flash floods (among others). NOAA recorded 386 extreme weather events in Nobles County during this time period. Typically, such storms are local in extent, short in duration, and result in damage to relatively small geographic areas. There were 53 event days with property damage reported during this period (NOAA, 2020).

9.2 LOCATION OF OTHER WIND TURBINES WITHIN 10 MILES OF PROJECT BOUNDARY

Based on the U.S. Wind Turbine database (USGS, 2020), there are 153 existing wind turbines associated with eight wind farms within 10 miles of the Project Area. These include the following:

- Community Wind South (15 turbines) in Nobles County
- Nobles Wind Farm 2 (74 turbines) in Nobles County
- Wilmont Hills Wind Farm (1 turbine) in Nobles County
- Wolf Wind Project (5 turbines) in Nobles County
- Missouri River Energy Services Wind Farm (6 turbines) in Nobles County
- Don Sneve Wind Farm (1 turbine) in Nobles County
- Arnold Wind Farm (1 turbine) in Nobles County
- Fenton Wind Farm (50 turbines) in Nobles and Murray Counties

Note that some of these wind farms have more turbines than are included in the 10-mile buffer from the Project Area. For example, the Fenton Wind Farm includes 137 turbines, 50 of which are within 10 miles of the Nobles Wind Farm. Figure 18 shows the location of existing wind turbines and wind energy projects. As displayed on Figure 18, there are several more existing wind turbines up to 20 miles northwest and southeast of the Repower Project.

10.0 PROJECT CONSTRUCTION

Repowering will consist of the following general construction steps: completing improvements to existing gravel roads to accommodate truck deliveries, preparing laydown and staging areas, installing temporary crane crossings over streams, offloading new turbine components near operating turbines, removing and replacing existing blades and nacelles with a construction crane, removal of existing met towers, performing engineering inspections on new components, returning turbines to operation, and restoring temporarily disturbed areas to pre-construction conditions.

As a repowering project, earthmoving is fairly minimal and generally limited to temporary turning radius improvements, staging at turbine sites, potential foundation work, and ditch or stream crossing areas. Land will be graded only where needed to allow for crane and delivery truck access. Detailed descriptions of construction processes are described within sections below for primary grading and preparation areas. Prior to any earthwork being performed, Gopher State One Call will be contacted to mark utility locations, rights-of-way will be identified as needed, and construction stakes placed. Limited access road widening and temporary storage area construction will be completed as necessary to accommodate the repower.

Professional design engineering firms and experienced pre-qualified trade contractors will be hired and managed by the primary contractor for component dismantling and installation. Xcel Energy will have overall project management responsibilities. The repowering team will be on-site to handle materials, deliveries, staging, repowering, and quality assurance. An on-site construction manager will coordinate all aspects of the work, including ongoing communication with local officials, citizens groups, and landowners.

The construction manager will also oversee the temporary widening of access roads, crane routes, gear box and blade installations, electrical infrastructure, as well as the coordination of materials receiving, inventory, and distribution.

10.1 ROADS AND INFRASTRUCTURE

During construction, roadways will be accessed by a variety of small to large construction vehicles requiring temporary roadway improvements along some public roads within the Project Area. Following the completion of the repower process, operations traffic will return to normal including small-to-medium sized vehicles performing routine maintenance on turbines and associated facilities. Xcel Energy estimates that the maximum construction workforce the Project will create is approximately 925 additional trips per day on local roadways during peak repowering when turbine components and equipment are being delivered. Total trips per day will decrease to approximately 4 to 9 vehicle trips per day following repowering.

There will be turning radii installed at various intersections to allow for turbine component deliveries and typically includes widening select intersections to allow for the long delivery trucks to turn, and upgrading road surfaces by grading or the addition of gravel. Due to the short-term nature of the repower work, road improvements will primarily be compaction and placement of gravel. Xcel Energy will coordinate with the State, County, and townships, as applicable, regarding the planned use of haul routes that may require road improvements or traffic control measures

during the construction period and to ensure that any overweight permits, road use permits, road maintenance agreements and other approvals are secured.

During construction, Xcel Energy will perform routine maintenance and roadway repairs associated with upkeep needed or damage resulting from the Project activities.

10.2 ACCESS ROADS AND CRANE CROSSINGS

The Project will not require construction of new, permanent access roads. Some access roads will be temporarily widened to allow for crane movement and delivery of equipment to the construction easement located at the base of each turbine. Cranes will be constructed along the access roads to enable removing and replacing turbine components. Xcel Energy will coordinate with landowners throughout the repowering process to minimize disturbances due to active agricultural lands. Upon completion of repowering, temporary access roads will be returned to their normal 16-foot (4.9-meter) widths.

To facilitate crane movement and equipment delivery during construction, crane paths will be utilized during the repower process. Crane paths will be finalized based on landowner requests, avoidance of environmental constraints such as wetlands, Sites of Biological Significance, prairies, sensitive habitat, and other factors. These crane paths will be installed in a 100-foot (30.5-meter) corridor, all of which will be matted. Access roads widened for crane paths and equipment deliveries will be reduced to their permanent width of approximately 16 feet (4.9 meters) upon completion of construction. Where temporary installations are removed, areas will be graded to natural contours, soil decompaction and reseeding will occur as described further in Section 10.5.

Streams and wetlands will be crossed in several locations with cranes. Wetland crossings will generally be installed and restored in accordance with the following steps, and the site SWPPP:

a. Plan crane walks according to unique area conditions where crane walk will occur.

b. Install down grade perimeter controls such as fiber rolls, silt fence, and erosion control blanket to protect conveyances as field conditions dictate.

c. Install geotextile fabric, timber mats.

d. Walk cranes across wetlands during dry conditions.

e. Restore all disturbed areas to pre-construction conditions following crane walk activity by removing timber mats and geotextile fabric, seeding all disturbed areas, installing erosion control blankets on all ditch bottoms and disturbed slopes great than 3:1, and then removing erosion control measures once final stabilization has occurred.

10.3 ASSOCIATED FACILITIES

No changes to the existing O&M building are proposed or needed to accomplish repowering. Minor updates to the existing substation and collection circuits will be required as described in Sections 6.1 and 6.2, respectively. No new permanent meteorological towers are required for the Project. Xcel Energy will utilize the three existing permanent towers where currently installed.

10.4 TURBINE SITE LOCATION

10.4.1 Foundation Design

Existing turbine foundations will remain unchanged except for the installation of the foundation collars, if needed. To accomplish this, soils would be excavated to a depth of approximately 4 feet (1.2 meters) around the foundation pedestal to the existing top mat rebar for the construction of the concrete collar. Crews will drill dowel holes and place reinforcement into the foundation prior to pouring concrete.

For the V136 turbine, the turbine foundations will use a pad-and-pier tower mounting system consisting of top and bottom templates. These templates consist of anchor bolts and reinforcing steel bar (rebar); they are placed within the excavated portion of the turbine footing and filled with concrete. The anchor bolts protrude from the concrete pad surface and the turbine base is fastened to these bolts. The excavated portion of the concrete turbine pad ranges from approximately 291 to 737 cubic yards depending on soil requirements and turbine size. The turbine pad dimensions are approximately 20 feet in above-ground diameter and typically range in depth from four to six feet; an approximate height of two to three feet of the turbine pad remains above grade. Geotechnical surveys, turbine tower load specifications, and cost considerations will dictate final design parameters of the foundation.

10.4.2 Tower

The existing turbine towers will be used during repowering activities; no modifications will take place. The repowered rotor (consisting of hub and blades) will be assembled on the ground and picked up as a single unit to be bolted to the nacelle. At this point, crews will work within the tower to ensure all mechanical and electrical connections are completed to facilitate energization.

10.5 POST CONSTRUCTION CLEAN-UP AND SITE RESTORATION

Project activities causing temporary impacts are associated with the widening of existing access roads for equipment transport, crane walk paths, staging areas at turbines, and turbine repowering activities within the construction easements. Areas temporarily disturbed by construction activities will be re-graded to original contours and revegetated with native seed mixes, crops, or as otherwise noted in the land use agreement. Excavated soil associated with the electrical system upgrades during the ADLS system and foundation collar installation will be used as backfill and remaining soil will be spread over temporary construction areas and revegetated. In areas where soil compaction occurred from construction activities, areas will be uncompacted, topped with topsoil, and revegetated.

Impacted areas will be monitored to ensure revegetation. Stormwater BMPs, such as silt fence and straw wattle, will not be removed until at least 70 percent revegetation/regrowth has occurred, unless the area is in a tillable agricultural field. If the area is in tillable agricultural field, a cover crop will be planted to minimize soil loss.

All temporary road radius improvements and temporary culverts will be removed and restored as turbines become mechanically complete. For any section of state, county, or township road used

as a haul route, the roadway will be restored to its pre-construction state or better, as negotiated from road use agreements. This may consist or re-grading, re-paving, enhancing the shoulder of the road or enhancing the segment of roadway as agreed upon by Xcel Energy and the responsible road authority.

10.6 OPERATION AND MAINTENANCE OF PROJECT

NSP will be responsible for O&M of the Project upon final turnover. O&M will be conducted by NSP consistent with applicable North American Electric Reliability Corporation Reliability Standards. There will be 24 hours per day, 7 days a week operational monitoring of the Project through SCADA. The O&M crew will consist of 11 full-time staff who largely will be wind technicians (i.e., technicians who carry out the maintenance on the turbines) along with a site supervisor. These workers will work out of the Project O&M building.

Turbines and the substation are monitored remotely by an O&M contractor 24 hours a day at the O&M Contractor's monitoring center. Faults are reset when possible to ensure high turbine availability. Wind technicians are called out on non-resettable faults based on time of day and wind conditions. Certain turbine data is monitored for abnormalities at an Xcel Energy Maintenance and Diagnostic Center in Denver, Colorado.

Engineers also provide performance and reliability optimization using various methods and replicate best practices across the fleet. Fleet O&M is focused on prevention rather than an event response philosophy. Production assurance engineers and wind fleet team major component subject matter experts support fleet level O&M. It is the O&M staff's responsibility to provide root cause and fleet risk analyses, as well as to provide mitigation planning to assure countermeasures are performed on a scheduled basis, which serves to maximize production.

Facility maintenance is a combination of time based and predictive maintenance schedules and is also modified as needed based on engineering decisions. On-site service and maintenance activities include routine inspections, preventive maintenance, component replacements, parts inventory, and unscheduled maintenance and repairs of wind turbines, pad-mount transformers, electrical power network, data communication systems, safety/protection systems, meteorological towers, and radio communications systems. Scheduled time-based turbine maintenance is performed on lower wind days whenever possible to maximize site output on high wind days. Substation and collection system maintenance is scheduled in the summer during low wind periods. Spare parts are kept on site to address long lead times, and frequently used items are kept ensuring that the failed equipment is returned to service as quickly as possible.

10.7 COSTS

The Capital Expenditure for the Project is currently estimated to be approximately $240 million and includes all costs of development, design, and construction. Ongoing O&M costs and administrative costs are estimated to be approximately $4-6 million per year, including payments to landowners for wind lease and easement rights.

10.8 SCHEDULE

The anticipated date of commercial operations is December 2022.

10.9 ENERGY PROJECTIONS

A net capacity factor of approximately 47.7 percent to 51.1 percent is expected annually for the Project. An average annual output of 836,604 MWh is anticipated, a 15.5 percent increase from the existing GE 1.5 sle base case.

10.9.1 Wake Loss

Turbine locations will not be changed as part of the Project; therefore, wake loss is expected to remain similar after the repower. Wake loss calculations for the existing GE 1.5 sle base case was 7.05 percent. The Repower Project will have a wake loss of 6.84 percent. Wake loss from the Repower Project is modeled to decrease as a result of operating with NRO modes for noise mitigation (see Section 8.4.1).

11.0 DECOMMISSIONING AND RESTORATION

Section L of the original Site Permit Application for the Nobles Wind Project addressed decommissioning and restoration. With the exception of T47, the original project will not be decommissioned; it will be repowered. As part of the repowering process, the existing blades and other components as described in Section 1.4 of this Application will be removed. The Xcel Energy equipment supplier will coordinate with the appropriate agencies for responsible recycling or disposal of those components. The remaining materials will be reduced to transportable size and removed from the site for disposal. Materials will be disposed in a suitable disposal facility. Section 10.5 of this Application describes Post Construction Cleanup and Restoration.

Project decommissioning and restoration costs will change as a result of repowering. To address these changes, Xcel Energy prepared an updated decommissioning and restoration plan in January 2021 to reflect the repowered Project (Appendix J).

11.1 ANTICIPATED LIFE OF THE PROJECT

Xcel Energy estimates the service life of the Repower Project to be approximately 25 additional years.

11.2 ESTIMATED DECOMMISSIONING COSTS IN CURRENT DOLLARS

Xcel Energy estimates that net decommissioning cost (estimated cost of dismantling and removal less the salvage value) for the Wind Farm after the Repower Project is complete at $38,304,638.

11.3 METHOD FOR ENSURING THAT FUNDS ARE AVAILABLE FOR DECOMMISSIONING

Xcel Energy will be responsible for all costs associated with decommissioning the Nobles Wind Project. To ensure that there is an adequate recovery of future decommissioning and restoration costs, a negative net salvage rate is included in the calculation of the depreciation expense rate for the production assets in this project. The net salvage rate reflects the net of the estimated decommissioning costs and any offsetting proceeds from the salvaging and/or recycling of certain generation equipment, such as the towers, cables, and other material. The net salvage rate is negative in this case because the forecasted costs of decommissioning the facility are higher than the expected salvage proceeds.

In Docket No. E,G002/D-19-723 (the 2020 Annual Review of Remaining Lives), Xcel Energy has proposed a net salvage percent of -8.5 percent for the Nobles Wind Project. As per Commission order, every five years Xcel Energy is required to perform a comprehensive dismantling study on all electric generation plants. The most recent study was filed in in the 2020 Annual Review of Remaining Lives (Docket No. E,G002/D-19-723) and included all plants in-service as of April 2020. Plants added after that date will be incorporated in the next dismantling study to be performed in 2025.

11.4 METHOD FOR UPDATING THAT FUNDS ARE AVAILABLE AND UPDATING DECOMMISSIONING COSTS

As stated above, Xcel Energy is required to perform a comprehensive dismantling study on all electric generation plants. The most recent study was filed in 2020; the next study will be performed in 2025.

11.5 ANTICIPATED METHODS OF SITE DECOMMISSIONING AND RESTORATION

Decommissioning of the site will include: (1) removal of all turbines and towers; (2) removal of all pad mounted transformers; (3) removal of all above-ground distribution facilities; (4) removal of foundations to a depth of four feet below grade; and (5) removal of surface road material and restoration of the roads and turbine sites to previous conditions to the extent feasible, consistent with the landowner's desires. Removed components will either be scrapped and properly disposed of or recycled. The determination will be made based on the expected market for the used components.

Removal and restoration obligations shall be completed within eighteen (18) months, and in general accordance with the requirements of Minnesota Rules 7854.0500, subp. 13, and applicable county requirements.

12.0 IDENTIFICATION OF OTHER POTENTIAL PERMITS

Xcel Energy will be responsible for undertaking all required environmental review and will obtain all permits and licenses that are required following issuance of the LWECS Site Permit. The potential permits or approvals that have been identified as being required for the construction and operation of the Project are shown in Table 12-1. Copies of agency correspondence to date are provided in Appendix D.

Table 12-1
Potential Permits and Approvals

Administering Agency	Permit, Approval, or Consultation	Status and Applicability to the Project
Federal		
U.S. Army Corps of Engineers	Wetland Delineation Approvals	Xcel Energy has conducted a desktop review of wetlands and potential impacts with the MNDNR update to NWI data. Based on this desktop data, the Project will fall under the impact threshold for either a Nationwide Permit or Minnesota Regional General Permit. Prior to construction, Xcel Energy will conduct wetland delineations to confirm wetland boundaries and impacts based on final design.
	Jurisdictional Determination	
	Federal Clean Water Act Section 404	
U.S. Fish and Wildlife Service	Review for Threatened and Endangered Species	Based on coordination with USFWS, a Take Permit is not anticipated for the Project.
Environmental Protection Agency (Region 5) in coordination with the Minnesota Pollution Control Agency (MPCA)	Spill Prevention Control and Countermeasure Plan	The Construction Contractor will develop a Spill Prevention Control and Countermeasure Plan for use during construction and operation of the Project to minimize risk of site contamination.
Federal Aviation Administration	Form 7460-1 Notice of Proposed Construction or Alteration (Determination of No Hazard)	Xcel Energy submitted Form 7460-1 for the turbine locations in December 2020 to initiate FAA review of the turbines and ADLS.
	Notice of Actual Construction or Alteration (Form 7460-2)	After construction is complete, Xcel Energy will submit Form 7460-2 for the turbine locations.
State of Minnesota Approvals		
Board of Water and Soil Resources (BWSR)	Wetland Conservation Act approvals	Xcel Energy has conducted a desktop review of wetlands and potential impacts with the MNDNR update to NWI data. Based on this desktop data, the Project will fall under the impact threshold for either a Nationwide Permit or Minnesota Regional General Permit.

Table 12-1
Potential Permits and Approvals

Administering Agency	Permit, Approval, or Consultation	Status and Applicability to the Project
		Prior to construction, Xcel Energy will conduct wetland delineations to confirm wetland boundaries and impacts based on final design.
Minnesota Public Utilities Commission	Site Permit Amendment for Large Wind Energy Conversion System	Submitted February 26, 2021.
Minnesota State Historic Preservation Office (SHPO)	Minnesota Statute 138; Cultural and Historic Resources Review and Review of State and National Register of Historic Sites and Archeological Survey	Xcel Energy has coordinated with SHPO, conducted a literature review of the Project Area. Xcel Energy will conduct surveys for previously unidentified cultural resources in previously unsurveyed areas in spring/summer 2021. Xcel Energy will coordinate with SHPO on the protocol and any potential mitigation.
MPCA	Section 401 Water Quality Certification	Concurrent with Section 404, Clean Water Act – Xcel Energy will meet the Minnesota conditions
	National Pollutant Discharge Elimination System (NPDES) Permit – MPCA General Stormwater Permit for Construction Activity	After the Site Permit is Ordered by the Commission, Xcel Energy will submit NPDES Permit. The permit is required to be submitted within 30 days of the start of construction.
	Very Small Quantity Generator License – Hazardous Waste Collection Program	To be obtained prior to construction, if necessary.
	Aboveground Storage Tank Notification Form	To be obtained prior to construction, if necessary.
	Solid Waste Case Specific Beneficial Use Determination	Xcel Energy will provide information to MPCA to support the determination in accordance with 7035.2860 for a portion of T47 foundation that will remain underground.

Table 12-1
Potential Permits and Approvals

Administering Agency	Permit, Approval, or Consultation	Status and Applicability to the Project
Minnesota Department of Natural Resources	License to Cross Public Waters	To be obtained prior to construction, if necessary.
	Native Prairie Protection Plan	Potential Native Prairie Review
	General Permit for Water Appropriations (Dewatering)	To be obtained prior to construction, if necessary.
	Public Waters Work Permit	Xcel Energy will submit its application for a License to Cross Public Waters based on a final Project design.
Minnesota Department of Transportation (MNDOT)	Utility Permits on Trunk Highway Right-of-way (Long Form No. 2525)	To be obtained prior to construction.
	Oversize/Overweight Permit for State Highways	To be obtained prior to construction.
	Access Driveway Permits for MNDOT Roads	To be obtained prior to construction.
Local Approvals		
Nobles County	Right-of-way permits, crossing permits, driveway permits for access roads, oversize/overweight permits for County Roads	Xcel Energy will enter into a Development, Road Use, and Drainage Agreement prior to construction.
Townships	Right-of-way permits, crossing permits, driveway permits for access roads, oversize/overweight permits for township roads	Xcel Energy will enter into a Development, Road Use, and Drainage Agreement prior to construction.

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