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September 30, 2016

VIA E-FILING

Daniel P. Wolf
Executive Secretary
Minnesota Public Utilities Commission
121 7th Place E., Ste. 350
St. Paul, MN 55101

Re: In the Matter of the Application of Red Pine Wind Project, LLC for a Large Wind Energy Conversion System Site Permit for the 200 MW Red Pine Wind Project in Lincoln County
PUC Docket No. IP-6646/WS-16-618

Dear Mr. Wolf:

On behalf of Red Pine Wind Project, LLC ("Red Pine"), a subsidiary of EDF Renewable Energy, Inc., please find attached Amended Public and Non-Public Trade Secret versions of the Large Wind Energy Conversion System ("LWECS") site permit application for an up to 200.1 MW wind energy project in Lincoln County, Minnesota (the "Project").

Since filing the initial LWECS permit application on September 16, 2016, Red Pine has finalized an offtake agreement for the Project that targets commercial operation for January 1, 2018. As a result, the application has been revised to describe a 2017 construction schedule. In order to accommodate that construction schedule, Red Pine has moved the Project substation location to be adjacent to the point of interconnection (the Hawks Nest Lake Substation). Moving the substation location eliminates the need for Red Pine to build the two-mile large high voltage transmission line that was described in the initial application. Red Pine believes that removing the transmission line from the construction schedule and avoiding the regulatory processes that would have been required to obtain approval for the transmission line make the accelerated Project timeline feasible.

Attached for filing today are the Public and Non-Public Trade Secret versions of the LWECS permit application as well as revised versions of the Project maps showing the new Project substation location. The other appendices filed with the initial LWECS permit application on September 16, 2016 have not changed and are not being resubmitted. Red Pine also intends to

separately file an update relating to its Certificate of Need ("CON") application in Docket No. IP-6959/CN-16-140 soon.

Finally, it has come to our attention that the docket numbers for the two proceedings related to the Project incorporate different IP numbers: 9659 (associated with Red Pine and used in the CON docket) and 6646 (associated with EDF and used in the LWECS site permit docket). We wish to clarify that Red Pine is the applicant for both the CON and the LWECS site permit, which is consistent with the contents of both the CON and the LWECS applications.

Please feel free to contact me with any questions.

Very truly yours,

Stoel Rives LLP

s/Sarah Johnson Phillips

Sarah Johnson Phillips

SJP:srb
Attachments

Westwood

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

Red Pine Wind Project

Lincoln County, Minnesota
September 30, 2016

Prepared For:

Red Pine Wind Project, LLC
10 2nd Street, Suite 400
Minneapolis, MN 55413

MPUC Docket Number: IP6646/WS-16-618

Application to the Minnesota Public Utilities Commission Site Permit for a Large Wind Energy Conversion System

Red Pine Wind Project

Lincoln County, Minnesota

MPUC Docket Number: IP6646/WS-16-618

Prepared for:

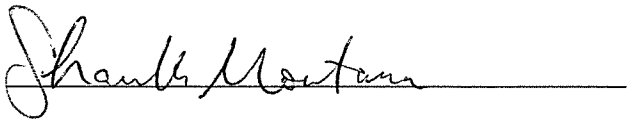
Red Pine Wind Project, LLC
10 2nd Street, Suite 400
Minneapolis, MN 55413

Prepared by:

Westwood Professional Services, Inc.
7699 Anagram Drive
Eden Prairie, Minnesota 55344

Project Number: 0006243.00

September 30, 2016

Project Name:	Red Pine Wind Project
Project Location:	Lincoln County
Applicant:	Red Pine Wind Project, LLC
Authorized Representative:	Ms. Shanelle Evens Montana, Project Developer
Signature:	
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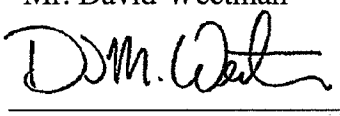
Signature:	
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CONTENTS

TABLES

MAPS

APPENDICES

ACRONYM	DEFINITIONS
AADT	Average Annual Daily Traffic
ABPP	Avian Bat Protection Plan
AEP	Annual Energy Production
Aggregate Surface	Road cover used for proposed access roads
AMSL	Above Mean Sea Level
ANSI	American National Standards Institute
APE	Area of Potential Effects
APLIC	Avian Power Line Interaction Committee
AST	Above Ground Storage Tank
ASTM	American Society for Testing and Materials
BGEPA	Bald and Golden Eagle Protection Act
BMPs	Best Management Practices; prevents soil erosion and sedimentation
BOP	Balance of Plant
BWSR	Board of Water and Soil Resources
Capacity	The capability of a system, circuit, or device for storing electronic charge
Phase Ia	Cultural Resources Literature Search – a large-scale review and compilation of known cultural resource data.
Phase I	Cultural Resources Reconnaissance Survey – physical inspection and identification of cultural resources within a specific area.
COD	Commercial Operation Date
Commission or PUC	Minnesota Public Utilities Commission
CN	Certificate of Need
CRP	Conservation Reserve Program
dB	Decibels
dB(A)	A-weighted decibel
Distribution	Relatively low-voltage lines that deliver electricity to the retail customer's home or business
DOC	Department of Commerce
DOE	United States Department of Energy
EBH	Environmental Bore Hole
EFP	Energy Facility Permitting – Minnesota Department of Commerce
Electromechanical (or EM)	Of, relating to, or being a mechanical process or device actuated or controlled electrically; especially being a transducer for converting electrical energy to mechanical energy
EMF	Electric and Magnetic Field
EPC	Engineering, procurement, and construction
EPCRA	Emergency Planning and Community Right-to-Know Act
ESA	Environmental Site Assessment
FAA	Federal Aviation Administration
FCC	Federal Communications Commission
FEMA	Federal Emergency Management Agency

FIRM	Flood Insurance Rate Maps
FPPA	Farmland Protection Policy Act
ft	foot/feet
GE	General Electric
Gearbox	An assembly of parts including the speed-changing gears and the propeller shaft by which the power is transmitted from an automobile engine to a live axle; the speed-changing gears in such an assembly
Generator	A machine by which mechanical energy is changed into electrical energy
GSU	Generator Step Up
Geotechnical	A science that deals with the application of geology to engineering
Hub	The central component of the wind turbine which connects the rotors to the generator.
HVTL	High Voltage Transmission Line
Interconnection	Location of project connection to the power grid.
kV	kilovolt
kW	kilowatt
LEGF	Large Energy Facility
Leq	Equivalent Sound Level
LGIA	Large Generator Interconnection Agreement
LGU	Local Government Unit
LHVTL	Large High Voltage Transmission Line
LWECS	Large Wind Energy Conversion System
MAPP	Midcontinent Area Power Pool
MCBS	Minnesota County Biological Survey
MW	megawatt
m	meter
m/s	meters-per-second
micrositing	The process in which the wind resources, potential environmentally sensitive areas, soil conditions, and other site factors, as identified by local, state and federal agencies, are evaluated to locate wind turbines and associated facilities.
MISO	Midcontinent Independent Transmission System Operator
MnDOT	Minnesota Department of Transportation
mph	miles-per-hour
MPCU, PUC or Commission	Minnesota Public Utilities Commission
Nacelle	A streamlined enclosure (as for an engine), which houses the gearbox, generator, brake, cooling system and other electrical and mechanical systems
NESC	National Electric Safety Code
NHIS	Natural Heritage Inventory System
NLCD	National Land Cover Dataset
NPDES	National Pollutant Discharge Elimination System

NRCS	National Resource Conservation Service
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
NWR	National Wildlife Refuge
NWS	National Weather Service
O & M	Operations and maintenance facility
PII	Potential Impact Index
Pitch	The action or a manner of pitching; especially an up-and-down movement
POI	Point of Interconnection
PPA	Power Purchase Agreement
Project	Red Pine Wind Project
PTC	Production Tax Credit
PWI	Public Waters Inventory
RECs	Recognized Environmental Conditions
RES	Renewable Energy Standard
Resistance	The opposition offered by a body or substance to the passage through it of a steady electric current
Rotor	The rotor consists of three blades mounted to a rotor hub
RD	Rotor Diameter: Diameter of the rotor from the tip of a single blade to the tip of the opposite blade
ROW	Right-of-Way
rpm	revolutions-per-minute
SCADA	Supervisory Control and Data Acquisitions (communications technology)
SHPO	Minnesota State Historic Preservation Office
SNA	Scientific and Natural Area
SPCC	Spill Prevention Control and Countermeasure
Step-up Transformer	A transformer that increases voltage
Substation	A subsidiary station in which electric current is transformed
SWCD	Soil and Water Conservation District
SWPPP	Storm Water Pollution Prevention Plan
TI	Turbulence Intensity – a measure of the standard deviation of wind speed over an hour, divided by the mean for the same time period
Torque	A force that produces or tends to produce rotation or torsion; also a measure of the effectiveness of such a force that consists of the product of the force and the perpendicular distance from the line of action of the force to the axis of rotation : a turning or twisting force
Transformer	An electrical device by which alternating current of one voltage is changed to another voltage
Transmission	An assembly of parts including the speed-changing gears and the propeller shaft by which the power is transmitted from an automobile engine to a live axle; the speed-changing gears in such an assembly
USACE	US Army Corps of Engineers
USFWS	US Fish and Wildlife Service

VSQG	Very Small Quantity Generator
WCA	Wetland Conservation Act
WCFZ	Worst Case Fresnel Zone
WMA	Wildlife Management Area
WMD	Wetland Management District
WPA	Waterfowl Protection Area
WRRS	Wildlife Response Reporting System
Yaw	To deviate erratically from a course (as when struck by a heavy sea); especially to move from side to side: to turn by angular motion about the vertical axis

1.0 APPLICANT INFORMATION

Red Pine Wind Project, LLC ("Red Pine" or "Applicant"), a subsidiary of EDF Renewable Energy, Inc. (EDF-RE), respectfully submits this application to the Minnesota Public Utilities Commission ("Commission") for a site permit to construct and operate the up to 200 megawatt ("MW") Red Pine Wind Project ("Project"). The Project is an independent power producer (IPP). The Project is a large wind energy conversion system ("LWECS"), as defined in the Wind Siting Act, Minnesota Statues Chapter 216F. The Project is located in Lincoln County in southwestern Minnesota, immediately east of Ivanhoe and north of Arco.

The Project is pursuing potential off-take arrangements that involve selling to utilities or other large energy consumers that have renewable energy requirements or goals. Depending on the off-take arrangement, Red Pine may either contract with an outside group to operate the wind project, or will oversee and administer all aspects of project execution internally. "All aspects of project execution" includes, but is not limited to, design, solicitation and award of construction contracts, construction, construction monitoring and oversight, third party quality assurance, and final commissioning and acceptance. Red Pine reserves the right to sell or assign the Project to another qualified entity before, during, or after the Project's construction, provided it receives the proper Commission approvals.

The Project will offer renewable energy that may be used to satisfy renewable energy obligations in Minnesota or other states, the renewable energy goals of other large energy consumers, or in the MISO market. In Minnesota, the Renewable Energy Standard ("RES") established in Minn. Stat. §216B.1691 requires Xcel Energy to provide 30 percent of its "total retail electric sales" from eligible renewable sources by 2020 and other utilities to provide 25% of their total retail electric sales from eligible renewable sources by 2025.

Construction of the Project is scheduled to begin as early as Q2 2017. The wind energy facility will include turbines, a project substation, collection lines, an operation and maintenance building, permanent meteorological tower(s) and gravel access roads. The Midcontinent Independent System Operator ("MISO") has conditionally accepted a Generator Interconnection Agreement with Red Pine Wind Project, LLC. Currently, the project does not anticipate the need for any new large high voltage transmissions lines ("LHVTL").

Consistent with Commission objectives, the Applicant is committed to optimizing the wind resource for the Red Pine Wind Project. Decisions with respect to equipment selection, site layout, and spacing are designed to make the most efficient use of land and wind resources. EDF Renewable Energy will evaluate the project to optimize wind resources, transmission interconnection opportunities, and economic factors, while avoiding and minimizing impacts to environmental resources to the degree practicable. Impacts which are taken into consideration to ensure responsible siting of the project include avoiding proximity to aviation facilities, wildlife habitats, environmentally sensitive areas, sound and shadow propagation, community impact and minimizing disturbance to agricultural land.

EDF Renewable Energy is a leading U.S. independent power producer with more than 25 years of expertise in project development and operations and maintenance services. EDF Renewable

Energy is the U.S. subsidiary of EDF Energies Nouvelles. The company currently operates and maintains 10,722.9 MW of renewable energy including wind, solar, biomass, and biogas projects. EDF-RE has put into service 6.7 gigawatts of energy, for projects across the country, including two wind projects currently owned in Minnesota (Fenton and Wapsipinicon), which combined provide over 310 MW of renewable wind energy to the state.

2.0 CERTIFICATE OF NEED

Red Pine filed an Application for a Certificate of Need ("CON") in Docket No. IP-6959/CN-16-140, pursuant to Minn. R. 7849.0200 and Minn. Stat. §216B.243, subd. 4, to construct and operate the Red Pine Wind Project. The Project is a Large Energy Facility ("LEGF") as defined in Minn. Stat. §216B.2421, subd. 2(1) and a Large Wind Energy Conversion System ("LWECS") as defined in Minn. Stat. § 216F.01. On February 12, 2016, Red Pine Wind Project, LLC filed a request for certain certificate of need filing criteria exemptions and a request for variance to the 45-day timing requirements between the filing of the exemption request and a certificate of need application. The Commission approved the request on March 25, 2016. However, since beginning the certificate of need proceeding and filing the application on September 16th, Red Pine has confirmed offtake arrangements that qualify the Project for an exemption under Minn. Stat. §216B.243, subd. 8(7). Red Pine plans to file an update in the Certificate of Need docket that will describe in more detail how the Project qualifies for this exemption.

Red Pine does not currently have a signed Power Purchase Agreement (PPA), but is pursuing potential off-take arrangements that involve selling to utilities or other large energy consumers.

3.0 STATE POLICY

Pursuant to Minnesota Statutes § 216F.03, the Applicant will further state policy by siting the Project in an orderly manner compatible with environmental preservation, sustainable development, and the efficient use of resources. The Applicant is designing the Project and spacing turbines to maximize wind development while minimizing impact on land resources.

The Wind Siting Act (Minnesota Statutes § 216F) requires an application for a site permit for a LWECS 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 application for a 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 site as a location for the Project.

This application has been prepared following the Minnesota Department of Commerce, Energy Facility Permitting ("EFP") Application Guidance for Site Permitting of Large Wind Energy Conversion Systems in Minnesota (DOC, 2010) ("LWECS Application Guidance").

4.0 PROJECT DESCRIPTION AND OVERVIEW

4.1 Project Description and Location

The Red Pine project area was selected after EDF-RE assessed a broader area for wind suitability (e.g. wind resource, landowner interest, environmental resources, transmission availability and economic potential). This particular project area was selected (identified in **Maps 1a and 1b**) because of its available land, proximity to viable interconnection options, interested landowners, optimal wind resource, and economics.

This site-specific wind assessments completed by Red Pine indicates the Project area is highly-suitable for wind power and will provide a reliable and sustainable source of wind power production. Red Pine also proposes to install up to four permanent meteorological towers to monitor the performance of the wind project as it relates to grid integration requirements and turbine power curves.

The overall footprint of the Red Pine project has been modified over time to respond to identified environmental constraints such as eagle use areas, state parks, airports, and sensitive natural areas. The entire area previously proposed within Lyon County was eliminated from the project footprint to respond to identified sensitive landscape features. Red Pine continues to assess its turbine options, and is currently evaluating wind turbines with rated power outputs of 2.0 and 3.45 MW, which would result in the installation of 58 to 100 wind turbines depending upon the model chosen. The Project Area contains approximately 42,000 acres, of which approximately 30,597 acres are currently leased. The Project's above ground facilities will occupy less than one percent of that area.

The Project is located in Lincoln County in southwestern Minnesota, immediately east of Ivanhoe and north of Arco, Minnesota (Maps 1a and 1b). Table 4.1 below lists the Township, Range, and Sections in which the Project is located.

Table 4.1: Project Location

County	Township Name	Township	Range	Section
Lincoln	Ash Lake	111N	45W	5, 6,12
Lincoln	Lake Stay	111N	44W	2-19, 21-28, 35, 36
Lincoln	Limestone	112N	44W	3-10,13-36
Lincoln	Marble	113N	45W	36
Lincoln	Royal	112N	45W	1, 2, 3, 12, 13, 24, 25, 35, 36

Associated facilities will include wind turbines mounted on towers, underground and above ground electrical collection and communications lines, an operation and maintenance

building, permanent meteorological tower(s) and gravel access roads. The Hawks Nest Lake Substation is where the electricity collected from the wind turbines interfaces with the utility transmission grid to become usable power for consumers and businesses.

Red Pine has an executed Generator Interconnection Agreement and intends to interconnect the Project at the 345 kV Brookings County-Hampton transmission line, one of the lines designated by the Midcontinent Independent System Operator as a Multi Value Project. That portion of the project would be constructed and owned by Northern States Power, and is expected to be in close proximity to the project substation (see Section 6.1). The project is planning to be in commercial operation by December 31, 2017.

4.2 Size of the Project Area in Acres

The Project is composed of approximately 42,097 acres (65.8 square miles) of mostly agricultural land. Red Pine will site the equipment and facilities within the 42,097-acre Project Area as shown in **Maps 2 and 3**. This will allow some siting flexibility in the event turbine locations currently identified prove to be unsuitable as project design evolves, and will provide sufficient room for buffers and setbacks required for avoidance of siting conflicts with infrastructure and natural resources.

4.3 Rated Capacity

The rated capacity of the Red Pine Wind Project is up to 200 megawatts (MW) at the MISO injection point, the Hawks Nest Lake Substation. The rated capacity of the Project may be 200.1 under certain turbine selection options; however, the MISO injection point capacity remains 200 MW.

4.4 Number of Turbine Sites

The wind project will consist of up to 100 wind turbine generators in the 2.0 to 3.45 megawatt range. While EDF Renewable Energy has not made a final selection of wind turbine generators for the project, this application evaluates the Vestas V100, V117, and V126.

4.5 Meteorological Towers

Once the Project is constructed, the Applicant will likely install up to four permanent meteorological towers within the Project Area that will remain for the duration of the Project. The exact number of Met towers is still under review. The permanent meteorological towers will likely be installed at hub height, and be guyed lattice or free standing lattice towers. The exact tower type will be selected once locations are finalized and other constraints are reviewed. Red Pine will meet FAA and local requirements for lighting and marking these towers. Additional details regard the permanent meteorological tower can be found in Section 6.3.2.

4.6 Percent of Wind Rights Secured

Red Pine currently has agreements with landowners over approximately 30,597 acres of private land within the Project Area, or roughly 72%, which is sufficient to support this 200 MW Project (see Section 7 for more information on wind rights).

Red Pine is currently contacting 95 "small tract" landowners for wind rights leases. Small tract landowners are typically 5 acres or less within the project boundary.

4.7 Ownership Statement

EDF-RE currently owns the Fenton Wind (Murray and Nobles Counties) and Wapsipinicon (Mower County) projects in Minnesota, which combined provide over 310 MWs of renewable wind energy to the state.

5.0 PROJECT DESIGN

5.1 Description of Project Layout

Red Pine has designing the Project to optimize the wind resource and minimize impacts to potentially sensitive infrastructure, ecological resources, and cultural features. Consequently, wind turbines and associated facilities have been sited primarily on cultivated cropland. Approximately 71% of the Project Area is mapped as cultivated cropland. Smaller amounts of other cover types such as wetland, grassland and shrubland may be affected, but will not be completely quantifiable until further field studies are completed during the growing season. Estimated land cover impacts per type are provided in Section 8.15.

The Project layout closely adheres to the wind energy conversion facility siting criteria outlined in the Commission's *Order Establishing General Wind Permit Standards*, Docket No. E, G999/M-07-1102 (MPUC, 2007) ("PUC General Permit Standards"), applicable local government ordinances and Red Pine's best siting practices. Turbines siting and spacing is further dictated by the selected turbine model, setback requirements, proximity to existing residences, interconnection with available transmission and proximity to natural resources. Preliminary site layouts are shown on **Maps 3a-1 to 3a-3** along with the preliminary project substation location and planned Point of Interconnection.

For purposes of this application, Red Pine has quantified anticipated impacts to land cover types from each of the three turbine model layouts, but has assessed and evaluated potential mitigation options and needs based upon the layout with the most proposed turbines and intensive use, the Vestas V100. This layout would have up to 100 turbines and require the most land conversion for turbines, access roads, and collection.

The Project has been designed to ensure consistency with setbacks and standards established by the Commission and previous PUC actions. This includes a wind access buffer of 5 RD in the prevailing wind direction and 3 RD in the non-prevailing wind direction; a noise setback meeting Minnesota Noise Standards, Minnesota Rules Chapter 7030; and a minimum 1,000-foot setback from homes. Project setbacks as they relate to the preliminary site layout for the three turbine models under consideration are provided on **Maps 3b-1 to 3b-3**, and are further discussed in Section 8.2.1.2.

Lincoln County maintains a Windpower Management (Section IX) ordinance that applies to all wind energy facilities with a rated capacity of less than 5 megawatts. Since Lincoln County has delegation authority, County ordinances which exceed MPUC requirements may apply to the project pending demonstration by the Project with good cause to the Commission that the more restrictive standards would prevent the project from being sited. Red Pine does not anticipate conflicts with the current county ordinance, and has designed the project to meet or exceed required setbacks. Section 8.2.1.2 demonstrates how the setbacks established by Red Pine compare to the required setbacks.

While turbine procurement efforts have not been finalized, Maps 3a-1 to 3a-3 depict the various layouts for the V100, V117, and V126 turbines. Turbine locations are subject to adjustment based upon final turbine model selection, findings of Project preconstruction geotechnical and environmental surveys, micrositing and field constructability reviews. The procurement efforts for the specific turbine models proposed have potential to influence the final location and placement of the generators within the Project Area. When turbine models are finalized, optimization of turbine layouts will occur and include 1-3 alternative locations within the project boundary. As the Project moves forward with the remaining land acquisition and small tract leases, additional buildable land will become available which may influence alternatives and turbine locations. Final alternatives and layouts will be presented to the MN DOC during the preconstruction meeting.

The Applicant will prepare the final siting layout to optimize generation while minimizing the impact on land and other potentially sensitive resources, and to ensure compliance with setback and other siting requirements. The topography of the site, environmental constraints, as well as the selected turbine technology dictates turbine spacing and layout of electric collection lines. Project engineering and operational design is summarized in subsequent sections of this report.

5.2 Description of Turbines and Towers

Red Pine is currently considering up to 100 wind turbine generators in the 2.0 to 3.45 megawatt range. The Vestas V100, V117, and V126 wind turbines have been used for preliminary layout and performance modeling. As previously noted, turbine procurement efforts are still in process with on-going consideration of various models and manufacturers. All turbines under consideration are three bladed, active yaw, and active aerodynamic control regulated wind turbine generators with power/torque control capabilities. The rotors

utilize blade pitch regulation and other technologies to achieve optimum power output under various site conditions and wind speeds.

Red Pine Wind Project, LLC is currently in the process of final selection for turbine manufacturer and model. The criteria used in turbine selection are: 1) Overall performance and reliability, 2) turbine suitability for the Project's wind data, and 3) availability and cost of turbines.

The Vestas V100, V117, and V126 wind turbines are used as representative turbines within the 2.0 to 3.45 megawatt range. Table 5.2 shows the characteristics for both turbines.

Table 5.2: Wind Turbine Characteristics

Design Features	Vestas V100 2.0 MW Wind Turbine	Vestas V117 3.3 MW Wind Turbine	Vestas V126 3.45 MW Wind Turbine
Nameplate Capacity	2,000 kW	3,300 kW	3,450 kW
Hub Height	262.5 ft (80 m)	262.5 ft to 382.2 ft (80m to 116.5m)*	285.4 ft to 544.6 (87 m to 166 m)*
Total Height	426.5 ft (130 m)	138.5 to 175m*	150 to 129 m*
Rotor Diameter	328.0 ft (100 m)	383.9 ft (117m)	413.4 ft (126 m)
Design Life	Minimum of 20 years	Minimum of 20 years	Minimum of 20 years
Cut in Wind Speed	6.7 mph (3m/s)	6.7 mph (3m/s)	6.7 mph (3m/s)
IEC Wind Class	IIB	IB to DIBtS	IIA to DIBtS
Cut out Wind Speed	49.2 mph (22m/s)	55.9 mph (25 m/s)	50.3 mph (22.5m/s)
Rotor Speed	7.2-15.3 rpm	6.3-17.7 rpm	5.3-16.5 rpm
Sound at Turbine	105 dB(A)	108.5 dB(A)	108.5 dB(A)
Power Regulation	Use of microprocessor pitch control system, OptiTip and the Vestas Converter Unity System (VCUS) to operate rotor at variable speed (RPM). Unit is also equipped with low voltage ride thru technology for demanding reliability standards	Use of microprocessor pitch control system, OptiTip and the Vestas Converter Unity System (VCUS) to operate rotor at variable speed (RPM). Unit is also equipped with low voltage ride thru technology for demanding reliability standards	Use of microprocessor pitch control system, OptiTip and the Vestas Converter Unity System (VCUS) to operate rotor at variable speed (RPM). Unit is also equipped with low voltage ride thru technology for demanding reliability standards
Generation	2.0 MW per turbine	3.3 MW per turbine	3.45 MW per turbine
Tower	Multi-coated, conical tubular steel with safety ladder to the nacelle (rest platforms every 9 m for height of tower)	Multi-coated, conical tubular steel with safety ladder to the nacelle (rest platforms every 9 m for height of tower)	Multi-coated, conical tubular steel with safety ladder to the nacelle (rest platforms every 9 m for height of tower)
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

Table 5.2: Wind Turbine Characteristics			
Design Features	**Vestas V100 2.0 MW Wind Turbine**	**Vestas V117 3.3 MW Wind Turbine**	**Vestas V126 3.45 MW Wind Turbine**
Main Bearings	Spherical roller bearings	Spherical roller bearings	Spherical roller bearings
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	Standard FAA lighting	Standard FAA lighting
Foundation	Per manufacturer specifications, foundation structural engineer design and site conditions	Per manufacturer specifications, foundation structural engineer design and site conditions	Per manufacturer specifications, foundation structural engineer design and site conditions

*depending on wind class

Source: Manufacturer-supplied turbine data.

A control panel inside the base of each turbine tower houses communication and electronic circuitry. Each turbine is equipped with a wind speed and direction sensor that communicates to the turbine's control system to signal when sufficient winds are present for operation. The development site will also include an automated SCADA system located at the project substations which provides local and remote supervision and control of key aspects of the projects performance and equipment. Turbines feature variable-speed control and independent blade pitch to enhance aerodynamic efficiency.

The cylindrical/tapered tubular steel turbine towers, upon which the nacelle is mounted, typically consist of three to four manufactured steel sections. Welds are typically factory fabricated in automatically controlled welding machines and ultrasonically inspected during manufacturing per American National Standards Institute (ANSI) specifications. Surfaces are typically sandblasted and multi-layer coated (generally non-glare white, off-white, or gray) for protection against corrosion. Access to the turbine is typically through a lockable steel door at the base of the tower. Platforms inside the tower are accessed by a ladder or lift within the tower and include attachments for fall arresting safety system to facilitate access to the interior and exterior of the nacelle.

5.3 Description of Electrical System

Construction of the project will include up to 100 wind turbines, each with its own step-up transformer either within the nacelle or pad-mounted outside at the base of unit, depending upon the turbine manufacturers design. Energy from the turbines will be routed through both underground and above-ground electrical collection systems that will deliver power to the project substation. This power will be stepped up at the Project's substation from the collection line voltage of 34.5 kilovolts (kV) to the transmission voltage of 345 kV. See Section 6.1 and 6.2 for a more detailed description of the proposed electrical system. The

preliminary electrical collection layout for each turbine model is provided on Maps 3a-1 to 3a-3.

Red Pine will contract to have the electrical system designed by a professional, experienced and qualified electrical system design firm. The entire collection system will be designed to meet National Electric Safety Code (NESC), National Electric Code (NEC), and American National Standard Institute (ANSI), National Electrical Manufacturers Association (NEMA) and Occupational Safety and Health Administration (OSHA) standards. The design work includes a load flow analysis for the Project to ensure the facility will meet the power factor and voltage control specifications. A coordination study will determine the appropriate protective relay settings for optimum protection and selectivity for the Project's electrical system and transmission system interface requirements.

6.0 DESCRIPTION AND LOCATION OF ASSOCIATED FACILITIES

Associated facilities that will be constructed to support the operation of the wind turbines and facilitate the delivery of the electricity to consumers including, but are not limited to: a project substation, an electrical collection system, an O&M facility, permanent meteorological towers, access roads, and a laydown yard. Red Pine is seeking permitting approval from the Commission through an LWECS site permit for the associated facilities described below.

6.1 Transmission and Project Substations

Currently, the project does not anticipate the need for any new large high voltage transmission lines ("LHVTL"). The Midcontinent Independent System Operator (MISO) has conditionally accepted a Generator Interconnection Agreement with Red Pine Wind Project, LLC, effective March 4, 2015. Red Pine intends to interconnect to the existing Brookings County-Hampton MVP 345kV overhead transmission line that runs through the northernmost portion of the Project Area. Connections to the project substation and ultimately the Brookings County-Hampton MVP 345kV line will be through 34.5kV collection lines. The 34.5kV lines will be permitted as a Conditional Use through Lincoln County. The point of interconnection (POI), as will be further defined later in MISO's interconnection process, would be constructed and owned by the transmission owner, Xcel Energy, and is anticipated to be in close proximity to the project substation, as shown on Maps 3a-1 to 3a-3.

The project substation will be located in the northern portion of the Project Area, approximately six miles northeast of Ivanhoe, Minnesota. The Hawks Nest Lake Substation (H081) will be constructed by Northern States Power Company.

6.2 Collector Lines and Feeder Lines

Power from each turbine will be fed down the tower from the generator through the power conditioning equipment and breaker panel. The generator voltage is stepped up to the

collector system voltage of 34.5 kV by means of a Generator Step Up transformer (GSU), which is located either within each turbine nacelle or on a grade mounted pad outside the base of each tower. The electricity from each turbine GSU is connected to the project substation through the underground collection lines, and then to the POI on the power grid after stepping up the project substation output to the 345 kV transmission voltage.

The collector lines will combine the electrical output of the wind turbines into one 34.5kV circuit and step up to the 345kV transmission voltage within the project substation. The total preliminary length of the collector lines for the Vestas V100 layout is approximately 65 miles, 54 miles for the V117, and 51 miles for the V126. New transmission interconnection facilities will be constructed, owned, operated and maintained by the transmission owner, which will be specifically defined and located during the interconnection process.

The project substation will be located in the northern portion of the Project Area, approximately six miles northeast of Ivanhoe, Minnesota. The project will interconnect with the existing 345kV overhead transmission facility that runs through the northernmost portion of the Project Area (Maps 3a-1 to 3a-3).

6.3 Other Associated Facilities

6.3.1 O & M Facility

An Operation and Maintenance (O&M) facility will be needed on or near the site and will provide access and storage for project maintenance and operations. The specific location of the O&M facility is currently undecided. The Red Pine Wind Project will either be operated and maintained by EDF-RE's own O&M group, or through maintenance and service agreements negotiated as part of the Turbine Supply Agreement with manufacturers, or to other pre-qualified service providers. EDF-RE may exercise an option to seek permitting approval for an O&M facility locally.

6.3.2 Permanent Meteorological Tower

The Applicant may install up to four permanent meteorological towers within the Project Area that will remain operational for the duration of the Project. Permanent meteorological towers will be free standing, made of galvanized steel with medium dual-intensity day and night lights as required by the FAA, and will have the capability to have acoustic recording equipment installed on them. The location of permanent meteorological towers is yet to be determined.

Met tower site selection is based upon coordination with the final locations of the wind turbines and for proper operation of wind assessment equipment, but will be placed no closer than 300 feet from the edge of the road rights-of-way and from the site control boundaries (wind and land rights). The towers will contain instruments such as

anemometers, data loggers, wind direction sensors, temperature probes that can be configured at various elevations and a communication system for providing remote reporting of the data being collected. The temporary area required to construct the meteorological towers is expected to be approximately 400 by 400 feet and includes equipment storage, material lay down, and construction staging. The permanently impacted area will be approximately 20 by 20 feet after the towers are operational.

6.3.3 Turbines Access Roads and Temporary Laydown/Staging Areas

Access road networks for the project will be designed to serve the Project in an efficient manner, taking into consideration the needs landowners and comments from local road authorities. Construction

The project will also require grading of a main, centrally-located, temporary laydown area of approximately 10 acres to serve both as a parking area for construction personnel and staging area for turbine components during construction. Other, temporary staging areas may be needed for parking and unloading of large equipment deliveries.

6.4 Associated Facilities Permitting

The Applicant will be responsible for undertaking all required environmental review and will obtain all permits and licenses required following issuance of the LWECS Site Permit. Red Pine will apply to Lincoln County for individual addresses for the towers, as well as a Conditional Use Permit (substation, O&M building, and 34.5 kV line), Land Use, and other local permits, as needed.

7.0 WIND RIGHTS

Red Pine Wind Project, LLC has substantially completed securing landowner agreements for wind rights and property easements necessary to support the Project. The overall area within the project boundary consists of approximately 42,097 acres. Red Pine has executed and recorded landowner agreements for 30,597 acres of private land within the Project Area which is roughly 72% of the land within the overall project boundary. Current participating and non-participating parcels and landowners are shown on Map 2. The secured easement agreements will ensure access for construction and operation of the Project and identifies landowner and Red Pine Wind Project, LLC obligations and responsibilities during the implementation and operation of the wind project. Project facilities have been sited on leased land, and the current leasehold is sufficient to accommodate the proposed 200 MW project.

8.0 ENVIRONMENTAL IMPACTS

In accordance with Minnesota Rules Chapter 7854, the Applicant provides the following description of the environmental conditions of the Project Area. Red Pine Wind Project, LLC has

considered exclusion and avoidance criteria in selecting the Project Area, consistent with MPUC procedures on LWECS siting criteria.

Red Pine Wind Project, LLC sent letters to various regulatory and governmental authorities to request review of the Project Area for applicable comments and concerns. A list of the agencies who received this letter is included in **Appendix A**. Responses from agencies that included comments regarding the proposed Project are discussed in the following sections. A copy of agency responses is included in **Appendix B**. In total, comments were received from nine government agencies and organizations.

The Project location is rural with an agricultural-based economy. Corn, soybeans, grasslands and pasture crops are the predominant crops in Lincoln County. The County also produces livestock including: hogs, cattle and calves, dairy and sheep and lambs. Typical landscapes within the project area are shown on **Map 4**.

8.1 Demographics

The Project is located in southwestern Minnesota in a rural/agricultural region within Lincoln County. The 2014 census population for Lincoln County was 5,788, and the U.S. Census 2010 American Community Survey (ACS) population estimate was 4,682, resulting in a decrease of 0.6%. The estimated household size for Lincoln County based on the 2010-2014 ACS data was 2.28 people, with 3,113 housing units.

Table 8.1 presents the U.S. Census Bureau 2010-2014 ACS demographic profile data of Lincoln county and relevant townships. The Project is located in the following Townships: Ash Lake, Lake Stay, Limestone, Marble and Royal. The demographic profile summarizes some of the population and economic characteristics of the county and townships in which the project is located. The estimated median household income for the period between 2010 and 2014 for Lincoln County was $49,122. The per capita income for the majority of the townships in the Project Area is higher than the overall county per capita income. No impact to local demographics is expected.

Table 8.1: Population and Economic Characteristics

Location	Population	Housing Units	Per Capita Income	Families Below Poverty Line (%)
Lincoln County[1]	**5,788**	**3,113**	**$25,764**	**6.0%**
Ash Lake Township[2]	152	68	$26,814	6.6%
Lake Stay Township[2]	156	65	$28,164	7.6%
Limestone[2]	121	58	$34,409	7.5%
Marble[2]	171	76	$23,004	2.4%
Royal[2]	175	118	$28,348	3.3%

Source: U.S. Census Bureau, 2010-2014 American Community Survey

[1] 2014 Values

[2] 2010 Values

There are three population centers near the Project Area. The City of Ivanhoe is located on the west central border of the Project Area and has a population of approximately 500. The City of Arco, with a population of approximately 91, is located approximately 0.4 miles southwest of the Project Area. The City of Russell is located approximately 6 miles southeast of the Project Area and has a population of 404. The largest population center is the City of Marshall with a population of approximately 13,609; the western extent of Marshall is located approximately 12 miles east of the Project Area.

According to the U.S. Economic Census 2010-2014 ACS, the largest industries employing residents in Lincoln County are educational services, health care and social assistance, which make up nearly 26.6% of the workforce while agriculture, forestry, fishing and hunting and mining make up nearly 16.6% of the workforce.

8.1.1 Potential Impacts

The Project is anticipated to result in positive socioeconomically impacts to the project area, and beneficial to landowners, local governments, and communities. The project will result in increased wages to local businesses and landowners during Project construction and operation, and a sizeable increase to the Lincoln County tax base.

Participating landowners will also benefit economically through lease payments, which will offset potential financial losses associated with removing small amounts of land from agricultural production. In general, the land surrounding each turbine can continue to be utilized for crops and cattle grazing. On average, approximately 0.5 acre to 1 acre of land per turbine is removed from agricultural production. Landowner compensation is established by voluntary land lease and wind easement agreements.

No significant demand increases are anticipated on long-term housing. The project will require temporary housing for out-of-town laborers, which is anticipated to be accommodated by local short-term lodging providers. The operations and maintenance of the facility will require approximately 10 full time site technicians, a Wind Power Plant Supervisor and additional support staff as appropriate. The Project anticipates that sufficient permanent housing will be available in or near the Project to accommodate these employees.

8.1.2 Mitigation Measures

Minor losses in agricultural production will be compensated through the established wind rights agreements with landowners. Additional mitigation measures are not anticipated as the socioeconomic impacts associated with the Project will be largely positive.

8.2 Land Use

8.2.1 Local Zoning and Comprehensive Plans

A comprehensive plan is a land use and community planning tool used to guide the growth and intentions of a county or municipality. Generally, comprehensive plans include details regarding existing and future land use, population and housing trends, economic development, and environmental characteristics. In preparing this application, the Applicant reviewed and analyzed the most recently adopted comprehensive plans of Lincoln County and municipalities within and adjacent to the proposed Project Area. A list of the plans reviewed can be found in Table 8.2.

Lincoln County has its own comprehensive plan and comprehensive development ordinance. Lincoln County has a Windpower Management Ordinance for wind energy facilities with a rated capacity of less than 5MW, and the County has assumed responsibility for permitting projects less than 5MW as described in Minnesota Rules Chapter 216F.011. Lincoln County Comprehensive Development Ordinance Section IX further discusses Windpower Management and regulatory standards. According to Lincoln County Environmental Office, the Red Pine project is situated entirely within the Rural Preservation Management District (AG) of Ash Lake, Lake Stay, Limestone, Marble and Royal Townships as defined by the Lincoln County Comprehensive Development Ordinance. The project will be designed to meet the minimum setback requirements identified by the local ordinance. Specific Lincoln County setback requirements are outlined in Section 600.0. The County will likely require a Conditional Use Permit for portions of the project.

8.2.1.1 Adopted Comprehensive Plans

Lincoln County has a Comprehensive Land Use Plan that was updated in 2009. The following table provides an inventory of Land Use Plans for Local Governments within and adjacent to the Project Area.

Table 8.2.1.1: Comprehensive Plan Inventory for Local Government Units

Local Government	Plan Name	Year Adopted/Updated	Associated Development Plan(s)
Lincoln County	Comprehensive Land Use Plan	2009	Comprehensive Development Ordinance
Ash Lake Township	NA	NA	NA
Lake Stay Township	NA	NA	NA
Limestone Township	NA	NA	NA
Marble Township	NA	NA	NA
Royal Township	NA	NA	NA
City of Ivanhoe	NA	NA	NA
City of Arco	NA	NA	NA

Table 8.2.1.1: Comprehensive Plan Inventory for Local Government Units			
Local Government	**Plan Name**	**Year Adopted/Updated**	**Associated Development Plan(s)**
City of Russell	NA	NA	NA
City of Marshall	Comprehensive Land Use Plan	1995	Zoning Ordinance

8.2.1.2 County or Local Ordinances

The project will be designed to meet or exceed the minimum setback requirements identified by the local ordinance, to the degree they are intended for, and applicable to, commercial scale wind projects over 25MW in size. The table below compares the Red Pine Wind Project design and setbacks with those required by the Lincoln County ordinances, and those subject to MPUC requirements.

Table 8.2.1.2: Red Pine Wind Project Setback Comparison			
Resource	**MPUC**	**Lincoln County**	**Project Design**
Non-participating/ Participating Property Lines	3 RD on east-west axis and 5 RD on north-south axis from non-participating property lines[1]	5 RD	3 X 5 RD
Residential Dwellings	500 feet (152 meters) and sufficient distance to meet state noise standard.	750 feet (228 meters)	>1,000 Feet
Meteorological Towers	250 feet from the edge of road ROW and boundaries of developer's site control	None specified.	250 feet
Other Structures	None specified.	1.25 times their height[3]	At least 1.25 times height of turbines.
Public Roads and Recreational Trails	250 feet (76 meters)	300 feet (91 meters; from right-of-way)	300 Feet
Public Lands	3 RD east-west axis and 5 RD on north-south[1]	None specified.	3 X 5 RD
Wetlands,	No turbines, towers or	None specified.	Avoidance of

Table 8.2.1.2: Red Pine Wind Project Setback Comparison			
Resource	**MPUC**	**Lincoln County**	**Project Design**
Streams and Ditches	associated facilities allowed. Electric collector and feeder lines may cross or placed subject to DNR, FWS and/or USACOE permits.		wetlands with turbines.
Internal Turbine Spacing	3 RD on east-west axis and 5 RD on north south axis[1]	None specified.	3 X 5 RD
Public conservation lands managed as grasslands	None specified.	None specified.	Avoided.
Native Prairies	Turbines and associated facilities shall not be placed in native prairies, unless approved in the native prairie protection plan	None specified.	Outside of native prairies
Sand & Gravel Operations	Turbines and associated facilities shall not be placed in active sand and gravel operations, unless negotiated with landowner.	None specified.	Outside of active gravel mines
Aviation	Turbines and associated facilities shall not be located so as to create an obstruction to navigable airspace of public and private airports.	None specified.	Nearest airport is 7.8 miles.

[1]3 RD for Vestas V100 turbine is 300 meters (984 feet); 5RD for Vestas V100 turbine is 500 meters (1,640 feet); 3 RD for Vestas V117 turbine is 351 meters (1,151 feet); 5RD for Vestas V117 turbine is 585 meters (1,919 feet); 3 RD for Vestas V126 turbine is 378 meters (1,240 feet); 5RD for Vestas V126 turbine is 630 meters (2,067 feet); actual setbacks to be confirmed following site survey of individual project parcel boundaries;

[2] 1.1 times the total height = Vestas V100 – 88 meters (288 feet); Vestas V117 – 88 meters (288 feet); Vestas V126 - 96 meters (315 feet); from edge of public right-of-way

[3] 1.25 times height = Vestas V100 – 100 meters (328 feet); Vestas V117 – 100 meters (328 feet); Vestas V126 - 109 meters (358 feet); from edge of public right-of-way

Red Pine Wind turbines are located at least 1.7-miles from the nearest Waterfowl Production Area (WPA), Yellow Medicine River WPA. The nearest state-owned Wildlife Management Area (WMA) is located at least 0.2 miles away from the turbine locations (Rost WMA). Turbines will be set back from public lands based on a minimum of the 3 RD by 5 RD setbacks from all non-leased properties per the LWECS Application Guidance.

8.2.1.3 Current and Future Zoning

The Lincoln County Comprehensive Land Use Plan (March 2009) describes sustainable goals for the county's economic development, including the following specific mention of the development of wind energy in the area (Chapter 3):

1. Sustain and continue to develop wind energy generation.
2. Take advantage of sustainable economic opportunities that evolve out of wind energy such as tourism.

One of the objectives in the Comprehensive Plan is "Continue to take an active role in the development of renewable energy projects that benefit community interests." The policies and strategies mentioned under Renewable Energy are as follows:

Policies:

1. Support coordination in the siting and development of renewable energy structures.
2. Become more involved in the utility right-of-ways.

Strategies:

1. Continue to take an active role in legislation effecting wind energy.
2. Assist property owners in education about wind rights.

The Southwest Regional Development Commission (SRDC), with support of the McKnight Foundation, developed a planning and zoning guide for local government. In this study, the most compatible land use around wind turbines is sited as agriculture.

8.2.2 Conservation Easements

The USFWS, Lincoln County Soil and Water Conservation District (SWCD), and the Natural Resource Conservation Service (NRCS) offer conservation programs that encourage setting aside wetlands and grasslands for conservation purposes, or implementation of conservation practices on private land. These programs can provide another source of income for local farms and landowners. Some of these programs include the Conservation Reserve Program (CRP), Reinvest in Minnesota (RIM), Wetland Reserve Program (WRP), and the Environmental Quality Incentive Program (EQIP). These programs vary in their requirements, payments, and the length of time for which a piece of property must be enrolled. Some of these easements are perpetual in nature. As shown on **Map 5**, there are multiple areas that have been set aside under the Conservation Reserve Program and other state funded conservation easement programs.

As shown on **Maps 3b-1 to 3b-3**, the preliminary layouts have avoided impacts to conservation easements held by public agencies and private organizations to the extent practicable. CRP and WRP areas will be verified by evaluating current land lease

agreements for participating landowners prior to construction. Red Pine Wind Project, LLC plans to avoid CRP, RIM and WRP lands as it continues to develop the project.

8.2.3 Potential Impacts

The Project is generally consistent with Lincoln County's comprehensive plans and zoning. Agricultural use of the Project Area will continue. The Project will positively impact local economies by providing a diversified income stream for landowners, possible temporary jobs for local workers, and tax benefits to the local governments.

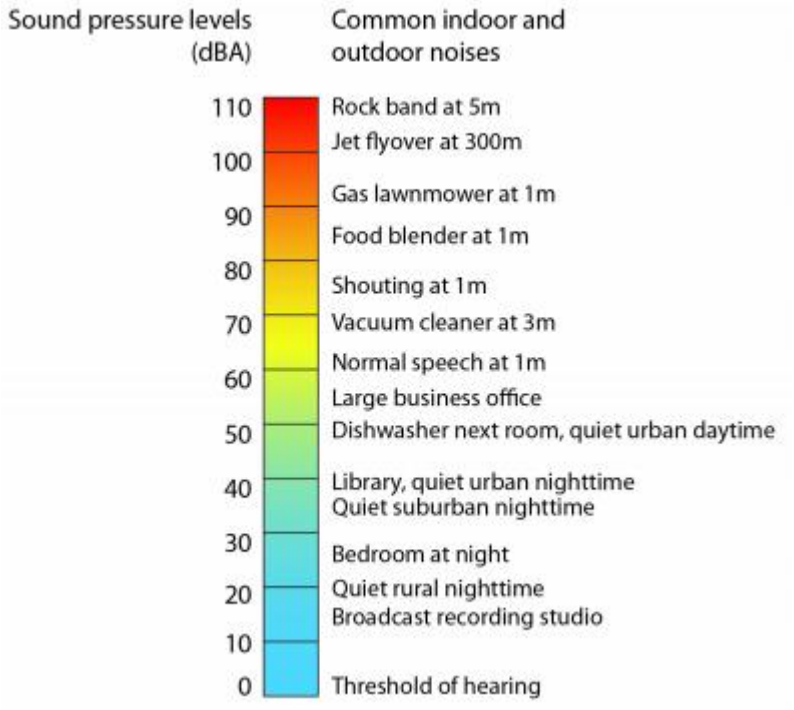
8.2.4 Mitigation Measures

Red Pine does not propose any mitigation measures because negative impacts to local zoning and comprehensive plans are not expected. No mitigation measures are proposed for conservation easements because impacts to lands subject to conservation easements are not anticipated. However, if these lands are unavoidable, Red Pine Wind Project, LLC will work collaboratively with the USDA NRCS, as well as the landowner, to remove the impacted portion of the parcel from the program or provide appropriate mitigation.

8.3 Noise

The term "noise" is commonly used to describe unwanted sound. Sound is an audible variation of air pressure, and can vary in both intensity and frequency. The intensity of a sound wave can vary greatly and is measured on a logarithmic scale in units called decibels [dB]. Each 10 dB increase is a doubling of the intensity. Because people are more sensitive to sounds of certain frequencies, the A-weighted ["dB(A)"] scale is used to discuss sound impacts on humans. The dB(A) scale gives more weight to sounds within the normal human hearing range and less weight to sounds that are at the upper and lower range of audible frequency. Table 8.3 shows sound levels associated with some common sources and/or locations:

Table 8.3: Common Noise Sources and Sound Levels



Source: MPCA, November 2015.

8.3.1 Description of Resources

The term "ambient acoustic environment" refers to composite sound generated in a given environment or community. Common sound sources within an agricultural and/or rural environment include, but are not limited to, sound from farm equipment such as tractors and combines, sound generated from traffic on roadways, sounds from birds, and wind rustling through the vegetation. The outdoor ambient acoustic environment is a composite of sound from varying sources, distances, and directions. Typical ambient night time sound levels for windy rural areas or an agriculturally-oriented community are in the low-to-mid 30 dB(A) range. Ambient levels up to 60 dB(A) may exist near roads, farmsteads and other areas of human activity during normal daytime work hours (EPA 1974). The windy conditions in the Project Area will tend to increase the natural ambient sound levels and mask other sound sources.

The Minnesota Pollution Control Agency establishes acceptable sound levels based on time of day and the use of an area. For example, higher sound levels are acceptable in industrial areas during the day than residential areas during the night. According to Minnesota Rules Chapter 7030.0040, night time sound levels in the Project Area must be below 50 dB(A) 50% of the time within an hour, called the $L_{50,}$ and below 55 dB(A) 90% of the time within an hour, called the L_{90}. The Leq for an area is the average sound energy level over a given period. The Minnesota Pollution Control Agency has the authority to

adopt noise standards pursuant to Minnesota Statute Section 116.07, subd. 2. The adopted standards are set forth in Minnesota Rule Chapter 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 volumes that may not be exceeded for more than 10 percent of any hour (L_{10}) and 50 percent of any hour (L_{50}). Household units, including farm houses, are included in Land Use Classification 1. Table 8.3.1 shows the MPCA State noise standards. All the land within the Project Area is considered Land Use Class 1.

Table 8.3.1: MPCA State Noise Standards — Hourly A-Weighted Decibels

Land Use	Code	Daytime (7:00 AM - 10:00 PM) dBA		Nighttime (10:00 PM - 7:00 AM) dBA	
		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

8.3.2 Potential Impacts

Operation of wind turbines will contribute to sound levels in the area. The sound associated with the wind project will vary based on wind speed, distance from turbines, the number of turbines in operation, weather and surface conditions, and the nature of obstacles and/or the topography between the wind turbines and the location where the sound is heard. Generally, turbines produce more sound on windier days, but the wind also produces more ambient noise. Therefore, perceived increases in sound levels within the Project Area as modeled for this project are expected to be minimal.

Ambient sound monitoring was conducted at four residential locations and summarized in a pre-construction sound monitoring report (**Appendix C**). The objective of the study was to measure sound levels over a week period to establish representative pre-construction sound levels within and near the wind project boundary. Three locations were within the Project Area and one was at an off-site location. Monitoring was completed in conformance with the Minnesota Department of Commerce, Energy Facility Permitting "Guidance for Large Wind Energy Conversion System Noise Study Protocol and Report". Sound level readings were taken every second for approximately seven days between 22 February and 29 February 2016. Readings were taken with Larson-Davis Model 831 sound level meters located within 100 to 200 feet of homes on the residential properties. Average energy equivalent sound levels (Leq) and statistical sound levels including the L50 (level exceeded 50% of an hour) were automatically calculated and stored by each meter each hour of the monitoring period.

The four monitoring locations are as follows and shown on **Maps 6a to 6f**.

- Site M1: Located northeast at 3162 County Hwy 7
- Site M2: Located southeast outside the Project boundary at 1375 County Road 4
- Site M3: Located southeast at 2464 280th Avenue
- Site M4: Located in the center at 2780 250th Avenue

Three sites M1, M3 and M4 showed very similar sound level variations over the time period. Site M2 was affected by some farm machinery and operations and was eliminated from the study results. M2 is the monitoring location in Lyon County that currently falls outside of the project area. Average Leq and L50 were estimated from the large data set. As shown in Table 8.3.2, in the existing condition, the current Leq sound levels range from 33 to 40 dB(A) during both the daytime and nighttime, and Average L50s range from 28 to 35 dB(A). L50s for the site are well below Minnesota Noise Standards for both daytime and nighttime readings at 60 dB(A) and 50 dB(A), respectively.

Table 8.3.2: Average Pre-Construction Sound Levels dB(A)

Period	Location	Leq	L50
Nighttime	M1	33.2	26.1
	M3	33.2	28.3
	M4	35.3	30.3
	Average	33	28
Daytime	M1	40.9	33
	M3	39.1	33.3
	M4	39.1	38.3
	Average	40	35

Three wind turbine types and layout configuration were selected for analysis. **Table 8.3.3** outlines the characteristics of each turbine type. Maps 6a to 6f show the various proposed wind turbine locations in reference to sensitive receptors and monitoring locations. Monitoring meters were generally placed within about 100 feet of a residence, and between a proposed turbine location.

Noise modeling was completed for each of the three wind turbine model options using industry-accepted sound-modeling software. The software used to model the project was WindPRO, and the full report is provided in **Appendix D**. The scenarios assumed that the wind turbines were operating at a wind speed that resulted in the loudest sound being emitted from the turbines. According to the Vestas sound documentation provided by the manufacturer, the loudest normal operating noise level emitted from the V100-2.0 is 105.0 dB(A) at 10 m/s and higher at 80 m above ground level (AGL), for the V117-3.3 and V126-3.3 it is 108.5 dB(A) at 10 m/s and higher at their respective hub heights (80 and 87 meters). For the worst case scenario, the manufacturer-provided turbine emission values

were increased by 2 dB(A) to account for the uncertainty associated with wind turbine noise emission levels in the receptor-based calculations.

The analysis also assumed the ISO 9613-2 General noise calculation model with General ground attenuation and an attenuation factor of 0.5. Sound levels were modeled 1.5m AGL at determined potential occupied residences. An ambient noise level of 35 dB(A) was assumed at all modeled sensors for the nighttime scenario, and 40 dB(A) was assumed for the ambient daytime noise level. These ambient levels were selected based on a summary of ambient measurements conducted on-site earlier in the year.

The sound scenarios resulted in no locations being above 50.0 dB(A) for the nighttime scenario, nor any locations above 60 dB(A) for the daytime scenario. In fact, no daytime levels were found to be above 50 dB(A). The 50 dB(A) nighttime level and 60 dB(A) daytime level were selected for comparison since they are Minnesota's allowed noise levels as described in Minnesota Rules Chapter 7030. The worst case noise scenario results are shown on **Maps 6a - 6c**, and also in Tables 2-4 in **Appendix D**; realistic noise scenario results are shown on **Maps 6d – 6f** and also in **Appendix D.**

The selected turbine models are expected to generate a maximum sound power levels ranging from 105.0 dB(A) to 108.5 dB(A) immediately adjacent to the turbine hub at 10 m/s and higher (Table 8.3.3). For Red Pine's noise analysis, the lowest hub height under consideration for each turbine model was evaluated. Decibels decrease as the receptor moves further away from the turbine. Consequently, assuming general ground attenuation, a single V100 turbine is expected to generate less than 50 decibels at approximately 150 meters (492 feet), and the other two turbine models at approximately 200 meters (656 feet).

Table 8.3.3: Wind Turbine Sound Specifications

Turbine	Total Sound Power Level [dB(A)]
Vestas V100 – 2.0 MW	105.0 dB(A)
Vestas V117 – 3.3 MW	108.5 dB(A)
Vestas V126 – 3.45 MW	108.5 dB(A)

The full noise analysis report is provided in **Appendix D**, and shows noise levels at each receptor location and hourly Leq sound distributions in comparison to average wind speeds for the project area. The monitored hourly Leq and L50 data was also compared to measured wind speeds.

Maps 6d to 6f depict the sound contours anticipated by the construction of the Red Pine Wind project for each of the proposed turbine models. The Minnesota Pollution Control Agency ("MPCA") State Noise Standards restrict noise levels to 60 dB(A) during the daytime, and 50 dB(A) at night. Since actual background noise levels are not known for each receptor, the sound impacts are summarized for an assumed Leq background level of 35 dB(A) at night and 40 dB(A) during the day.

Cumulative sound impact analysis results showing the highest modeled L_{eq} sound power level at any home in the Project Area for each of the preliminary layouts are in Table 8.3.4:

Table 8.3.4: Cumulative Modeled Maximum Leq Sound Levels

Turbine	Sound [dB(A)]
Vestas V100 – 2.0 MW	45.8 dB(A)
Vestas V117 – 3.3 MW	47.5 dB(A)
Vestas V126 – 3.45 MW	47.3 dB(A)

The analysis indicates that operation of the Red Pine project does not have noise levels of 60 dB(A) or greater during the daytime conditions or 50 dB(A) or greater during the nighttime conditions on any modeled receptor, nor will the cumulative impact on any residence exceed 50 dB(A) or 60 dB(A) when assuming a 35 to 40 dB(A) background sound level. When assuming a nighttime background sound level of 35 dB(A), the cumulative sound levels range from 35.3 dB(A) to 47 dB(A), indicating that the change in sound levels caused by the wind project would range from 0.3 dB(A) to 7 dB(A). When assuming a daytime background sound level of 40 dB(A), the cumulative sound levels range from 40.1 dB(A) to 47.5 dB(A), indicating that the change in sound levels caused by the wind project would range from 0.1 dB(A) to 7.5 dB(A). This additional sound from the wind turbines would not be noticeable. During the daytime or nighttime conditions, only with a background sound level already approaching or exceeding the 60 dB(A) or 50 dB(A) thresholds would the cumulative sound level (background and wind turbine sound) exceed the MPCA requirements.

8.3.3 Mitigation Measures

Red Pine Wind Project, LLC has taken considerable effort to site turbines carefully and responsibly to exceed the MPCA noise standards. The Red Pine Wind Project is maintaining a minimum setback distance of 1,000 feet to occupied dwellings. This distance facilitates the dissipation of sound waves before they reach homes in and around the Project Area to minimize adverse impacts to ambient sound levels. Modeled sound levels at the occupied residences are anticipated to be below 50.0 dB(A) for all scenarios (i.e., all layouts, all turbines models, all ambient noise scenarios). Therefore, the Red Pine project would be in compliance with Minnesota's allowable sound levels as described in Minnesota Rules Chapter 7030. Red Pine Wind Project, LLC will continue to take possible sound impacts to nearby rural residences, farmsteads, and other potentially affected parties into account during development, construction, and operation of the proposed project. Noise monitoring will be conducted during operation to validate and confirm the pre-construction noise modeling.

8.4 Visual Impacts

The topography of the Project Area is gently undulating and is interrupted only by a small number of public drainage ditches and a few larger lakes (Map 1b). Elevations range from 1,368 feet to 1,719 feet above mean sea level. The typical visual landscape within the

Project Area consists of agricultural fields, farmsteads with trees planted as windbreaks, and active or fallow fields.

Within the Project Area local vegetation is predominantly agricultural crops and rural open space. Crops include corn, soybeans, grassland and pasture fields which visually create a low uniform profile. A mix of deciduous and coniferous trees planted for windbreaks typically surrounds farmsteads. Generally, these are isolated groves or windrows established by the landowner/farmers to prevent wind erosion and shelter dwellings. Grasslands and pasturelands constitute about 20% the landscape in the project area and contain both native and non-native species.

Aside from the local vegetation, the main focal points present in the agricultural landscape are farm residences and buildings (both inhabited and uninhabited) which break up the agricultural landscape. Icelandic Church and Cemetery is located in Limestone Township in Section 20 along County Road 7. In addition to structures, there are 8 gravel pits located within the Project Area in Lake Stay and Ash Lake within Lincoln County.

In addition to residences and farm buildings, this area also has a number of existing wind farms and high voltage transmission lines that are visible from within the Project Area. There are 235 existing commercial scale wind turbines within 10 miles of the Project Area of varying heights and rotor diameters. These existing turbines include models such as the Enron Z48, Kenetech 33M-Vs, GE 1.5sle, Suzlon S64, Suzlon S88, Vestas V47 2.4mw, NEG Micon NM48_750, NEG Micon NM52_900 and Gamesa G52. The physical characteristics of these models are similar to the turbine models proposed for the Project. In addition, there are several existing high voltage transmission lines, including the existing Lyon County to Brookings County 345kV transmission line that runs across the northern part of the Project Area.

The Federal Communications Commission (FCC) database shows one microwave communication towers located within the Project boundary on Highway 19 approximately 3.6 miles east of the City of Ivanhoe. Within 10 miles of the Project Area, 63 towers (as of January 2015), potentially including microwave, AM, FM, and other FAA permitted towers have been identified and have altered the landscape from being strictly agricultural.

A fairly substantial number of wind projects have been built in southwest Lincoln County, and in both Pipestone and Murray Counties. Of the nearby counties, Murray has seen the most wind development (see Table 8.4 and **Map 7**).

Table 8.4: Wind Turbines in Surrounding Counties (FAA/AWEA)

County	October 2015
Lincoln	64
Lyon	3
Pipestone	76
Murray	190
Cottonwood	21

Source: FAA, October 2015.

According to the American Wind Energy Association (AWEA), as of December 2015, there was 3,235 MW of installed wind capacity in the state, and a total of 2,257 turbines. Minnesota currently ranks 7th in the nation for existing wind energy capacity. The presence and visual effect of towers and turbines have existed for some time in the county.

8.4.1 Visual Impacts on Private Lands and Homes

Wind turbines will change the visual surroundings within and near the project area. The visual effect of the Project will depend largely upon perceptions of observers and residents within several miles of the project boundary. The visual contrast added by wind projects may be perceived as a visual disruption to some, or as points of visual interest with their own aesthetic quality and appeal to others. Post-construction operation of the wind project is not expected to significantly increase day-to-day human activity or traffic in the area. The Project Area will therefore retain its rural sense and remote character, which is defined primarily by row-crop agriculture and interspersed farmsteads that provide visual focal points on the landscape. The turbines are also compatible with the rural agricultural heritage of the area, which includes windmills, silos, and grain elevators.

While existing wind projects are located in Lincoln County, most of them are not located in the immediate vicinity of the Project and are therefore not expected to cumulatively contribute to the visual effect. The already existing wind projects are located approximately 6 miles southwest of the proposed Red Pine Wind Project, which should also limit the extent to which the proposed Project is viewed as a disruption to the area's scenic integrity. The proposed project is consistent with existing uses in the area for wind energy production.

The FAA requires obstruction lighting or marking of structures over 200 feet above mean sea level because they are considered obstructions to air navigation. To mitigate the visual impact of such lighting, Red Pine will use FAA guidance and standards when applying to the FAA for approval of a lighting plan that will light the project, and will follow the approved plan to meet the minimum requirements of FAA regulations for obstruction lighting. It is Red Pine's intent to include details of its lighting plan prior to construction, and at the time Form 7460-1 is submitted to the FAA for final approval.

8.4.2 Visual Impacts on Public Lands

The presence of turbines within the viewshed of natural areas may affect the aesthetic quality of those areas, although the degree of impact is largely dependent upon the individual perspectives of observers. Public lands and natural areas that exist within the viewshed of the project are typical of other public lands in agricultural settings.

The potential turbine models are similar in appearance, and feature a tubular tower, a single hub, and three blades. The primary difference among the models is the RD and hub height ("HH"), which influences the number of turbines on the landscape. In general, larger RD and HH turbines generate more power and thus fewer are required to obtain the same overall energy output. Table 8.4.2 outlines four representative turbine models' RDs and HHs, and the associated number of turbines for a 200 MW wind energy project.

Table 8.4.2: Rotor Diameter and Number of Turbines

Turbine Model	Nameplate Capacity	Rotor Diameter (m)	Hub Height (m)	Number of Turbines for a 200MW Project
Vestas V100	2.0 MW	100	80	100
Vestas V117	3.3 MW	117	80	60
Vestas V126	3.45 MW	126	87	58

If a 2.0 MW wind turbine were selected, 100 turbines would be installed for the Project; and if a 3.45 MW turbine were selected, 58 - Vestas V126 turbines would be installed. Wind turbines with a larger nameplate capacity generally create less visual impact because fewer turbines are needed to meet the nameplate capacity.

Some of the Project's turbines will be located within the viewshed of DNR-managed Wildlife Management Areas ("WMAs"), USFWS Waterfowl Production Areas ("WPAs"), and other local resources, and may be seen by people using those areas. Map 5 identifies recreation and wildlife areas within the Project's vicinity.

As shown in Map 5, there are 46 WMAs and 10 WPAs within five miles of the Project Area. Further information regarding recreational lands in relation to the Project Area is found in Section 8.7. While wind turbines will impact the visual surroundings of the Project Area, the degree and nature of the visual impact will vary based upon personal perceptions and preferences.

Visual impacts will be noticeable for users of a state-funded snowmobile trail. Lincoln County Drift Clipper runs north-south in the southwestern section of the Project paralleling County Road 7 and State Highway 19. Another section of the snowmobile trail parallels US Highway 75 approximately 2 miles west of the Project boundary and meets the trail at State Highway 19 near City of Ivanhoe. No winter use information was available from the DNR or the county on this trail. However, the report *Snowmobiling in Minnesota: Economic Impact and Consumer Profile* (April 2005), indicates that snowmobilers participate in the activity about 18 times during the season on average, and most snowmobiling takes place in the northern portion of the state.

Wind turbines will likely also be somewhat visible from US Highway 75, located approximately 1 mile west of the project boundary. US Highway 75 is designated as the "King of Trails" state scenic byway. The road stretches 414 miles along the state's western border. Scenic byways are designated for one or more of six intrinsic qualities including scenic, cultural, recreational, natural, cultural, or historical. The majority of turbines have been sited at least 3 miles east of the scenic byway to minimize visual impacts to the roadway, and the experience of those traveling along the route. The nearest turbines are at least 2 miles away.

The draft "King of Trails" Corridor Work Plan (May 2015) indicates that the project is located within Section 5 of the Highway 75 corridor. The work plan mentions the Buffalo Ridge and its wind turbines as a point of interest along the roadway, indicating that many turbines can be seen from the road, creating clean, renewable electricity. The Applicant intends to coordinate with the leader/stakeholder group as the project advances.

8.4.3 Mitigation Measures

Red Pine Wind Project, LLC will work to avoid or minimize visual impacts into the final design and siting of the Project and will work with landowner and stakeholder groups to identify concerns related to Project aesthetics and to address potential visual impacts. Red Pine Wind Project, LLC proposes the following mitigation measures:

1. Turbines will be uniform in color;
2. Turbines will not be located in biologically sensitive areas such as public parks, WMAs, Scientific and Natural Area (SNAs), WPAs, or wetlands;
3. Turbines will be illuminated to meet the minimum FAA requirements for obstruction lighting of wind turbine projects (e.g. reduce number of lights on turbines and synchronized red strobe lights);
4. Collector lines will be buried to minimize aboveground structures within the turbine array;
5. Existing roads will be used for construction and maintenance where possible to minimize the amount of new roads constructed;
6. Access roads created for the wind facility will be located on gentle grades to minimize erosion, visible cuts and fills; and
7. Temporarily disturbed areas will be converted back to cropland or otherwise reseeded with native seed mixes appropriate for the region.

8.5 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, caused by the shadow cast by moving turbine blades. Multiple independent conditions must be met in order for shadow flicker to occur, and these conditions play a role in the intensity and frequency at which a receptor may experience shadow flicker. These conditions and interacting factors are further described below:

1. Number, size, and position of windows: In order for shadow flicker to be perceived within a building, windows must be facing the sun, and an operating turbine blade must be between the window and the sun.
2. Ambient lighting conditions: If inside, having lights on may significantly diminish the perception of shadow flicker.
3. Cloud cover: When the sunlight is obscured by clouds shadow flicker is reduced or eliminated.
4. Time of day: It must be daytime for shadow flicker to occur. Very early and very late in the day, when the sun is very low to the horizon, the turbine's shadow is long and diffuse such that the perception of flicker is diminished. In the middle of the day the shadow does not extend far from the base of the turbine and is generally confined to areas within setback distances and away from homes.
5. Season: The sun travels further from the horizon during the summer and closer to the horizon during the winter. As the seasons change the shape and location of a turbine's shadow will also change significantly. This limits the number of consecutive days a home may receive shadow flicker.
6. Visual Screening: Objects such as trees, topography, buildings, awnings, blinds and drapes can all reduce or eliminate the potential for shadow flicker.
7. Location of wind turbines: Because Minnesota is in the northern hemisphere, the sun is in the southern sky which causes turbine shadows to occur mostly to the north of the unit.
8. Operation of the wind turbine: A wind turbine that is not spinning cannot cause shadow flicker. Turbines may not be spinning because the wind is above or below its operating speeds, or they may be offline for maintenance.
9. Orientation of the wind turbine: A wind turbine faces into the wind, which may or may not be into the sun. The shape and size of a wind turbine's shadow changes based on which direction it is facing relative to the sun. If the turbine is facing directly into or away from the sun, it will cast the largest shadow. If it is facing directly perpendicular to the sun, it will cast the smallest shadow.

The above factors combined with careful and responsible project siting reduces the likelihood that shadow flicker will adversely impact the Project Area.

8.5.1 Potential Impacts

WindPRO software was used to model the preliminary project layout for potential shadow flicker at receptors in and around the Project Area. Turbine operation assumptions are based on measured wind direction and sunshine probability from the project site, and are shown in Table 8.5.1 below. A full assessment report of the shadow flicker expected to occur at the site is provided in **Appendix D**.

Table 8.5.1: Modeled Annual Operating Hours by Wind Direction

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW
948	364	341	373	483	625	1,207	923	579	685	869	1,169

Table 8.5.1 shows the number of hours in a year each turbine is expected to be turning while facing the direction indicated. For example, turbines are expected to operate facing south for 1,207 hours in a typical year. The total modeled annual operating hours are **[TRADE SECRET - [redacted] - TRADE SECRET]** hours in a year, which is approximately **[TRADE SECRET - [redacted] - TRADE SECRET]** of the time. Based on measured data, the wind may be too slow or too fast for a turbine to operate a percentage of the time.

Sunshine probability assumptions are from the National Climatic Data Center (NCDC) sunshine probabilities for Huron, South Dakota (approximately 16.5km south of the latitude of the Red Pine project area), and are shown in Table 8.5.2 below. The Huron weather station was determined to be the best fit for the Red Pine site in regards to latitude, hours of daylight, and weather conditions that affect cloud cover.

Table 8.5.2: Expected Percent Sunshine by Month

Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
57%	59%	59%	61%	65%	70%	76%	74%	69%	63%	50%	49%

WindPRO uses the above assumptions to simulate the turbine shadows throughout a year and calculates the expected number of hours per year, and expected minutes per day, a given receptor would realistically expect to receive shadow flicker. WindPRO can model both a "worst-case" scenario and an "expected" or "realistic" scenario based upon data inputs. The worst-case setting in the model has assumptions such as (1) the turbines are always in operation, (2) the sun is always shining (no cloud cover), (3) the turbine rotors are always perpendicular to the direction creating the largest amount of flicker, (4) shadows cast beyond 1,500 meters of the source are not distinguishable, (5) no obstacles are considered, and (6) the receptors are "greenhouses" (shadows are accumulated from all directions. WindPRO allows the model to be refined to create an "expected" result based upon realistic data inputs such as (1) actual wind directions from on-site data collection, (2) expected turbine operating hours, and (3) actual sunshine hours at the site. Running the model with some or all of these "expected" factors creates a result that is more representative of the amount of shadow flicker that is likely to occur at various receptor locations.

The potential for shadow flicker varies with time of year and time of day. Based on the 1,000-foot setback from homes, receptors will generally experience shadow flicker within 2 hours of sunrise and sunset, when the sun is low in the sky and only when climatic and other conditions are favorable to generate flicker as previously described. Total shadow flicker is only expected to occur at any given receptor for a few days per year, and for generally only a fraction of annual daylight hours.

Trees, buildings, drapes, blinds, and other screening objects between these homes and the turbines generating flicker were not considered in the current analysis and will further minimize potential for shadow flicker, and total hours of flicker. **Maps 8a to 8f** show worst case and expected shadow flicker in hours per year for the preliminary turbine layouts. The detailed reports for the worst case and realistic scenarios can be found in **Appendix D**.

As detailed above, the potential for shadow flicker is based on varying degrees and combinations of multiple independent conditions. Appendix D provides the total hours per year of shadow flicker for both worst-case and expected case for each of the three turbine models. As indicated in the report, none of the turbine models evaluated for the project area expected to experience more than 30 hours of shadow flicker per year under the "expected" or "realistic" scenarios. It is important to note that individual windows and local obstacles (e.g. out buildings, wind breaks, etc.) are not considered in this analysis. Refined analysis may determine that some of these locations would experience less or no hours of shadow flicker. As noted in the shadow flicker study report, due to the sun angle at the site location, receptors southwest, south, and southeast at least 1,000 feet away from a turbine would experience no shadow flicker.

The shadow from a moving wind turbine blade pulses approximately once every second, According to the Epilepsy Foundation, pulses of this frequency are not harmful to the health of individuals with photosensitivity or epilepsy[2]. Frequency of flicker is generally no greater than 1.5 hertz, or 1.5 flashes per second. The Epilepsy foundation has determined that flashing lights in the frequency of 5 to 30 flashes per second are most likely to trigger seizure activity.

8.5.2 Mitigation Measures

Red Pine Wind Project, LLC has taken considerable effort to site turbines carefully and responsibly to minimize the impact of shadow flicker to the area. The potential for shadow flicker will continue to be considered during development, construction, and operation of the project. A 1,000-foot minimum setback from residences has been used in project siting to minimize the potential for shadow flicker on receptors. Although unlikely to occur, specific cases of documented excessive shadow flicker will be addressed.

Flicker mitigation will be addressed as unlikely situations arise where receptors are experiencing significantly more flicker than originally estimated during modeling efforts. Mitigation will be based on additional daily documentation of duration and time of day for several consecutive months at the location in question.

[2] http://www.epilepsyfoundation.org/about/photosensitivity/gerba.cfm

Additional mitigation options the project 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.

Red Pine Wind Project, LLC can also provide educational 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

The Project is located in a lightly populated, rural/agricultural area in southwest Minnesota. Public services to farmsteads and rural residences within the Project Area include transportation/roadways, electric and telephone. The nearest city to the Project Area is the City of Ivanhoe located immediately adjacent to the western boundary. The City has its own fire department, and is routinely patrolled by the Lincoln County Sheriff's Office. Lincoln County Communications Center receives and dispatches all 911 calls for the county. This includes fire, medical and police related emergencies. Other cities with similar services provided by Lincoln County within 5 miles of the Project Area include Arco, Russell, Lynd, Minneota and Taunton. While there are no railroad lines in the Project Area, a BNSF Railroad generally runs north-south approximately 7 miles southeast of the Project area at its nearest location.

The Project is expected to have minimal effect on existing services and infrastructure of the area (**Map 9**). Construction and operation of the Project will be in accordance with associated federal, state and local permits and laws, as well as industry construction and operation standards and best practices. The Project is designed to have manageable temporary effects on the existing infrastructure during Project construction and operation. Because only minor impacts are expected, extensive mitigation measures are not anticipated. The following sections describe specific impacts that may occur to public services and infrastructure and how they will be mitigated.

8.6.1 Traffic and Roads

Existing roadway infrastructure in and around the Project Area consists of county and township roads that generally follow section lines, with private unpaved farmstead driveways and farming access roads. Minnesota State Highway 19 provides the main access to nearby communities and runs east-west through the center of the Project. Various county and township roads (two-lane paved and gravel roads) provide access to the proposed site. In the agricultural areas, many landowners use private, single-lane farm roads and driveways on their property. Existing traffic volumes on the area's state, and county roads and highways are documented in **Table 8.6.1** and on **Map 10**.

Table 8.6.1: Summary of Roadways within Project Area	
Road Type	**Miles within Project Area**
Federal Highways	0
State Highways	7.5
County Highways/Road	54.4
Township Roads	103.4

Of the roads within or adjacent to the Project Area, State Highway 19 has the highest Annual Average Daily Traffic ("AADT") count at 1,650 vehicles per day. For purposes of comparison, the functional capacity of a two-lane paved rural highway is in excess of 5,000 vehicles per day. Other roadways in the vicinity of the project have AADTs ranging from 370, to as few as 10 cars per day in the center of the Project Area on County Road 114.

Table 8.6.2: Existing Daily Traffic Levels					
Roadway Segment Description		**Year data collected**	**Miles within Project Boundary**	**Existing Annual Average Daily Traffic (AADT)**	
				Minimum Volume	**Maximum Volume**
Lincoln County	CR 110	2012	8.00	40	40
Lincoln County	CR 114	2008	3.00	10	10
Lincoln County	CR 125	2008	2.00	40	40
Lincoln County	CR 126	2008	3.02	20	20
Lincoln County	CR 127	2008	3.03	35	35
Lincoln County	CR 134	2008	2.99	20	20
Lincoln County	CSAH 15	2014	7.03	215	310
Lincoln County	CSAH 17	2012	5.05	220	370
Lincoln County	CSAH 5	2012	5.20	135	370
Lincoln County	CSAH 7	2012	9.06	175	220
Lincoln County	CSAH 8	2012	8.22	165	325
Lincoln County	TH 19	2014	9.39	1100	1650

Source: MnDOT 2014 Traffic Forecasting and Analysis Data.

8.6.2 Telecommunications

Telephone
Telephone service in the area is provided to farmsteads, rural residences and businesses by Frontier Communications of Minnesota, Inc., Mediacom, Interstate Telecommunications Cooperative, Inc., Sprint Communications Company L.P and Verizon Communications.

Microwave Beam Paths
On behalf of Red Pine, Comsearch completed an evaluation of licensed non-federal government microwave beam paths in the vicinity of the Project Area and determined that there are six microwave beampaths that intersects the project boundary in the east and central portions of the Project. Comsearch calculated Worst Case Fresnel Zones (WCFZ), which is considered the mid-point of a full microwave path and the location of the widest Fresnel zone. The microwave path and WCFZ buffer are depicted on Figure 3 in the Comsearch Licensed Microwave Report (**Appendix E**), and on Maps 3b-1 to 3b-3.

AM/FM Radio
On behalf of Red Pine, Comsearch analyzed AM and FM radio broadcast stations whose service could potentially be affected by the proposed Red Pine Wind Project in Lincoln County, Minnesota. Comsearch found one database record for AM stations within approximately 30 kilometers (18.6 miles) of the project. This record represents station KMHL, which broadcasts out of Marshall, Minnesota, to the east of the project. Comsearch determined that there were six records for FM stations within a 30-kilometer radius of the Red Pine Wind Project. All of these stations are currently licensed and operating, three of which are low-power or translator stations that operate with limited range. A listing of the nearest AM and FM stations are provided in the attached AM and FM Radio Report (**Appendix E**).

Fixed Land Mobile Stations
Land mobile sites, such as emergency response, public safety, and local government communications, are typically unaffected by the presence of wind turbines. The frequencies of operation for these services have characteristics that allow the signal to propagate through wind turbines.

Television
On behalf of Red Pine, Comsearch analyzed the off-air television stations where service could potentially be affected by the project. Off-air stations are television broadcasters that transmit signals which can be received directly on a television receiver from terrestrially located broadcast facilities. Comsearch compiled all off-air television stations within 150 kilometers (93.2 miles) of the wind Project Area. However, the TV stations that are most likely to provide off-air coverage to the Project Area will be those stations at a distance of 75 kilometers (46.6 miles) or less. There are a total of twenty-two database records for stations within approximately 75 kilometers of the project. Of these stations, only eighteen are currently licensed and operating, fifteen of which are low-power stations or translators. Translator stations are low-power stations that receive signals from distant broadcasters and retransmit the signal to a local audience. The two remaining full power digital stations licensed under call signs KRWF and KSMN may have their reception

disrupted in and around the Red Pine Wind Project. This is due to multipath interference caused by signal scattering as TV signals are reflected by the rotating wind turbine blades and mast. The stations within 75 kilometers are listed in the attached Off-Air TV Analysis report (**Appendix E**).

8.6.3 Other Local Services

Pipelines
Northern Border Pipeline Company underground natural gas pipeline is located within the southern portion of the project area. Northern Natural Gas Company pipeline is located approximately 3 miles southeast of the Project boundary. Turbines and infrastructure will be carefully sited away from identified pipeline; consequently, impacts to pipelines are not expected and therefore no mitigation measures have been proposed.

Electrical Services
There are currently two utility transmission lines within the Project Area. Great River Energy Lyon County to Brookings County 345kV line and the East River Electric Power Coop Inc. 69kV transmission line currently run across the northern portion of the Project Area as indicated on **Map 9**. Three East River Electric Power Coop Inc. 69kV lines run north-south approximately 0.6 miles west of the Project area. There are no substations in the Project area and one substation (Ivanhoe Substation) approximately one mile west of the Project boundary, where the two existing transmission lines intersect.

Limited and short-term impacts to the electrical service may be experienced where coordinated short term outages occur when high clearance construction equipment needs to cross areas with overhead distribution and/or transmission lines. Outages associated with project transmission interconnection may also be required. Red Pine Wind Project, LLC and local service providers will work closely to ensure outages are planned and coordinated with local residents and other impacted users.

Water Supply and Sanitary Service
Homes and farmsteads in the project area typically utilize on-site water wells and septic systems for individual household water and sanitary needs. Construction and operation of the proposed Project is not anticipated to affect water supply or sanitary service of existing residents. No installation or abandonment of water supply wells is anticipated for the Project. In the event that water supply wells are abandoned or installed, or environmental bore holes are drilled, Red Pine Wind Project, LLC will do so in accordance with applicable Minnesota law and Minnesota Department of Health (MDH) requirements. Red Pine Wind Project, LLC will also coordinate closely with individual landowners to ensure that water supply and sanitary facilities are identified prior to project construction and avoided.

It is not anticipated that the Project will require the appropriation of surface water or permanent dewatering. Temporary dewatering may be required during construction for specific turbine foundations and/or electrical trenches. Water use during construction may occur to provide dust control and water for concrete mixes and other construction

purposes. If temporary dewatering is required during construction activities, discharge of dewatering fluid will be conducted under the requirements of the National Pollutant Discharge Elimination System (NPDES) permit and Storm Water Pollution Prevention Plan (SWPPP) which will be developed for this project.

8.6.4 Potential Impacts

Traffic and Roads

During project construction, temporary impacts are anticipated on some public roads within the Project Area. Roads will be affected by the normal wear and tear by vehicles required to deliver materials and equipment to and from the Project. Some specific routes will also be impacted by the temporary expansion of road widths and/or intersections to facilitate the safe and efficient delivery of equipment.

The maximum construction traffic is expected to be approximately 250 to275 additional trips per day during peak construction and maximum workforce, and the functional capacity of a two-lane paved rural highway is in excess of 5,000 vehicles per day. Because many of the area roadways have AADTs currently well below capacity, the additional 250 to 275 vehicle trips on a temporary basis would be perceptible, but similar to seasonal traffic increases such as observed during autumn crop harvest.

Truck access to the Project Area is mainly served by State Highway 19 which runs east and west through the center of the Project and County Roads throughout the Project area. Specific additional truck routes will be determined by the location required for delivery. Additional operating permits will be obtained for over-sized truck movements. Transportation of equipment and materials associated with the construction of wind projects involves oversized and/or overweight loads and road use that is not consistent with normal traffic in the Project Area.

Once project construction is completed, maintenance crews will periodically drive through the Project Area to monitor and maintain the wind turbines. Wind project operation, maintenance and repair activities are not expected to adversely impact normal traffic in the Project Area. Traffic control measures and coordination with local authorities will be implemented to ensure public health and safety is protected with respect to the project.

Comments were received from the Minnesota Department of Transportation (MnDOT) in regards to the need for oversize/overweight hauling, construction work that may affect MnDOT right-of-way, proximity to Trunk Highway 19, US 75 Scenic Byway, and placement of facilities within public right-of-way. Comments were also received from the Lincoln County Highway Department in regards to road life consumption, safety, restoration of roadways after construction, and ongoing maintenance. The county suggested that a Development Agreement be adopted between Lincoln County and EDF Renewable Development, Inc. defining and addressing the issues once the project design has been completed.

Telephone
Construction and operation of the proposed wind project is not expected to impact telephone or internet service to the Project Area. Prior to construction, a utility locate service will be contacted to locate underground utilities so they can be avoided. Red Pine Wind Project, LLC will coordinate collector line placement with local telecommunications providers and avoid installing collection lines parallel, and in close proximity, to existing copper telephone lines if concerns exist regarding the possibility of magnetic field interaction and telephone circuit noise.

Microwave Beampaths
Comsearch conducted a Licensed Microwave Study for Red Pine. The Comsearch study concludes that as long as the turbines (including blade radius) are located outside of the identified Fresnel zone, there should be no impact to the microwave beam path by the project. Three sets of turbine layouts with different blade lengths were considered in the analysis. Of those turbines, none were found to have potential obstruction with the microwave systems in the area.

AM/FM Radio
As described in the Comsearch study, the exclusion distance for AM broadcast stations varies as a function of the antenna type and broadcast frequency. For directional antennas, the exclusion distance is calculated by taking the lesser of 10 wavelengths or 3 kilometers. For non-directional antennas, the exclusion distance is simply equal to 1 wavelength. Potential problems with AM broadcast coverage are only anticipated when AM broadcast stations are located within their respective exclusion distance limit from wind turbine towers. The closest AM station to the Red Pine Wind Project, KMHL, is more than 25.9 kilometers from the nearest turbine in all three turbine layouts. As there were no stations found within 3 kilometers of the project, which is the maximum possible exclusion distance based on a directional AM antenna broadcasting at 1000 KHz or less, the project should not impact the coverage of local AM stations.

The coverage of FM stations is generally not susceptible to interference caused by wind turbines, especially when large objects, such as wind turbines, are sited in the far field region of the radiating FM antenna in order to avoid the risk of distorting the antenna's radiation pattern. The closest operational stations to the Red Pine Wind Project, K212FH, K277AI, KARL, and KARZ, are located more than 19.2 kilometers from the nearest turbine in all three turbine layouts. At this distance, there should be adequate separation to avoid radiation pattern distortion.

Fixed Land Mobile Stations
A change in coverage of fixed land mobile stations associated with wind turbine installation is not expected by the project.

Television
Construction of wind turbines has the potential to impact television reception as a result of an obstruction in the line of sight between residents relying on digital antennas for TV reception and the TV station antennas. However, based on the low number of full-power TV channels available in the immediate vicinity of the project area, it is unlikely that off-

air television stations are the primary mode of television service for the local communities. Signal scattering could still impact certain areas currently served by the TV stations mentioned, especially those that would have line-of-sight to at least one wind turbine but not to a respective station antenna. TV cable service, where available, and direct broadcast satellite service (DBS) are more likely the dominant modes of service delivery. While the impact to television reception in the project area is relatively unknown, pre-construction television reception analysis can provide an estimate of the number of homes that may be affected.

Other Local Services

The Project will be constructed to avoid impacts to pipelines and other underground infrastructure.

8.6.5 Mitigation Measures

Roads

Turbines will be setback from all public roadways a minimum of 300 feet from the edge of the right-of-way to ensure safety for travelers, and to address issues such as the potential for shadow flicker and ice. Turbines have also been set back from US Highway 75 to respect the scenic nature of the roadway as described further in Section 8.4.2. Currently, no turbine has been sited closer than 0.1-mile to Trunk Highway 19. Turbines have been sited according to state and local standards, and a prudent distance away from Trunk Highway 19 to avoid potential adverse impacts to travelers.

Prior to construction, Red Pine Wind Project, LLC will coordinate with the applicable local and state road authorities to ensure that the weights being introduced to area roads are acceptable, and to obtain all relevant permits for access and utility installation. Red Pine Wind Project, LLC will work with the city of Ivanhoe, townships in Lincoln County and MnDOT, as necessary, regarding roadway concerns, right-of-way work (if any), and setbacks during construction of the Project. Red Pine Wind Project, LLC will also work closely with the landowners in the placement of access roads to minimize land-use disruptions during construction and operation of the Project to the extent possible. Designated haul-roads will be reviewed with the local authority having jurisdiction and road use agreements will be executed where required. Road use agreements will be used to identify suitable travel routes, traffic control measures, methods for evaluating, monitoring and restoring roads, and mitigation measures to ensure roads used for oversize/overweight loads are properly identified, monitored and stabilized. Construction-related impacts are further described in Section 10.1

Impacted roadways will be restored and improved per a formalized road Development Agreement between Red Pine Wind Project, LLC and the relevant local governments, including Lincoln County. As recommended by the Southwest Regional Development Commission (SRDC), Red Pine Wind Project, LLC will coordinate with all applicable counties and townships on the preparation and execution of a single, cooperative Development Agreement. Red Pine Wind Project, LLC will ensure that the general contractor communicates with the relevant road authorities throughout the construction process, particularly regarding the movement of equipment on roads and the terms of the road agreement.

Telecommunications
If the Project negatively impacts telecommunication services, Red Pine Wind Project, LLC will provide a specific mitigation plan and take the necessary steps to restore all impacted services. Red Pine Wind Project, LLC will execute the necessary steps after the Project is constructed because it is very difficult to predict what services may ultimately be impacted (if any) before the project is constructed.

Because of Red Pine Wind Project, LLC's careful micrositing of turbines, interference with communications systems is not expected. If interference is identified during or after construction of the Project, Red Pine Wind Project, LLC will address the interference on a case-by-case basis. Red Pine does not propose mitigation measures at this time.

Telephone
At this time, no impacts are anticipated to telephone service. Should inadvertent impacts to these systems arise, Red Pine Wind Project, LLC will work to remedy service interruptions on a case-by-case basis.

Microwave Beampaths
Red Pine Wind Project, LLC has sited the Project's turbines in a manner that avoids identified microwave beam paths and communication systems. Red Pine will not operate the wind project so as to cause microwave, radio, or navigation interference contrary to FCC regulations or other law.

AM/FM Radio
Because there are no AM/FM radio stations operating in close enough proximity to the project that would typically cause impacts to reception, no mitigation is proposed at this time. Should issues arise, Red Pine will work closely with area stations in regards to mitigation options.

Fixed Land Mobile Stations
In the unlikely event a land mobile licensee believes their coverage has been compromised by the presence of the wind project, there are options to improve signal coverage through optimization of a nearby base station or adding a repeater site. Utility towers, meteorological towers or even the turbine towers within the wind Project Area can serve as the platform for a land mobile base station or repeater sites.

Television
If interference to a residence's or business's television service is reported to Red Pine Wind Project, LLC will work with affected parties to determine the cause of interference and, when necessary, reestablish television reception and service. Red Pine plans to address post-construction television interference concerns on a case-by-case basis. If television interference is reported to Red Pine Wind Project, LLC, project representatives will:

a. Review results of the report to assess whether impacts are likely wind project related;

b. Meet with landowner and local communication technician to determine the current status of their television reception infrastructure;

c. 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;

d. At the landowner's election, Red Pine Wind Project, LLC will either install the necessary equipment or enter into an agreement to reimburse the landowner for the cost of comparable satellite TV services;

e. If the landowner chooses satellite service, Red Pine Wind Project, LLC will consider the matter closed upon installation of the satellite dish;

f. If the landowner chooses to have the antenna and/or amplifier installed and later complains of continued interference issues, Red Pine Wind Project, LLC 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;

g. If wind project related interference remains an issue, Red Pine Wind Project, LLC will propose an agreement that reimburses the landowner for the costs of comparable satellite TV services and will remove the antenna and amplifier equipment, unless it was initially installed to serve multiple households;

h. If Red Pine Wind Project, LLC and the landowner are unable to reach an agreement to resolve interference-related issues, Red Pine Wind Project, LLC will report the concern as an unresolved complaint and defer to the PUC's dispute resolution process to resolve the matter.

Red Pine Wind Project, LLC recognized that some impacts to TV service within the Project Area may occur, but these impacts are likely to be minimal based on the findings of the off-air TV analysis. The applicant is committed to operating the facility in a manner that does not adversely impact television reception. Should issues arise following construction of the project, Red Pine Wind Project, LLC will work with the affected residents in a timely manner to determine the cause of the interference and establish acceptable reception.

Other Local Services

Red Pine Wind Project, LLC will coordinate with pipeline companies and other utility services before and during construction to fully understand infrastructure and safety concerns and to prevent possible structural conflicts.

8.7 Cultural and Archaeological Resources

8.7.1 Description of Resources

The proposed Project Area is located entirely within the Prairie Lakes South Archaeological Region (2s) (Anfinson 1990). The Prairie Lakes East Region is located in south-west Minnesota and includes, Lac Qui Parle, Yellow Medicine, Lyon, Redwood, Brown, Cottonwood, Watonwan, Jackson and Martin Counties and portions of Blue Earth, Faribault, Lincoln, Pipestone, Murray, and Nobles Counties.

The majority of prehistoric sites in this part of the region are expected to be located near water, with base camps near the woods of more substantial lakes and rivers, temporary camps near any water source, and winter camps in large river valleys. Resource procurement sites are most common near water, but could also be found in upland areas (Anfinson 1990).
In February 2016 Westwood, on behalf of the Red Pine Wind Project, LLC, conducted a review of records at the Minnesota State Historic Preservation Office (SHPO) and Office of the State Archaeologist (OSA) for the Project Area and a one-mile buffer surrounding the Project Area. The background literature (**Appendix F**) search identified six previously inventoried archaeological sites located within one-mile of the proposed Project Area. One of the previously recorded archaeological sites is located within the defined Project Area. None of these sites have been listed or evaluated as eligible for listing on the National Register of Historic Places (NRHP), although it is possible that not all of the sites have yet been evaluated. A summary of the identified archaeological sites is provided in the following Table 8.7.1 and shown on **Map 11**.

Table 8.7.1: Previously Recorded Archaeological Sites

Site Number	Site Name	Site Type	Location	Project/Buffer
21LN0016	None	Single Artifact	T113N, R44W, Sec. 32	Buffer
21LN0042	Stay Lake Access Site I	Artifact Scatter	T111N, R44W, Sec. 29	Buffer
21LN0043	Stay Lake Access Site II	Lithic Scatter	T111N, R44W, Sec. 29	Buffer
21LN0044	Stay Lake Access Site III	Lithic Scatter	T111N, R44W, Sec. 29	Buffer
21LN0076	None	Lithic Scatter	T112N, R45W, Sec. 1	Project
21LN0077	Stay Lake AMA	Lithic Scatter	T111N, R44W, Sec. 29	Buffer

Key: Site Number = site designation applied by State Archaeologist; Site Name = name given to site; Site Type = defined site use type; Location = amended legal description of

recorded property; Project/Buffer = location of site within defined project area (Project) or within a one-mile buffer (Buffer).

The background literature search identified 22 previously inventoried historic architectural resources located within one-mile of the proposed Project Area. Five of the historic architectural resources are located within the defined Project Area. Two of these resources have been listed or evaluated as eligible for listing on the NRHP, although it is possible that some of the other resources have yet been evaluated. The Ivanhoe Creamery (Inventory Number LN-IVC-012) in the City of Ivanhoe is certified as eligible for listing on the NRHP. The Lincoln County Courthouse and Jail (Inventory Number LN-IVC-016), also in the City of Ivanhoe, is listed on the NRHP. The NRHP listed and eligible resources are outside of the project area within the one-mile buffer. A summary of the identified historic architectural resources is provided in the following Table 8.7.2. NRHP listed or eligible structures are shown on **Map 11**.

Table 8.7.2: Previously Recorded Historic/Architectural Resources

SHPO Number	Description	Location	Project/Buffer
LN-IVC-001	Geo Graff House	T112N, R45W, Sec. 34	Buffer
LN-IVC-002	House	T112N, R45W, Sec. 34	Buffer
LN-IVC-003	House	T112N, R45W, Sec. 34	Buffer
LN-IVC-004	House	T112N, R45W, Sec. 34	Buffer
LN-IVC-005	School	T112N, R45W, Sec. 34	Buffer
LN-IVC-006	House	T111N, R45W, Sec. 3	Buffer
LN-IVC-007	House	T111N, R45W, Sec. 3	Buffer
LN-IVC-008	House	T112N, R45W, Sec. 34	Buffer
LN-IVC-009	House	T112N, R45W, Sec. 34	Buffer
LN-IVC-010	Ivanhoe Methodist Church	T112N, R45W, Sec. 34	Buffer
LN-IVC-011	Bandstand	T112N, R45W, Sec. 34	Buffer
LN-IVC-012	Ivanhoe Creamery	T112N, R45W, Sec. 34	Buffer
LN-IVC-013	Commercial building	T112N, R45W, Sec. 34	Buffer
LN-IVC-014	Commercial building	T112N, R45W, Sec. 34	Buffer
LN-IVC-015	Funeral Home	T112N, R45W, Sec. 34	Buffer
LN-IVC-016	Lincoln County Courthouse and Jail	T112N, R45W, Sec. 34	Buffer
LN-LST-001	ACO Silo	T111N, R44W, Sec. 10	Project
LN-LST-002	School	T111N, R44W, Sec. 4	Project
LN-LMS-001	Church	T112N, R44W, Sec. 20	Project
LN-LMS-002	School	T112N, R44W, Sec. 29	Project
LN-LMS-003	Ivanhoe Depot (moved)	T112N, R44W, Sec. 19	Project

Table 8.7.2: Previously Recorded Historic/Architectural Resources			
SHPO Number	**Description**	**Location**	**Project/Buffer**
LN-ROY-001	St. John Cantius Catholic Church	T112N, R45W, Sec. 23	Buffer

Key: SHPO Number = inventory number for recorded property in SHPO files; Description = name of historic structure or description of type of structure; Location = amended legal description of recorded property; Project Area / Buffer = denotes if listed site is within the defined project area or within the one-mile buffer.

8.7.2 Potential Impacts

While the Red Pine Wind Project will attempt to avoid archeological sites, the proposed construction activities for the Project may have the potential to impact such sites or to add to the visual impacts on cultural resources in the region of the Project Area. In the event that an impact would occur, Red Pine Wind Project will determine the nature of the impact and consult with the SHPO on whether or not the resource is eligible for listing in the National Register of Historic Places (NRHP).

On February 11, 2016, Westwood, on behalf of Red Pine Wind Project, sent the Minnesota SHPO a letter informing them of the Project and requesting comments. On March 11, 2016, the Minnesota SHPO responded recommending a Phase IA literature search. Additionally, they recommended a Phase I archaeological survey if a survey was recommended in the Literature Search, or if areas within the project have not been previously surveyed or disturbed.

8.7.3 Mitigation Measures

Red Pine Wind Project will attempt to avoid impacts to identified archeological and historic resources to the extent possible. If archaeological or historic resources are found during cultural resource investigations or during construction, the integrity and significance of such resources will be addressed in terms of the site's potential eligibility to the NRHP. Also, an assessment of the Project's potential impacts upon the resource will be undertaken. If such resources are found to be eligible for the NRHP, adverse effects to the resource will be avoided by adjustment of the project layout when possible. If avoidance is not possible, appropriate mitigation measures will need to be developed in consultation with Minnesota SHPO, the State Archaeologist, and consulting American Indian communities. While avoidance would be a preferred action, mitigation for Project-related impacts on NRHP-eligible archaeological and historic resources may include additional documentation through data recovery.

Should previously unknown archaeological resources or human remains be inadvertently encountered during Project construction and/or operation, the discoveries will be reported

to the SHPO. With regard to a discovery of human remains, procedures would be followed to ensure that the appropriate authorities would become involved quickly and in accordance with local and state guidelines.

8.8 Recreational Resources

8.8.1 Description of Resources

Information from the U.S. Fish & Wildlife Service (USFWS), Minnesota Department of Natural Resources (MNDNR), and Lincoln County were reviewed to identify recreational resources within and near the Project Area. Significant recreational resources identified within these portions of Lincoln County include several Wildlife Management Areas (WMAs), Waterfowl Production Areas (WPAs), an Aquatic Management Area (AMA), a Scientific and Natural Area (SNA), a National Wildlife Refuge (NWR), recreational lakes and trails, a state park, and snowmobile trails (Map 5). Recreational opportunities in Lincoln County include boating and canoeing, fishing, camping, snowmobiling, hunting, snow shoeing, cross country skiing, bird and wildlife viewing, golfing, and hiking.

There are nine WMAs and portions of one snowmobile trail within the Project Boundary. There are no federal, state, county, or city parks, Scientific and Natural Areas (SNAs), Aquatic Management Area (AMAs), or National Wildlife Refuges (NWRs) within the Project Boundary.

Wildlife Management Areas (WMAs) are managed by the MNDNR and are part of Minnesota's outdoor recreation system and represent a large portion of the Minnesota DNR's wildlife management efforts in the state. The areas were established to protect certain lands and waters that have a high potential for wildlife production, public hunting, trapping, fishing, and other compatible recreational uses and are integral to protecting wildlife habitat for future generations and providing citizens with opportunities for outdoor recreation (MNDNR 2016). There are nine WMA's wholly or partially within the Project Boundary totally approximately 660 acres. Seventy-one WMAs totaling approximately 11,583 acres were identified within 10 miles of the Project Boundary, of which 14 are located within one mile of the Project Boundary and an additional 17 are located within five miles of the boundary. **Table 8.8.1** lists WMA's within 10 miles of the Project Boundary and includes the approximate acreage and distance from the Project.

Table 8.8.1: WMAs within 10 Miles of the Project Area

Name and Type	Acres	Distance from Project Boundary
Bosque WMA*	292.8	< 1 mile
Coot WMA	347.8	< 1 mile
Dead Coon Marshes WMA	101.4	< 1 mile
Elmer Weltz WMA	160.7	< 1 mile
Furamme WMA	152.0	< 1 mile

Table 8.8.1: WMAs within 10 Miles of the Project Area		
Name and Type	**Acres**	**Distance from Project Boundary**
Hawks Nest WMA*	2.8	< 1 mile
Muldental WMA*	27.1	< 1 mile
Poposki WMA*	287.7	< 1 mile
Rogge WMA*	105.5	< 1 mile
Roost WMA*	250.7	< 1 mile
Salix WMA*	85.6	< 1 mile
Sioux Prairie WMA	389.8	< 1 mile
Thostenson WMA*	160.9	< 1 mile
Tillemans WMA*	155.3	< 1 mile
Anderson Lake WMA	592.4	1 to 5 miles
Ash Lake WMA	300.2	1 to 5 miles
Blue Wing WMA	57.6	1 to 5 miles
Bossuyt WMA	82.1	1 to 5 miles
Chain-O-Sloughs WMA	281.2	1 to 5 miles
Christine WMA	41.3	1 to 5 miles
Clare Johnson WMA	119.6	1 to 5 miles
Coon Creek WMA	1049.4	1 to 5 miles
Herschberger WMA	242.6	1 to 5 miles
Iron Horse WMA	32.5	1 to 5 miles
Ivanhoe WMA	382	1 to 5 miles
Norgaard WMA	21.1	1 to 5 miles
Pothole WMA	49.6	1 to 5 miles
Prairie Dell WMA	199.7	1 to 5 miles
Richard J. Dorer WMA	337.6	1 to 5 miles
Spanton WMA	48.3	1 to 5 miles
Ten Sloughs WMA	49.7	1 to 5 miles
Antler WMA	174.4	5 to 10 miles
Archerville WMA	237	5 to 10 miles
Bohemian WMA	467.1	5 to 10 miles
Boone Slough WMA	70.7	5 to 10 miles
Brawner Lake WMA	136	5 to 10 miles
Chen Bay WMA	257.4	5 to 10 miles
Colinoso WMA	80.5	5 to 10 miles
Collaris WMA	73.4	5 to 10 miles
Collinson WMA	86.6	5 to 10 miles
Discors WMA	43.3	5 to 10 miles
Emerald WMA	77.4	5 to 10 miles

Table 8.8.1: WMAs within 10 Miles of the Project Area		
Name and Type	**Acres**	**Distance from Project Boundary**
Erie WMA	69.1	5 to 10 miles
Expectation WMA	47.4	5 to 10 miles
Grandview WMA	437.7	5 to 10 miles
Hansonville WMA	34.8	5 to 10 miles
Hendricks WMA	113.7	5 to 10 miles
Hope WMA	214	5 to 10 miles
Horse Slough WMA	22.8	5 to 10 miles
Kvernmo WMA	102	5 to 10 miles
Legacy WMA	164.8	5 to 10 miles
Lower Antelope Valley WMA	220.7	5 to 10 miles
Lyndwood WMA	71.6	5 to 10 miles
Lyons WMA	22.7	5 to 10 miles
Marshfield WMA	74.7	5 to 10 miles
Middle Antelope Valley WMA	198.4	5 to 10 miles
Muskrat Junction WMA	14.3	5 to 10 miles
Nyroca Flats WMA	42.4	5 to 10 miles
Pato WMA	18.8	5 to 10 miles
Platyrchnchos WMA	85.2	5 to 10 miles
Prairie Marshes WMA	277.7	5 to 10 miles
Redwood WMA	40	5 to 10 miles
Richard Dwire WMA	40.2	5 to 10 miles
Russell WMA	35.1	5 to 10 miles
Shaokatan WMA	449.9	5 to 10 miles
Sioux Lookout WMA	1.4	5 to 10 miles
Sokota WMA	144	5 to 10 miles
Suhr WMA	7.4	5 to 10 miles
Two Sloughs WMA	17.1	5 to 10 miles
Tyler WMA	401.2	5 to 10 miles
Weeks WMA	102.8	5 to 10 miles
Total WMA Acres	**11,582.7**	

*Located completely or partially within the Project Area

Aquatic Management Areas (AMAs) are managed by the MNDNR and are established to protect, develop, and manage lakes, rivers, streams, and adjacent wetland and lands that are critical for fish and other aquatic life, for water quality, and for their intrinsic biological value, public fishing, or other compatible outdoor recreational uses. There are no AMAs within the Project Boundary. There are two AMAs within ten miles of the Project; Stay Lake AMA is located within one mile of the Project near the city of Arco and Benton Lake

AMA is located on Benton Lake in the city of Lake Benton approximately eight miles from the Project.

The National Wildlife Refuge System (NWR) is run by the USFWS and protects areas important for native vegetation and wildlife across the United States. While there are no NWRs within the Project Boundary, Northern Tallgrass Prairie lands (~1,180 acres) are located adjacent to the east Project Boundary in Lincoln County. Another approximately 118-acre unit of Northern Tallgrass Prairie lands is located approximately nine miles south of the Project, south of the city of Tyler.

Waterfowl Production Areas (WPAs) are public, National Wildlife Refuge lands managed by the USFWS for the purpose of preserving wetlands and grasslands critical to waterfowl and other wildlife. No WPA's are located within the Project Area. The nearest WPA, Yellow Medicine River (163 acres), located just over one mile east of the Project. There are a total of 14 WPAs within ten miles of the Project which are listed in **Table 8.8.2**.

Table 8.8.2: WPAs within 10 Miles of the Project Area

Name and Type	Acres	Distance from Project Boundary
Arends WPA	319.4	1 to 5 miles
Coon Creek WPA	256.8	1 to 5 miles
Unknown	163.9	1 to 5 miles
Yellow Medicine River WPA	163.1	1 to 5 miles
Swedzinski WPA	84.5	1 to 5 miles
Christianson WPA	41.1	1 to 5 miles
Unknown	40.3	1 to 5 miles
Black Rush Lake WPA	964.7	5 to 10 miles
Swede Home WPA	321.4	5 to 10 miles
Weber WPA	160.3	5 to 10 miles
Fox WPA	146.3	5 to 10 miles
Shaokatan WPA	80.2	5 to 10 miles
Agribank WPA	71.1	5 to 10 miles
Anderson WPA	57.1	5 to 10 miles
Total WPA Acres	**2,870.2**	

Scientific and Natural Areas (SNAs) are managed to protect rare and endangered species habitat, unique plant communities, and significant geologic features that possess exceptional scientific or educational values, and provide important recreational and wildlife viewing opportunities for visitors. There are no SNAs located within the Project Boundary. One SNA, Antelope Valley, is located in Yellow Medicine County approximately 9 miles north of the Project.

There are no federal, state, county, or city parks located within the Project Boundary; however, Camden State Park, approximately 2,250 acres in size, is located about seven

miles from the southeast Project Boundary. Several recreational and snowmobile trails are present throughout this park and connect to regional trails that extend beyond the park. The Redwood River Trail is a regional water trail that intersects Camden State Park and extends nearly 80 miles north, then east through Lyon and Redwood counties and subsequently connects to the Minnesota River regional trail near Redwood Falls, Minnesota.

One snowmobile trail, the Lincoln County Drift Clipper Trail, extends approximately three miles within the southwest part of the Project Boundary. Within Lincoln County, the Drift Clipper Trail unit extends between the cities of Ivanhoe and Arco and to nearby communities including Hendricks to the west, and Lake Benton and Tyler south of the Project. Other snowmobile trails within ten miles of the Project Boundary include the Lyon County Trail which extends along the BNSF railway and goes through the towns of Russell, Lynd, and Marshall and also goes through Camden State Park.

There are three Lincoln County Parks located between 5 and 10 miles from the Project Boundary (Lincoln County 2016). The Hole in the Mountain and Norwegian Creeks County Parks are near the city of Lake Benton, and the Picnic Point County Park is approximately five miles west of the Project along the south shore of Shaokatan Lake. There were no Lyon County Parks identified within 10 miles of the Project.

There are several natural lakes wholly or partially within the Project Area including Popowski, Hawksnest, Drietz, Oak, and several unnamed Lakes. These lakes offer recreational opportunities such as fishing, boating, and wildlife viewing. Oak Lake provides state-supported water access locations. MNDNR PWI data indicates an additional 95 Public Water Lakes and Public Water Wetlands within 10 miles of the Project Area. Several of the lakes offer public water access and a variety of recreational uses.

8.8.2 Potential Impacts

The Project has been designed in a way that will avoid direct impacts to recreational resources. No turbines have been sited within public lands, or within the normal 3 X 5RD setback of designated public lands including WMAs and WPAs. In addition, no turbine has been sited within one mile of Northern Tallgrass Prairie lands located along the eastern Project Boundary. Recreational resources within the Project Area also include approximately 6 miles of the Lincoln County Drift Clipper Snowmobile Trail in the southwest part of the Project. This trail is provided a minimum 300-foot setback from the nearest turbine.

As non-participating parcels, the Project provides public lands with a five rotor diameter setback for turbines along the prevailing wind direction and three rotor diameter setback on the non-prevailing wind direction.

Potential impacts to recreational resources within and around the Project Boundary are anticipated to be visual in nature by altering the viewshed from those public lands, trails

and open spaces within and around the Project. Section 8.4 further discusses visual impacts and proposed mitigation measures. Visual impacts will be most evident to visitors using recreational resources within a mile radius of the site. Because all of the public lands identified within the Project Boundary have a minimum setback of 1,000 feet from Project infrastructure, and recreational trails a minimum 300-foot setback, no direct impacts to recreational resources are anticipated.

8.8.3 Mitigation Measures

No direct impacts to recreational resources are anticipated as a result of the Project. Turbines will be set back from public lands based on the established LWECS Application Guidance of 3 RD by 5 RD. Turbines will also be sited at least 250 feet from public trails or the distance required by county ordinance, as applicable.

8.9 Public Health and Safety

8.9.1 Electromagnetic Fields and Stray Voltage

Electromagnetic Fields (EMF) arise from the movement of electrical charge on a conductor such as transmission lines, power collection (feeder) lines, substation transformers, house wiring, and electrical appliances. 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 electric field rapidly dissipates as the distance from the line increases (US EPA 2011).

8.9.2 Potential Impacts

Extensive research has been conducted by the National Institute of Environmental Health Sciences (NIEHS 1999). While there is no conclusive research evidence that EMFs pose a significant health impact from power lines and wind turbines, the turbines will be installed beyond the minimum allowable distances from occupied residences, where EMF is expected to be at background levels unrelated to wind project proximity. EMFs from underground electrical collection and feeder lines dissipates 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 3 feet of stronger EMF sources (such as transmission lines and transformers) (NIOSH 2011).

Stray voltage is a natural phenomenon that is the result of low levels of electrical current flowing between two points that are not directly connected. Electrical systems, including farm systems and utility distribution systems, must be adequately grounded to ensure continuous safety and reliability, and to minimize this current flow. Potential effects from

stray voltage can result from a person or animal coming in contact with neutral-to-earth voltage. Stray voltage does not cause electrocution and is not related to ground current, EMF, or earth currents.

8.9.3 Mitigation 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, EMF's associated with the project are not expected to have an impact on public health and safety. Potential issues related to stray voltage and distribution lines can be readily managed by correctly connecting and grounding electrical equipment. Red Pine is committed to siting turbines and associated facilities correctly to minimize the potential for stray voltage and EMFs.

8.9.4 Aviation

Aviation resources surrounding the proposed project were investigated for this project. A review of the AirNav, LLC (AirNav 2016) database revealed eight registered airports located within 20 miles of the Project Area. Details about these airports are described in Table 8.9.4. The calculated distances are from the boundaries of the Project Area. The MnDOT airport licensing staff also lists these nearby airports. The public airports nearest the project are the Tracy Municipal airport (19.9 miles east-southeast of the project), and the Marshall Southwest Regional airport (7.8 miles east-northeast).

Table 8.9.4: Nearby Airports and Heliports

Airport ID	City	Airport Name	Approximate Distance from Project	Runway Type	Elevation (Feet)	Distance and Direction to Nearest City
4MN4	Ivanhoe	Mulder Field Inc. Airport	West side of site within the project	Turf	1669	1 mile E of Ivanhoe
63Y	Tyler	Tyler Municipal Airport	6.5 mi SW	Turf	1742	1 mile NW of Tyler
MML	Marshall	Southwest Minnesota Regional, Marshall/ Ryan Field Airport	7.8 mi ENE	Asphalt	1183	1 mile W of Marshall
MY04	Taunton	Koch's Personal Field Airport	8.9 mi NE	Turf	1130	4 mile N of Taunton

Table 8.9.4: Nearby Airports and Heliports						
Airport ID	**City**	**Airport Name**	**Approximate Distance from Project**	**Runway Type**	**Elevation (Feet)**	**Distance and Direction to Nearest City**
91MN	Canby	Sanford Canby Medical Center Heliport	11.5 mi N	Concrete	1244	Canby
CNB	Canby	Myer Field Airport	12.7 mi N	Asphalt	1194	1 mile N of Canby
TKC	Tracy	Tracy Municipal Airport	19.5 mi ESE	Asphalt	1340	1 mile NE of Tracy
07MN	Hadley	Dairyview Airport	19.9 mi S			Hadley

[1] The nearest turbine to the heliport will be at least 12.1 miles away north.

[2] The nearest turbine to the Mulder Field Inc., Airport will be 1.8 miles west.

The nearest airport to the project is Mulder Field. It is located one mile east of Ivanhoe, Minnesota. This is a private use airport with a turf runway which requires permission prior to landing. There is one runway which is oriented 17/35 degrees and is 2,240 feet by 118 feet in length.

There are no registered public airports located within the Project Area. All registered airports are at least 5 miles away from the project boundary, with most registered airports being at least 12 miles away.

Westwood contacted the FAA Central Regional Office on February 11, 2016 for comments on the proposed Project. A response letter from the FAA had not been received at the time of filing this report. However, the FAA generally recommends that the applicant consider adding identified airports to the project distribution list to allow them opportunity to provide comment on the proposed wind facility. The Applicant will contact these airports, as appropriate, and work closely with them to ensure any potential concerns are evaluated.

Through project development, research, and agency coordination, Red Pine determined that the Department of Defense and the Department of the Air Force have Common Air Route Surveillance Radar (CARSR) operations in Tyler, Minnesota, south of the project area. The CARSR near Tyler is a long range surveillance radar system. Wind development in the line of sight of radar systems can, in some cases, cause interference with those systems. In January 2016, the U.S. Department of Energy (DOE) published a Federal Interagency Wind Turbine Radar Interference Mitigation Strategy (US DOE 2016). To facilitate strategy development, a Wind Turbine Radar Interference (WTRIM) Working Group (WG) was established. The WTRIM WG "seeks, by 2025, to fully address wind turbine radar

interference as an impact to critical radar missions, ensure the long-term resilience of radar operations in the presence of wind turbines, and remove radar interference as an impediment to future wind energy development (US DOE 2016)." The report acknowledges the important benefits of wind energy to the economy, public health, and the overall environment. The WTRIM WG plans to achieve their objectives by: (1) Improving the ability to evaluate impacts of existing and planned wind energy installations on sensitive radar systems, (2) through deployment of hardware and software mitigation measures to increase the resilience of existing radar systems to wind turbines, and (3) by encouraging the development of radar systems that are resistant to wind turbine radar interference (US DOE 2016).

8.9.5 Potential Impacts

No adverse impacts to aviation are anticipated as a result of construction or operation of the proposed project. The installation of wind turbine towers in active croplands increase the potential for conflict with crop-dusting aircraft.

Red Pine will mark and light turbines according to FAA standards, and work with local landowners on coordinating crop dusting activities to reduce risk to local pilots.

Permanent meteorological towers will be free standing, have FAA mandated lighting consistent with the turbines, and no guy wires. Temporary meteorological towers will have supporting guy wires which will be marked with colored sleeves and safety shields (marker balls) for increased visibility.

The Project is currently in negotiation with the Department of Defense and the Department of the Air Force for a Radar Mitigation Agreement. A potential conflict exists between the Department of Defense's operations at the Tyler, Minnesota Common Air Route Surveillance Radar (CARSR). An executed Radar Mitigation Agreement will ensure that the Project can be constructed and operated without having an adverse impact on military operations and readiness.

8.9.6 Mitigation Measures

To ensure public safety is not adversely impacted by the project, project planning, construction and operation will be closely coordinated with air traffic agencies and local airports. The applicant will continue to work to ensure local airports, aerial applicators, and hospital heliports are notified regarding the project. In addition, the applicant will work with and coordinate siting of the wind turbines with the FAA and Mn/DOT-Office of Aeronautics staff regarding tall tower permitting and applicable structure height regulations.

The wind turbines and meteorological towers will be equipped with lighting and markings in compliance with FAA requirements. Permanent meteorological towers are typically hub height (80m) and are free standing (no guy wires), have galvanized steel tower construction, and medium dual-intensity day and night lights.

In addition, the Red Pine will continue to work with the DOD in regards to an executed Radar Mitigation Agreement to ensure proper mitigation of potential impacts to military operations and readiness.

8.9.7 Safety and Security

The Lincoln County Emergency Management (LCEM) director, located in Ivanhoe, Minnesota, is responsible for emergency preparedness and administration throughout the county. The office coordinates with other local, state and federal governmental agencies and private service organizations to direct emergency preparedness and homeland security efforts. In addition to planning and educating, they provide assistance to local jurisdictions and county agencies to ensure adequate resources are available during emergency situations and disasters.

LCEM works closely with nearby city, county and state law enforcement jurisdictions to provide education and awareness of hazards in the county. They maintain and enhance homeland security and better prepare for and respond to incidents. According to the Lincoln county web site, "*Lincoln County Emergency Management works closely with the Minnesota Department of Public Safety's Division of Homeland Security and Emergency Management as well as our neighboring counties to ensure adequate resources are available during disasters. Emergency Management is the process of mitigation, preparedness, response, and recovery within a community or organization. Reducing hazards and overall coordination for disasters are the key functions of Emergency Management. Effective emergency management relies on integration of emergency plans at all levels of government and non-government organizations."* (Lincoln County, 2016)

Census data collected during the American Community Survey 2010 indicate that the total Lincoln County, MN population and number of homes were 5,896 and 3,108 respectively, with 81% of the homes being owner occupied. The estimates for 2015 reflect a population decreased of 2.1 percent to 5,771 and an increase in estimated housing units to 3,115 in 2014. The average household size for the county is 2.28 people per unit.

8.9.8 Potential Impacts

Potential safety and security impacts resulting from the project are a primary consideration to Red Pine because hazards always exist on wind energy projects since they consist of complex, large electrical generating structures requiring specialized equipment and trained

workers for installation and operations. Also, this project is located on leased rural properties in a relatively remote area.

There are 122 dwelling units within the Project Area. The estimated population within the project boundary based on an average household size of 2.28 people per unit is 278. With a total Project Area of 65.8 square miles, the approximate density of people per square mile is 4.2. Given that the population within the Project Area is low in overall density, construction and operation of the Project is not expected to have an adverse impact on the security and safety of the local population.

8.9.9 Mitigation Measures

To mitigate safety and security impacts from the project, the applicant is integrating current engineering standards for wind energy projects with governmental inspections into the project design. The applicant will employ an adaptive management strategy for safety and security to incorporate improvements into the project. The applicant will actively work with LCEM and other agencies to prepare an emergency management plan for Red Pine for response to emergencies, natural hazards, hazardous materials incidents, manmade problems (e.g. fire, etc.) and related incidents. Red Pine will also work with the County Planning Office for assignment of 911 addresses for coordination of emergency response.

These systems will be a part of the site operations and maintenance manual and the health and safety training plan for the facility, which will include contacts, education and training materials, actions plans and procedures to reduce the potential for safety and security issues. Red Pine will also restrict access to the Project during construction and operation. Access control measures will be implemented to protect against unauthorized access and exposure to potential hazards.

In addition, Red Pine will work with participating and neighboring landowners to provide education and information about the wind energy systems and to inform residents about wind project safety and security.

While no impact to the security of local residents is expected as a result of construction or operation of the Project, Red Pine will use the following security measures to reduce the possibility of property damage or personal injury at the Project Area:

- The Project wind turbine locations will be registered with LCEM to develop appropriate procedures for emergency responses related to the Project;
- Towers will follow PUC and Lincoln County setback standards;
- Contractors will be trained to use proper construction and maintenance methods to promote and protect workers and public health and safety;

- Red Pine and its contractors will use temporary and permanent safety fencing, warning signs, and locks and other access control features on equipment and wind power facilities during construction and operation of the Project;
- Red Pine will conduct regular operation, maintenance and inspections during the life of the Project to minimize and address potential equipment failures;
- Turbines will be situated on steel enclosed towers where electrical equipment will be located, except for the pad-mounted transformer. Access to the tower will only be allowed through a solid steel door that will be locked when not in use. External electrical equipment will be clearly marked with appropriate warning signs;
- Up to four meteorological towers may be included in the Project, and will feature medium dual-intensity day and night lights for FAA compliance.
- A vegetation control and snow removal plan will be implemented around the project facilities to reduce risk of fire and provide access for emergency responders.

Incorporation of these measures will help to reduce significant impacts to safety and security and provide measures to mitigate them.

8.10 Hazardous Materials

8.10.1 Description of Resources

Potential hazardous materials within the Project Area would likely be associated with agricultural use of the land, which includes use of petroleum products (diesel fuel, gasoline, natural gas, heating oil, lubricants, and maintenance chemicals), and pesticides and herbicides. Older farmsteads may also contain lead-based paint, asbestos-containing building materials (e.g. shingles and siding), and polychlorinated biphenyls (PCBs) in electrical transformers. Unmarked farmstead waste dumps which may contain various types of wastes are also commonly found in rural/farming areas.

The Minnesota Pollution Control Agency "What's In My Neighborhood?" database (MPCA 2016) of known and potential sources of soil and ground water contamination was consulted for the Project Area. The database revealed thirty-three construction stormwater permits, one hundred and twenty-eight feedlots, eight small quantity hazardous waste generation facilities, two wastewater generator sites, and twelve tank sites within a one mile buffer of the Project Area. Additional noteworthy sites on and within one mile of the Project boundaries are shown in the table below:

Table 8.10.1: What's In My Neighborhood Sites		
Site Name	**Type/Activity**	**Distance/Direction/Location**
Larry Sterzinger	Contaminated Soil Treatment Facility	0.85 m W Ivanhoe, MN
MnDOT Truck Station	Leak Site	0.65 m SW RR 2 Box 56a, Ivanhoe, MN
Ivanhoe Post Office	Leak Site	0.37 m W 321 N Shurwood St, Ivanhoe, MN
Veire's Standard	Leak Site	0.68 m SW Highway 19, Ivanhoe, MN
Lyon County Coop Oil Co	Leak Site	0.32 m W 222 N Norman, Ivanhoe, MN
19 & 75 Filling Station LLC	Leak Site	Project Area 2792 US Highway 75, Ivanhoe, MN
Ivanhoe Dump	State Assessment Site	0.26 m W Ivanhoe, MN
Divine Providence Health Center	Leak Site	0.2 m W 312 E George St, Ivanhoe, MN
Gisloson Lake Property PBR	Solid Waste, Permit By Rule	0.13 m N 2824 State Highway 19, Ivanhoe, MN
Velva Sovell Residence	Solid Waste, Permit By Rule	Immediately Adjacent 2812 County Highway 5, Ivanhoe, MN

* Unpermitted dumps are usually old farm or municipal disposal sites that accepted household waste.

During construction, vehicles and equipment will use gasoline, diesel and other petroleum products. While in operation, the Project is not expected to generate significant amounts of hazardous waste or materials. The wind turbines will use synthetic gear box oil, hydraulic fluid, and gear grease. Materials used for operating the wind project will be handled and maintained by qualified operations and maintenance personnel. Disposal of wastes will be in compliance with local, state, and federal laws.

8.10.2 Potential Impacts

Prior to site construction, the Applicant will conduct an ASTM-conforming Phase I Environmental Site Assessment (ESA) to identify and avoid any existing environmental hazards within the project area.

Minimal amounts of hydraulic oil, lube oil, grease and, possibly, and cleaning solvents will be used on the site to maintain the wind turbines and other equipment, and small amounts will be properly stored in the O&M building. Materials will be transported, handled and disposed of by trained and qualified personnel utilizing established procedures and proper equipment. Turbine hydraulic oils and lubricants will be contained within the wind turbine nacelle, and transformer oil will be contained within the transformer. When lubricants are replaced during normal turbine maintenance cycles, used oils, coolants, and waste products will be handled according to applicable regulations and disposed of through an approved waste disposal firm.

8.10.3 Mitigation Measures

Red Pine has prepared a turbine layout that avoids farmsteads and other occupied buildings by a minimum setback distance of at least 1,000 feet, thereby avoiding most potential encounters with existing hazardous materials and unmarked waste dumps. Prior to site construction, the Applicant will conduct a Phase I Environmental Site Assessment (ESA) to identify and avoid any existing environmental hazards within the project area.

Hydraulic oils and lubricants used within the wind turbines will be contained within the turbine nacelle, or brought to the Project Area as needed. Potential hazardous materials will be properly managed, stored and used in compliance with local, state and federal guidelines for their use by trained technicians. Red Pine will ensure that wastes generated by the Project are properly disposed of offsite using certified waste handlers.

Fuels and lubricants for vehicles and maintenance equipment will not be stored at the site during project operation. Transformer oil will be contained within the electric transformers, and fluid levels will be monitored during scheduled maintenance at each turbine and transformer location. Small amounts of hydraulic oil, lube oil, grease, and cleaning solvents may be used on site and either stored in a nacelle, or brought to the Project Area as needed by the operations and maintenance contractor. When fluids and lubricants are replaced, the waste products will be handled and disposed of according to local, state and federal regulations through an approved waste firm by trained technicians.

8.11 Land-Based Economies

Agriculture

Land use within the Project Area is primarily agricultural as shown in the Land Cover Map (**Map 12**). In 2012, over 82% of the land in Lincoln County (roughly 290,940 acres) was used for agriculture on approximately 699 farms (USDA, 2012 Census Report). Major crops grown in the county include: corn, soybeans, forage-land (hay). Predominant livestock raised in the counties includes hogs and pigs and cattle and calves. Market value of agricultural products sold in the county for 2012 was $198.5 million with crops market value being $135.1 million and livestock market value being $63.4 million. Lincoln County ranks

52nd of the 87 counties in Minnesota for total value of agricultural products sold; Lincoln County ranks 50th for the value of crops and 44th for livestock, poultry and their products.

As shown on **Map 13**, 47.66% of the soil within the Project Area is considered prime, 23.04% is prime farmland when drained and 13.86% is considered farmland of statewide importance. Approximately 13.37% of the Project Area is neither non-prime farmland nor farmland of statewide importance.

8.11.1 Potential Impacts

To the extent possible, Red Pine will design the Project and locate wind turbines, access roads and associated facilities to avoid or minimize temporary and permanent impacts to farmland and pasture. Turbine and facility siting will include discussions with landowners to identify features on their property, including drain tiles and other obstacles that should be avoided.

Feedlots used for the confined feeding, breeding or holding of animals are a common practice for animal production. The MPCA is the state agency charged with regulating animal feedlots in Minnesota. Lincoln County has been delegated authority as a county administer of the MPCA's feedlot program. There are currently 430 registered feedlots in the county (MPCA 2016). Seventy-one feedlots exist within the project boundary according to the MPCA's "What's In My Neighborhood" map search tool (April, 2016).

Some livestock operations and pasture land may be temporarily disrupted during the installation of the wind turbines and associated infrastructure. The applicant will coordinate with landowners about work being performed on their property, and contractors will ensure fenced pasture land remains secure. Aside from the specific areas where wind turbines, roads, and infrastructure are physically located, the remaining portions of the property will be available for grazing and use by livestock. The Project will have little, if any, long-term effects on the ability of the land to be productive for raising livestock.

The only land that will be taken permanently out of crop production will be those areas encumbered by turbines, access roads, and supporting aboveground infrastructure. Additional farmland may be temporarily impacted for use during construction as staging and access areas. Soil compaction will occur, and is considered a temporary impact.

Table 8.11.1: Potential Permanent Impacts to Agricultural Lands[1]					
Turbine Model	**Prime Farmland (Acres)**	**Farmland of Statewide Importance (Acres)**	**Non-Prime Farmland (Acres)**	**Prime Farmland if Drained (Acres)**	**Prime Farmland if Protected from Flooding[2] (Acres)**
V100	93.6	30.3	5.7	14.5	1.9
V117	59.1	17.9	3.1	9.6	0.5
V126	60.5	17.1	3.6	9.9	0.2

[1] Table 8.11.1 represents potential permanent impacts to agricultural lands from sited turbines and access roads. Additional, minor impacts may occur from accessory structures.

[2] Prime farmland if protected from flooding or not frequently flooded during the growing season.

8.11.2 Mitigation Measures

To mitigate impacts resulting from compaction, the construction equipment used in the erection of wind turbines, much like agricultural equipment, is designed with wide tires and tracks to distribute their weight over a larger area and provide stability. This minimizes the degree of soil compaction resulting from construction. Once construction is complete, Red Pine will assess disturbed areas and determine whether excessive soil compaction has occurred in conjunction with the affected landowners and local officials. In areas where excessive soil compaction has occurred from project activities, Red Pine will work with the landowner and establish appropriate corrective action measures (e.g. tilling, chiseling, or other methods). Sites used for temporary storage, material staging, and access areas typically experience significant amounts of traffic which will likely require de-compacting prior to resumption of agricultural use.

To the extent practicable, staging areas will be placed in previously disturbed locations to minimize the impact to agricultural production. While significant impacts to drain tiles and other existing facilities due to Project construction and operation are not planned, Red Pine will promptly repair or replace drain tile that may be impacted by the Project. Prior to beginning site work, Red Pine will contact the landowner where the work will be conducted to properly identify and locate drain tiles or other drainage structures that may be present in the work area.

If a project is affecting agricultural lands, and federal monies are involved, it is generally a requirement that a Farmland Policy Protection Act (FPPA) site assessment be appropriately filed. FPPA land evaluations are typically conducted by local NRCS personnel who review the project for possible effects on unique, prime or statewide important farmland. Red Pine notified the USDA about the project in February. Red Pine will continue to coordinate with USDA staff to determine if the FPPA applies to this project, submit the appropriate documentation to the USDA once final locations have been identified, and efile any required documentation to the project docket.

Overall, impacts to agriculture as a result of the Project are anticipated to be short term, minimal and are not expected to significantly alter crop production. Once the Project is completed, Red Pine will restore disturbed areas as close as practicable to its original condition. Post construction restoration will largely depend upon the amount of disturbance occurring on the site and the soil types at each location.

While in operation, it may occasionally be necessary for Red Pine to complete repairs, or clear vegetation around a turbine or facility, which could result in additional temporary impacts to agricultural operations. These interruptions are expected to be infrequent and short term and landowners will be compensated in accordance with the terms of their agreements with Red Pine.

Forestry

There are no significant forestry resources within the Project Area. National Land Cover Database mapping (Map 12) indicates that less than <1% of the Project Area is forested. Most wooded areas consist of shelter belts or small woodlands surrounding active farmsteads and residences, or wooded hillslopes along swales, ditches and streams. Dominant tree species common in this area include bur oak, locust, box elder and cottonwood. According to land cover mapping for the Project Area obtained from the U.S. Geological Survey, deciduous woodland makes up 0.39% of land cover within the county. Because of Lincoln County's agricultural history, much of the original woodlands were removed to make way for agricultural production within fertile soils. Most of the remaining forested areas in the county are association with farmsteads, which typically contain woodlots and shelterbelts. Therefore, Lincoln County does not currently represent an economically important source for forestry products.

8.11.3 Potential Impacts

Only negligible, if any, impacts to forestry resources are anticipated. Wooded areas near farmsteads and waterbodies will be, for the most part, avoided by the proposed Project. While significant tree removal is not anticipated, some trees and limbs may occasionally need to be removed to install access roads, or trimmed to prevent damage to electrical lines from wind and ice, and to ensure reliable operation. Red Pine will coordinate with affected landowners for replacement of trees lost on private property as a result of the Project.

8.11.4 Mitigation Measures

Because economically important forestry resources are not found in the project area, and only negligible, if any, impacts to forestry resources are anticipated, no mitigation has been proposed.

Mining

There are no significant mining resources within the Project Area. However, crushed rock, sand, and gravel are extracted from mines around the county primarily for the purpose of building roads. Based on a review of aggregate resource mapping from a number of available sources including MnDOT interactive aggregate mapping, there are nine gravel pits located within the Project Area (**Map 14**). Eleven active and inactive gravel pits are located outside of the project boundary, north of Ivanhoe, within seven miles, and at least five additional pits are located within a mile north and south of State Highway 19 near the county boundary in Lyon County. According to Lincoln County LMIC land cover mapping for the period between 1988 and 1990, gravel pits and open mines makes up less than 0.1% of land cover within the county.

8.11.5 Potential Impacts

No impacts to mining resources or operations are anticipated; however, some of the identified aggregate resources may be used for access road construction. The Applicant will coordinate with the appropriate landowners prior to utilizing materials from these aggregate resource locations.

8.11.6 Mitigation

Because there are no significant mining resources within the Project Area, no mitigation has been proposed.

8.12 Tourism

Lincoln County offers community centered tourism and recreational opportunities throughout the year. Lincoln County ranks 82 of 87 in Minnesota counties with annual traveler expenditures of approximately 8,552,795 (UMTC 2008), which equates to about 136 tourism-related jobs in the county. Tourism in the county centers around a calendar of local community events found at http://www.co.lincoln.mn.us/calendar_of_events.htm. The list includes the New Swing Revival at the Legion Hall, Tyler in January; the Lake Benton Chili Cook-Off, Lake Benton's Got Talent in Lake Benton in February; Polka fest in May; Polska Kielbasa festival in Ivanhoe in August; the Lincoln County Fair in August; October fest in Hendricks; and the Christmas lighting contest in Lake Benton in December to name a few (Lincoln County, 2016). In addition to the community events, County outdoor recreational opportunities include biking, camping, wildlife watching and hunting, fishing and snowmobiling in the 61 wildlife management areas. The Lincoln County Drift Clippers Snowmobile Club uses and maintains over 144 miles of groomed trails in the county; including a section that transects the Red Pine project boundary. The trail offers a tourism draw for recreational snowmobilers.

8.12.1 Potential Impacts

Because project facilities will be located on private lands, there will be no direct impacts to existing recreational facilities and tourism activities that typically generate revenue for the local community.

8.12.2 Mitigation Measures

No negative impacts to tourism and community benefits are expected, and therefore no mitigation measures are proposed.

8.13 Local Economies

According to Minnesota's Quarterly Census of Employment and Wages ("QCEW"), the main industries in Lincoln County include natural resources and mining, construction, trade, transport, utilities, education, and health services (Minnesota Department of Employment and Economic Development 2015).

8.13.1 Potential Impacts

The project is expected to positively impact the local economy by adding temporary and permanent jobs, and by increasing the County's tax base from production tax credit payments. Jobs are expected to be added including numerous temporary jobs for construction of the Project, approximately 10 full time site technicians, a Wind Power Plant Supervisor and additional support staff, as appropriate, for operation of the Project once it is built. The communities near the Project are also expected to receive positive economic benefits. Short-term impacts to the socioeconomic resources of the area are expected to be minor. It is anticipated that some land will be removed from production for the length of the easement agreements. Landowners will be compensated for this loss under the terms of the landowner agreements. Participating landowners with fully executed agreements within the Project Area who receive a wind turbine on their property, and those who do not, will be compensated for wind rights through easements. Construction is anticipated to stimulate some local industries and is not expected to have any negative impacts to the local industries as a whole. There is no indication that any minority or low-income population is concentrated within the Project Area, or that the wind turbines will be placed in an area occupied by a minority group.

To the extent possible, Red Pine Wind plans to use local contractors and suppliers for portions of the construction. Wages and salaries paid to contractors and workers in Lincoln County will contribute to the overall personal income of the region. Additional personal income will be generated for residents in the counties and state by circulation and recirculation of dollars Red Pine Wind pays for business expenditures and for state and

local taxes. Equipment, fuel, operating supplies, and other product and service expenses will benefit businesses in the counties and the state. Landowners having a turbine or other Project facilities on their land will receive payment annually for the life of the Project. Such payments should strengthen the local economy.

Construction and operation of the Project will provide long-term beneficial impacts to the counties' tax bases and contribute to improving the local economy in this part of Minnesota. As described in other nearby wind project site permit applications, the development of wind energy in this area of Minnesota has been important in diversifying, supporting and strengthening the personal income and property tax base of southwester Minnesota.[4]

In addition to creating jobs and personal income, the Project will pay an energy production tax to the local units of government of $1.20 cents per MWh ($0.0012 per kWh) of electricity produced, resulting in an annual wind energy production tax projected to be between **[TRADE SECRET -** [redacted] **- TRADE SECRET]**.

8.13.2 Mitigation Measures

Impacts to regional socioeconomics as a result of the proposed Project will be primarily positive due to an influx in wages and expenditures at local businesses during construction and an increase in the county's tax base from the construction and operation of the wind turbines. In addition, the easement payments to landowners will offset potential financial losses associated with removing land from agricultural production. Therefore, because no negative impacts are expected, no mitigation measures are proposed.

8.14 Topography

8.14.1 General Description

Topography within the Project is generally undulating consisting of rolling hills, stream networks, a few lakes and numerous wetlands. Digital elevations are provided on **Map 15**. Overall, the Project area slopes downward from southwest to northeast from a high elevation of 1,719 feet above mean sea level (amsl) to a low of 1,368 feet amsl. Topography in the east part of the Project is more undulating with some deeply incised

[4] See Minnesota Public Utilities Commission, Docket Nos. IP6631/WS-07-388 (Site Permit Application for a Large Wind Energy Conversion System for the Elm Creek Wind Project in Jackson and Martin Counties, Minnesota (June 15, 2007); NSP-WGR-1-95 (NSP Phase II). See also *Assessing the Economic Development Impacts of Wind Power* (2003), Northwest Economic Associates, which analyzes the NSP Phase II/Lake Benton I Wind Project in Lincoln County, MN.

stream channels with elevations in the west part of the Project that generally slope downward to the east.

According to the MN DNR Ecological Classification System, the Project Area is located primarily in the Coteau Moraines subsection (251Bb) of the North-central Glaciated Plains section, of the Prairie Parkland province (MN DNR 2016). The Coteau Moraines is a mixture of rolling moraine ridges through its center, and around its edges characterized by a series of end moraines and escarpments. Few large lakes and drainage networks are found throughout the Coteau Moraines.

8.14.2 Potential Impacts

Potential impacts to topographic and physiographic resources from the proposed Project include visual changes to the local landscape and the potential for decreased slope stability. Excavation for the construction of turbine pads, access roads, underground and overhead electric collection and communication systems, and other project facilities would create some topographic changes. These changes to the topographic character of the area would be minor but long-term. The primary impact of these topographic changes would be on visual resources. Visual impacts are described in Section 8.4.

The site has good access from the existing roadway network across the Project Area, which will reduce the overall length of new access roads needed for the Project. Significant impacts to existing topography are not anticipated because steep slopes (greater than 10 percent) only comprise a small percentage of the site area. Grading within steep slope areas will be avoided to the degree practicable. Minimizing cut and fill requirements will reduce erosion control potential as well as decrease overall construction costs. Layout and siting of access roads will be completed in such a way as to tie into the existing road network, where practicable, to reduce unnecessary grading.

8.14.3 Mitigation Measures

Construction Best Management Practices (BMPs) will be implemented surrounding graded areas in accordance with State standards, the MPCA *Stormwater Best Management Practices Manual*, and the approved Stormwater Pollution Prevention Plan (SWPPP) for the Project. Based on recommended and required mitigation measures, and avoidance of areas with slopes > 10 percent, there would be no adverse impact on topographic resources as a result of construction and operation of the proposed Project.

8.15 Soils

8.15.1 General Description

Two general soil associations are mapped in the Project Area. These include the Flom-Barnes and Forman-Buse-Aastad (**Map 14**). The Flom-Barnes association is the

predominant soil association in the Project Area extending from the northwestern and western boundary southeastward across the Project Area. It covers about 36,659 acres or 87 percent of the Project Area. Flom-Barnes association soils are deep, well-drained to poorly drained, mainly undulating to hilly and moderately steep soils formed in loamy glacial till. Forman-Buse-Aastad association soils are present only in the extreme northeastern portion of the Project boundary and comprise approximately 5,438 acres or 13 percent of the Project Area. These soils are deep, well-drained to moderately well drained, nearly level to very gently undulating soils formed in loamy glacial till.

As with most of the soils in southern and western Minnesota, soils within the Project Area have a combination of physical and chemical characteristics of Prime Farmland, or Farmland of Statewide Importance, as determined by the USDA Natural Resource Conservation Service (NRCS). Approximately 49 percent (20,810 acres) of the Project Area is classified as Prime Farmland, 14 percent (5,800 acres) as Farmland of Statewide Importance, 4,664 acres of Non-Prime Farmland, 9,768 of Prime Farmland if drained, and 1,050 acres of Prime farmland if protected from flooding or not frequently flooded during the growing season. Soils excluded from these classifications are generally highly erodible soils on steep slopes or are hydric soils associated with streams or wetlands.

8.15.2 Potential Impacts

Construction and operation of the proposed Project would result in minor short- and long-term impacts to soils within the Project Area. Impacts would result from the clearing of vegetation, excavation, salvage, stockpiling, and redistribution of soils during construction and reclamation activities associated with turbine pads, access roads, underground and overhead electric collection and communication systems, and other proposed facilities. Initial project assumptions are that turbine sites (crane pad and foundation) would disturb up to 1 acre per turbine (60 to 100 total acres), access roads approximately 176 acres, the substation approximately 11 acres, the O&M facility would occupy up to 5 acres, and the met towers up to 4 acres. An additional area of approximately 10 acres would be required during construction for material laydown and staging, a concrete batch plant, spoils storage, etc. Therefore, the combined total area of temporary and permanent disturbance to soils within the Project Area is not expected to exceed 350 acres; less than 1% of the overall site area. Potential permanent impacts from turbines and access roads may total 93.6, 59.1, and 60.5 acres of Prime farmland for the V100, V117, and V126 turbine models, respectively. A complete summary of anticipated impacts to prime, prime if drained, non-prime farmland, and farmland of statewide importance is provided in Table 8.11.1.

8.15.3 Mitigation Measures

The potential for construction-related soil erosion will be minimized by siting turbines and access roads so as to avoid highly erodible soils on steep slopes. Avoiding steep topography will also reduce the size of cut and fill areas. Red Pine will work with landowners in the Project Area to site turbines and access roads so as to minimize impacts

to high quality farmland to the extent practicable. Erosion control measures would also be implemented during construction to avoid or minimize soil erosion and off-site deposition. Erosion and sedimentation would be reduced through the use of BMPs including, but not limited to; mulching, hydroseeding, erosion control blankets, silt fence installation, jute matting, revegetation, and/or interim reclamation. Based on the implementation of these recommended and required mitigation measures, there would be no adverse impact on soil resources as a result of implementation of the proposed Project.

8.16 Geologic and Groundwater Resources

8.16.1 General Description

The basement rocks in the Project Area and surrounding region consist largely of Precambrian granite and quartzite. These are overlain locally by flat-lying Upper Cretaceous strata composed of thick sections of soft dark-bluish-gray shale and some thin beds of loosely consolidated sandstone (Rodis 1963). The Cretaceous strata are more than 500 feet thick in certain areas, but gradually pinch out toward the northeast and southwest against the highs of the Precambrian bedrock surface (Rodis 1963). Glacial drift overlies the Precambrian and Cretaceous rocks and forms the surface of the Project Area and surrounding region. The drift consists largely of till and range in thickness from about 200 to 600 feet.

The principal aquifers in the Project Area and surrounding region are glacial-melt-water deposits of sand and gravel, and sandstone of Cretaceous age (Rodis 1963). The underlying Precambrian rocks and the alluvium are of only local importance as water sources. Melt-water deposits composed of stratified clay and silt as well as sand and gravel occur in channels having surficial expression, in buried channels having no direct surface expression, and as small isolated bodies within the till (Rodis 1963). Large quantities of ground water are available from melt-water channels in the region. Moderate quantities, adequate for domestic and small industrial needs, are available from many of the small isolated deposits of sand and gravel in the till. Small quantities of ground water, adequate only for domestic supply, generally can be obtained from Cretaceous sandstone (Rodis 1963).

8.16.2 Potential Impacts

Construction and operation of the proposed Project is not expected to impact groundwater within the region, and construction of the proposed turbine foundations is unlikely to affect local groundwater supply from many of the small isolated deposits of sand and gravel in the till. Municipal water supplies will be used for mixing concrete needed for turbine foundations, as untested, non-potable water from wells does not meet ASTM standards. Approximately 17,500 gallons is required per foundation, which includes the mud mat.

According to the MN Department of Health's County Well Index online database, (Minnesota Department of Health - Division of Environmental Health 2016), well depths

vary widely, with most being in excess of 100 feet in depth. Turbine foundation construction is unlikely to affect local water supply from the buried confined sand and gravel aquifers. Geotechnical testing will occur at turbine locations prior to final design and construction.

A new water supply well may be required for the O&M facility. Water usage from the new well is expected to be similar to the average household volume of less than five gallons per minute. Potential water-related needs will be minimal and can be accommodated locally, thus no impacts to geologic and groundwater resources are expected from construction and operation of the proposed project.

8.16.3 Mitigation Measures

No impacts to geologic and groundwater resources are expected from construction and operation of the proposed project, therefore, no specific mitigation is proposed. If identified wells require abandonment, they will be capped in accordance with Minnesota law.

8.17 Surface Water and Floodplain Resources

8.17.1 Wetlands

According to data from the U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) spatial data, 1,259 wetlands are mapped within the proposed Project Area and comprise approximately 3,531 acres or eight percent of the Project Area (**Table 8.14.1** and **Map 16**). The majority of the wetland acreage was classified as seasonally flooded basins (n=556), shallow marshes (n=210), and wet meadows (n=174).

Table 8.14.1: Mapped PWI Lakes, Wetlands, and Watercourses within the Project Area

Wetland Type	Number in Project Area	Total Area (Acres)	Percent of Project Area
Seasonally Flooded Basin	556	1294.759022	3.07564
Shallow Marsh	210	667.603991	1.585862
Wet Meadow	174	561.920746	1.334817
Shallow Open Water Community	127	701.740266	1.666952
Hardwood Wetlands	115	91.309492	0.22
Shrub Wetlands	57	50.491623	0.12
Non-Vegetated Aquatic Community	9	158.579052	0.38
Artificially Flooded Shallow Open Water Community	7	1.7048	0.0040
Deep Marsh	3	0.489409	0.0012

Table 8.14.1: Mapped PWI Lakes, Wetlands, and Watercourses within the Project Area			
Wetland Type	**Number in Project Area**	**Total Area (Acres)**	**Percent of Project Area**
Hardwood Wetlands / Seasonally Flooded Basin	1	2.1747	0.0052
Grand Total	**1,259**	**3,530.77**	**8.39**

8.17.2 Lake, Streams, and Ditches

There are nine mapped MN DNR Public Water Lakes and Wetlands (PWI) within the Project Area totaling approximately 760 acres, (**Table 8.14.2**). The National Hydrography Dataset (NHD) also mapped several waterbodies within the Project; most of which correspond with mapped PWI and NWI water features. Intermittent and perennial MNDNR Public Watercourses cover approximately 41 linear miles within the Project Area and include South Branch of the Yellow River, Three Mile Creek, Coon Creek, the Yellow Medicine River, and several unnamed watercourses. NHD mapping indicates an additional 66 miles of intermittent watercourses and ditches, many of which are tributaries to the mapped PWI watercourses. In addition, based on NHD and PWI data, approximately 10 miles (9.4%) of the mapped watercourses within the Project are identified as ditches.

Table 8.14.2: Mapped PWI Lakes, Wetlands, and Watercourses within the Project Area		
PWI Name	**Type**	**Area/Length within Project**
Hawksnest Lake	Public Water Lake	301.2 acres
Popowski Lake	Public Water Lake	143.2 acres
Oak Lake	Public Water Lake	110.0 acres
Drietz Lake	Public Water Lake	75.5 acres
Unnamed (South portion)	Public Water Lake	71.6 acres
Unnamed lake	Public Water Lake	29.4 acres
Unnamed wetland	Public Water Wetland	26.8 acres
Unnamed (North portion)	Public Water Lake	2.1 acres
Slough	Public Water Wetland	0.01 acres
Unnamed stream	Intermittent	23.6 miles
South Branch Yellow Medicine River (County Ditch 35)	Perennial	12.7 miles
Threemile Creek	Intermittent	2.3 miles
Yellow Medicine River	Perennial	1.6 miles
Coon Creek	Intermittent	1.1 miles

8.17.3 Designated Wildlife Lakes and Special Waters

There are no MN DNR Designated Wildlife Lakes within the Project Area or 10-mile buffer. There are also no outstanding resource value waters, sensitive lakeshore, or trout streams or lakes within the Project Area. One designated trout stream, Redwood River, is located about one mile southeast of the Project. Approximately 3,793 acres of shoreland is located within the Project.

Of the mapped streams and ditches within the Project Area, several including the Yellow Medicine River, Threemile Creek, Coon Creek, South Branch Yellow Medicine River (County Ditch 35), and an unnamed creek are listed as impaired by the Minnesota Pollution Control Agency (MPCA). Impairments listed for one or more of the aforementioned water features include fecal coliform, turbidity, Mercury in fish tissue, and or failing to meet one or more bioassessment standards for fish.

8.17.4 FEMA Floodplains

There are three areas within the Project mapped within FEMA Flood Zone A, 100-year floodplains (**Appendix G**). These floodplains are mapped adjacent to the Yellow Medicine River in the northwest corner of the Project, the South Branch Yellow Medicine River across the central section of the Project, and Coon Creek along a small portion of the southern Project boundary.

8.17.5 Calcareous Fens

No calcareous fens are located within the Project Area. The two nearest mapped calcareous fens are located approximately 5 miles east of the Project in Lyon County. Calcareous fens are a rare wetland type found in Minnesota and are very calcium-rich environments due to their relationship with a groundwater discharge high in bicarbonates. As a result, the species that grow and utilize fens as habitat (i.e., calciphiles) are very specialized and are unlikely to migrate from the fens into the Project (MN DNR 2015).

8.17.6 Potential Impacts and Mitigation Measures

Optimal turbine locations are those which are topographically elevated from their surroundings. Ideally, turbines are to be located on elevated uplands where they are not expected to affect streams or surface water bodies. Impacts typically associated with similar projects include the conversion of wetland to upland to accommodate project infrastructure including access roads and associated facilities. Access roads are more likely to necessitate wetland fill than turbines, collection lines, and substations. Impacts for road crossings typically require a small amount of fill for placement of culverts and road base materials. Temporary crossing widths would be widened to a maximum of 40-56 feet to allow for construction cranes. Crossings would be reduced in width following construction to approximately 16 feet wide.

Collector lines are generally installed by trenching and only create temporary impacts. It may be possible to directional bore some collector lines beneath wetland areas, which would eliminate both temporary and permanent impacts.

The Project Area is served by a regular grid network of county and township roads, which will provide flexibility in the avoidance of water features and shoreland during the design process. Also, given the isolated nature of the wetlands found within the Project Area, wetlands should be relatively avoidable. As field work is planned, wetland review and delineation will be coordinated with layouts for final turbine siting, access road alignments and collector line routing, especially where wetland delineation may be required for those wetlands and stream crossings that cannot be avoided, or are in close proximity to proposed structures.

Based on the current site layout, only minimal, if any, impacts to drainage ditches and wetlands are anticipated. Some minor impacts to unavoidable drainage ditches and associated wetlands may occur as a result of access road construction and collector line installation. It is the goal of Red Pine to maintain access road and collector line wetland impacts below levels that would require mitigation in the form of replacement.

If some wetlands are determined to be unavoidable, wetland delineations will be completed and a wetland replacement plan submitted for review by the USACE, the Lincoln Soil and Water Conservation District (SWCD), and the Board of Water and Soil Resources (BWSR). As the Local Government Unit (LGU), the Lincoln SWCD is responsible for administering the Minnesota Wetland Conservation Act in this area, and the St. Paul District of the U.S. Army Corps of Engineers administers Section 404 of the Federal Clean Water Act. Wetland impacts will be minimized in accordance with sequencing and replacement requirements of the Minnesota Wetland Conservation Act (WCA) and Section 404 of the Federal Clean Water Act (CWA). Mitigation will be necessary if the areas impacted exceed the minimum exemption thresholds (e.g. the maximum amount of wetland fill permitted without necessitating replacement). If replacement is necessary, a wetland replacement area will be constructed onsite, or Wetland Bank Credits from an approved wetland bank in the same Wetland Bank Service Area of the impact will be purchased. Applicable documentation related to needed wetland replacement, such as permits, de minimis, or exemption approvals will be efiled upon receipt to the project docket.

Activities regulated by the Corps would include the installation of underground utilities through waters of the U.S. if there is discharge of dredge or fill material. However, underground utilities installed using vibratory plow and directional bore methods would not require a permit unless there is the need to excavate or backfill at the location of connecting points. Temporary placement of fill material into any waterbody or wetland for purposes of constructing bypass roads, temporary stream crossings, cofferdams, or storage sites may require coordination with the Corps as well.

The Minnesota Pollution Control Agency (MPCA) administers the National Pollutant Discharge Elimination System (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 Storm Water Pollution Prevention Plan (SWPPP) will identify erosion and sedimentation control measures to prevent adverse water quality impacts to streams and wetlands during and after construction. Measures included in the SWPPP should be sufficient to ensure that streams and surface waters on the project site do not incur adverse construction-related stormwater impacts. No surface water or floodplain mitigation is anticipated at this time, as Red Pine is planning on avoiding impacts to surface waters through design.

The Local Comprehensive Management Plans for Lincoln County highlights existing and potential water issues and set specific actions to achieve goals for sound hydrological management of water resources in each County. Priority concerns for both counties include: ground water, surface water quality, erosion, sedimentation, and runoff. Red Pine is committed to addressing these priority concerns as they apply to the project. Table 8.14.6 provides a summary of the priority concerns that apply to the project and describes how the project will address each one.

Table 8.14.6: Priority Water Concerns for Lincoln County

Concern	Description	Project Specifics
Groundwater Protection for the Verdi Well Field	Protect public water supply from potential contamination.	No impacts to groundwater are anticipated
Surface Water Quality Deterioration	Protect surface water from nutrient loading and bacteria by restoring, protecting, and improving surface water runoff.	BMPs will be implemented to manage erosion and sedimentation during construction.
Erosion and Sediment Control on Agricultural Land	Protect and preserve topsoil and reduce erosion to preserve soils and water resources.	Upper levels of topsoil will be scraped and stockpiled and reapplied to disturbed areas following construction. BMPs will be implemented to manage erosion and sedimentation during construction.
Lake Management Improvement	Increase recreational potential of lakes in Lincoln County, especially Lakes Benton, Shaokatan, and Hendricks.	Project will avoid public waters and adhere to setbacks.
Surface Water Runoff and Drainage	Improve surface water management by reducing runoff and flooding.	Project will install proper BMPs to manage project-related runoff.

8.18 Vegetation

8.18.1 Description of Resources

According to the MN DNR Ecological Classification System, the Project Area is located primarily in the Coteau Moraines subsection of the (251Bb) of the North-central Glaciated

Plains section, of the Prairie Parkland province in what was once the largest tract of grassland in the world (MN DNR 2016). The Coteau Moraines sub-section is located on an elevated glacial landform that stretches across southwestern Minnesota, southeast South Dakota, and northwest Iowa and is divided into two distinct parts; the middle and outer Coteau. Pre-settlement vegetation of the Coteau Moraines consisted primarily of tallgrass prairie. Wet prairie and woodland could also be found along stream and river margins. Given the thick deposits of loess across the region and the predominance of loamy well-drained soils, present vegetation and land use throughout this sub-section is overwhelmingly dominated by row crop agriculture.

Land cover mapping for the Project Area was obtained from the U.S. Geological Survey National Land Cover Database (NLDC; USGS 2011). The data is based on a 16-class land cover classification scheme that has been applied consistently across the United States at a spatial resolution of 30 meters and is created through a decision-tree classification of Landsat satellite data (circa 2011)(Home *et. al* 2015). Based on the NLDC dataset, 71.4 percent of the Project Area is cultivated cropland, consisting primarily of corn, soybeans, and alfalfa (Map 12 and Table 8.15.1), and grassland and pasture areas account for about 20 percent of the Project Area. The NLDC data indicates the remaining area is composed of disturbed/developed land, wetland, and forest. For the most part pasture and grassland areas are fragmented across the Project; however several larger tracts of grassland and pasture occur in the northwest and east-central areas of the project. Forested areas appear limited to areas along stream corridors, near lentic water features, and around homesteads.

Table 8.15.1. Land Cover Types and Percentages

Land Cover Type	Total Area (Acres)	Percent of Project Area
Cultivated Crops	30,041.05	71.36
Grassland	4,637.60	11.02
Hay/Pasture	4,038.36	9.59
Disturbed/Developed	1,877.35	4.46
Open Water	943.54	2.24
Wetlands	352.06	0.83
Deciduous Forest	165.44	0.39
Barren Land	41.82	0.10
TOTAL	**42,097.22**	**100%**

Minnesota Biological Survey (MBS) sites of biodiversity significance represent areas with varying levels of native biodiversity that may contain high quality native plant communities, rare animals, and/or animal aggregations. A biodiversity significance rank is assigned based on the number of rare species, the quality of the native plant communities, size of the site, and context within the landscape. Of the 53 MBS sites located within the Project Area, 39 are classified as below the minimum biodiversity significance threshold

and 12 are classified as having moderate biodiversity significance. Sites characterized as "below" lack occurrences of rare natural features and rare species but offer conservation value at the local level. Sites considered "moderate" do contain rare features and species but are disturbed. Two areas, one in the northwest and one along the east-central border, are characterized as having outstanding and high biodiversity significance, respectively. The MBS sites within the Project encompass mapped MN DNR Native Plant communities.

There are 91 MN DNR Native Plant Communities mapped within the Project Area, accounting for approximately 504 total acres (Map 5). These plant communities are located primarily in the northwest corner and along the eastern border of the Project. The plant communities are fairly fragmented across these areas; however, several areas are mapped as larger plant community complexes. MN DNR Native Plant Communities mapped within the Project include seven different community types, including southern dry sand - gravel prairie (242.8 acres), southern dry hill prairie (174.6 acres), basswood -bur oak - green ash forest (34.6 acres), southern mesic prairie (23.6 acres), southern wet prairie (18.0 acres), prairie meadow/carr (6.5 acres), and seepage meadow/carr - tussock sedge subtype (4.2 acres).

8.18.2 Native Prairie

WEST, Inc. evaluated the presence and quality of native and non-native grassland within the Project Area through desktop analysis and field surveys of the Project Area in September 2015. Biologists reviewed potential grassland parcels within leased lands, either from the road, or when necessary by walking into grassland areas. Biologists noted which grassland parcels appeared to be previously tilled and which appeared to never have been tilled (i.e., native). For areas where there was some question, historical aerials were consulted to determine if the parcel had been cultivated in the past. Native and non-native grassland parcels were delineated in GIS and used to inform siting decisions. Changes in the Project boundary since September 2015 may require additional surveys to better inform layout design and fulfill Department of Commerce requirements, if Project infrastructure is proposed in grassland areas that were not field checked as part of the 2015 survey.

WEST, Inc. delineated approximately 5,850 acres of grassland, covering approximately eight percent of the overall Project Area. Over 72 percent of the delineated grassland area was identified as native and about 27 percent was identified as non-native. The majority of these areas were identified as moderate quality (4,149 acres), indicating most of the grassland area within the project boundary has been, or is currently used for grazing, or has experienced some anthropogenic disturbance. Since this field work was completed, the Project Area has been refined. The current Project boundary encompasses 3,069 acres of delineated grassland; covering only seven percent of the Project Area. However, because the delineated grasslands from WEST's site visit concentrated on leased lands within the 2015 Project boundary, WEST has coordinated with EDF on layout revisions to determine if any turbines are proposed in potential grassland parcels that were not field evaluated in

September 2015 either because they were not leased, or were outside of the 2015 Project boundary.

8.18.3 Potential Impacts and Mitigation Measures

Impacts to native prairie will be avoided by the Project, and a Native Prairie Protection Plan (NPPP) will be prepared and submitted to document avoidance. Proposed turbine locations will be sited primarily on agricultural lands and access roads will be sited and connected to public roads while avoiding woodlands, shrubland, grasslands and water resources to the extent practicable. Similarly, it is anticipated that collection lines can be sited to avoid such resources. However, as discussed in Section 8.16.6, some minor impacts to unavoidable drainage ditches and adjacent wetlands, grasslands and shrubland may occur as a result of access road construction and collector line installation. These areas may contain some native vegetation and if disturbed, Red Pine is committed to restoring and seeding these areas with native mixes appropriate for the region. It is the goal of Red Pine to minimize impacts to non-cultivated and native plant communities and will coordinate field reviews of layouts for final turbine siting, access road alignments and collector line routing. Given the ecological significance of some of the MBS locations within the project area, the DNR has recommended that MBS site rated Moderate or above be considered avoidance areas within the permitting boundary (NHIS 2016). Should disturbance of native plant communities or areas identified as native prairie become necessary, Red Pine will coordinate with the DNR and DOC accordingly. Given the distance to identified calcareous fens (5 miles), impacts to this resource are not anticipated.

8.19 Wildlife Resources

In accordance with the U.S. Fish and Wildlife Service Land-Based Wind Energy Guidelines (March 2012), Red Pine has conducted a tiered approach for assessing potential impacts to wildlife and habitats. Tier 1 of the approach is a preliminary evaluation or screening of sites (landscape-level screening of possible project sites). Tier 2 includes site characterization (broad characterization of one or more potential project sites), and Tier 3 is characterized by field studies to document site wildlife conditions and predict project impacts (site-specific assessments at the proposed project site).

Tier 1 was completed by Red Pine as they evaluated available sites for wind development and completed a Critical Issues Analysis (CIA) in 2009. Along with proximity to transmission interconnection, distance from airports, and willing landowners, Red Pine also looked for a site that was primarily agricultural and had a reasonable buffer from publicly managed lands in an effort to reduce impacts to wildlife. Tier 2 was addressed through the completion of a Site Characterization Study (SCS) and is attached as **Appendix H**. The SCS consisted of evaluating publicly available mapping (e.g. wetlands, land cover, public lands) and a detailed review of sensitive resources, potential wildlife habitat, and potential for federal and state listed species to occur within the Project Area. In addition, WEST, Inc.

conducted a variety of bat and avian use studies to further fulfill Tier 2 and 3 assessments including the following:

1) Bat Activity Studies, April – October 2013,
2) Raptor Nest Survey Memo -2013,
3) Breeding Bird Transect Studies, June-July 2013,
4) Avian Use Surveys, March 2013 to March 2014,
5) Landcover/Habitat Mapping Memo – 2014,
6) Raptor Nest Survey and Eagle Nest Monitoring, July 2015,
7) Northern Long-Eared Bat Presence/Absence Surveys, October 2015, and
8) Eagle Nest Survey Report - 2016

Appendix I contains a copy of each of these Tier 3 studies. The results of completed Tier 1, 2, and 3 processes are outlined in the remainder of Section 8.

8.19.1 Potential and Observed Wildlife Usage

Mammals

Mammal species likely to utilize or occupy the Project Area include species common to agricultural areas of southwestern Minnesota. Mammals likely using the area include white-tailed deer (*Odocoileus virginianus*), red and gray fox (*Vulpes fulva and V. Urocyon cinereoargenteus*), raccoon (*Procyon lotor*), opossum (*Didelphis virginiana*), cottontail (*Sylviligus floridanus*), coyote (*Canis latrans*), thirteen-lined ground squirrel (*Spermophilus tridecemlineatus*), gray and fox squirrels (*Sciurus carolinensis* and *S. niger*), striped skunk (*Mephitis mephitis*), badger (*Taxidea taxis*), and short-tailed weasel (*Mustela erminea*). Most large mammals are likely to concentrate along woodland fringes and near water features; utilizing crop fields on occasion to forage. Smaller mammals are likely to utilize crop fields for burrowing.

Bat species likely to utilize the Project Area include the big brown bat (*Eptesicus fuscus*), hoary bat (*Lasiurus cinereus*), eastern red bat (*Lasiurus borealis*), little brown myotis (*Myotis lucifugus*), and silver-haired bat (*Lasionycteris noctivagans*); all of which are common within the state. Forested areas within the Project are primarily restricted to areas along stream corridors and around homesteads. Tree-roosting bats could utilize these wooded stream corridors and wetland areas for foraging and roosting habitat. Other roosting habitat may also include abandoned buildings and operational farmsteads. No mines, caves, karst, or pseudo-karst formations are known to occur within or near the Project Area or surrounding region; suggesting it is very unlikely any of the seven bat species found in Minnesota will utilize the site for hibernation. Furthermore, the relatively flat to gently undulating topography of the Project Area and vicinity does not appear to contain topographic features that would funnel bat movements during migration.

According to results of a 2013 study conducted by WEST, Inc. (West, 2013), low-frequency calling bat activity was consistently greater than high-frequency calling bat activity across the Project Area; suggesting silver-haired bats, big brown bats, and hairy bats are the most common species found within the Project Area. Across the Project, WEST, Inc. recorded between 2.93 ± 0.42 and 15.92 ± 1.62 bat passes per detector night. Bat monitoring study results indicated bat activity at Red Pine was greatest near areas of wetland and woodland; suggesting bats are using water features and woodland for foraging and roosting. Results also suggested bat activity was relatively low in areas of agriculture in comparison and, therefore, there may be lower potential risk of collision with turbines sited in agricultural fields, away from woodland and water features. WEST, Inc. additionally conducted acoustic monitoring and mist-netting studies for northern long-eared bats (NLEB). NLEB was not quantitatively verified or captured during studies suggesting this species is absent from the Project Area (West 2015).

Birds

West Inc. conducted point counts to quantify raptor use within the Project Area between March 22, 2013 and March 6, 2014. WEST, Inc. identified six raptor species and observed a total of 88 individual raptors. Red-tailed hawks were most commonly observed raptors (42.0%) followed by northern harriers (40.9 %) and bald eagles (12.5%). Raptor use was highest in the spring and lowest in the winter and 80 percent of raptors were observed flying within RSZ. Mean diurnal raptor use across the Project Area was 0.22 raptors/800-m plot/20-min survey and no clear spatial use patterns were observed (West, 2014). In addition, no federally endangered, threatened, or candidate raptor species were observed incidentally or during point counts.

Raptor Nest surveys for the majority of the project area were conducted in 2013 by WEST, Inc.; expanded portions of the project area were covered by a ground-based survey in April 2015. This survey was conducted in order to document potential nests within the portions of the expanded Project area that were not previously surveyed as well as to document any new or newly active nests. WEST biologists detected a total of 46 raptor nests representing two species during surveys in 2015. Of these nests, three were identified as red-tailed hawk nests (RTHA), one as a bald eagle nest (BAEA), one as a potential BAEA, and 41 unknown raptor species nests (UNKN). One occupied active bald eagle nest was located within approximately 300 feet of the Project boundary in the southeastern portion of the Project. This nest was not documented during the previous 2013 surveys conducted at the Project. Two adult bald eagles were seen in the nest and appeared to be feeding chicks, though the chicks could not be directly observed. One potential bald eagle nest was located within a quarter mile of the boundary in the southwestern portion of the Project. The nest was a stick nest in good condition that was large enough to support nesting eagles. No eagles were documented in the vicinity of this nest. This nest was also documented in the 2013 nest survey, as an unoccupied raptor nest. In 2016, WEST biologists focused on identifying eagle nests within a 10 mile buffer of the current Project boundary, per the Eagle Conservation Plan Guidance (ECPG) and recommendation of the USFWS, and an aerial survey was conducted on March 29 and 30, 2016. Seven occupied

active bald eagle nests were documented in this survey, along with three likely bald eagle nests that appeared to be inactive and/or unoccupied. The two bald eagle nests documented in 2015 were both active in 2016; an additional five active bald eagle nests were observed within the expanded 10 mile survey area.

In addition, WEST, Inc. completed breeding bird transect studies between June and July of 2013. Of the 1,500 birds observed, red-winged black birds (n = 131), common yellow-throats (n = 129), cliff swallows (n = 129), and clay-colored sparrows (n = 114) accounted for 49.7% of the observations. In total, 47 species were identified. Mean bird use across the Project Area was 31.25 birds/transect/survey and no distinct spatial use patterns were observed. In addition, no federal or state listed endangered, threatened, or state listed species of special concern were observed.

Reptiles and Amphibians

Species of amphibians such as the western chorus frog (*Pseudacris triseriata),* American toad (*Bufo americanus),* Great Plains toad *(Anaxyrus cognatus),* northern leopard frog *(Rana pipiens),* and the tiger salamander *(Ambystoma tigrinum)* may utilize the habitat along drainage ditches and streams in the Project Area. Common upland snakes in the area include common garter snake (*Thamnophis sirtalis*), smooth green snake (*Ophedrys vernalis*), and plains garter snake (*Thamnophis radix*). Turtle species likely found in the Project Area include painted turtles (*Chrysemys picta*) and snapping turtles (*Chelydra serptina*).

8.19.2 Rare and Unique Natural Resources

The Project Area was evaluated for the presence of federal and State listed species, their habitat, and the potential for the proposed Project to affect such species. A review of the MN DNR NHIS database licensed to Westwood (LA763, May 2015), and endangered and threatened species lists from the MN DNR and USFWS (MN DNR 2015; USFWS 2016) was conducted to identify rare species known or likely to occur in the Project Area.

Natural Heritage Information System Data

Red Pine reviewed publicly available sources of information regarding federal and state-listed threatened and endangered species known or likely to be found within the Project Area. A formal Natural Heritage Information System (NHIS) data request was submitted to the Minnesota Department of Natural Resources (MN DNR) Natural Heritage Program, which maintains the most up-to-date database of rare species records, on January 29, 2016.

A formal response was received on April 4, 2016 from DNR Natural Heritage Review staff (**Correspondence #ERDB 20110259-0007 – Appendix B**). The review letter indicates that their search of the state database did identify rare features within an approximate one-mile radius of the proposed project. It should be noted that the analysis was completed on a slightly larger project area that extended into Lyon County. Currently, the project boundary ends at the Lincoln/Lyon County boundary. Consequently, some resources listed

in the DNR's April 4 letter may have been excluded from the project area. For instance, one of the MBS Sites of High Biodiversity Significance and one Site of Outstanding Biodiversity Significance noted in the DNR's letter are no longer located within the project boundary. The following analysis uses the MN DNR NHIS database licensed to Westwood (LA763, May 2015) on the current, smaller project boundary.

Results from the MN DNR NHIS database review for the Project Area indicated 10 records of rare plants and animals within the Project (MN DNR 2015). The mapped occurrences include two animal assemblages, five records of vertebrate animals, one record of invertebrate animals, and two records of plants. It should be noted that the absence of rare species records in the Project cannot be construed as lack of occurrence. Instead, it may mean the area has not been surveyed. Within one mile of the site an additional five NHIS occurrences are mapped and include one additional animal assemblage, two vertebrates, and two additional plants occurrences (Table 8.16.2).

Table 8.16.2: Summary of MN DNR NHIS Records within One Mile of the Project Area

Species	Number of Mapped Occurrences within One Mile of Project Area	State/Federal Status
Vascular Plants		
Missouri milk-vetch	1	SC/None
Red Three-awn	1	SC/None
Western white prairie-clover	2	SC/None
Invertebrate Animals		
Regal fritillary	1	SC/None
Vertebrate Animals		
American white pelican	1	SC/None
Bell's vireo	1	SC/None
Henslow's sparrow	2	END/None
Northern grasshopper mouse	1	SC/None
Prairie vole	1	SC/None
Richardson's ground squirrel	1	SC/None
Animal Assemblage		
Colonial waterbird nesting site	3	None/None
Total	**15**	

U.S. Fish and Wildlife Data

Review of the USFWS' Information Planning and Conservation System (IPaC) identified two federally listed threatened or endangered species as potentially occurring within the Project Area and surrounding region. These include the northern long-eared bat and Dakota skipper (*Hesperia dacotae*). IPac also identified designated critical habitat for the Dakota skipper and Topeka shiner within the Project Area. Critical habitat for the Dakota skipper

is mapped within the northwest corner of the project and critical habitat for the Topeka shiner covers the entire Project Area. The USFWS's listed species for Lincoln County also included the federally endangered Topeka shiner. Only minimal, if any, impacts to drainage ditches and wetlands are anticipated based on the current project layout, and no impacts to local groundwater is anticipated. Some minor impacts to unavoidable drainage ditches and associated wetlands may occur as a result of access road construction and collector line installation. Red Pine is committed to working closely with the USFWS in regard to the Topeka shiner to ensure adequate protections and BMPs are in place prior to construction.

Red Pine requested USFWS comment on the Project on February 11, 2016; the agency has not to date provided a formal response letter in regards to the Site Permit Application. However, USFWS staff has been in active communication with other members of the project team in regards to avian issues. Red Pine will follow up with the USFWS and coordinate potential concerns it may have regarding threatened or endangered species and the Project. Once a more complete understanding of USFWS concerns is developed, Red Pine will work with the USFWS to address them as needed.

State and Federally Listed Species in Lincoln County

Based on the review of the listed species' natural history and understanding of the Project Area, a likelihood rating was assigned of *None*, *Low*, *Moderate*, or *High* to describe the probability of a particular species occurring within the Project Area; details can be found in the 2016 Site Characterization Study (SCS) (Westwood 2016, Appendix H). Of the reviewed state and federally listed species found in Lincoln and Lyon County, eight were identified as highly likely to occur within or utilize habitats within the Project Area. These species include the northern grasshopper mouse, prairie vole, Richardson's ground squirrel, American white pelican, bald eagle (delisted), Henslow's sparrow, Poweshiek skipperling, and the regal fritillary. Ten of the reviewed species were identified as having moderate likelihood of occurring within the Project and include the Bell's vireo, Forester's tern, loggerhead shrike, trumpeter swan, Wilson's phalarope, Blanding's turtle, Topeka shiner, phlox moth, Dakota skipper, and the western white prairie-clover. Of these species the Poweshiek skipperling and Topeka shiner are federal listed as endangered and the Dakota skipper is federally listed as threatened. The Henslow's sparrow, loggerhead shrike, Blanding's turtle, Topeka shiner, Dakota skipper, Poweshiek skipperling, and Wilson's phalarope have state listing status with regulatory effect and are listed as endangered and threatened, respectively. The remaining species with high or moderate potential to occur within the Project Area are considered state species of concern.

Since the completion of the SCS, the project boundary has been refined. Based on the Project boundary changes and data received from field surveys, it appears the state threatened common tern and Franklin's gull also have high likelihood of occurring within the Project Area as they were observed during point count surveys (West 2014). In addition, the likelihood the Poweshiek skipperling or phlox moth will utilize the Project Area is greatly reduced given no mapped or identified habitat or NHIS occurrences are located within 5 miles of the refined Project Area. Overall, the refined Project Area is less

likely to support significant wildlife and sensitive species than the Project Area reviewed in the 2016 SCS due to the removal of several sensitive or mapped native habitat areas from the Project.

8.19.3 DNR Waterfowl Feeding and Resting Areas

According to the DNR's August 5, 2011 list of established Migratory Waterfowl Feeding and Resting Areas (MWFRA), there are no established MWFRA's within Lincoln County or within neighboring counties.

8.19.4 Important Bird Areas

The National Audubon Society lists Important Bird and Biodiversity Areas (IBAs) as sites providing essential habitat for one or more species of birds. These include sites for breeding, wintering, and/or migrating birds and can range from only a few acres to thousands of acres in size. The nearest IBA is the Prairie Coteau Complex which is a collection of five areas that are located in Lincoln, Murray, Yellow Medicine, Pipestone, and Rock counties and constitutes approximately 177,997 acres. The closest of these IBA areas covers Lake Benton and is located approximately seven miles south of the Project Area.

8.19.5 Potential Impacts

Wildlife Habitat

Field and desktop studies indicate wildlife usage and resources in the Red Pine Project are comparable to other wind facilities sited in agricultural areas of the Midwest. Impacts to wildlife and wildlife habitat are expected to be minimal because grasslands, woodland areas, shrublands, water features and other spaces identified as important wildlife habitat will be avoided whenever possible. Based on current Project plans, it is estimated that less than 1% of the land area within the Project Area will be affected by permanent construction. Any potential minor impacts to drainage ditches and associated wetlands, grasslands, and shrubland will be identified during micrositing. Furthermore, construction and operation of the wind project will not change adjacent land uses.

Bats

Bat fatalities are highly variable among facilities and regions of the country (NWCC 2010) but have been reported for most wind projects where post-construction monitoring data is available. The prominent proximate causes of bat deaths at previously developed wind projects are barotrauma (Grodsky et al. 2011) and direct collision (i.e., blunt-force trauma) (NREL 2013). Most documented bat fatalities at wind projects have been associated with migratory species that conduct long migrations between summer roosts and winter hibernacula. Three species of migratory tree bats (i.e., hoary bat, eastern red bat and silver-

haired bat) compose the majority of fatalities, and hoary bats alone compose about half of all documented fatalities in North America. The exact magnitude of these mortalities and the degree to which bat species may be affected is difficult to determine.

At wind projects in Minnesota and Wyoming, where grassland and crop fields accounted for a substantial proportion of the vegetative cover, over 90 percent of the reported bat collision fatality occurred between mid-July and mid-September (Erickson et al. 2002). Similarly, bat mortality at the Top of Iowa Wind Project peaked during August in both 2003 and 2004 (Jain 2005). These seasonal peaks in bat fatality coincide with the dispersal and migration period. Based on post construction bat fatality modeling from other wind facilities with similar habitats and features, including Big Blue, Grand Meadow, Oak Glen, and Lakefield wind projects, it is likely that bat fatality rates at the proposed Red Pine Project will fall between 3.09 - 20.2 bat/MW/year (WEST, Inc. 2013; Westwood 2015). Results from the 2013 WEST, Inc. study also suggest bat use patterns at Red Pine will be similar to the aforementioned projects; such that bat fatality peaks will likely occur in late summer and early fall and that hoary and eastern red bats will comprise the majority of the reported species fatalities. Based on the distance of the project to managed lands, and minimal roosting habitat for bats within the Project Area, impacts are not expected to be different from results of other previous studies conducted in similar agricultural settings in Minnesota.

Birds

Data from four previously developed wind projects in southern MN including Big Blue, Grand Meadow, Oak Glen, and Lakefield wind projects, have estimated bird fatality rates between 0.40 - 1.07 birds/MW/study periods (West 2013; Westwood 2015). No state or federally threatened or endangered species were among the fatalities observed at the aforementioned wind projects and fatalities were predominately associated with fall migration and common songbirds such as common grackles and eastern starlings (West 2013; Westwood 2015). Other mortality data analyzed by Burns & McDonnell regarding wind projects of the upper Midwest showed the highest percentage of bird fatalities were passerines (2013). Although differences in project design, methodology, and statistical modeling can make direct comparison and prediction difficult; patterns of fatality and the rate of bird fatality due to turbine collisions for the Red Pine Project are likely to be comparable to the aforementioned MN wind projects due to its similar general avian species composition, landscape, land use, and location.

In addition, the Project is not in a raptor migration corridor nor are there any unique features that appear to attract large numbers of raptors. Regional data suggest raptor fatalities at wind projects in MN are typically low and are unlikely to cause significant adverse impacts to raptor populations (WEST, Inc. 2014). It is possible, however, that some of the sensitive grassland-dependent birds observed during 2013 Red Pine breeding bird surveys could be displaced by construction and operation of the wind facility if turbines are placed in grassland or wetland areas (WEST, Inc. 2014). Potential impacts could be minimized or avoided by avoiding grassland areas when determining turbine locations.

Rare and Unique Natural Resources

The 2016 SCS for Red Pine indicated the Project has moderate probability for adverse impacts on wildlife and sensitive resources. This conclusion was based on the number and proximity of NHIS occurrences and information from cited data sources, and the inclusion of several areas seemingly adequate habitat for a variety of wildlife and plant communities. However, the refined Project Area is less likely to support significant wildlife and sensitive species than the Project Area reviewed in the 2016 SCS due to the removal of several sensitive or mapped native habitat areas from the Project. Based on the refined boundary there are also fewer NHIS records within and in close proximity to the Project Area. Although some quality habitat is still available within the Project, the area is predominantly agricultural and the vast majority of the water resources, plant communities, and habitat areas are fragmented and considered degraded and/or disturbed. Also, Red Pine is committed to avoiding special resource areas and will avoid impacts to water resources and quality habitat areas to the extent practicable.

8.19.6 Mitigation Measures

Red Pine has refined the Project boundary such that some of the avoidance areas indicated in a MN DNR letter dated March 14, 2016, are no longer incorporated in the Project. (**Appendix B**). Avoidance areas indicated by the DNR that are still within the refined Project Area will be avoided to the extent practicable. Wildlife habitat impacts will be mitigated by: (1) siting turbines, roads and other facilities on cultivated/agricultural land (with the possible exception of a few minor unavoidable areas for utility and access road crossings); (2) designing to avoid impacts to wetlands, streams, forested areas and shrublands, and native plant communities to the extent practicable; (3) placing electrical collection/feeder lines underground; (4) implementing a Wildlife Response Reporting System (WRRS) once turbine construction is completed (the WRRS will include protocols for field technicians during routine maintenance operations to report and document avian and other wildlife mortalities); (5) minimally lighting turbines and meteorological towers while meeting FAA requirements; (6) using tubular monopole towers to minimize perching; and (7) minimizing other Project infrastructure.

An Avian and Bat Protection Plan (ABPP) has been prepared by WEST, Inc. for the project, and functions as a program to identify and avoid risks to avian and bat species that may result from construction and operation of the Project (WEST, 2016; **Appendix J**).

Specifically, the ABPP document was developed to:

1. Provide a framework for fulfilling the application requirements for a Large Wind Energy Conversion System (LWECS) Site Permit issued by the Minnesota Public Utilities Commission (PUC), in accordance with the Chapter 216F, Minnesota Statutes;
2. Respond to the recommendation of the USFWS Wind Energy Guidance for completion of a ABPP and a post-construction fatality monitoring protocol;

3. Consolidate documentation of steps already taken to avoid and minimize potential effects on birds and bats during the Project planning and development;
4. Identify and implement steps to further reduce the potential for avian and bat fatality or other potential adverse effects on birds and bats at the Project, including the plan for implementation of adaptive management measures if they are determined to be appropriate; and
5. Increase the understanding and coordination between EDF and state and federal wildlife agencies.

USFWS Minneapolis Ecological Services Field Office is making recommendations for the Project pursuant to the 2013 USFWS Eagle Conservation Plan Guidance. Specifically, these include a study program in 2016 for additional eagle nest data collection and eagle point count surveys to more fully characterize the Project's potential risk to bald eagles.

Given the known bald eagle fatalities in the region, the expanding population and the location of eagle nests in the vicinity of the Project, USFWS has also recommended that the Project pursue a programmatic eagle take permit. USFWS is expected to make this recommendation if a wind project has the potential to take an eagle during its operational life.

A programmatic eagle take permit is a voluntary action and is not required by law or a regulatory agency as a prerequisite to construct or operate a wind project. However, EDF RE is committed to advancing the Project collaboratively with USFWS such that it is complaint with the Bald and Golden Eagle Protection Act. Therefore, development of an Eagle Conservation Plan in consultation with USFWS is currently underway.

The Project expects to submit a complete draft Eagle Conservation Plan and application for a programmatic eagle take permit in January 2017 following the completion of the 2016 study program.

The Project will advance according to the proposed schedule. Should the Project reach commercial operations prior to permit issuance, reliance on USFWS technical assistance letter documentation and implementation of avoidance and minimization measures as outlined in the eagle conservation plan will allow for compliance with the Bald and Golden Eagle Protection Act.

The Applicant will continue wildlife agency coordination based on the permitted project boundary to evaluate post-construction avian surveys, potential operational procedures to minimize impacts to bats, and the specific needs outlined in the project's ABPP.

9.0 SITE CHARACTERIZATION

9.1 Description of Resources

The Department of Energy's Wind Program and the National Renewable Energy Laboratory (NREL) published a wind resource map for Minnesota (11 October 2010). This revised wind resource map shows the predicted mean annual wind speeds at 80-m height. The wind resource across Southwestern Minnesota has been documented for more than 20 years by U.S. Department of Energy, Minnesota Department of Commerce (DOC) and public utility companies. Extensive wind measurements have been taken and synthesized by various parties. These revised data suggest that the long-term mean annual 80-m wind speeds across Lincoln County in the area of interest for the Red Pine Wind Project range from 8.0 to 8.5 meters per second (mps) (18 to 19 mph).

Four temporary meteorological towers have been collecting data for the project area (Mast 2313, Mast 2314, Mast 2315 and Mast 2316). The meteorological towers are NRG tubular-type guyed towers equipped with NRG anemometers and directional vanes.

Red Pine Wind Project has collected data from this facility for 6.5 years at one Met tower location, and for roughly 3 years at the other locations at ten-minute intervals. Based on measured data, the average annual wind speed at the site is approximately 8.6 m/s at an 80-meter hub height (Average at turbine locations).

The climatological characteristics representative of the Red Pine Wind Project were gathered from data collected by the National Climatic Data Center (NCDC) at the Marshall weather station. The climatological temperature information recorded at the Albert Lea station indicates an annual high temperature of 55.7°F, a minimum of 33.8°F, and an annual daily average temperature of 44.75°F. The average annual precipitation for the site is approximately 28.28 inches.

9.1.1 Interannual Variation

Interannual variation is the expected variation in wind speeds from one year to the next. There is a very strong correlation between Red Pine’s meteorological tower data and the long-term reference data sets available through the National Oceanic and Atmospheric Administration's ("NOAA") NCEP/NCAR reanalysis program and the weather monitoring stations available in the vicinity. Based on analysis of weather stations and model data in the vicinity of the project, the inter-annual variability (IAV) of wind speed is expected to be 5.5 percent. Based on AWS Truepower proprietary atmospheric modeling system IAV is expected to be 3.5 percent. The IAV of wind speed based on a DNV GL assessment is expected to be 4 percent.

9.1.2 Seasonal Variation

Seasonal variation is represented by the shift in wind speeds from one month to the next. Table 9.1.2 shows the estimated average seasonal variation based on long-term correlations with on-site data. Generally, the months of November through February are expected to have the highest wind speeds, while the months of June through August are expected to have the lowest wind speeds.

Table 9.1.2: Average Wind Speed

Month	Wind Speed (m/sec)
January	10.3
February	9.3
March	9.1
April	9.5
May	9.0
June	7.9
July	7.1
August	7.4
September	8.0
October	9.1
November	9.7
December	9.1
Annual Average	8.7

9.1.3 Diurnal Conditions

As shown in Figure 9.1, the daily wind pattern at the Red Pine Wind Project site has an increase in wind speeds during the evening and overnight hours as the atmosphere heats from the ground upward and convective mixing occurs (Figure 9.1). The presence of the nocturnal low level jet is also a common occurrence that drives low-level winds.

During the spring and fall, the largest variations between wind speeds during the night and day occur, whereas there is generally less variation in the diurnal pattern during the winter months.

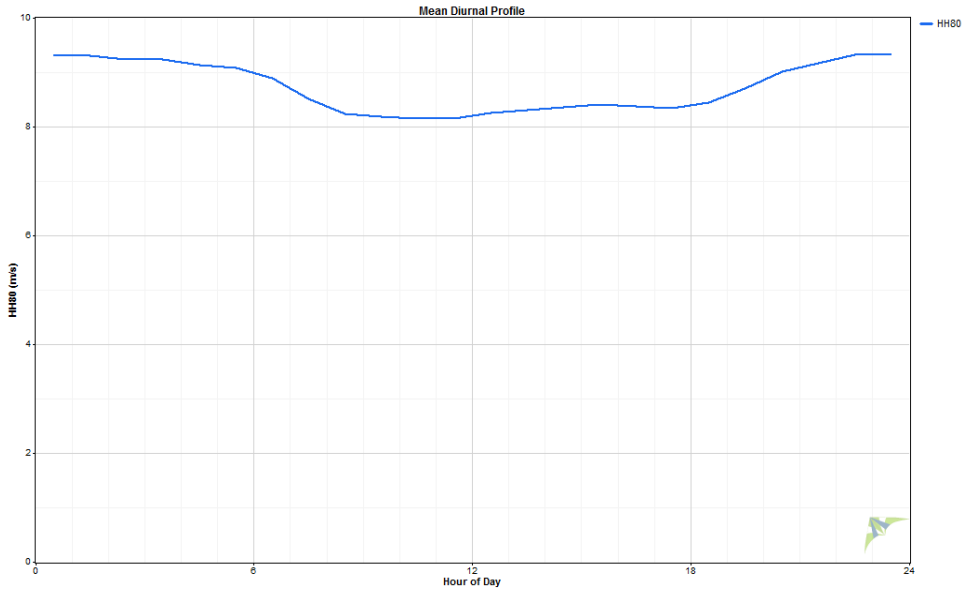


Figure 9.1. Diurnal Wind Speed Pattern at Red Pine Wind Project

9.1.4 Atmospheric Stability

The stability of the atmosphere can be calculated when the temperatures at two levels are available. For the Red Pine Wind Project, temperature sensors at multiple heights were not available from the met tower data at the time of this report. However, based on data from other Met towers in southwest Minnesota, atmospheric stability is expected to be moderately stable at a 60 meter elevation.

9.1.5 Hub Height Turbulence

The turbulence intensity at the site provides information on the variability within the wind flow. High turbulence intensity at a site could provide extra stress on turbines as wind passes through the swept area of the wind turbine blades. The turbulence intensity at the Red Pine Wind Project is on average 11% at 75-105 m based upon measured wind data from the project meteorological towers, and is shown in Figure 9.2 for a range of wind speeds. Overall, the turbulence intensity at this site is in the low to normal range of operating parameters for the wind turbines being considered.

9.1.6 Extreme Wind Conditions

The extreme wind speeds for the project were estimated by Vbar using the seven years of measured wind data from the six meteorological towers between 2008 and 2014. The estimated maximum hourly mean wind speed at the Project Area is 25.2 m/s (56.3 mi/h). Other extreme conditions that occur around the Project Area are thunderstorms

during the summer months and blizzards during the winter months. The peak gust based on the seven years data from the site meteorological towers is estimated to be 54 m/s.

9.1.7 Wind Speed Frequency Distribution

Figure 9.3 provides the anticipated long-term annualized wind speed frequently distribution for the four Red Pine Wind Project meteorological towers at 80 meters (262.5 feet).

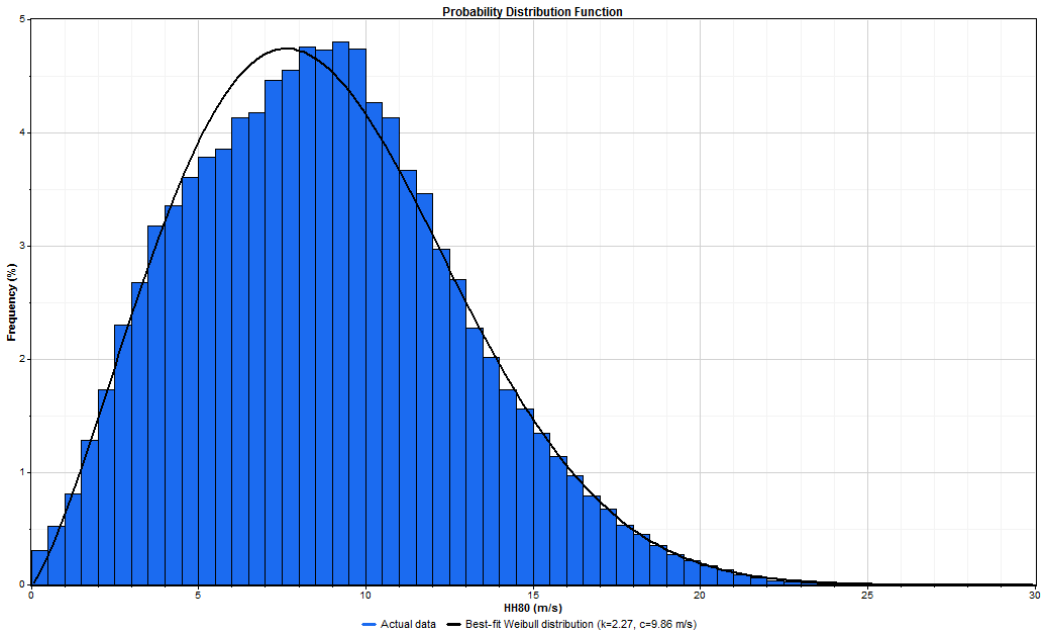


Figure 9.3. Annual Average Wind Speed Frequency Distribution at 80 meters.

9.1.8 Wind Variation with Height

Wind shear is the relative change in wind speed as a function of height. Wind shear is calculated using a power function based upon the relative distance from the ground. The general equation used for calculating wind shear is S/So = (H/Ho) where So and Ho are the speed and height of the lower level and a is the power coefficient. The power coefficient can vary greatly due to terrain roughness and atmospheric stability. The power coefficient will also change slightly with variation in height.

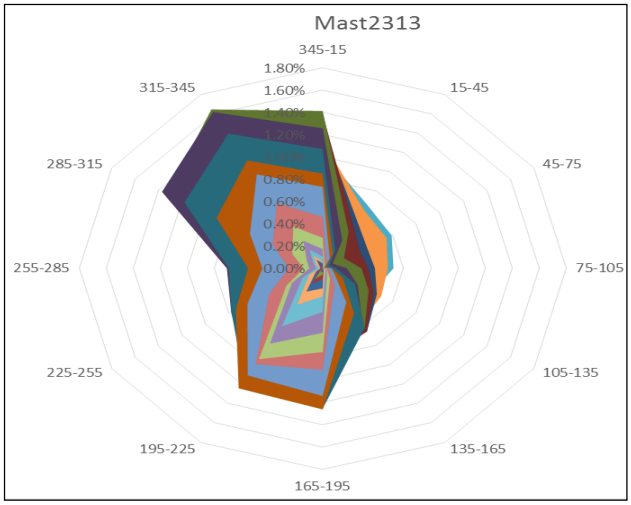
Based upon data collected from the Red Pine Wind Project meteorological towers during a seven year data collection period (2008 and 2014), the average wind shear exponent for the project is 0.20. The wind turbine models being considered for use at the site are expected to be well suited for this level of wind shear and average wind speed. However, the appropriateness of each turbine model under consideration will be evaluated through a specific site suitability process in regards to wind shear prior to selection.

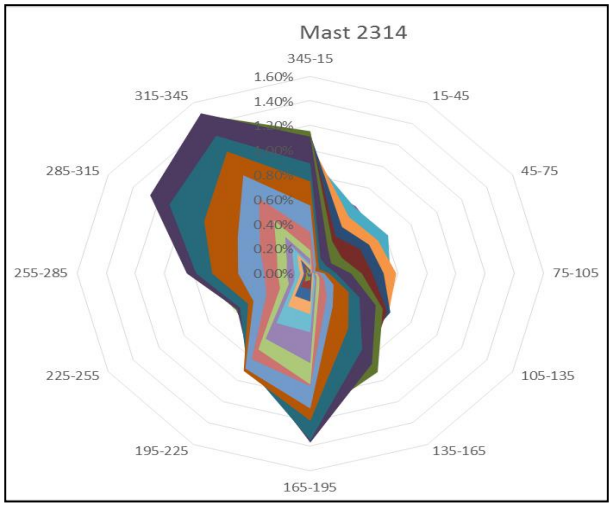
9.1.9 Spatial Wind Variation

As noted above, the Department of Energy's wind resource analysis program estimates that the spatial variation in wind speed across the Project Area is 8.0 to 8.5 mps (18 to 19 mph). However, the wind speed at turbine locations was computed by Red Pine using a software package called Openwind to be 8.4 to 8.9 m/s at an 80m height.

9.1.10 Wind Rose

A wind rose is a graphical representation that shows the various compass points and the frequency at which the wind has been measured in the Project Area with respect to direction. The measurements are collected from the project meteorological towers. Figure 9.3 shows an annual wind rose at the met tower locations.





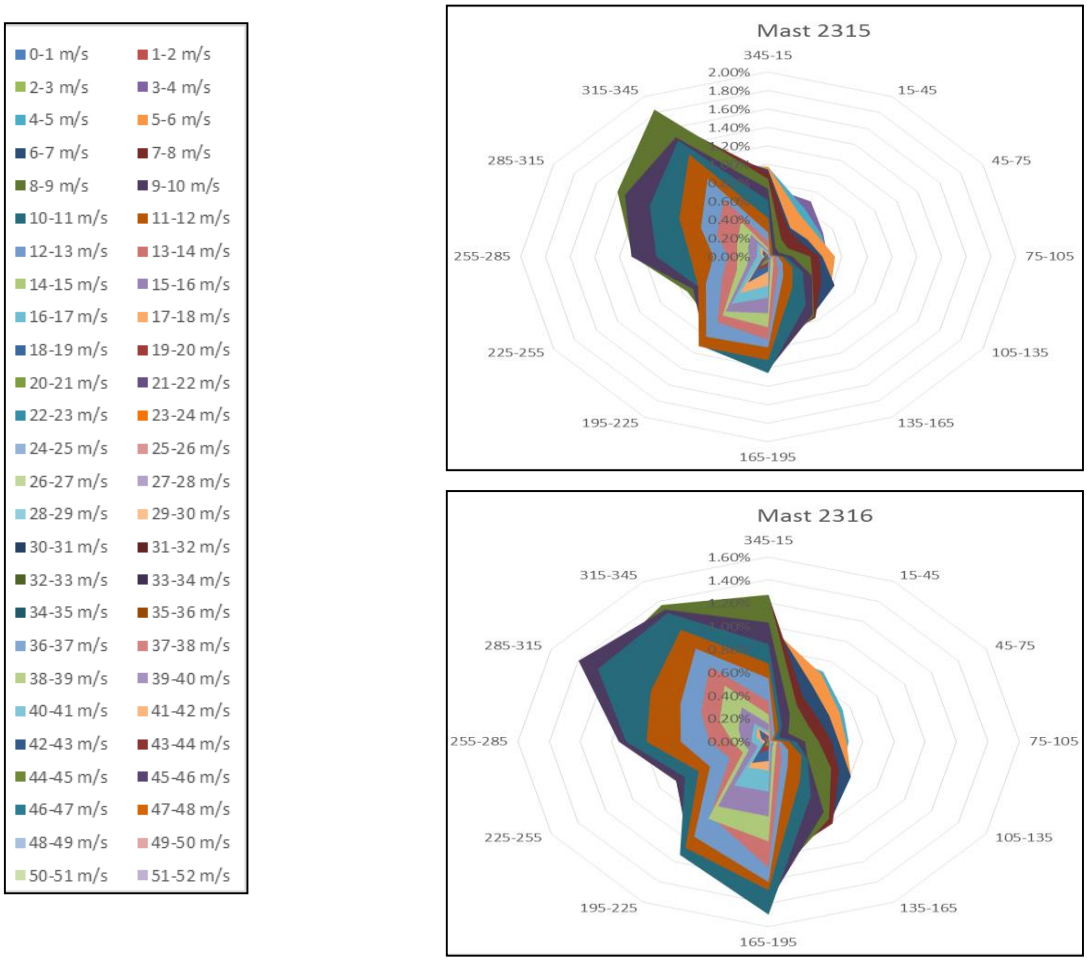


Figure 9.3. Annual Long-Term Wind Speed and Direction Rose (80 m) – EDF 2016

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, high thunderstorm winds, high winds and blizzard conditions, do occur and are discussed further in this section.

Specific, long-term climatological data does not exist for the Project Area. However, data from a National Weather Service climate station located approximately 12 miles east of the site near Marshall (Station 215204; Latitude: 44.47056 Longitude: -95.79083) was used to represent meteorological conditions at the site. The warmest month of the year is July with an average high temperature of 84 degrees Fahrenheit, while the coldest month of the year is January with an average minimum temperature of 4 degrees Fahrenheit. The annual

average precipitation at Marshall is 28.28 inches. Rainfall is fairly evenly distributed throughout the year, with the wettest month being June with an average rainfall of 3.82 inches.

Extreme weather events in the Project Area have been recorded by the National Climatic Data Center (NOAA, 2016) in the US Storm Events Database for the period of time from December 1950 through December 2015. 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). The NCDC recorded 257 extreme weather events in Lincoln County during this time period including 17 tornadoes, 20 high wind events, 65 thunderstorm wind events, and 20 blizzards. Typically, such storms are local in extent, short in duration, and result in damage to relatively small geographic areas. There were 43 event days with property damage reported during this period (NCDC 2016).

9.2 Other Nearby Wind Turbines

The Moraine Wind II Project, just completed in 2009, is located approximately 14 miles south of the Project area in Pipestone and Murray Counties. Ridgewind Wind Project is located 20 miles south of the proposed Project in Pipestone and Murray Counties, and has approximately 100 installed turbines.

10.0 PROJECT CONSTRUCTION

Land will be graded on site for the turbine pads. Drainage systems, access roads, storage areas, and shop facilities will be installed as necessary to fully accommodate all aspects of the construction, operation, and maintenance of the wind project.

Professional design engineering firms and experienced pre-qualified trade contractors will be hired for the design and construction of the Project. Red Pine Wind Project, LLC will have overall project management responsibilities. Contracts for construction and third party testing and inspection services will be awarded for civil work, electrical work, and noise analysis and turbine erection. The services of local contractors to assist in Project construction will be considered where possible. The construction team will be on-site to handle materials purchasing, construction, 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 installation of roads, concrete foundations, towers, turbines and blades, electrical infrastructure, as well as the coordination of materials receiving, inventory, and distribution. Several activities must be completed prior to the proposed commercial production date. The majority of the activities relate to equipment ordering lead-time, as well as design and construction of the facility. Below is a preliminary schedule of activities necessary to develop the Project. Civil works and improvements required for the preparation of roads and infrastructure for the Project include the following:

- Order necessary components including towers, nacelles, blades, foundations, transformers, etc.;
- Finalize turbine micro-siting;
- Complete survey to establish locations of structures and roadways,
- Document and potentially improve existing road sections of access routes to the project area;
- Complete soil borings, testing, and analysis for proper foundation design and materials;
- Clear & grub for access roads, laydown yards and O&M facilities;
- Obtain necessary over-weight and over-size permits issued by MnDOT for turbine delivery;
- Construct culverts and drainage features to maintain drainage patterns;
- Complete construction of access roads, to be used for construction and maintenance;
- Construct aboveground or underground feeder lines;
- Design and construct the metering station adjacent to the interconnection substation;
- Design and construct the step-up substation;
- Install site fencing and security measures;
- Install tower foundations;
- Install underground collection lines for connecting turbine strings for delivery to collection and metering locations;
- Place towers and set wind turbines;
- Complete facility acceptance testing; and
- Commence commercial production.

The permanently impacted area is considered to be only the land that will be disturbed by the exposed portions of the turbine foundations, permanent access roads, and the substation footprint. Less than 1% of the total project site is anticipated to be permanently impacted utilizing the more intensive Vestas V100 layout. Impacts associated with the Vestas V126 layout are expected to be less. The collector system will be underground and is not considered in the permanent impact calculation.

10.1 Roads and Infrastructure

Area roadways will be accessed by a variety of small to large construction vehicles during project construction. Once the project is constructed, only small-to-medium sized vehicles will access local roadways to perform routine maintenance on turbines and associated facilities. Heavy equipment will occasionally return to the site if large turbine components need to be repaired or exchanged. The Applicant estimates that the maximum construction workforce project will create approximately 250 to 275 additional trips per day on local roadways during peak construction when turbine components are delivered and foundations are being poured. It is anticipated that total trips per day will decrease substantially following turbine installation.

Because of the size of the equipment to be installed, and the turning radii of the delivery trucks, some local roadways may require upgrades to improve drivability and access. This 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. The degree to which existing roadways will require upgrading for the project remains under evaluation by Red Pine Wind Project, LLC. Pavement reinforcement will be dependent on the time of year, but will be returned to pre-construction condition at the conclusion of the Project. All proposed upgrades will be coordinated through agreements in advance with counties and township authorities.

10.2 Access Roads

As discussed in section 6.3.3, permanent service roads will be built adjacent to the towers, allowing access both during and after construction. Each wind turbine will have a 16 foot wide gravel access road that will provide year-round access. These access roads will be designed to meet or exceed minimum dimension requirements for expected vehicles and will be constructed of class-five gravel and geotextile fabric underlay. Red Pine Wind Project, LLC will coordinate with land owners throughout the micro-siting process to minimize disturbances due to access road construction. Access roads will be temporarily widened to a maximum of 40-56 feet to allow for crane movement and delivery of equipment. Temporary crane pads will be constructed on the access roads to allow for wind turbine component lay down. Culverts will be placed where needed to facilitate existing drainage patterns. Farm equipment will continue to have maneuverability along and over all access roads. Any temporary access roads used solely for construction will be re-graded, filled and dressed as needed at the completion of all construction activities. All local or state requirements will be followed where access roads join state or local roadways including permits to work within right-of-way.

10.3 Associated Facilities

10.3.1 Operation and Maintenance Facility

An O&M building may be constructed on the site for access and storage for project maintenance and operations. The buildings for O&M are typically less than 5,000 square feet and will have an adjacent parking lot of approximately 3,000 square feet. Red Pine anticipates that a new well will provide water service for the O&M building, and that on-site septic system will provide for sanitary needs.

10.3.2 Step-Up Substation

The project step up substation will consist of a switch gear, metering, transformers, electrical control and communications systems, and other high voltage equipment needed to convert the electricity generated by the project from 34.5kV to 345kV. Final specification of the substation will be determined by the agreements the Project has with

MISO, as well as the transmission owner. The project substation will be approximately 11 acres in size including the graded area which may be larger than the area actually fenced.

10.3.3 Laydown and Staging Areas

A secure laydown yard and staging area will be prepared where wind turbine components are temporarily stored, assembled, or processed, as part of the wind turbine assembly operation. The parcel will be approximately 10 acres in size, and may also house temporary construction offices and facilities. The laydown yard will be relatively flat, near the site access point, and central to the proposed turbine sites. Both areas will be gravel pads and will have geotextile fabric placed in between the gravel and the soil on the site to increase the ease of site restoration.

10.3.4 Meteorological Towers

Red Pine also proposes to install one or more permanent meteorological towers to maintain the performance of the wind project, conform to grid integration requirements and validate wind turbine power curves.

10.4 Turbine Site Selection

Turbines sites were selected based on a number of factors including wind resource, topography, access, avoidance of wetlands and water features, subsurface geology, and other natural resource risk factors.

Construction of the turbines will include temporary impacts of gravel roadway on either side of the permanent roadway, and a gravel crane pad extending from the roadway to the turbine foundation. In addition to the disturbances associated with temporary travel roads for cranes, it is possible that temporary impacts could occur when cranes move cross-country between strings of turbines.

Each turbine is equipped with a lightning protection system. The turbine is grounded and shielded to protect against lightning. The grounding system will be installed during foundation work and must be accommodated to local soil conditions. The resistance to neutral earth must be in accordance with local utility or code requirements. Lightning conductors are placed in each rotor blade and in the tower. The electrical components are also protected.

10.4.1 Foundation Design

The freestanding tubular wind turbine towers will likely be erected on reinforced concrete spread footing foundations. The bearing surface of the foundation will likely be at a

depth of up to 12 feet, while the octagonal footprint of each foundation will be approximately 3,200 square feet. The tubular steel tower will be connected to the concrete foundation through a base plate and high strength anchor bolts embedded in the concrete foundation. The concrete turbine foundations will require approximately 600 cubic yards of excavation depending on soil requirements and turbine size. The turbine pad diameter will be approximately 150 feet around each wind turbine. Geotechnical data, turbine loads, and costs considerations will dictate the final design of the foundation at each site.

10.4.2 Tower

The towers are conical tubular steel with a hub height of 80 to 87 meters (262 to 285 feet). The turbine towers, where the nacelle is mounted, consist of three sections manufactured from certified steel plates. Welds are made in automatically controlled power welding machines and are ultrasonically inspected during manufacturing per American National Standards Institute (ANSI) specifications. All surfaces are sandblasted and multi-layer coated for protection against corrosion. Access to the turbine is through a lockable steel door at the base of the tower. Access to the nacelle is provided by a ladder connecting four internal platforms and equipped with a fall arresting safety system.

10.5 Post-Construction Cleanup and Site Restoration

During construction, additional areas will be temporarily impacted. Activities causing temporary impacts are associated with the widening of access roads for equipment transport, installation of turbine foundations, installation of underground electrical collector and communication cables, and for staging and support purposes. At the completion of construction activities temporary access roads, crane pads, laydown yard and O&M areas will be graded back to natural contours with soil loosened and seeded as needed with native seed mixes. New gravel roads that are to be kept for ongoing operation and maintenance access will be corrected of any deterioration due to the construction process. Erosion control practices will be kept in operating condition until seeded areas are stabilized. The applicant anticipates that cleanup and restoration will take no longer than 30 days. Red Pine is committed to cleaning up construction debris and restoring temporarily impacted areas to the extent practicable, and to the satisfaction of landowners, following turbine installation.

10.6 Operation and Maintenance of Project

Red Pine Wind Project, LLC will oversee all operations, maintenance, service, and management of the facilities either through service agreements with qualified O&M service providers or through EDF Service Corporation.

The Project will have full time staff of technicians, supervisor, and others as necessary. The staff will be required to complete scheduled maintenance, non-scheduled repairs, daily checks, and resets. When site staff is not present, on call technicians will be available to perform repairs in a timely manner.

On-site service and maintenance activities include routine inspections, regular preventive maintenance on all turbines and related facilities, unscheduled maintenance and repair, and routine minor maintenance on the wind turbines, electrical power systems, and communications systems. Red Pine staff will assess the condition of oil levels and filters, see to the tightening of bolts, repair minor electrical issues, upgrade computer software as needed, and periodically test the SCADA and other monitoring systems.

Wind turbine and transmission facility maintenance schedules and required outage duration are based on equipment manufacturer's recommendations and Red Pine Wind Project, LLC's experience operating this type of facility. Wind turbine scheduled maintenance includes a first service inspection, which is performed one to three months after the turbines have been engaged. Following the first service inspection, turbines will be serviced bi-annually. Turbine maintenance will be performed during periods of low wind so as to not sacrifice energy production. Scheduled maintenance will be phased so that not more than two turbines will be offline at any time. During turbine commissioning and initial commercial operation, turbines will be inspected on-site daily to see that they are operating properly. Following the "break-in" period during the initial commercial operation date, the turbines will be remotely monitored on a continuing basis with planned service and maintenance at routine intervals recommended by the turbine manufacturer.

O&M staff will address both scheduled and unscheduled major maintenance on the wind project, including repairs, replacement of parts and removal of failed parts. The O&M technicians will be equipped with the necessary tools and instruments for routine service, repairs, and Project/site operational control. Turbine maintenance will be performed as an on-going function during the life of the Project. Transformer and other substation maintenance will be accomplished on an annual basis and will be scheduled and performed during low or no wind periods. Components of the interconnection owned by the transmission owner will be maintained by the transmission owner under the interconnection agreement.

Civil maintenance will include maintaining Project structures, as well as access roads, drainage systems, and other facilities. Maintenance will be required for site facilities and transmission facilities. Site facilities (roads, drainage, fences, etc.) will be maintained as needed and scheduling will be adjusted based on local use and environmental conditions.

Other maintenance activities include cooperation with the local governmental agencies dealing with environmental concerns, including the management of lubricants, solvents, and other hazardous materials, and the implementation of appropriate security methods. Project access roads will also be maintained to facilitate site access including snow removal and re-grading as necessary.

Site Control and Data Acquisition (SCADA) System

The Project will include a computer-controlled communications system that permits automatic, independent operation and remote supervision of each turbine and the facility collectively, thus allowing the simultaneous control of the wind turbines. Each wind turbine will be programmed to operate autonomously, and will make its own control "decisions" under normal conditions. The turbines will continuously communicate with a Supervisory Control and Data Acquisition (SCADA) system that monitors operation and energy production. Error messages from the SCADA system are sent to the Operations Control Center (OCC). OCC staff will then evaluate the nature of the error message and make a determination of the correct procedure. Site technicians will be alerted if necessary.

The SCADA system collects data on wind turbine generation, availability, alarms and communication error information, and meteorological and communications data. Performance data and parameters for each machine can also be viewed in real time, and machine status can be changed. The SCADA system also reports and archives generation data. Design of the SCADA system is not yet finalized.

10.7 Costs

The total Project installed capital cost is currently estimated to be between **[TRADE SECRET -** [redacted] **- TRADE SECRET]** including wind turbines, associated electrical and communications systems, and site facilities. The final installed capital cost of the Project is dependent on site conditions including ease of access, geologic and hydrologic conditions, and turbine layout. The bulk of Project costs are attributed to the wind turbine equipment.

10.8 Schedule

Red Pine has secured offtake and is scheduled to be operational by December 31, 2017. Construction will begin on the project in May, 2017. Development activities such as micrositing, wetland and cultural onsite studies, project design, and civil engineering are taking place to ensure the Project can meet the 2017 timeline. Red Pine expects the Site Permit to be issued within approximately six months of this Application's acceptance.

Land acquisition is complete; however, Red Pine Wind Project, LLC will continue land acquisition to re-sign any expiring leases between now and the start of construction.

Red Pine will be responsible for undertaking all required environmental review and will obtain all project specific permits and licenses that are required following issuance of the LWECS Site Permit.

Equipment deliveries and site mobilization will be initiated upon the issuance of the Site Permit and will continue through construction. The construction of the roads, turbine foundations, and electrical collection system would take approximately five months to complete. The turbine erection schedule will overlap the civil and electrical installations and take approximately two months to complete. The entire construction and commissioning of the project should take 7 – 8 months.

10.9 Energy Projections

Red Pine Wind Project, LLC has performed energy projections based on data gathered from met towers located on site as well as long term correlations to other available data. It is estimated that the Project will have an annual average production of **[TRADE SECRET - [redacted] - TRADE SECRET]** MWh (Megawatt hours) depending on turbine model and type used. The estimate net capacity factor is **[TRADE SECRET - [redacted] - TRADE SECRET]**. Energy estimates can be further analyzed after the final design and layout of the wind project has been completed.

10.10 Decommissioning and Restoration

10.10.1 Anticipated Life of the Project

Red Pine Wind Farm LLC estimates the service life of the Project to be approximately 30 years. This estimate is based on EDF-RE's extensive experience in the ownership and operation of this type of facility.

10.10.2 Estimated Decommissioning Costs in Current Dollars

The exact dollar amount necessary to cover decommissioning costs has not been determined at this stage in the project; however, adequate funds will be set-aside with oversight of an independent administrator of such funds on behalf of the Project.

10.10.3 Method for Ensuring that Funds are Available for Decommissioning

Adequate funds will be set aside to fund decommissioning and site restoration after Project operations cease, to the extent that the salvage value does not cover decommissioning costs. However, the salvage value of the turbines and other components should ensure that sufficient funds will be available to pay for decommissioning and restoration costs.

10.10.4 Method for Updating that Funds are Available and Updating Decommissioning Costs

The project owner and operator will administer this project with governance and good practice as it does its other generating assets and facilities. Over the life of the project, the Applicant will budget and maintain funds to cover decommissioning costs. Red Pine has a contractual obligation with landowners for remediation of the properties back to a condition comparable to that of the property prior to the installation of the wind project.

The independent administrator will report annually to the Project on the status of decommissioning funds. The Project will report every eight years to the independent administrator with an updated budget for the cost of decommissioning the plant in current-year and decommissioning-year dollars.

10.10.5 Anticipated Methods of Site Decommissioning and Restoration

Following termination of the landowner agreement, Red Pine will remove all of the remaining improvements on the Property and reasonably restore the Property to its approximate original condition prior to the installation of the improvements, all at Red Pine's sole cost and expense. Easement agreements include a license to enter the Property to perform such removal and restoration. There are provisions within the landowner agreement that enable the agreements to be transferred and reassigned, and requirements which identify the obligations and assignment of assets in the event of bankruptcy or default.

Such removal and restoration obligations shall be completed within twelve (12) months, and in general accordance with the requirements of Minnesota Rules 7854.0500, subp. 13, and applicable county requirements. Decommissioning will involve removal of all above-ground wind facilities including wind turbine nacelles, blades, towers, foundations, cables, roads, and other ancillary facilities. Foundations will be removed to a depth of 36 inches below grade. All access roads will be removed unless the affected landowner provides written notice that the road or portions of the road can remain. Additionally, disturbed surfaces shall be graded, reseeded, and restored as nearly as possible to their preconstruction condition.

Red Pine requests the right to re-evaluate decommissioning alternatives at the end of the LWECS Site Permit term and to update decommissioning costs. Red Pine requests the right to re-apply for a LWECS Site Permit and continue operation of the Project upon expiration of the original LWECS Site Permit. Red Pine may also decide to retrofit, repower or replace the turbines and power system with upgrades based on new or available technology to continue to operate the Project.

11.0 IDENTIFICATION OF OTHER POTENTIAL PERMITS

The federal, state and local permits or approvals that have been identified as potentially being required for the construction and operation of the Project are provided in Table 21. Permits dependent on the final site layout will be applied for after receiving PUC approval, but prior to construction.

Table 11.0: Potential Permits and Approvals Required for Construction and Operation of the Proposed Facility

Agency		Name and Type of Permit/Approval
Federal	Federal Aviation Administration	Form 7460-1 Notice of Proposed Construction or Alteration (Determination of No Hazard)
		Notice of Actual Construction or Alteration (Form 7460-2)
	U.S. Army Corps of Engineers	Federal Clean Water Act Section 404 and Section 10 Permits; Wetland Delineation Approvals; Jurisdictional Determination.
	U.S. Fish and Wildlife Service	Review for Threatened and Endangered Species
	Environmental Protection Agency ("EPA")/("MPCA")	Spill Prevention Control and Countermeasure ("SPCC") Plan
	Lead Federal Agency	Federal Section 106 Review
	National Historic Preservation Act	Cultural Field Survey
	U.S. Department of Agriculture	Form AD-1006
		Conservation / Grassland / Wetland Easement and Reserve Program releases and consents
		FSA Mortgage Subordination & Associated Environmental Review
State of Minnesota	Minnesota Public Utilities Commission	Large Wind Energy Conversion System (LWECS) Site Permit
		Certificate of Need Exemption for LWECS
	Minnesota State Historic Preservation Office	Cultural and Historical resources review; State and National Register of Historic Sites review
	Minnesota Department of Natural Resources	General Permit for Water Appropriations, dewatering
		Native Prairie Protection Plan Review
		Public Waters Work Permit
		License to Cross Public Lands and Waters
	Minnesota Pollution Control Agency	Aboveground Storage Tank ("AST") Notification Form
		NPDES Permit for Construction Activities and Storm Water Pollution Prevention Plan (SWPPP)
		License for Very Small-Quantity Generator of Hazardous Waste

Table 11.0: Potential Permits and Approvals Required for Construction and Operation of the Proposed Facility

Agency		Name and Type of Permit/Approval
		Section 401 Water Quality Certification
	Minnesota Department of Health	Environmental Bore Hole ("EBH")
		Plumbing Plan Review
		Water Well Permit
	Minnesota Department of Transportation	Utility Access Permit
		Highway Access Permit
		Aviation clearance from Office of Aeronautics
		Oversize and Overweight Permit
	Lincoln County	Land Use Permit
		Conditional Use Permit, if needed
		Roadway Access Permit
		Drainage Permit
		Working in the Right-of Way Permit
		Overweight/Over-Dimension Permit
		Utility Permit
	Lincoln County Soil and Water Conservation District	Wetland Conservation Act Approval
	Townships	Right-of-way permits, crossing permits, road access permits, and driveway permits for access roads and electrical collect system, as needed.

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CERTIFICATE OF SERVICE

I, Cheryl Long, hereby certify that I have this day, served a true and correct copy of the following documents to all persons at the addresses indicated below or on the attached list by electronic filing, electronic mail, courier, interoffice mail or by depositing the same enveloped with postage paid in the United States Mail at Minneapolis, Minnesota.

RED PINE WIND PROJECT, LLC'S
AMENDED SITE PERMIT APPLICATION - PUBLIC AND NON-PUBLIC TRADE SECRET VERSIONS

In the Matter of the Application of Red Pine Wind Project, LLC for a Large Wind Energy Conversion System Site Permit for the 200 MW Red Pine Wind Project in Lincoln County, Minnesota
PUC Docket No. IP-6646/WS-16-618

Dated this 30th day of September, 2016

/s/ Cheryl Long
Cheryl Long

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