Fredrikson
& BYRON, P.A.

November 15, 2017

VIA ELECTRONIC FILING

Mr. Daniel P. Wolf
Executive Secretary
Minnesota Public Utilities Commission
121 Seventh Place East, Suite 350
Saint Paul, MN 55101-2147

Re: In the Matter of the Application of Blazing Star 2 Wind Farm, LLC for a Site Permit for the up to 200 MW Blazing Star 2 Wind Farm in Lincoln County, Minnesota
MPUC Docket No. IP-6985/WS-17-700

Dear Mr. Wolf:

Please find enclosed the Site Permit Application, Figures and Appendices for the up to 200 MW Blazing Star 2 Wind Farm in Lincoln County, Minnesota. The Application is being submitted on behalf of Blazing Star 2 Wind Farm, LLC ("Blazing Star 2") and has been efiled through www.edockets.state.mn.us.

In accordance with Minnesota Rules, parts 7829.0500 and 7854.0400, subp. 4, and Minnesota Statutes, Chapter 13 ("Government Data Practices Act"), Blazing Star 2 has designated as trade secret certain commercially sensitive information, i.e., certain wind turbine sound power levels, which are considered confidential and proprietary information, included with the NONPUBLIC Appendices to Appendix A of the Site Permit Application. Release of this data would have a detrimental effect on Blazing Star 2 and its potential turbine suppliers by providing potential competitors and others with valuable information not otherwise readily ascertainable and from which these persons would obtain economic value. Given the need to include trade secret information, Blazing Star 2 has prepared and is e-filing both NON-PUBLIC AND TRADE SECRET and public versions of Appendices to Appendix A of the Site Permit Application.

A copy of this filing is also being served upon the persons on the Official Service List of record. Hard copies will be delivered next week. Please let me know if you have any questions regarding this filing.

Sincerely,

/s/ *Haley Waller Pitts*

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62731370.1

AFFIDAVIT OF SERVICE

In the Matter of the Application of Blazing Star 2 Wind Farm, LLC for a Site Permit for the up to 200 MW Blazing Star 2 Wind Farm in Lincoln County, Minnesota

MPUC Docket No. IP-6985/WS-17-700

STATE OF MINNESOTA)
) SS.
COUNTY OF HENNEPIN)

Nicole Garvey, of the City of Minneapolis, the County of Hennepin, State of Minnesota, being duly sworn on oath, deposes and states that on the 15th day of November, 2017, she e-filed with the Minnesota Public Utilities Commission the following:

1. Site Permit Application;
2. Figures 1 – 19;
3. Appendix A (Public and Nonpublic);
4. Appendices B - G; and
5. Affidavit of Service.

A copy has also been served in accordance with the attached service list of record.

Nicole Garvey

Subscribed and sworn to before me
this 15th day of November, 2017

Notary Public

DEBORAH L. SYNOWCZYNSKI
NOTARY PUBLIC - MINNESOTA
My Commission Expires
January 31, 2020

62755781.1

MPUC Docket No. IP-6985/WS-17-700
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62755883.1

Public Utilities Commission

Site Permit Application for a Large

Wind Energy Conversion System

Blazing Star Wind Farm 2

Lincoln County, Minnesota

November 15, 2017

BLAZING STAR WIND FARM 2, LLC

7650 Edinborough Way

Suite 725

Edina, MN 55435

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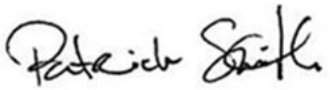
Signature:	
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ACRONYMS

Acronym	Definition
AADT	Annual Average Daily Traffic
ABPP	Avian and Bat Protection Plan
AMA	Aquatic Management Area
ACOE	Army Corps of Engineers
BGEPA	Bald and Golden Eagle Protection Act
BMP	Best Management Practices
BWSR	Board of Water and Soil Resources
Cadna-A	Computer Aided Design for Noise Abatement
Commission	Minnesota Public Utilities Commission
CN	Certificate of Need
CRP	Conservation Reserve Program
CWA	Clean Water Act
dB	Decibels
dB(A)	A-weighted scale
DOC	Department of Commerce
DoD	Department of Defense
EMF	Electromagnetic Field
ECPG	Eagle Conservation Plan Guidelines
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FCC	Federal Communications Commission
FEMA	Federal Emergency Management Agency

Acronym	Definition
IBA	Important Bird Area
ITC	Interstate Telecommunications Cooperative
kV	Kilovolt
LGU	Local Government Unit
LiDAR	Light Detection and Ranging
LWECS	Large Wind Energy Conversion System
m/s	Meters per second
MBTA	Migratory Bird Treaty Act
Merjent	Merjent, Inc.
MISO	Midcontinent Independent System Operator
MN DNR	Minnesota Department of Natural Resources
MN DOT	Minnesota Department of Transportation
MPCA	Minnesota Pollution Control Agency
MVP	Multi-Value Project
MW	Megawatt
NAC	Noise Area Classification
NHIS	Natural Heritage Information System
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resource Conservation Service
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
NWR	National Wildlife Refuge

Acronym	Definition
O&M	Operations and Maintenance
OSA	Office of the State Archaeologist
PEM	Palustrine emergent
PFO	Palustrine forested
Phase I ESA	Phase I Environmental Site Assessment
Project	Blazing Star Wind Farm 2
PSS	Palustrine scrub-shrub
PUB	Palustrine unconsolidated bottom
PWI	Public Waters Inventory
RD	Rotor Diameter
RIM	Reinvest in Minnesota
RP	Route Permit
SCADA	Supervisory Control and Data Acquisition
SCS	Site Characterization Study
SHPO	State Historic Preservation Office
SNA	Scientific and Natural Area
SOBS	Sites of Biodiversity Significance
SoDAR	Sonic detection and ranging
SPCC	Spill Prevention Control and Countermeasure Plan
SWECS	Small Wind Energy Conversion Systems
SWPPP	Stormwater Pollution Prevention Plan
TI	Turbulence Intensity
U.S.C.	United States Code

Acronym	Definition
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
USFWS	U.S. Fish and Wildlife Service
WCA	Wetland Conservation Act
WEG	Wind Energy Guidelines
WIA	Walk-In Access
WMA	Wildlife Management Area
WPA	Waterfowl Production Area

1.0 Applicant Information

Blazing Star Wind Farm 2, LLC ("Blazing Star 2" or "Applicant"), a wholly-owned subsidiary of Geronimo Energy, LLC ("Geronimo"), respectfully submits this application (the "Application") to the Minnesota Public Utilities Commission ("Commission") for a site permit to construct and operate the up to 200 megawatt ("MW") Blazing Star 2 Wind Farm (the "Project"). The Project is a large wind energy conversion system ("LWECS"), as defined in the Wind Siting Act, Minn. Stat. Chapter 216F. The Project is located in southwestern Minnesota's Lincoln County and its footprint spans approximately 57,800 acres in portions of Diamond Lake, Drammen, Ash Lake, Shaokatan, Royal, Hendricks, and Marble Townships.

Blazing Star 2 is developing the Project and would be the permittee. The Project is part of Xcel Energy's 1,550 MW wind generation portfolio that was approved by the Commission in September 2017.[1] The Project is one of the four projects that Xcel Energy intends to build, own, and operate.[2] Onsite physical construction of the Project is scheduled to begin as early as 2nd Quarter 2018. Blazing Star 2 proposes to connect to Brookings-Hampton 345 kilovolt ("kV") transmission line, part of the Midcontinent Independent System Operator ("MISO") Multi-Value Project ("MVP") Transmission line portfolio, that runs through the Project Area, defined below. Blazing Star 2 will need to build approximately 7 miles of 115 kV transmission line, a new autotransformer next to the Blazing Star collector substation and a short (1000') 345 kV transmission line to connect to the Brookings-Hampton 345 kV transmission line. Because the proposed 115 kV transmission line is approximately 7 miles in length, a Route Permit ("RP") from the Commission will be required, pursuant to Minn. Stat. Ch. 216E and Minn. R. Ch. 7850. Blazing Star 2's RP application will be submitted concurrently with/shortly after the submission of this Application.

Geronimo is a leading full-service North American renewable energy company based in Minneapolis, Minnesota, with satellite offices located in southwest Minnesota, North Dakota, South Dakota, Illinois, Colorado, New York and Michigan. Geronimo provides renewable energy development solutions for utilities and corporations looking to harness renewable energy for business growth. Geronimo has developed several operating wind farms and solar projects throughout the United States. Over 1,600 MW of wind projects and solar projects developed by Geronimo are either operational or currently under construction. Geronimo has a multi-gigawatt development pipeline of wind and solar projects in various stages of development throughout the United States.

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[1] *See* Order Approving Petition, Granting Variance, and Requiring Compliance Filing, *In the Matter of the Petition of Xcel Energy for Approval of the Acquisition of Wind Generation from the Company's 2016-2030 Integrated Resource Plan*, MPUC Docket No. E002/M-16-777 (Sept. 1, 2017), at p. 2.

[2] *See* Order Approving Petition, Granting Variance, and Requiring Compliance Filing, *In the Matter of the Petition of Xcel Energy for Approval of the Acquisition of Wind Generation from the Company's 2016-2030 Integrated Resource Plan*, MPUC Docket No. E002/M-16-777 (Sept. 1, 2017), at p. 2.

Geronimo's two operating renewable energy developments closest to the Project are the Prairie Rose Wind Farm and Odell Wind Farm.[3] Prairie Rose, a 200 MW wind farm constructed in Rock County, results in approximately $1.1 million in landowner payments, $40,000 in a community fund, and approximately $850,000 in tax revenue per year. Similarly, Odell is a 200 MW project constructed in Cottonwood, Jackson, Martin, and Watonwan counties results in approximately $1.1 million in landowner payments, $40,000 in a community fund, and approximately $850,000 in tax revenue per year. Geronimo and its subsidiaries partner with community members to meet common goals while constructing new renewable energy generation sources that benefit the state and the region. Geronimo has also been actively developing the Blazing Star Wind Farm, which is located adjacent to the Blazing Star 2 Project to the north and west and has received a certificate of need ("CN") and site permit from the Commission.

Geronimo is committed to developing renewable energy projects that meet the Minnesota state policies of locating energy facilities in an orderly manner compatible with environmental preservation and the efficient use of resources.

2.0 Certificate of Need

A certificate of need is required for all "large energy facilities," as defined in Minn. Stat. § 216B.2421, subd. 2(1) unless the facility falls within a statutory exemption from the CN requirements. Because the Project is a generating plant larger than 50 MW, it meets the definition of a large energy facility. However, it will not require a CN because the Commission has determined that the Project is exempt from the requirement to obtain a CN under Minn. Stat. § 216B.2422, subd. 5.[4]

3.0 State Policy

After analyzing a broader area for wind resource, geographic characteristics, easement availability, landowner interest, environmental resources, transmission availability, and economic potential, Blazing Star 2 selected the area within the Project boundary identified in Figure 1 of this Application (the "Project Area"). The Project Area was selected based on its excellent wind resources, its close proximity to existing transmission infrastructure and substations, the landowner's interest in participating in the Project and the low environmental impacts resulting from siting the Project in the Project Area compared with other potentially developable projects in the region. Blazing Star 2 also conducted due diligence on environmental factors, which indicated no environmental fatal flaws were present. The siting of an LWECS is

[3] Geronimo no longer owns these developments. Per Minn. R. 7854.0500, subp. 1(E), neither Applicant nor Geronimo has an ownership or financial interest in any LWECS in Minnesota.

[4] Order Approving Petition, Granting Variance, and Requiring Compliance Filing, *In the Matter of the Petition of Xcel Energy for Approval of the Acquisition of Wind Generation from the Company's 2016-2030 Integrated Resource Plan*, MPUC Docket No. E002/M-16-777 (Sept. 1, 2017).

to be made in an orderly manner compatible with environmental preservation, sustainable development, and the efficient use of resources (Minn. Stat. § 216F.03). Blazing Star 2 is designing the Project to comply with the Commission's wind turbine setback and siting guidelines. Table 3.1 provides a completeness checklist for the Application, identifying the Minnesota Administrative Rules for a Large Wind Energy System and where each of those rules is addressed in the Application.

Table 3.1: Completeness Checklist

Authority	Required Information	Location
Minn. R. Ch. 7854		
Minn. R. 7854.0500	**SITE PERMIT APPLICATION CONTENTS**	
Minn. R. 7854.0500, subp. 1	**Applicant**. An applicant for a site permit must provide the following background information regarding the applicant:	
A.	A letter of transmittal signed by an authorized representative or agent of the applicant;	*See* Application Filing Letter and Cover Page
B.	The complete name, address, and telephone number of the applicant and any authorized representative;	*See* Application Filing Letter and Cover Page
C.	The signature of the preparer of the application if prepared by an agent or consultant of the applicant;	*See* Application Filing Letter and Cover Page
D.	The role of the permit applicant in the construction and operation of the LWECS;	Section 1.0
E.	The identity of any other LWECS located in Minnesota in which the applicant, or a principal of the applicant, has an ownership or other financial interest;	Section 1.0
F.	The operator of the LWECS if different from the applicant; and	Section 1.0
G.	The name of the person or persons to be the permittees if a site permit is issued.	Section 1.0
Minn. R. 7854.0500, subp. 2	**Certificate of need or other commitment**.	
A.	The applicant shall state in the application whether a certificate of need for the system is required from the commission and, if so, the anticipated schedule for obtaining the certificate of need. The commission shall not issue a site permit for an LWECS for which a certificate of need is required until the applicant obtains the certificate, although the commission may process the application while the certificate of need request is pending before the commission.	Section 2.0
B.	The commission may determine if a certificate	N/A

Table 3.1: Completeness Checklist

Authority	Required Information	Location
	of need is required for a particular LWECS for which the commission has received a site permit application.	
C.	If a certificate of need is not required from the commission, the applicant shall include with the application a discussion of what the applicant intends to do with the power that is generated. If the applicant has a power purchase agreement or some other enforceable mechanism for sale of the power to be generated by the LWECS, the applicant shall, upon the request of the commission, provide the commission with a copy of the document.	Section 2.0
Minn. R. 7854.0500, subp. 3	**State policy**. The applicant shall describe in the application how the proposed LWECS project furthers state policy to site such projects in an orderly manner compatible with environmental preservation, sustainable development, and the efficient use of resources.	Section 3.0
Minn. R. 7854.0500, subp. 4	**Proposed site**. The applicant shall include the following information about the site proposed for the LWECS and any associated facilities:	
A.	The boundaries of the site proposed for the LWECS, which must be delineated on a United States Geological Survey Map or other map as appropriate;	Section 4.0 and Figure 1
B.	The following characteristics of the wind at the proposed site: (1) interannual variation; (2) seasonal variation; (3) diurnal conditions; (4) atmospheric stability, to the extent available; (5) turbulence, to the extent available; (6) extreme conditions; (7) speed frequency distribution; (8) variation with height; (9) spatial variations; and (10) wind rose, in eight or more directions;	Section 9.1
C.	Other meteorological conditions at the proposed site, including the temperature, rainfall, snowfall, and extreme weather conditions; and	Section 9.1.11
D.	The location of other wind turbines in the general area of the proposed LWECS.	Section 9.2

Table 3.1: Completeness Checklist

Authority	Required Information	Location
Minn. R. 7854.0500, subp. 5	**Wind rights**. The applicant shall include in the application information describing the applicant's wind rights within the boundaries of the proposed site.	Section 7.0
Minn. R. 7854.0500, subp. 6	**Design of project**. The applicant shall provide the following information regarding the design of the proposed project:	
A.	A project layout, including a map showing a proposed array spacing of the turbines;	Section 5.1 and Figures 1, 3a-3d, 4a-4d
B.	A description of the turbines and towers and other equipment to be used in the project, including the name of the manufacturers of the equipment;	Section 5.2
C.	A description of the LWECS electrical system, including transformers at both low voltage and medium voltage; and	Section 5.3
D.	A description and location of associated facilities.	Section 6.0
Minn. R. 7854.0500, subp. 7	**Environmental impacts**. An applicant for a site permit shall include with the application an analysis of the potential impacts of the project, proposed mitigative measures, and any adverse environmental effects that cannot be avoided, in the following areas:	
A.	Demographics, including people, homes, and businesses;	Sections 8.1 and 8.2
B.	Noise;	Section 8.3
C.	Visual impacts;	Section 8.4
D.	Public services and infrastructure;	Section 8.5
E.	Cultural and archaeological impacts;	Section 8.6
F.	Recreational resources;	Section 8.7
G.	Public health and safety, including air traffic, electromagnetic fields, and security and traffic;	Section 8.8
H.	Hazardous materials;	Section 8.9
I.	Land-based economics, including agriculture, forestry, and mining;	Section 8.10
J.	Tourism and community benefits;	Sections 8.11 and 8.12
K.	Topography;	Section 8.13
L.	Soils;	Section 8.14
M.	Geologic and groundwater resources;	Section 8.15
N.	Surface water and floodplain resources;	Section 8.16

Table 3.1: Completeness Checklist

Authority	Required Information	Location
O.	Wetlands;	Section 8.17
P.	Vegetation;	Section 8.18
Q.	Wildlife; and	Section 8.19
R.	Rare and unique natural resources.	Section 8.20
Minn. R. 7854.0500, subp. 8	**Construction of project**. The applicant shall describe the manner in which the project, including associated facilities, will be constructed.	Sections 10.1, 10.2, 10.3, 10.4, and 10.5
Minn. R. 7854.0500, subp. 9	**Operation of project**. The applicant shall describe how the project will be operated and maintained after construction, including a maintenance schedule.	Section 10.6
Minn. R. 7854.0500, subp. 10	**Costs**. The applicant shall describe the estimated costs of design and construction of the project and the expected operating costs.	Section 10.7
Minn. R. 7854.0500, subp. 11	**Schedule**. The applicant shall include an anticipated schedule for completion of the project, including the time periods for land acquisition, obtaining a site permit, obtaining financing, procuring equipment, and completing construction. The applicant shall identify the expected date of commercial operation.	Section 10.8
Minn. R. 7854.0500, subp. 12	**Energy projections**. The applicant shall identify the energy expected to be generated by the project.	Section 10.9
Minn. R. 7854.0500, subp. 13	**Decommissioning and restoration**. The applicant shall include the following information regarding decommissioning of the project and restoring the site:	
A.	The anticipated life of the project;	Section 10.10.1
B.	The estimated decommissioning costs in dollars;	Section 10.10.2
C.	The method and schedule for updating the costs of decommissioning and restoration;	Section 10.10.2
D.	The method of ensuring that funds will be available for decommissioning and restoration; and	Section 10.10.3
E.	The anticipated manner in which the project will be decommissioned and the site restored.	Section 10.10.4
Minn. R. 7854.0500, subp. 14	**Identification of other permits.** The applicant shall include in the application a list of all known federal, state, and local agencies or authorities, and titles of the permits they issue that are required for the proposed LWECS.	Section 11.0

4.0 Project Description and Overview

The Project is located adjacent to the Blazing Star Wind Farm, as shown in Figures 2a-2d. Blazing Star Wind Farm received a CN and site permit from the Commission in August 2017 and was approved (along with this Project) by the Commission as part of Xcel Energy's acquisition of additional wind generation in September 2017.[5]

According to the National Renewable Energy Laboratory's "Wind Powering America," wind resources within the Project's region range from 8 to 9 meters per second ("m/s") at Blazing Star 2's proposed turbine hub heights (U.S. Department of Energy, Energy Efficiency and Renewable Energy 2012). Blazing Star 2 initiated its internal wind resource and energy assessment using data collected by meteorological towers installed in and around the Project Area in 2015. Long-term data was available from the National Weather Service Automated Surface Observing Systems network Redwood Falls, Sioux Falls, Sisseton and Watertown (South Dakota) stations. This site-specific wind analysis indicates the Project Area has a highly-suitable wind resource for economical, sustainable, and reliable production of power. Blazing Star 2 also proposes to install up to four (4) permanent meteorological towers to monitor the performance of the Project, conform to grid integration requirements, and validate wind turbine power curves.

Blazing Star 2 has modified the footprint of the Project over time to create the most efficient and effective wind energy project possible while minimizing environmental impacts. The Project will be located in Lincoln County, Minnesota. The Project will have up to 200 MW of nameplate wind energy capacity. Blazing Star 2 continues to assess its turbine options. Blazing Star 2 is evaluating wind turbines with rated nameplate power outputs ranging from 2.0 MW to 3.5 MW, which would result in the installation of between 57 and 100 wind turbines. For the purposes of this application Blazing Star 2 has provided an evaluation of turbines that are typical of the environmental impacts that may be associated with turbines in this nameplate range. The Project Area contains approximately 57,800 acres, of which 38,313 are currently leased for the Project. The land secured by Blazing Star 2 is sufficient to construct and operate the Project, including associated wind rights; the Project may also continue to acquire additional land leases. The Project's above ground facilities will occupy less than one percent of the Project Area.

The Project's facilities will include:

- Wind turbines and related equipment;
- New gravel access roads and improvements to existing roads;
- Underground and / or above ground electrical collection and communication lines;

[5] *See* MPUC Docket Nos. IP-6961/CN-16-215 and WS-16-686; *see also* Order Approving Petition, Granting Variance, and Requiring Compliance Filing, *In the Matter of the Petition of Xcel Energy for Approval of the Acquisition of Wind Generation from the Company's 2016-2030 Integrated Resource Plan*, MPUC Docket No. E002/M-16-777 (Sept. 1, 2017).

- Operations and maintenance ("O&M") facility[6];
- Project substation facility and interconnection facilities;
- Up to 4 permanent meteorological towers (height dependent on the final turbine hub height);
- Sonic Detection and Ranging ("SoDAR") or Light Detection and Ranging ("LiDAR") unit;
- Aboveground electrical feeder line;
- A temporary batch plant and staging/laydown area for construction of the Project.

Table 4.1 lists the counties, townships, sections, and ranges that are included in the Project Area. Figure 1 shows the Project's location.

Table 4.1: Project Location

County Name	Township Name	Township	Range	Sections
Lincoln	Diamond Lake	110	45	3-6, 9-10, 16
Lincoln	Drammen	110	46	1-2
Lincoln	Ash Lake	111	45	4-9, 16-22, 27-34
Lincoln	Shaokatan	111	46	1-17, 20-21, 24, 34-36
Lincoln	Royal	112	45	3-10, 16-22, 28-33
Lincoln	Hendricks	112	47	1, 12-14, 23-27, 29-36
Lincoln	Marble	113	45	16, 21-22, 27-28, 31-35

5.0 Project Design

5.1 Description of Layout

Blazing Star 2 is designing the Project to optimize the wind resource and minimize impacts to potentially sensitive infrastructure, ecological resources, and cultural features. As discussed in this section, the interaction among the local topography, the wind resource, applicable setbacks, landowner input and Project design also influences the layout of the Project's facilities. The Project Area contains approximately 57,800 acres, of which 38,313 are currently leased for the Project. Descriptions of the proposed turbine models are provided in Section 5.2. The specific design specifications of each turbine model will influence the final Project micrositing activities.

The wind turbines and associated facilities will be sited primarily on agricultural land. The Project Area is comprised of approximately 65.9% cropland, 11.5% grassland/herbaceous,

[6] Blazing Star 2 will seek a local land use permit for the operations facility.

10.4% hay/pasture, 6.6% open water/wetlands, 5.0% developed, and 0.6% forest/shrub scrub (Homer et al., 2015).

The Project's layout follows 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 (January 11, 2008) ("Commission's General Permit Standards"), applicable local government ordinances and Geronimo's best practices. In instances when setbacks differ for the same feature, the most stringent setback distance is used. Table 5.1 shows turbine setbacks and Figures 3a-3d illustrate the relevant Project setbacks.

Lincoln County has a Windpower Management Ordinance for permitting energy facilities with a rated capacity of less than five (5) MW, which are small wind energy conversion systems ("SWECS") as defined in Minn. Stat. § 216F.01, subd. 3. The Lincoln County ordinance is not discussed in detail in this Application because the Lincoln County ordinance only applies to SWECS and not LWECS, including this Project, which are subject to siting and oversight by the State of Minnesota.

Table 5.1: Wind Turbine Setback Requirements for the Project

Turbine Setback Requirement	Distance for Setback	Authority
Wind Access Buffer – Prevailing Wind Directions	5 x rotor diameter	Commission's General Permit Standards
Wind Access Buffer – Non-Prevailing Wind Directions	3 x rotor diameter	Commission's General Permit Standards
Residences	1,000 feet, or the minimum distance required to meet the state noise standard of 50 dB(A), whichever is greater.*	Blazing Star 2
	500 feet, or the minimum distance required to meet the state noise standard of 50 dB(A), whichever is greater.	Commission's General Permit Standards
Public Roads and Trails	Minimum 250 feet	Commission's General Permit Standards
Noise Requirements	Distance must meet the state noise standard of 50 dB(A)**	Minnesota Pollution Control Agency ("MPCA")

* Commission's General Permit Standards identify the minimum setback from residences as 500 feet, or the minimum distance required to meet the state noise standard of 50 decibels ("dB") using the A-weighted scale ("dB(A)"), whichever is greater. Blazing Star 2 follows the practice of siting turbines at least 1,000 feet from residences, unless other arrangements have been made with specific residents (while still complying with the MPCA's limit of the 50 dB(A) nighttime L50 noise level).

** Noise standards are regulated by the MPCA under Minn. Rules Ch. 7030. These rules establish the maximum night and daytime noise levels that effectively limit wind turbine noise to 50 dB(A). The MPCA standards require A-weighting measurements of noise; background noise must be at least 10 dB lower than the noise source being measured.

As shown in Table 5.1, Blazing Star 2 adheres to siting turbines at least one thousand (1,000) feet from residences. Blazing Star 2 and a participating landowner may, however, formally agree in writing to a setback of less than 1,000 feet in certain situations. In the event that such arrangements are made, those turbines will be setback at least 500 feet plus the distance required to comply with the MPCA limit of 50 decibels ("dB") using the A-weighted scale ("dB(A)") nighttime L_{50} (the level exceeded for 50% of the time) noise level. Noise data for each turbine model described in Section 8.3 demonstrates that Blazing Star 2's setback of 1,000 feet is greater than the distance required to meet the 50 dB(A) noise level setback for the individual turbine models under consideration.

Blazing Star 2 applied a minimum setback of 250 feet from all public roads. All turbines will be located a minimum of five rotor diameters ("RD") from non-leased properties in the prevailing wind direction (generally the northern and southern edge of leased areas) and three RD in the non-prevailing wind direction (generally the eastern and western edge of leased areas) to accommodate disruption of the normal wind flow and protect the wind rights of non-participating landowners. Similarly, internal turbine spacing will be at least five RD in the prevailing wind direction and three RD in the non-prevailing wind direction, with no more than twenty percent (20 %) of the Project's turbines closer than the prescribed internal setbacks. Table 5.2 reflects the differing setbacks based on RD for the types of turbines under consideration for the Project.

Table 5.2: Representative Minimum Turbine Setback Distances by Turbine Model

Turbine Description	5 RD* (m)	3 RD* (m)	Total Height[1] (including blades, m)
Gamesa G126	630	378	147
Acciona 3.0-132	660	396	150
GE 2.5-116	580	348	138/150
Vestas V110	550	330	135/150

**The listed RDs provide the range of rotor sizes; depending on the final turbine selection, the RD may vary from the listed values[1]. Tower heights may vary between 80 and 95 m tall.*

Each of the four turbine layouts include primary and alternate positions. A final layout will be designed to minimize environmental impacts and meet applicable setbacks, while optimizing engineering efficiencies and energy production.

Additional turbine siting considerations and an approximate schedule for determining these factors are included in Table 5.3.

Table 5.3: Turbine Siting Considerations and Approximate Schedule

Issue	Expected Resolution Schedule	Siting Consideration
Exclusion Areas	At issuance of permit	All exclusion areas in the Application are those proposed by Blazing Star 2 and are based on environmental and existing infrastructure constraints. Additional exclusion areas, if any will be determined through the site permit process.
Setbacks	At issuance of permit	All setbacks in the application are proposed by Blazing Star 2 and are based on the Commission's General Permit Standards as well as Blazing Star 2's commitments.
Turbine type	Once turbine purchase negotiations are complete	Siting turbines is based on: A) Manufacturer specs and standards B) Turbine interaction within the Project microclimate, etc.
Final leased land boundary	Once final lease and easement negotiations are complete with landowners	Blazing Star 2 will not site turbines on unleased properties and will observe a wind rights buffer from unleased property lines.
Title Clearance	After site control is complete	Blazing Star 2 will site turbines on leased land that has been properly cleared using any necessary Subordination, Non-Disturbance and Attornment agreements and consent forms from appropriate parties. All signed land is to be insured through a title insurance policy. Blazing Star 2 will not site turbines on non-participating landowner properties.
Energy optimization	After all final leases and setbacks requirements are complete	Wind energy will be optimized by considering the turbine interaction with the site's microclimate and internal spacing between turbines within the Project.
Geotechnical analysis	After all other field surveys and turbine micrositing are complete	Geotechnical soil borings will be conducted at the location of final turbine placement to determine the soil suitability to support turbine foundations.
Wetlands	Jurisdictional wetlands and waters within the construction limits of Project	Permanent impacts to wetlands/waters subject to state and federal jurisdiction will be avoided or minimized as practicable.

Table 5.3: Turbine Siting Considerations and Approximate Schedule

Issue	Expected Resolution Schedule	Siting Consideration
	facilities will be delineated prior to construction. Necessary, state and/or federal permits for unavoidable impacts must be obtained before construction commences in wetlands.	
Cultural	Surveys of all areas with proposed ground disturbance will be surveyed for cultural resources	Cultural resources identified within the proposed construction areas and existing known resources in the area will be avoided as feasible. If avoidance is not practical, additional investigation of the resource may be needed and further discussion with regulating agencies would be necessary prior to any direct impact to the resource occurring.

This Application contains preliminary site layouts that reflect Blazing Star 2's best effort to maximize the energy production of the Project, follow applicable setbacks and minimize impacts to the land and surrounding community. Blazing Star 2 selected the proposed turbine locations to minimize the potential land use and environmental impacts from the Project. Blazing Star 2 has selected the turbines outlined in this Application because they span the suite of potential environmental impacts from this Project. Blazing Star 2 expects that the final layout will remain substantially similar to that presented in this Application, but also recognizes that changes may occur as a result of the ongoing information gathering, permitting processes and micrositing activities.

5.2 Description of Turbines and Towers

5.2.1 Wind Turbine Design and Operation

A wind turbine generally consists of a nacelle, hub, blades, tower, and foundation. The nacelle houses the generator, gear boxes, upper controls, generator cabling, hoist, generator cooling, and other miscellaneous equipment. The hub supports the blades and connecting rotor, yaw motors, mechanical braking system, and a power supply for emergency braking. The hub also contains an emergency power supply to allow the mechanical brakes to work if electric power from the grid is lost. Each turbine has three blades composed of carbon fibers, fiberglass, and internal supports to provide a lightweight but strong component. The tip of each blade is equipped with a lightning receptor.

The tower supports the nacelle, hub, and blades. The tower houses electrical, control, and communication cables and a control system located at the base of the tower. Towers may include lifts for use by Project personnel. Tubular towers are painted a non-glare white, off-white or gray. Electrical equipment at the base of each tower conditions the generated electricity to match electric grid requirements. The expected tower foundation will be a spread foundation design. The above-ground portion of the foundation will be approximately twenty feet in diameter.

The wind turbine blades convert linear energy from wind into rotational energy. An anemometer and weather vane located on the turbine nacelle continuously sense wind speed and wind direction.

The hub and nacelle are constantly being rotated to match wind speed direction. Yaw motors rotate the blades to optimize blade angles in relation to wind speed and direction. The hub transfers mechanical force from the blades to the shaft connecting the hub to the gear box located within the nacelle. The mechanical braking system, located within the hub, locks the blade rotor to prevent the blades from spinning during maintenance periods or other times when the turbine is out of service. The gear box adjusts shaft speeds to match the required generator speed. Electricity is produced by the generator and transmitted through insulated cables to the electrical conditioning unit, known as a pad-mount transformer, located at the base of the tower.

5.2.2 Turbine Model Selection and Types

Blazing Star 2 has not yet finalized the specific turbine choice for the Project. The decision will be finalized prior to construction in order to create the most viable, cost-effective and optimal design for the Project given the known conditions of the Project Area and the turbines that are commercially available when the Project is constructed. The turbines Blazing Star 2 is considering for the Project span the energy production range of 2.0 MW to 3.5 MW. Turbine hub heights would range from 80 to 95 m (262 to 312 ft) and the RD would range from 110 to 132 m (361 to 446 ft). Table 5.4 shows the range of characteristics for the four representative turbines as well as the number of primary and alternate turbine positions for each of the four layouts.

Table 5.4: Wind Turbine Characteristics

Characteristic	Turbine			
	Gamesa G126	Acciona 3.0-132	GE 2.5-116	Vestas V110
Nameplate capacity (kW)	2625	3000	2500	2000
Hub height (m)[1]	84	84	80/94	80/95
Rotor Diameter (m)	126	132	116	110
Total height[2] (m)	147	150	138/150	135/150
Cut-in wind speed[3] (m/s)	3	3	3	3
Rated capacity wind speed[4] (m/s)	10	10	11	11

Table 5.4: Wind Turbine Characteristics

Characteristic	Turbine			
	Gamesa G126	Acciona 3.0-132	GE 2.5-116	Vestas V110
Cut-out wind speed[5](m/s)	25	25	25	20
Maximum sustained wind speed[6] (m/s)	52.5	52.5	52.5	52.5
Wind Swept Area (m^2)	12,469	13,685	10,568	9,503
Rotor speed (rpm)	6.0-11.6	6.6-12.5	8.0-15.7	6-17.0
Primary Turbine Positions	76	67	80	100
Alternate Turbine Positions	35	44	31	11

[1] Hub height = the turbine height from the ground to the top of the nacelle. Tower heights may range from 80 to 95 m.
[2.] Total height = the total turbine height from the ground to the tip of the blade in an upright position.
[3] Cut-in wind speed = wind speed at which turbine begins operation
[4] Rated capacity wind speed = wind speed at which turbine reaches its rated capacity
[5] Cut-out wind speed = wind speed above which turbine shuts down operation
[6] Maximum sustained wind speed = wind speed up to which turbine is designed to withstand

Turbine

Table 5.4 provides details on the hub height, RD, and wind speed operation parameters for the Gamesa G126-2.625 MW wind turbine, the Acciona 3.0-132 wind turbine, the GE 2.5-116 wind turbine, and the Vestas V110-2.0 MW wind turbine. All four models have active yaw and pitch regulation and asynchronous generators. The turbines use a bedplate drive-train design where all nacelle components are joined on common structures to improve durability. All four turbine models are capable of operating with adjusted cut-in speeds and full blade feathering.

All proposed turbine models have Supervisory Control and Data Acquisition ("SCADA") communication technology to control and monitor the Project. The SCADA communications system permits automatic, independent operation and remote supervision, allowing the simultaneous control of the wind turbines.

Operations, maintenance, and service arrangements between the turbine manufacturer and the Applicant will be structured to provide timely and efficient O&M. The computerized data network will provide detailed operating and performance information for each wind turbine. The Applicant will maintain a computer program and database for tracking each wind turbine's operational history.

Other turbine specifications include:

- Rotor blade pitch regulation

- Gearbox with three-step planetary spur gear system
- Double fed three-phase asynchronous generator
- A braking system for each blade and a hydraulic parking brake (disc brake)
- Yaw systems that are electromechanically driven

Some of the turbines being considered also incorporate new technology compared to turbines currently in the landscape, including:

- Force-flow bedplates (nacelle components joined on a common structure to improve durability)
- New gearbox bearing designs (improving reliability by reducing bending and thrust)
- Low noise trailing edges
- SCADA Controlled Generation Modulation

Rotor

The rotor consists of three blades mounted to a rotor hub. The hub is attached to the nacelle, which houses the gearbox, generator, brake, cooling system, and other electrical and mechanical systems. Summary technical characteristics for each turbine model can be found in Table 5.4.

Tower

The towers are conical tubular in shape with a hub height of 80 to 95 meters (262 to 312 ft). The turbine tower, where the nacelle is mounted, consists of three to four sections manufactured from certified steel plates. Welds are made with automatically controlled power welding machines and are ultrasonically inspected during manufacturing per American National Standards Institute 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. Within the tower, access to the nacelle is provided by a ladder connecting four platforms and equipped with a fall arresting safety system.

5.3 Description of Electrical and Fiber Optic Communication System

Construction of the Project will include up to 100 wind turbines, each potentially with a pad-mounted transformer at its base and with underground and/or aboveground electrical collection and fiber optic communication systems. These wires will connect the Project's wind turbines to the substation and provide communications between the wind turbines, substation, O&M facility and electrical grid. If underground, the wires will be placed in the same trench wherever possible and will include a marking system and occasional aboveground junction boxes. All of the

collection circuits will connect to Blazing Star 2's substation, which will have a fiber optic connection to the O&M building and a communication system to the grid operator. The power delivered to the project substation will be converted to 115 kV. There will then be a 115 kV transmission line connecting the project to a new step up 345 kV/115 kV substation adjacent to or part of Blazing Star's similar step up facilities. This transmission line and step up facility will be addressed in a separate route permit application. Once the power is stepped up to 345kV it will then travel via a short 345 kV line into a new, utility owned 345 kV switch yard[7]. All grid to Project communications will be specified by the interconnecting utility(ies) under a Generator Interconnection Agreement.

6.0 Description and Location of Associated Facilities

There are a number of facilities that will be constructed to support the operation of the wind turbines and facilitate the delivery of the electricity to consumers. Blazing Star 2 seeks permitting approval from the Commission through LWECS site permit for the following associated facilities: permanent meteorological towers and other weather data collection systems, an electrical collection and communications system, access roads, temporary laydown and staging areas, the Project substation and associated equipment and an O&M facility. The Project substation will require approximately ten acres of land within the Project Area. The O&M Facility may be located adjacent to the substation also on approximately ten acres or it may be located within the Blazing Star facilities. These facilities have been sited such that the disturbance from installation of the collection system and fiber-optic communications are minimized to the extent feasible. As discussed in Section 5.3 of this application, Blazing Star 2 also proposes to construct a 115 kV transmission line between the Project substation and point of interconnection, which will be permitted under an RP application. A potential location for the Project facilities, including the Project substation, is shown on Figures 4a-4d.

[7] Depending on utility designs this switching facility may simply be an expansion of the switching facilities built for Blazing Star. Those plans will be made by the interconnection transmission owner and not by Blazing Star 2.

6.1 Collector Lines and Feeder Lines

At the base, or within the tower section of each turbine, a step-up transformer will be installed to raise the voltage of the electricity generated by the turbine to the power collection line voltage of 34.5 kV. In some turbine models (e.g. Gamesa G126 and Vestas V110), the step-up transformer is located within the nacelle. If external transformers are used (Acciona 132 and GE116), then small, concrete slab foundations will be constructed, to support the transformers, within the gravel area at the turbine base. The transformer is a rectangular steel box measuring approximately 2.3 by 2.6 m (7.5 by 8.5 ft). Support for the transformer is provided by a concrete pad or foundation approximately 8.0 in thick, which is placed over 0.6 m (2 ft) of concrete fill. The concrete fill will measure 2.3 by 4.1 m (7.5 by 13.5 ft) and will be placed under the transformer pad and between the transformer and the tower pedestal. The exact dimensions of the transformers, concrete pad and concrete fill will be dependent upon transformer manufacturer specifications and site specific engineering requirements.

Power will run through an underground and/or aboveground collection system to the Project substation, which will raise the voltage to 345 kV. It is likely that the Project will utilize underground collection lines. The electrical collection system will consist of a network of underground electrical cabling operating at 34.5 kV. Approximately 94 miles of underground lines will be installed by trenching, plowing, or, where needed, directionally boring the cables underground. Generally, the electrical collection lines will be buried in trenches. Additionally, collector system cabling may go aboveground when conflicts with existing underground utilities, other infrastructure, or sensitive environmental conditions such as native prairie remnants cannot be resolved and aboveground cabling will resolve the conflict. Where electrical collectors meet public road right-of-way, the power collection lines will either rise to become aboveground lines (if requested by the road authority or if shallow bedrock, sensitive environmental conditions, or conflicts with underground utility or other infrastructure are encountered) or will continue as underground lines. The collection lines will occasionally require an aboveground junction box when the lines from separate spools need to be spliced together.

Conceptual electrical layouts based on the proposed turbine layouts are shown on Figures 4a-4d.

6.2 Additional Associated Facilities

An O&M building will be constructed in or near the Project Area and will provide access and storage for Project maintenance and operations. The O&M facility may be co-located with the Project substation or may be located at a site easily accessible to the Project. Construction of the O&M facility will require a building and/or zoning permit from the applicable county and/or township in which the O&M facility will be located. The buildings typically used for this purpose are approximately 3,000 to 5,000 square ft and house the equipment to operate and maintain the Project. The parking lot adjacent to the building is typically approximately 3,000 square feet.

Blazing Star 2 proposes to construct up to four permanent meteorological towers with the potential for a SoDAR and/or a LiDAR unit(s). Met towers may be used for monitoring wildlife activity as well as meteorological data. The expected locations of the four permanent meteorological towers or SoDAR/LiDAR units are shown on Figures 4a-4d.

Blazing Star 2 will also grade a temporary laydown area of approximately ten acres, centrally-located within the Project Area, to serve both as a parking area for construction personnel and staging area for turbine components during construction. A separate staging area of approximately ten acres will serve as a parking and unloading area for large equipment deliveries.

6.3 Access Roads

The Project will include permanent all-weather gravel roads that provide access to the wind turbines. The primary function of the roads is to provide accessibility to the turbines for turbine maintenance crews. The roads will be low-profile to allow farm equipment to cross. Roads will initially be approximately 34 feet wide to accommodate transportation of heavy construction equipment. Once Blazing Star 2 completes construction of the turbines, the roads will be reduced to their permanent width of 16 – 18 feet. Total access road length will be approximately 26 miles with final lengths determined by the civil engineering and final turbine layout.

Blazing Star 2 designed the access road network to serve the Project most efficiently. Blazing Star 2 also takes landowner input on road locations into consideration.

6.4 Permitting for Associated Facilities

The Applicant will be responsible for undertaking all required environmental reviews. Blazing Star 2 will obtain all permits and licenses that are required following issuance of the LWECS Site Permit.

7.0 Wind Rights

Blazing Star 2 worked with landowners to secure sufficient land lease and wind easements/setback easement agreements to build the Project. Land rights secured from each landowner vary, and may include, but are not limited to the rights to construct wind turbines and Project facilities, including access roads, rights to wind and buffer easements, authorization to construct transmission feeder lines in public road right-of-way, and rights to additional land, if any, required to mitigate environmental impacts. Blazing Star 2 currently leases approximately 38,313 acres of the 57,800 acres within the Project Area (66% of the Project Area). Geronimo remains in negotiation with a number of landowners within the Project Area and anticipates acreage being added to the Project's leased lands before construction. Figures 5a-5d provide maps of the turbine layout and the property lines within the Project Area. All Project facilities will be sited on leased land and the current leasehold is sufficient to accommodate the proposed facilities, required buffers, and turbine placement flexibility needed to avoid natural resources, homes, and other sensitive features. Figures 3a-3d depict the Project facilities and underlying parcels required to site the Project following applicable setbacks.

8.0 Environmental Impacts

This section provides a description of the environmental conditions that exist within the Project Area, along with an analysis of the potential impacts of the Project, mitigative measures, and any adverse environmental effects that cannot be avoided. Consistent with Commission procedures on siting LWECS and with applicable portions of the Power Plant Siting Act, various exclusion and avoidance criteria were considered in selecting the Project Area.

8.1 Demographics

The Project Area is located in rural southwestern Minnesota. According to the Lincoln County Comprehensive Land Use Plan (Lincoln County, 2009), the population of the county is evenly divided between rural households and incorporated municipal centers. The County has experienced an approximately 30% decline in population over the past thirty years. The 2010 population of Lincoln County was 5,896 and the estimated 2015 population was 5,771. The Project Area is located in parts of Ash Lake, Diamond Lake, Dramman, Hendricks, Marble, Royal, and Shaokatan townships, where the average household size in the year 2010 was 2.47. The total number of housing units in Lincoln County in 2010 was 3,108. Demographics for the townships within the Project and Lincoln County are summarized in Table 8.1.

Table 8.1: Demographics in the Project Vicinity

	2010 Population	2010 Population Density	2010 Number of Housing Units	2010 Average Household Size
Lincoln County	**5,896**	**11.00**	**3,108**	**2.24**
Ash Lake Township	151	4.19	76	2.22
Diamond Lake Township	207	5.75	122	2.59
Dramman Township	118	3.28	58	2.51
Hendricks Township	201	2.84	127	2.58
Marble Township	161	4.47	80	2.52
Royal Township	189	5.25	115	2.30
Shaokatan Township	178	4.94	111	2.54

Densities within 5 miles of the Project Area boundary range from 2.5 people per square mile in Hansonville Township in Lincoln County to the north and east of the Project Area to 7.3 people per square mile in Norman Township, to the north of the Project Area in Yellow Medicine County. The townships within the Project Area have an average population density of 4.78 people per square mile. There are 198 homes within the Project Area (Figures 3a-3d). There is no indication that any minority or low-income population is concentrated in any one area of the Project, or that the wind turbines will be placed in an area occupied primarily by any minority population.

8.1.1 Impacts

No impacts are anticipated. The construction of the Project will not displace residents or change the demographics of the Project Area.

8.1.2 Mitigative Measures

No impacts are anticipated, and as such, no mitigation is necessary.

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 direction and intent of growth for a municipality. Generally, comprehensive plans include elements on existing and future land use, population and housing trends, economic development, and environmental characteristics. In preparing this Application, the Applicant has reviewed and analyzed the land use and other applicable elements of the most recently adopted comprehensive plans of the municipalities within and adjacent to the proposed Project Area. Table 8.2 provides an inventory of municipalities within and adjacent to the Project Area, along with their respective comprehensive plans, if available.

Table 8.2: Comprehensive Plan Inventory for Local Governments within the Project Boundary

Governing Body	Name of Plan	Year Adopted	Associated Development Plan(s)
Lincoln County	2009 Comprehensive Development Ordinance	2009	Comprehensive Land Use Plan
City of Hendricks	Hendricks City Code	Unknown	Chapter 10: Zoning and Subdivision Regulations
City of Ivanhoe	Ivanhoe Development Management Ordinance	2001	NA
Hendricks Township	None Adopted	NA	NA*
Marble Township	None Adopted	NA	NA*
Township of Royal	None Adopted	NA	NA*
Township Shaokatan	None Adopted	NA	NA*
Township of Ash Lake	None Adopted	NA	NA*
Township of Diamond Lake	None Adopted	NA	NA*
Township of Drammen	None Adopted	NA	NA*

** While these townships have not adopted their own comprehensive plans all are included in the 2009 Lincoln County Comprehensive Development Ordinance.*

Portions of the Project Area fall within the Floodplain Management District, Shoreland Management District, Urban Expansion District, Businesses and Industry District, and Rural Preservation Management District as identified in the 2009 Lincoln County Comprehensive Development Ordinance (Figures 6a-6d and Figures 17a-17d; Lincoln County, 2009). All districts are defined as follows:

- Floodplain Management District: All lands designated as floodplain based on the 100-year water surface profile (Figures 17a-17d).
- Shoreland Management District: Shorelands of all designated public waters in Lincoln County include lands within 1,000 feet of the normal high water mark of a lake, pond, or flowage; and within 300 feet of a river or stream or the landward side of a floodplain.
- Urban Expansion District: All lands within one-quarter (¼) mile in all directions of incorporated municipalities.
- Businesses and Industry District: All lands between one-quarter (¼) mile and one and one-quarter (1 ¼) in all directions of municipalities.
- Rural Preservation District Management District: All lands not identified as included in one of the four previous districts.

The majority of the Project Area falls within the Rural Preservation Management District. The proposed Project will not alter the land use or zoning classification of any parcel within or adjacent to the Project Area boundary.

The Applicant reviewed available Federal Emergency Management Agency ("FEMA") 100-year floodplain mapping of the Project Area in determining the location of facilities. As illustrated in Figures 17a-17d, none of the proposed Project facilities are located within the 100-year floodplain zones. The Applicant also reviewed available Lincoln County Shoreland Management District digital data in determining proposed facility locations (Lincoln County, 2016); none of the proposed Project facilities would be located within the Shoreland Management District.

In determining the existing and future land use and zoning classifications for the proposed Project, the Applicant reviewed the official zoning maps for Lincoln County and all associated townships and municipalities. According to these maps, the proposed Project Area does cross into the Urban Expansion District and Business and Industry District around the cities of Hendricks and Ivanhoe (Lincoln County, 2008) (Figures 6a-6d). The Urban Expansion Management District includes lands classified as partial, perimeter or potential urban areas. Classification is based on parcel location in relation to incorporated municipalities and public services such as paved streets, sewer and/or water facilities. While the proposed Project Area does overlap with the Urban Expansion Management Districts near Hendricks and Ivanhoe, no proposed Project facilities are located within the districts, and the proposed Project facilities will not impact the zoning or current use of the parcels within these districts.

The Business and Industry District allows retail, commercial and general industrial uses in unincorporated areas of Lincoln County at standards that will not impair the traffic carrying capabilities of abutting roads and highways to encourage development that is compatible with surrounding Districts (Lincoln County, 2008). The Business and Industry District begins one-

quarter (¼) mile from the exterior boundary of an incorporated municipality and extends outward one and one-quarter (1¼) mile. Layouts for all four turbine options include Project facilities within the Business and Industry Districts of the cities of Hendricks and Ivanhoe. Wind energy projects are generally consistent with the uses in these zoning districts.

The existing zoning map is available on the Internet through the Lincoln County Website (Lincoln County, 2008).

8.2.2 Conservation Easements

The U.S. Fish and Wildlife Service ("USFWS") administers a program by which it holds easements on private lands that have wetlands and/or grassland habitat. Land covered by a USFWS grassland easement may not be cultivated and mowing, haying, and grass seed harvesting must be delayed until after July 15 each year. This restriction is to help grassland nesting species, such as ducks and pheasants, complete their nesting before the grass is disturbed. Wetlands covered by a wetland easement cannot be drained, filled, leveled, or burned. A USFWS wetland easement protects the wetland area of a parcel; the upland area outside the wetland is not covered by the easement. The wetland easements help provide crucial habitat for many types of wildlife including ducks, pheasants, and deer. Development may be restricted on lands held in a USFWS easement. USFWS grassland and wetland easements are shown on Figures 7a-7d. The USFWS has been contacted to verify the presence or lack of easements. Blazing Star 2 is also conducting a title search to identify conservation easements on any properties within the Project Area boundary.

In addition to USFWS grassland and wetland easements, the USFWS has two National Wildlife Refuge ("NWR") easements in the northeastern portion of the Project. These easements are associated with the Northern Tallgrass Prairie NWR. The Northern Tallgrass Prairie NWR encompasses all or part of 85 counties in western Minnesota and northwestern Iowa and includes nearly 3,000 acres of land owned by the refuge system and an additional 2,500 acres protected in conservation easements.

Blazing Star 2 has also identified a Pheasants Forever easement in the north central portion of the Project Area. The Forever Land Trust protects habitat by creating and conserving habitat through fee-title acquisition, by establishing conservation easements, and by establishing long-term conservation stewardship support. The Trust ensures protection of critical and unique habitats for pheasants, quail, and other wildlife.

Reinvest In Minnesota easements ("RIM") are administered by the Minnesota Board of Water and Soil Resources ("BWSR") and protect and improve water quality, reduce soil erosion, and enhance fish and wildlife habitat on privately owned lands by retiring environmentally sensitive lands from agricultural production. RIM easements within and adjacent to the Project vicinity are shown on Figures 7a-7d.

8.2.3 Impacts

The Project is consistent with Lincoln County's comprehensive plans. As noted previously, the majority of the Project Area falls within the Rural Preservation Management District, and,

consistent with the purpose of that zoning district, 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. Wind energy projects are generally compatible with the zoning districts inside Blazing Star 2's Project Area. The installation of the Project may induce additional build-out of the existing industrial zoned areas with services to support the Project's operation. Further, Blazing Star 2 will avoid conducting Project activities within conservation easements held by public agencies or private organizations to the extent practicable. Based on publicly available information, the Project will not impact any USFWS grassland, wetland, or NWR easements, RIM easements, or the Pheasants Forever easement. Blazing Star 2 will complete a title search to identify any other conservation easements in the Project and coordinate with those entities identified as having conservation easements to identify their trust resources and additional potential impacts. Blazing Star 2 will work with the Minnesota Department of Natural Resources ("MN DNR"), USFWS, BWSR, or other relevant authority to develop appropriate mitigation.

8.2.4 Mitigative Measures

The Project is generally consistent with both comprehensive planning documents and local zoning, and no Project facilities are currently planned to be constructed or operated within zoning districts that are not compatible with wind energy projects. Blazing Star 2 will prioritize avoidance of conservation easements over impacts to those areas. Easement holders will need to consent to impacts that may affect their land interests; Blazing Star 2 will work with conservation easement holders to obtain consents for impacts to their easements if impacts are unavoidable.

8.3 Noise

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

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

The A-weighting is the most appropriate weighting for wind turbine sound for two reasons. The first is that sound pressure levels due to wind turbine sound are typically in the appropriate range for the A-weighting at typical receiver distances (50 dBA or less). The second is that various

studies of wind turbine acoustics have shown that the potential effects of wind turbine noise on people are correlated with A-weighted sound level (Pedersen and Waye, 2008) as well as to the perceived loudness of wind turbine sound. Other researchers found that 51% of the energy making up a C-weighted measurement of wind turbine sound is not audible. Thus, it is more difficult to relate the level of C-weighted sound to human perception. That is, two sounds may be perceived exactly alike, but there could be significant variations in the C-weighted sound level depending on the content of inaudible sound in each.

8.3.1 Description of Resources

The term ambient acoustic environment refers to the all-encompassing sound in a given environment or community. The outdoor ambient acoustic environment is a composite of sound from varying sources, distances, and directions. The applicant has conducted background sound level monitoring throughout the project area to quantify the existing sound levels and to identify existing sources of sound. Monitoring was conducted at four locations distributed throughout the project area and at two offsite locations. Daytime sound levels throughout the project area generally ranged from 33 to 41 dBA (L_{50}), while nighttime sound levels were generally between 30 and 42 dBA (L_{50}). The average daytime L_{50} across the project area was 37 dBA, and the average nighttime L_{50} across the project area was 35 dBA. Common sources of sound included wind rustling through vegetation, roadway traffic, aircraft overflights, occasional farming operations, and biogenic sources such as birds and insects.

Higher sound levels typically exist near roadways and near areas that experience greater human activities such as farming. Agricultural/rural areas with higher wind resources generally experience higher sound levels compared to agricultural/rural areas with lower wind resources. Different communities can experience a wide variety of sound levels within their given ambient acoustic environments, and the variability of sound sources creates their respective spectral content. A comparison of typical noise generators is outlined below in Table 8.3.

Table 8.3: Decibel Levels of Common Noise Sources

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

Source: MPCA, 2008.

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

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

Land Use	Code	Day (7:00am – 10:00pm) dBA		Night (10:00pm – 7:00am) 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 Impacts

When in motion, the wind turbines emit audible sound. The level of this sound varies with the speed of the turbine and the distance of the listener from the turbine. Sound is generated from the wind turbine at points near the hub or nacelle from the blade tips as they rotate. The most stringent noise standards, as regulated by the MPCA under Minn. Rules Ch. 7030, is a 50 dB limit for nighttime noise levels.

Unless other arrangements have been made with specific residents, the Applicant proposes siting turbines the minimum 1,000 ft from residences plus the distance required to comply with the MPCA limit of a 50 dBA nighttime L_{50} noise level (L_{50} is the median noise level or the level exceeded 50 percent of the time) (MPCA, 2015).

The Applicant has conducted a preliminary noise assessment of the Project and a model was developed, using a software program called Computer Aided Design for Noise Abatement ("Cadna-A"), to determine the sound levels at receptors within the Project boundary. The monitoring methodologies and results are detailed in Appendix A. The Cadna-A acoustical analysis software is designed for evaluating environmental noise from stationary and mobile sources and was used to calculate the L_{50} for all four turbine models for each conceptual layout. Assuming that wind speeds are at the maximum sound power level wind speed for each turbine model and are constant for an entire one-hour period, the L50 calculated by Cadna-A was compared to the MPCA L_{50} standard.

The analysis accounted for all noise generating elements associated with the various proposed wind turbine types and conceptual layouts for the Project. All proposed wind turbines (noise sources) were modeled in Cadna-A and Project-related noise levels were calculated at 455 noise-sensitive receptors within the Project Area and approximate one-mile buffer. Table 8.5 presents

analysis results. The baseline noise isopleths (a line or curve of equal values) are depicted in Figures 8a-8d.

Table 8.5: Summary of Noise Assessment

Turbine Model		Residence Classification		
		dB(A) Levels at All Residences	dB(A) Levels at Participating	dB(A) Levels at Non-Participating
AW132	Avg L_{50} Modeled	36	37	35
	Max L_{50} Modeled	49	49	43
	Min L_{50} Modeled	25	24	25
GE116	Avg L_{50} Modeled	35	38	32
	Max L_{50} Modeled	47	48	42
	Min L_{50} Modeled	23	22	18
Gamesa 126	Avg L_{50} Modeled	37	41	34
	Max L_{50} Modeled	49	49	44
	Min L_{50} Modeled	24	26	22
Vestas 110	Avg L_{50} Modeled	37	40	35
	Max L_{50} Modeled	49	49	45
	Min L_{50} Modeled	27	26	23

The maximum calculated noise level, based on assumptions incorporated into the Cadna-A model and the most current turbine layout, results in a 49 dBA L_{50} at the nearest noise-sensitive receptor (maximum Project related L_{50} range from 47 to 49 dBA). Average Project-related noise levels at residences for all turbine models range from 35 to 37 dBA, on an hourly L_{50} basis. As depicted in the multi-turbine constraint maps, all proposed conceptual turbine layouts comply with MPCA noise guidelines at residential receptors. Maximum calculated noise levels at all residential receptors for all turbine models are below the nighttime L_{50} noise limit of 50 dBA.

Infrasound is sound pressure fluctuations at frequencies below about 20 Hz. Sound below this frequency is only audible at very high magnitudes. Low frequency sound is in the audible range of human hearing, that is, above 20 Hz, but below 100 to 200 Hz depending on the definition.

Measurements of infrasound at distances from wind turbines typical of their nearest residential neighbors have consistently found that infrasound levels are below published audible human perception limits. O'Neal et al. measured sound from wind projects that used the GE 1.5 sle and Siemens SWT 2.3-93 model wind turbines. They found that at typical receptor distances away from a wind turbine, more than 1,000 feet away, wind turbine sound is typically audible starting at 50 Hz (O'Neal et. al., 2011).

Tachibana et al. (2014) measured sound levels from 34 wind projects around Japan over a three-year period. They found that infrasound levels were "much lower than the criterion curve" proposed by Moorehouse et al. (2009). RSG et al. studied infrasound levels at two wind turbine projects in the northeastern U.S. (RSG et al., 2016). Both indoor and outdoor measurements were made. Comparisons between turbine-on periods and adjacent turbine shutdown periods indicated the presence of wind-turbine-generated infrasound, but well below ISO 389-7 (ISO, 2013) and

Wattanabe et al. (1990) perception limits. In their review of several wind turbine measurement studies (including O'Neal and Tachibana), McCunney et al. (2014) did not find evidence of audible or perceptible infrasound levels and typical residential distances from wind projects.

8.3.3 Mitigative Measures

Impacts to nearby residents and other potentially affected parties in terms of noise will be taken into consideration as part of the turbine siting. Unless other arrangements have been made with specific residents, the Applicant proposes siting turbines the minimum 1,000 ft from residences and any additional distance required to comply with the MPCA limit of a 50 dBA nighttime L_{50} noise level (MPCA, 2015). To the extent that the sound characteristics of the selected turbine vary, the Applicant will ensure compliance with MPCA noise standards. The preliminary layout has been modeled to help ensure cumulative impacts from all wind turbines, and maximum calculated noise levels for all turbine models, are below the MPCA's nighttime L_{50} noise limit of 50 dBA at residential receptors.

8.4 Visual Impacts

8.4.1 Existing Aesthetics

8.4.1.1 Description of Resources

The topography of the Project Area is glaciated, gently rolling plains with elevations ranging from 1,524 to 1,891 ft (465 to 577 m) above sea level. Agricultural fields, farmsteads, and gently rolling topography visually dominate the Project Area. The landscape can be classified as rural open space. Figures 9a-9d show the general topography within the Project Area.

Within the Project Area, local vegetation is predominantly agricultural crops and heavily grazed pasture. Crops include corn, soybeans, small grains, and forage crops, which visually create a low uniform cover. A mix of deciduous and coniferous trees planted for windbreaks typically surrounds farmsteads. Generally, these forested areas are isolated groves or windrows established by the landowner/farmers to prevent wind erosion and shelter dwellings. In the swales, there are occasional patches of native willows, cattails, sedges, and rushes.

The settlements in this area of Lincoln County are residences and farm buildings (inhabited and uninhabited) scattered along rural county roads. These structures are focal points in the dominant open space character of the vicinity.

8.4.1.2 Visual Impacts on Public Resources

Some of the Project's turbines will be located within the viewshed of MN DNR-managed Aquatic Management Areas ("AMAs"), Wildlife Management Areas ("WMAs"), Scientific and Natural Areas ("SNAs"), USFWS Waterfowl Production Areas ("WPAs"), USFWS NWR lands or other natural areas and may be visible by people using those areas. Figures 7a-7d identify recreation and wildlife areas within the Project's vicinity.

There are 17 WMAs, one WPA, and no AMAs or SNAs within the Project Area and several additional recreation lands within 10 miles of the Project Area. A section of the Lincoln County Snowmobile Trail bisects the Project along MN 19 and another along US 75. Additional information regarding recreational lands in relation to the Project Area is found in Section 8.7.

U.S. Highway 75, which is designated as a Minnesota scenic byway known as the "King of Trails", traverses the length of the eastern portion of the Project Area. It was designated as a scenic byway in Minnesota in 2004, where it stretches 414 miles from the U.S./Canada border to the Minnesota/Iowa border. Section 5 of the King of Trails corridor where the Project Area is located is characterized by local historical sites, such as European ethnic villages and museums (e.g., Little Europe), Laura Ingalls Wilder Historic highway, and Indian burial mounds, and by the wind turbines that can be seen along the corridor. The King of Trails Coalition describes the wind turbines as having a positive impact to the viewshed, stating that "From the road, many turbines can be seen, creating clean, renewable electricity. Electrical energy produced from wind is pollution free and it is also economical, competitive and plentiful along the Buffalo Ridge" (Fiedler, 2015).

While wind turbines will impact the visual surroundings of the Project Area, the degree of visual impact will vary based upon personal preferences.

8.4.1.3 Visual Impacts on Private Lands and Homes

The placement of turbines in the landscape will have an effect on the existing visual experience of the Project Area and in nearby areas. Discussion of the aesthetics of the Project is based on subjective human responses. For some viewers, the Project could be perceived as a visual intrusion; for other viewers, the Project may have its own positive aesthetic qualities. While people living in or travelling through the area are accustomed to viewing wind turbines, the Project will add to the cumulative visual impacts by adding up to 100 new turbines in the area.

The installation of the Project will alter the landscape and visual experience of the Project Area. The topography in the vicinity is generally flat and the vegetation is uniformly low, making the high topography vulnerable to visual disruptions. Visual impacts will be most evident to people traveling north and south along U.S. Highway 75 and east and west along Minnesota 19 which bisects the Project Area.

The Federal Aviation Administration ("FAA") requires obstruction lighting or marking of structures more than 200 feet above ground to provide safe air navigation (FAA, 2005). Blazing Star 2 will apply to the FAA for approval of a lighting plan that is compliant with FAA requirements. It is anticipated that approximately 50 percent of the turbines will be lit. FAA requires synchronized flashing of red lights for wind turbines.

Blazing Star 2 will also consider the Project's lighting protocols to minimize potential impacts to aesthetics and wildlife while maintaining safe construction and operations. Some of the Project's goals pertaining to lighting include minimizing the number of lights, minimizing the duration of the light flash, maximizing the light-off period between flashes, and maintaining synchronized flashing among all turbines. In addition, non-turbine facility lighting will be minimized by

various means, including only lighting the facilities when necessary, using downward facing lights and other means.

8.4.1.4 Visual Impact Mitigative Measures

All turbine models under evaluation for the Project will be relatively similar in appearance, with a monopole tower, a single hub, and three blades. The primary difference between layouts will be the RD and the number of turbines. In general, larger RD turbines will have larger maximum output and thus the Project will require fewer turbines. The four representative models will have the following RD and number of turbines and are shown in Table 8.6.

Table 8.6: Rotor Diameter and Number of Turbines

Turbine Model	Rotor Diameter	Rotor Tip Height – Top/Bottom of Rotor Diameter	Number of Primary Turbines	Number of Alternate Turbines
Gamesa G126	126 m (413.4 ft)	147/21m (482/69 ft)	76	35
Acciona 3.0-132	132 m (433.1 ft)	150/18m (492/59 ft)	67	44
GE 2.5-116	116m (380.6 ft)	138/22m (453/72 ft) or 152/36m (499/118 ft)	80	31
Vestas V110	110 m (360.9 ft)	135/25m (433/82 ft) or 147/40m (482/131 ft)	100	11

Blazing Star 2 notes that while the tallest (and thus most visible turbines) are considered here some models under consideration may have a bottom tip height of approximately 18 meters (site conditions may cause some variation). The 3.0 MW turbine tower can have the same, and can also exceed the 2.0 MW turbine tower height. The 3.0 MW turbine (with a 132 m tower) is about 20 percent taller than the 2.0 MW turbine (with an 95 m tower), using a 3.0 MW turbine will require about 33 percent fewer turbines, so the larger turbine would be expected to have a smaller overall visual impact on the surrounding area. Regardless of turbine model, 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 Commission siting guidelines (Commission, 2008). Additionally, as noted in Section 5.1, turbines will be sited a minimum of 1,000 from residences.

Blazing Star 2 will also consider the Project's lighting protocols to minimize potential impacts to aesthetics while maintaining safe construction and operations. Some of the Project's goals pertaining to lighting include minimizing the number of lights, minimizing the duration of the light flash, maximizing the light-off period between flashes, and maintaining synchronized flashing among all turbines. In addition, non-turbine facility lighting will be minimized by various means, including only lighting the facilities when necessary, using downward facing lights and other means.

8.4.2 Shadow Flicker

8.4.2.1 Description of Resources

Shadow flicker caused by wind turbines is defined as alternating changes in light intensity at a given stationary location, or receptor, such as the window of a home. In order for shadow flicker to occur, three conditions must be met: (1) the sun must be shining with no clouds to obscure it; (2) the rotor blades must be spinning and must be located between the receptor and the sun; and (3) the receptor must be sufficiently close to the turbine to be able to distinguish a shadow created by it. Shadow flicker intensity and frequency at a given receptor are determined by a number of interacting factors:

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

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

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

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

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

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

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

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

A typical shadow flicker distribution map is included in Figures 10a-10d. The shadow flicker frequency in the figure was created using the WindPro Modeling program (Version 3.0.618) using the typical assumptions for distribution of wind direction and sunshine probability (Table 8.7 and Table 8.8). The assumptions are specific to the Project Area.

Table 8.7: Wind Direction Distribution Assumptions for Shadow Flicker Model

Direction	N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW
Percent Blowing in Direction	10.7	5.0	4.0	4.2	5.2	7.9	14.3	9.7	6.1	6.9	10.9	15.2

Table 8.8: Probability of Sunshine Assumptions for Shadow Flicker Model

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Sunshine Probability	53%	59%	57%	56%	62%	67%	74%	69%	62%	51%	37%	38%

Data gathered from National Climatic Data Center for Minneapolis, MN, the closest, most representative station (1956-1983)

Appendix B shows results of the shadow flicker assessment at Blazing Star 2.

8.4.2.2 Shadow Flicker Impacts

Shadow flicker frequency calculations for the Project were modeled by 455 residences (receptors) with WindPRO 3.0, Build 618. The maximum predicted shadow flicker impacts that occurred at a residence for each turbine layout are show in Tables 8.9 and 8.10.

Table 8.9: Maximum Predicted Shadow Flicker Impacts Participating Residences

Participating Residences				
Statistic[1]	Turbine Model			
	Acciona	Vestas	GE	Gamesa
Max - Worst Case	215:18	175:15	196:22	195:12
Avg - Worst Case	51:38	50:31	45:50	49:19
Max - Real Case	80:27	55:24	64:14	72:55
Avg - Real Case	17:03	16:14	14:36	16:29

[1] Statistic described as "hours:minutes"

Table 8.10: Maximum Predicted Shadow Flicker Impacts Non-Participating Residences

Non-Participating Residences				
Statistic[1]	Turbine Model			
	Acciona	Vestas	GE	Gamesa
Max - Worst Case	92:.51	73:21	85:21	57:23
Avg - Worst Case	21:48	19:18	18:40	18:35
Max - Real Case	21:43	24:41	22:21	18:48
Avg - Real Case	6:54	6:13	5:51	5:57

[1] Statistic described as "hours:minutes"

WindPRO 3.0.618 calculates the number of hours per year as well as the maximum minutes per day during which a given receptor could realistically expect to be exposed to shadow flicker from nearby wind turbines. Simulated conditions for the worst case scenario were:

- There is always sunshine.
- The turbines are always in operation.
- The wind direction always orients the rotors perpendicular to the sun-receptor sightline.
- There are no local obstacles blocking potential shadows, such as buildings or vegetation.
- Specific window configurations on houses are not considered.
- Receptors are assumed to be exposed to the sky in all directions, and the shielding influence of terrain is not considered ("greenhouse receptors").

The worst case scenario model was refined to represent a less conservative expected scenario by incorporating the following more realistic features in the expected case scenario model:

- Wind direction – Turbine rotors do not orient themselves to the sun all day, every day, as modeled in the worst case scenario. To adjust for actual rotor direction, wind data is entered into the model. For the analysis included in this application, wind data was taken from the temporary meteorological tower located within the Project area.

- Turbine operating hours – The turbine will not be operational all of the time due to local winds being outside of turbine operation specifications. Project-specific wind data again was incorporated to reflect the frequency of sufficient wind speed to activate the turbine. The expected percentage of time the turbine is activated is multiplied by the number of minutes of shadow flicker.

- Consideration of maintenance and other downtime – Turbines, project facilities, and even the transmission grid may be unavailable due to routine maintenance activities or emergency situations. Industry best estimates are turbine availability of 97%, balance-of-plant availability of 99%, and grid availability of 99.8%. A 4.2% reduction in the annual operating hours was included to account for these factors.

- Actual sunshine hours – Sunshine hours are affected by cloud cover, fog or haze, time of day, and time of year. Monthly average sunshine probabilities are taken from the National Climatic Data Center Comparative Climatic Data. For the shadow flicker analysis, the Minneapolis, MN, station was chosen because it is the closest station in the database.

Combining these three mitigating factors creates a less conservative scenario which aims to produce a scenario closest to the actual expected results. These "expected" results represent a significant reduction in shadow flicker hours per day or per year in contrast to a worst case scenario. However, by including the above factors into the model, it is possible – although not likely – to have lower modeled results compared to actual results in the field. This is due to the fact that true meteorological factors like wind direction or sunshine hours could be different from the averages used in a way that is worse for shadow flicker.

There are no non-participating residences which the model calculates will receive more than 30 hours of shadow flicker per year in the real case.

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

Shadow flicker from the proposed turbines is not harmful to the health of photosensitive individuals, including those with epilepsy. The frequency of shadow flicker due to wind turbines is a function of the rotor speed and number of blades, and it is generally no greater than approximately 1.5 hertz (i.e., 1.5 flashes per second). The Epilepsy Foundation has determined

that generally, the frequency of flashing lights most likely to trigger seizures is between 5 and 30 flashes per second (Epilepsy Foundation, 2013).

8.4.2.3 Shadow Flicker Mitigative Measures

Blazing Star 2 considers shadow flicker when siting wind turbines to minimize impacts to area residents. Based on the results of the Project's shadow flicker modeling, no specific mitigation is currently proposed. To the extent a residence experiences inordinately more flicker than anticipated in the modeling, mitigation would be addressed at that time. However, because of the conservative methods used for the modeling, it is highly unlikely more flicker than modeled will occur. In order to assess site-specific mitigation measures, flicker occurrences should be documented daily for several consecutive months including time of location, day and duration. Mitigation measures will be considered and implemented based on individual circumstances of residences experiencing shadow flicker, and as a reasonable function of the amount of flicker experienced. Such mitigation measures may include Blazing Star 2 taking the following actions:

- Providing education to landowners about how to minimize the effect of shadow flicker.
- Providing indoor screening, such as curtains or blinds in windows, where appropriate and reasonable.
- Providing exterior screening, such as a vegetation buffer or awnings over windows, where appropriate and reasonable.
- Turbine Control Software programmed to temporarily shut down a specific turbine for a few minutes if conditions are present to create flicker.

8.5 Public Services and Infrastructure

8.5.1 Description of Resources

The Project is located in a rural area in southwestern Minnesota (Figure 1); the southwestern portion of the Project Area abuts the South Dakota border at the Lincoln County, Minnesota / Brookings County, South Dakota county line. There is an established transportation and utility network that provides access and necessary services to the light industry, small cities, homesteads, and farms existing near the Project Area. The city of Hendricks is located immediately north and west of the Project Area, and eastern edge of the Project Area abuts the western edge of Ivanhoe city limits. Other small towns in the Project vicinity include Arco, Tyler, and Lake Benton, all located within Lincoln County between 2 and 6 miles from the southern portion of the Project Area. These communities provide the following services:

- City of Hendricks: Police, volunteer fire department, library services, municipal park and campground, and private providers for cable/phone/internet.

- City of Ivanhoe: Police, library services, volunteer fire department, water/sewer, and private providers for cable/phone/internet. Ivanhoe is the Lincoln County seat and is home to the Lincoln County Sheriff's Department.

- City of Arco: Volunteer fire department and private providers for cable/phone/internet

- City of Tyler: Police, volunteer fire department, library services, and private providers for cable/phone/internet

- City of Lake Benton: Police, volunteer fire department, library services, municipal parks and campgrounds, and private providers for cable/phone/internet

The townships of Marble, Hendricks, Royal, Shaokatan, Ash Lake, Diamond Lake, and Drammen have limited public infrastructure services. The cities of Hendricks, Ivanhoe, Tyler, and Lake Benton provide police and fire services to these parts of the Project Area. Water is supplied by the Lincoln-Pipestone Rural Water distribution system. Natural gas is provided by Peoples Natural Gas. Lyon-Lincoln Electric Cooperative, Inc. is the electrical provider for Lincoln County (Lincoln County, 2009).

Homes and farms in the Project Area typically use private wells and septic systems for their household needs. According to the MN Department of Health's Minnesota Well Index online database, there are 42 located wells, and an additional 23 unverified well locations within the Project Area (MN Department of Health, 2016).

8.5.2 Impacts

The Project is expected to have a minimal effect on existing public services and infrastructure. The following section describes specific impacts that may occur during the Project construction and operation.

A water supply may be necessary for the O&M facility depending on its location, which is anticipated to require a new private well. Water usage during the operating period will be similar to household volume; less than five gallons per minute. Water use during construction will occur at a higher rate to provide dust control and water for concrete mixes. The Project will not require the appropriation of surface water or permanent dewatering. Temporary dewatering may be required during construction for specific turbine foundations and/or electrical trenches.

8.5.3 Mitigative Measures

Because impacts are not expected on the existing infrastructure during the Project construction and operation, mitigation measures are not anticipated. In the event facility associated wells are abandoned, they will be sealed as required by Minnesota law.

8.5.4 Roads

8.5.4.1 Description of Resources

In general, the existing roadway infrastructure in and around the Project Area is characterized by state, county, and township roads that generally follow section lines. Various county and township roads provide access to the Project Area. Access to the Project Area also includes two-lane paved and gravel roads. In the agricultural areas, many landowners use private, single-lane farm roads and driveways on their property. Roads within the Project Area are summarized in Table 8.11.

Table 8.11: Summary of Roadways within Project Boundary

Road Type	Miles within Project Boundary
Federal Highways	12.0
State Highways	11.5
County Highways/Roads	34.8
Township Roads	92.9

The existing traffic volumes on the area's highways are documented on Table 8.12. For purposes of comparison, the functional capacity of a two-lane paved rural highway is in excess of 5,000 vehicles per day, or Annual Average Daily Traffic ("AADT"). Based on 2014 data, the highest existing AADT in or near the Project Area is 1,100 vehicles per day along Minnesota Highway 19 between 190th Avenue and US 75 on the west side of Ivanhoe. Along the county highways, the AADTs are generally below 510 vehicles per day. Traffic counts are generally higher in close proximity to nearby cities.

Table 8.12: Existing Daily Traffic Levels

Roadway Segment Description	Existing Annual (AADT)
US 75 between MN 19 and CSAH 17	730
US 75 between CSAH 15 and CSAH 13	650
CSAH 18 between CSAH 4 and US 75	65
CSAH 17 between CSAH 4 and US 75	510
MN 19 between 100th Avenue and MN 271	900
MN 19 between MN 271 and 190th Avenue	960
MN 19 between 190th Avenue and US 75	1100
CSAH 16 between CSAH 1 and US 75	140

Table 8.12: Existing Daily Traffic Levels

Roadway Segment Description	Existing Annual (AADT)
CSAH 15 between CSAH 1 and US 75	170
CR 102 between MN 19 and CSAH 16	40
CR 122 between 170th Avenue and US 75	20

Source: 2014 Traffic Volume General Highway Map, Lincoln County, MN (Minnesota Department of Transportation ["MN DOT"], 2014)

8.5.4.2 Impacts

During the construction phase, temporary impacts are anticipated on some public roads within the Project Area. Roads will be affected by the transportation of equipment to and from the Project Area and Project facilities. Some roads may also be expanded along specific routes as necessary to facilitate the movement of equipment. Construction traffic will use the existing county, state, and federal roadway system to access the Project Area and deliver construction materials and personnel. Construction activities will increase the amount of traffic using local roadways, but such use is not anticipated to result in adverse traffic impacts. Operation and maintenance activities will not noticeably increase traffic in the Project Area.

The Project may also temporarily affect traffic numbers in the area due to construction traffic. During the construction phase, several types of light, medium, and heavy-duty construction vehicles will travel to and from the Project Area, as well as private vehicles used by construction personnel. The Applicant estimates that there will be 375 large truck trips per day and up to 875 small-vehicle (pickups and automobiles) trips per day in the area during peak construction periods. The functional capacity of a two-lane paved rural highway is in excess of 5,000 vehicles per day. Currently, the heaviest traffic is on Minnesota Highway 19 located along the east central edge of the Project at 1,100 AADT. Most of the county roads in and near the Project area have AADTs between 20 and 510.

After construction is complete, traffic impacts during the operations phase of the Project will be minimal. A small maintenance crew driving through the area in pickup trucks on a regular basis will monitor and maintain the wind turbines as needed. There would be a slight increase in traffic for occasional turbine and substation repair, but traffic function will not be impacted as a result.

8.5.4.3 Mitigative Measures

Blazing Star 2 will develop a transportation plan and road restoration agreement in cooperation with Lincoln County and/or the applicable township road authorities. Impacted roadways will be restored per the road restoration agreement(s). Blazing Star 2 will ensure that the general contractor communicates with the respective road authority throughout the construction process, particularly as it pertains to the movement of equipment on roads and those items identified within the road and transportation agreement(s).

Since many of the area roadways have AADTs that are currently well below capacity, the addition of 1250 vehicle trips during peak construction would be perceptible, but similar to seasonal variations such as spring planting or autumn harvest.

Truck access to the Project area is generally served by US 75. Specific additional truck routes will be dictated by the location required for delivery. Additional operating permits will be obtained for over-sized truck movements.

The operations phase of the proposed Project will require a small maintenance crew driving through the area to monitor and maintain the wind turbines as needed. There would be a slight increase in traffic for occasional turbine and substation repair, but no impacts to traffic function would result from these activities. Blazing Star 2 will apply the Commission standard of 250 foot setback from all public roads.

Impacted roadways will be restored and improved per a formalized road agreement between Blazing Star 2 and the relevant local governments. Blazing Star 2 is currently coordinating with all applicable counties and townships on the development and execution of a single, cooperative Road Maintenance Agreement. Blazing Star 2 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.

8.5.5 Telecommunications

8.5.5.1 Description of Resources

Telephone service in the area is provided by Interstate Telecommunications Cooperative (“ITC”), Citizens Utilities, and Frontier Communications (Lincoln County, 2009). ITC has provided Blazing Star 2 with locations for its facilities. ITC provides wire-based telecommunications service to the area including telephone, internet and television services.

8.5.5.2 Impacts

Construction and operation of the proposed wind farm will not impact telephone service to the Project Area. Blazing Star 2 is reviewing ITC’s data and will work with ITC to ensure its system’s level of service to the Project Area is maintained.

8.5.5.3 Mitigative Measures

Gopher One Call will be contacted prior to construction to locate and enable avoidance of all underground facilities. To the extent Project facilities cross or otherwise affect existing telephone lines or equipment, the Applicant will enter into agreements with service providers to avoid interference with their facilities. If the Project negatively impacts telecommunication services, Blazing Star 2 will provide a specific mitigation plan and take the necessary steps to restore all impacted services. Other mitigations associated with ITC's network may be included in the final plans for the Project. This mitigation might include relocation of ITC's lines or installation of dampening equipment or fiber optic lines where coper service currently exists.

8.5.6 Communications Systems

8.5.6.1 Description of Resources

The Applicant conducted a microwave beam path analysis, which identified five microwave beam paths through the Project Area and ten microwave beam paths in the Project vicinity (Appendix C and Figures 11a-11d). The microwave beam paths in the Project Area are primarily in the southern and eastern portions of the Project.

The Applicant also conducted a communication tower study by Comsearch, which identified eight communication tower structures and twenty-four communication antennas in the Project vicinity (Appendix C). These eight structures are registered with the Federal Communications Commission ("FCC"). The twenty-four antennas may be located on a variety of structure types such as guyed towers, monopoles, silos, rooftops, or portable structures. A summary of the types of communication systems in the vicinity of the Project are listed in Table 8.13.

Table 8.13: Communication Towers and Antennas in the Project Vicinity

Communication System Type		Number of Signals
Tower	Microwave	4
	Cellular	1
	Land Mobile	3
Antenna	Land Mobile	24
Total		**32**

Source: Comsearch (Appendix C)

8.5.6.2 Impacts

Because of their height, modern wind turbines have the potential to interfere with existing communications systems licensed to operate in the United States. Comsearch conducted a Licensed Microwave Study for Blazing Star 2. Blazing Star 2 has sited the Project's turbines in a manner that avoids all identified microwave beam paths and communication systems. Note that the Comsearch study in Appendix C identified two turbines within the Fresnel Zones of two microwave beam paths. Blazing Star 2 has shifted those turbines to be clear of the microwave

beam path. Blazing Star 2 will not operate the wind farm so as to cause microwave, radio, or navigation interference contrary to FCC regulations or other law.

8.5.6.3 Mitigative Measures

If interference is identified during or after construction of the Project, Blazing Star 2 will address the interference on a case-by-case basis. Blazing Star 2 does not propose mitigative measures at this time.

8.5.7 Television

8.5.7.1 Description of Resources

The Comsearch study identified nine licensed operational television stations whose coverage may potentially be impacted by the Project (Table 8.14 and Appendix C).

Table 8.14: Digital Television Signals in the Project Vicinity

Call Sign	Network Affiliate	Distance to the Nearest Turbine (mi)
K40FZ-D	-	17.6
KSMN	PBS	36.8
KRWF	ABC	38.3
KESD-TV	PBS	39.6
KWCM-TV	PBS	50.7
KELO-TV	CBS	59.8
KSFY-TV	ABC	59.8
KDLT-TV	NBC	61.0
KDLO-TV	CBS	66.9

Source: Comsearch (Appendix C)

8.5.7.2 Impacts

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.

The Comsearch TV Coverage Impact Study concluded that the Project may result in degraded reception in homes to the Project Area. These impacts are the result of obstruction of the line of sight between the residences relying on transmissions sent over the air for TV reception and the TV station antennas. The true impact of this obstruction is unknown; however, modern digital

TV receivers have undergone significant improvements to mitigate the effects of signal scattering. Television receptions at homes relying on cable or satellite television service will not be impacted by construction or operation of the Project.

8.5.7.3 Mitigative Measures

If interference to a residence's or business's television service is reported to Blazing Star 2, Blazing Star 2 will work with affected parties to determine the cause of interference and, when necessary, reestablish television reception and service.

Blazing Star 2 plans to address any post-construction television interference concerns on a case-by-case basis. If television interference is reported to Blazing Star 2 project representatives will:

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

8.5.8 Other Infrastructure and Services

No railroads are located within the Project Area and, therefore, the Project will not affect any railroads. The Brookings County – Hampton 345 kV MVP Transmission Line travels through the northern portion of the Project along 290th Street, 130th Avenue, and 330th Street to the

interconnect substation. Additionally, there are two 69 kV transmission lines owned by East River Electric Power Cooperative that traverse the Project Area. One travels east-west along 340th Street before turning south along 190th Avenue; the other traverses the southern portion of the Project along 230th Street before turning south between 200th and 210th Avenues. There are two underground pipelines that travel in a northwest to southeast direction through the Project Area. A Northern Border Pipeline Company gas transmission line travels through the central portion of the Project Area while a Magellan Pipeline Company liquid gas pipeline traverses the northern portion of the Project Area. Gas Distribution lines are present, but infrequent in the Project Area. Infrastructure within the Project area including existing transmission lines and pipelines is shown on Figures 4a-4d.

8.5.8.1 Impacts

The Project will be constructed to avoid impacts to pipelines and other underground infrastructure as well as overhead transmission lines.

8.5.8.2 Mitigative Measures

Blazing Star 2 will coordinate with Gopher State One Call and the pipeline companies before and during construction to fully understand infrastructure and safety concerns and to prevent possible structural conflicts.

8.6 Cultural and Archaeological Resources

8.6.1 Description of Resources

The Minnesota State Historic Preservation Officer ("SHPO") and Office of the State Archaeologist ("OSA") and the South Dakota State Historical Society Archaeological Research Center were contacted in May 2017 to initiate project coordination. Merjent, Inc. ("Merjent") staff cultural resource specialists conducted a literature review based on the Project Area and a one-mile buffer. The Project is located within the Prairie Lakes South archaeological sub-region, which includes all of Brown, Cottonwood, Jackson, Lac Qui Parle, Lincoln, Lyon, Martin, Redwood, Watonwan, and Yellow Medicine Counties and portions of Blue Earth, Faribault, Murray, Nobles, and Pipestone Counties (Anfinson, 1990). Archaeological resource sites are numerous in this region according to an overview entitled "Model: A Predictive Model of Precontact Archaeological Site Location for the State of Minnesota Final Report", specific section entitled "Minnesota's Environment and Native American Culture History" by Gibbon, et al., 2002.

Merjent collected data from the SHPO in St. Paul, Minnesota, and the Archaeological Research Center in Rapid City, South Dakota, regarding known cultural resources information derived from previous professional cultural resources surveys and reported archaeological sites and architecture inventory resources. Data collection included gathering records of sites within the Project Area and 1-mile buffer. This information was used to identify site types that may be encountered and landforms or areas that have a higher potential for containing significant cultural resources. Collected data included archaeological site files, architecture inventory files, and previous cultural resources studies and reports.

The literature review revealed one previously documented archaeological site located within the Project Area and 12 previously reported archaeological sites within the surrounding 1-mile buffer in Minnesota or South Dakota (Table 8.15; Figures 12a-12d).

Site 21LN0017, located within the northeastern portion of the Project Area, is a litihic scatter. This site has not been field verified and the National Register of Historic Places ("NRHP") eligibility is unknown. Of the 12 sites located within the Project buffer, four are prehistoric habitation sites, three are prehistoric lithic scatters/temporary camps, one is a prehistoric lithic scatter, one is a prehistoric isolated find, one is a site lead that indicated the possible location of a prehistoric mound group, and two are artifact scatters with both prehistoric and historic cultural components. One site, 21LN0010 (also known as the Boy Scout Hill site), has been deemed eligible for and nominated to the NRHP, one site (21LN0014) has been investigated and recommended as not eligible for the NRHP. The remaining 10 sites have not been formally evaluated for the NRHP.

Table 8.15: Previously Reported Archaeological Sites within the Project and 1-mile Buffer

County	State Site Number	Site Name	Site Type	Cultural Affiliation	NRHP Eligibility Recommendation	Project Area/Buffer
Lincoln	21LN0017	Lipinski	Lithic Scatter	Unknown Prehistoric	Unevaluated	Project Area
Lincoln	21LN0009	Hendricks Cemetery	Habitation	Middle - Late Woodland	Unevaluated	Buffer
Lincoln	21LN0010	Boy Scout Hill	Habitation	Woodland	Nominated	Buffer
Lincoln	21LN0011	Lake Shaokotan	Lithic Scatter	Unknown Prehistoric	Unevaluated	Buffer
Lincoln	21LN0014	Picnic Point County Park	Habitation	Woodland	Not Eligible	Buffer
Lincoln	21LN0015	N/A	Artifact Scatter	Unknown Prehistoric/ Historic Euro-American	Unevaluated	Buffer
Lincoln	21LN0029	Suhr	Habitation	Archaic, Woodland, Mississippian	Unevaluated	Buffer
Lincoln	21LN0031	C. Crietz	Artifact Scatter	Unknown Prehistoric/ Historic Euro-American	Unevaluated	Buffer
Lincoln	21LN0037	Lyle Kragh	Single Artifact	Unknown Prehistoric	Unevaluated	Buffer

Table 8.15: Previously Reported Archaeological Sites within the Project and 1-mile Buffer

County	State Site Number	Site Name	Site Type	Cultural Affiliation	NRHP Eligibility Recommendation	Project Area/Buffer
Lincoln	21LN0038	C.C. Spanton Knoll	Lithic Workshop/ Temporary Camp	Unknown Prehistoric	Unevaluated	Buffer
Lincoln	21LN0039	Don Carey Overlook	Lithic Scatter/ Temporary Camp	Unknown Prehistoric	Unevaluated	Buffer
Lincoln	21LN0040	Bell Lake Cattle	Lithic Scatter/ Temporary Camp	Unknown Prehistoric	Unevaluated	Buffer
Lincoln	21LNk	N/A	Site Lead, Burial Mounds	Unknown Prehistoric	Unevaluated	Buffer

A total of 42 previously reported architecture inventory resources are present within the Project Area and 1-mile buffer. Of these, six of the inventoried resources are located within the Project Area (Table 8.16; Figures 12a-12d). A wide variety of property category types are represented within the listing of previously inventoried resources, including domestic, commerce, government, education, religion, funerary, recreation & culture, agricultural processing, landscape, and transportation. A large portion of the previously reported resources are located in the Town of Ivanhoe (Figures 12a-12d). Further, the majority of the resources (n=30, 71%) have not been evaluated for the NRHP. Of the twelve resources that have been evaluated, two are considered to be eligible to be listed in the NRHP (LN-IVC-012 and BK00001251) and one is listed on the NRHP (LN-IVC-016); all three of these resources are located within the 1-mile buffer.

Table 8.16: Previously Reported Architecture Resources within the Project and 1-mile Buffer

County	Architecture Inventory Number	Property Name	Property Category	NRHP Eligibility Recommendation	Project Area/Buffer
Lincoln	LN-HNT-001	Lange Homestead	Domestic	Unevaluated	Project Area
Lincoln	LN-ROY-002	Bridge No. 2704	Transportation	Unevaluated	Project Area
Lincoln	LN-SHK-001	farmhouse	Domestic	Unevaluated	Project Area
Lincoln	LN-SHK-002	New Grove School	Education	Unevaluated	Project Area
Lincoln	LN-SHK-003	District School No. 20	Education	Unevaluated	Project Area
Lincoln	LN-SHK-006	Bridge No. 2755	Transportation	Unevaluated	Project Area

Table 8.16: Previously Reported Architecture Resources within the Project and 1-mile Buffer

County	Architecture Inventory Number	Property Name	Property Category	NRHP Eligibility Recommendation	Project Area/Buffer
Lincoln	LN-ALT-001	Ash Lake Township Hall	Government	Unevaluated	Buffer
Lincoln	LN-IVC-001	Geo Graff House	Domestic	Unevaluated	Buffer
Lincoln	LN-IVC-002	house	Domestic	Unevaluated	Buffer
Lincoln	LN-IVC-003	house	Domestic	Unevaluated	Buffer
Lincoln	LN-IVC-004	house	Domestic	Unevaluated	Buffer
Lincoln	LN-IVC-005	school	Education	Unevaluated	Buffer
Lincoln	LN-IVC-006	house	Domestic	Unevaluated	Buffer
Lincoln	LN-IVC-007	house	Domestic	Unevaluated	Buffer
Lincoln	LN-IVC-008	house	Domestic	Unevaluated	Buffer
Lincoln	LN-IVC-009	house	Domestic	Unevaluated	Buffer
Lincoln	LN-IVC-010	Ivanhoe Methodist Church	Religion	Unevaluated	Buffer
Lincoln	LN-IVC-011	bandstand	Recreation & Culture	Unevaluated	Buffer
Lincoln	LN-IVC-012	Ivanhoe Creamery	Agricultural Processing	Considered Eligible	Buffer
Lincoln	LN-IVC-013	commercial building	Commerce	Unevaluated	Buffer
Lincoln	LN-IVC-014	commercial building	Commerce	Unevaluated	Buffer
Lincoln	LN-IVC-015	Funeral Home	Funerary	Unevaluated	Buffer
Lincoln	LN-IVC-016	Lincoln County Courthouse and Jail	Government	NRHP Listed	Buffer
Lincoln	LN-MRB-001	Marble Lutheran Church	Religion	Unevaluated	Buffer
Lincoln	LN-MRB-002	Marble Township Hall	Government	Unevaluated	Buffer
Lincoln	LN-SHK-004	Shaokatan Township Hall	Government	Unevaluated	Buffer
Lincoln	LN-SHK-005	Thompsonburg	Landscape	Unevaluated	Buffer
Brookings	BK00001058	farmstead	Domestic	Unevaluated	Buffer
Brookings	BK00001244	house	Domestic	Not Eligible	Buffer
Brookings	BK00001249	house	Domestic	Not Eligible	Buffer
Brookings	BK00001251	Hexem Farmstead	Domestic	Considered Eligible	Buffer
Brookings	BK00001261	house	Domestic	Unevaluated	Buffer

Table 8.16: Previously Reported Architecture Resources within the Project and 1-mile Buffer

County	Architecture Inventory Number	Property Name	Property Category	NRHP Eligibility Recommendation	Project Area/Buffer
Brookings	BK00001268	house	Domestic	Unevaluated	Buffer
Brookings	BK00001269	house	Domestic	Not Eligible	Buffer
Brookings	BK00001270	house	Domestic	Unevaluated	Buffer
Brookings	BK00001272	house	Domestic	Not Eligible	Buffer
Brookings	BK00001280	house	Domestic	Unevaluated	Buffer
Brookings	BK00001339	house	Domestic	Not Eligible	Buffer
Brookings	BK00001350	farmstead	Domestic	Not Eligible	Buffer
Brookings	BK00001372	house	Domestic	Not Eligible	Buffer
Brookings	BK05000001	farmstead	Domestic	Not Eligible	Buffer
Brookings	BK05100001	house	Domestic	Not Eligible	Buffer

Six architecture resources are located within the Project Area (Figures 12a-12d). Two of these resources (LN-HNT-001 and SHK-001) are domestic farmsteads; two resources (LN-ROY-002 and LN-SHK-006) are transportation bridges; and the final two resources (LN-SHK-003 and LN-SHK-003) are schoolhouses. None of the six architecture resources located within the Project Area have been evaluated for the NRHP.

One previously reported archaeological site has been recorded within the Project Area, and 12 sites are located within the 1-mile study area; therefore, it is likely that undiscovered archaeological sites exist within the Project Area. Furthermore, the sizable number of previously recorded architecture inventory resources identified within the Project Area and 1-mile buffer indicate a strong historic European American presence in the Project vicinity.

8.6.2 Impacts

Archaeological resources could be impacted directly during the construction of a wind energy facility. However, the Project has been designed to avoid impacts to previously reported archaeological resources within the Project Area. Construction within the turbine footprint, cable trenching, access roads, and borrow areas could impact archaeological resources. In addition, construction of turbines or other protruding structures may impact view shed integrity from existing architecture inventory resources.

Project notification comment request letters were sent to the Minnesota SHPO and OSA on February 8, 2017. Blazing Star 2 received a response from SHPO dated March 7, 2017 (Appendix D). The Minnesota SHPO recommended that a Phase 1A Cultural Resources Background Literature Review be conducted to assess the need and provide potential scope definition for an archaeological resources survey be completed prior to Project construction.

8.6.3 Mitigative Measures

It is likely that the Project Area has potential to contain archaeological resources. These archaeological resources would most likely be located on or near elevated landforms and areas near permanent water sources. In addition, the high number of recorded architecture inventory resources in the study area imply that additional resources of these types and ages may be present within the Project Area. Blazing Star 2 will conduct a Phase I archaeological resources inventory and work cooperatively with SHPO and OSA.

The archaeological resource inventory will focus on areas proposed for Project construction, including wind turbine locations, associated access roads, electrical cable routes, and other construction elements. These investigations will be conducted by a professional archaeologist meeting the Secretary of the Interior's Standards for Archaeology as published in Title 36 Code of Federal Regulations Part 6. Survey strategies (pedestrian and/or shovel probing and/or deep testing) for the archaeological resource inventory will depend on surface exposure and the characteristics of the landforms proposed for development. After receiving the proposed turbine, access road, and electrical cable layouts, archaeologists will design an appropriate survey strategy for archaeological resources. This proposed survey strategy will be shared with SHPO to gather their input on the methodology prior to completing the study. Higher potential areas for archaeological resources will most likely include portions of the Project Area near a permanent water source, and areas of higher elevation.

If archaeological resources are identified during the survey, an archaeologist will identify the location and record Universal Transverse Mercator coordinates so that Project construction layout can consider the location and adjust construction plans if desired. If Project construction plans cannot be adjusted, further investigation of the resource may be needed and further coordination with SHPO and possibly OSA will be required if human remains may be present. This additional investigation would be described and documented on a case by case basis. The results of the investigation will be compiled and documented in a report or reports and shared with SHPO.

8.7 Recreation

8.7.1 Description of Resource

Recreational opportunities in Lincoln County include hiking, biking, boating, fishing, camping, swimming, horseback riding, cross country skiing, snowmobiling, hunting, and nature viewing. Figures 7a-7d depict the locations of AMAs, WMAs, SNAs, WPAs, and NWRs near the Project Area.

Minnesota AMAs are managed to protect, develop, and manage lakes, rivers, streams, and adjacent wetlands 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 two AMAs within ten miles of the Project Area: the Stay Lake AMA is located approximately three miles east on the west side of Stay Lake and immediately north of Arco, and the Benton Lake AMA is located approximately 4.5 miles south on the south side of Lake Benton.

Minnesota WMAs are managed to provide wildlife habitat, improve wildlife production, and provide public hunting and trapping opportunities. These MN DNR lands were acquired and developed primarily with hunting license fees. WMAs are closed to all-terrain vehicles and horses because of potential detrimental effects on wildlife habitat. There are 17 WMAs within the Project Area and one WMA immediately adjacent to the Project Area. WMAs located within ten miles of the Project Area boundary are included in Table 8.17.

Table 8.17: Wildlife Management Areas within Ten Miles of the Project Area Boundary

Distance from Project Area Boundary (mi)	WMA Name	General Location	WMA Area (Acres)
Within	Anderson Lake WMA	Within	592.0
Within	Ash Lake WMA	Within	300.0
Within	Blue Wing WMA	Within	57.5
Within	Bossuyt WMA	Within	82.1
Within	Chain-O-Sloughs WMA (multiple parcels)	Within/Adjacent	281.1
Within	Christine WMA	Within	41.3
Within	Emerald WMA	Within	77.4
Within	Expectation WMA	Within	47.4
Within	Herschberger WMA (multiple parcels)	Within	242.4
Within	Iron Horse WMA	Within	32.5
Within	Ivanhoe WMA	Within	381.8
Within	Legacy WMA	Within	164.7
Within	Muskrat Junction WMA	Within	14.3
Within	Pothole WMA	Within	49.6

Table 8.17: Wildlife Management Areas within Ten Miles of the Project Area Boundary

Distance from Project Area Boundary (mi)	WMA Name	General Location	WMA Area (Acres)
Within	Shaokatan WMA	Within	489.9
Within	Ten Sloughs WMA	Within	49.6
Within	Weeks WMA	Within	102.7
Adjacent	Horse Slough WMA	South	22.8
0.1	Spanton WMA	East	48.3
0.2	Kvernmo WMA	West	101.9
0.3	Prairie Dell WMA (multiple parcels)	North	199.6
0.5	Hendricks WMA (multiple parcels)	North	113.6
1.0	Suhr WMA	South	7.4
1.0	Two Sloughs WMA	South	17.0
1.1	Clare Johnson WMA	North	119.5
1.3	Collinson WMA	South	86.6
1.3	Collaris WMA	North	73.3
1.4	Richard J. Dorer WMA	North	338.5
1.5	Chen Bay WMA	South	257.3
1.6	Poposki WMA (multiple parcels)	East	287.6
1.7	Platyrchnchos WMA	North	85.2
1.9	Coot WMA (multiple parcels)	East	347.7
2.8	Archerville WMA	North	236.8
2.9	Rogge WMA	East	105.4
3.0	Hawks Nest WMA	East	2.8
3.2	Colinoso WMA	North	80.5
3.4	Thostenson WMA	East	160.8
3.5	Pato WMA	North	18.8
4.0	Rost WMA (multiple parcels)	East	250.6
4.0	Salix WMA	East	85.6
4.1	Sioux Lookout WMA	South	83.1
4.2	Sokota WMA	North	143.9
4.3	Boone Slough WMA (multiple parcels)	North	70.6
4.4	Marshfield WMA	Southeast	74.7
4.9	Hansonville WMA	Northwest	34.7
5.3	Bohemian WMA (multiple parcels)	Northwest	664.7
6.0	Discors WMA	Southeast	43.3

Table 8.17: Wildlife Management Areas within Ten Miles of the Project Area Boundary

Distance from Project Area Boundary (mi)	WMA Name	General Location	WMA Area (Acres)
6.1	Dead Coon Marshes WMA (multiple parcels)	East	101.3
6.3	Tyler WMA	Southeast	401.1
6.7	Muldental WMA	East	27.1
6.7	Antler WMA	Northeast	174.3
6.9	Saum Memorial WMA	Northwest	80.6
7.3	Coon Creek WMA	East	1049.3
7.4	Hole-In-Mountain WMA (multiple parcels)	South	638.2
7.4	Tatley WMA	Northwest	323.3
7.5	Minn-kota WMA	Northwest	137.7
7.8	Norgaard WMA	Southeast	21.1
8.0	Bosque WMA	East	292.8
8.1	Tillemans WMA	East	155.3
8.3	Penthole WMA	Northwest	31.1
8.5	Schindel WMA	South	156.3
8.8	Sioux Prairie WMA	East	389.7
8.8	Middle Antelope Valley WMA	Northeast	379.6
8.9	Upper Antelope Valley WMA	Northeast	161.4
9.0	Sioux Nation WMA	Northwest	486.8
9.0	Elmer Weltz WMA	East	160.7
9.0	Benjamin Thovson Memorial WMA	Northeast	150.6
9.3	Lower Antelope Valley WMA	Northeast	220.6
9.3	Furgamme WMA	East	152.0
9.5	Coteau Pit WMA	South	80.8
9.6	Reserve WMA	North	133.2
9.7	Altona WMA	South	552.0

SNAs are areas designated to protect rare and endangered species habitat, unique plant communities, and significant geologic features that possess exceptional scientific or educational values. There is one SNA located within ten miles of the Project Area: the Antelope Valley SNA is located approximately 9.3 miles northeast of the Project (Figures 7a-7d).

WPAs are managed to protect breeding, forage, shelter, and migratory habitat for waterfowl or wading birds, such as ducks, geese, herons, and egrets. WPAs provide opportunities for viewing

wildlife and intact ecosystems. WPAs located within ten miles of the Project boundary are shown on Table 8.18.

Table 8.18: Waterfowl Production Areas within Ten Miles of the Project Area Boundary

Distance from Project Area Boundary (mi)	WPA Name	General Location	WPA Area (Acres)
Within	Agribank WPA	Within	71.1
Adjacent	Unnamed	Adjacent	40.3
Adjacent	Unnamed	Adjacent	60.4
Adjacent	Unnamed	Adjacent	161.2
0.2	Unnamed WPA	South	166.3
0.5	Shaokatan WPA	South	81.5
1.0	Unnamed WPA	East	163.9
1.0	Christianson WPA	East	41.1
1.0	Weber WPA	South	160.2
1.4	Fox WPA (2 parcels)	South	146.2
2.3	Unnamed WPA	North	162.5
3.1	Johnson WPA	West	132.0
3.6	Bjornlie WPA	West	539.8
3.9	Black Slough WPA (2 parcels)	West	280.5
4.4	Johnson II (H) WPA	West	119.0
4.8	Elmore WPA	West	18.9
5.1	Anderson WPA	North	57.0
5.6	Rottum WPA	West	83.4
6.4	Adams WPA	West	67.9
7.1	Coon Creek WPA (2 parcels)	East	256.8
7.6	Montgomery WPA	West	29.8
7.8	Milton WPA	West	30.5
7.9	Swedzinski WPA	Northeast	84.5
8.0	Arends WPA (3 parcels)	Northeast	319.4
9.2	Yellow Medicine River	East	297.3
9.4	Johnson I (W) WPA	Northwest	69.1
10.0	Dakota WPA	Northwest	148.0

The Northern Tallgrass Prairie NWR was established to address the loss of America's grasslands and the decline of grassland wildlife. The NWR provides habitat for a number of grassland

dependent species. Easements and purchased lands are managed or overseen by the NWR or wetland management district office covering the area where the lands are located. As previously mentioned in Section 8.2.2, there are two NWR easements in the northeastern portion of the Project. NWR lands located within ten miles of the Project boundary are shown on Figures 7a-7d.

The MN DNR offers a Walk-In Access ("WIA") Program for public hunting on private land. There are 6 WIA parcels within the Project Area covering 386 acres. Two WIA parcels also overlap as RIM easements. WIA areas are shown on Figures 7a-7d. The WIA Program includes walk-in agreements with the landowner that typically last one to three years.

As described in Section 8.4, a section of the Lincoln County Snowmobile Trail bisects the Project along MN 19 and another along US 75.

8.7.2 Impacts

The Project will avoid all WMAs, SNAs, and NWR lands. There is one turbine and associated access road sited in a WIA. Additionally, a portion of another access road crosses a WIA to a turbine not within a WIA. The Applicant may need to modify WIA areas on a temporary basis for the safety of the construction and operation staff. This could include temporary closures of WIAs. WIAs are typically subject to one-to three-year contracts; as such, access changes from year to year based on landowner interest. Any access disruptions associated with the Project would be typical of normal WIA management.

Blazing Star 2 will work with the Lincoln County Drift Clipper snowmobile club to determine if rerouting of the path is needed and facilitate any modifications.

Other recreational impacts will be visual in nature affecting individuals using public land near the Project Area for recreation. See Section 8.4 for additional discussion of visual impacts and proposed mitigative measures. Visual impacts will be most evident to visitors using any WMA, WPA, or snowmobile trail within a 1- to 4-mile radius of the Project Area.

8.7.3 Mitigative Measures

Project turbines and facilities will not be located within public parks, trails, WMAs, or in USFWS lands. 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 Commission siting guidelines (Commission, 2008). The Applicant will work with the landowner and MN DNR to address safety issues associated with WIA areas and snowmobile trails. Blazing Star 2 will work with the Lincoln County Drift Clipper snowmobile club to determine if rerouting of the path is needed and to facilitate any modifications.

8.8 Public Health and Safety

8.8.1 Electromagnetic Fields and Stray Voltage

8.8.1.1 Description of Resource

The term electromagnetic field ("EMF") refers to electric and magnetic fields that are present around any electrical device. Electric fields arise from the voltage or electrical charges and magnetic fields arise from the flow of electricity or current that travels along transmission lines, power collection (feeder) lines, substation transformers, house wiring, and electrical appliances. The intensity of the electric field is related to the voltage of the line and the intensity of the magnetic field is related to the current flow through the conductors (wire). EMF can occur indoors and outdoors. However, there are no discernible health impacts from power lines (NIEH, 1999). The proposed interconnection transmission line will be located adjacent to the O&M facility. Wind turbine generators and associated interconnection cables will be setback from residences in excess of state standards, where EMF will be at background levels.

In those instances where distribution lines have been shown to contribute to stray voltage, the electric distribution system directly serving the farm or the wiring on a farm was directly serving the farm or the wiring on a farm was directly under and parallel to the transmission line. These circumstances are considered in installing transmission lines and can be readily mitigated. Problems related to distribution lines are also readily managed by correctly connecting and grounding electrical equipment.

8.8.1.2 Impacts

While the general consensus is that electric fields pose no risk to humans, the question of whether or not exposure to magnetic fields potentially causes biological responses or even health effects continues to be the subject of research and debate. EMF from underground electrical collection lines dissipates very close to the lines because they are installed below ground within insulated shielding. The electrical fields are negligible, and there is a small magnetic field directly above the lines that, based on engineering analysis, dissipates within 20 feet on either side of the installed cable. EMF associated with the transformers at the base of each turbine completely dissipates within 500 ft, so the 1,000 ft turbine setback from residences will be adequate to avoid any EMF exposure to homes.

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 the earth 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. Stray voltage is a particular concern for dairy farms because it can impact operations and milk production. Problems are usually related to the distribution and service lines directly serving the farm or the wiring on a farm affecting confined farm animals.

8.8.1.3 Mitigative Measures

No impacts due to EMFs or stray voltage are anticipated and no mitigation is proposed. Blazing Star 2 is committed to siting turbines and associated facilities to avoid conflicts with dairy farmers in the Project Area.

8.8.2 Air Traffic

8.8.2.1 Description of Resource

There are two public airports and three private airports/heliports within 20 miles of the Project Area (Table 8.19; AirNav, 2017). The nearest airport is Mulder Field Inc. Airport, located approximately 1.6 miles east of the Project Area.

Table 8.19: Airports within 20 Miles of the Project Area Boundary

Airport Name	City	County, State	Distance [a]	Runway Information [b]	Runway Elevation (feet) [c]
Mulder Field Inc Airport [d]	Ivanhoe	Lincoln, MN	1.6 miles E	Turf, fair	1,669
Tyler Municipal	Tyler	Lincoln, MN	6.2 miles SE	Turf, fair	1,742
Sanford Canby Medical Center Heliport [d]	Canby	Yellow Medicine, MN	8.4 miles N	90 X 90 ft concrete	1,244
Myers Field	Canby	Yellow Medicine, MN	9.5 miles N	Asphalt, good	1,194
Koch's Personal Field Airport [d]	Taunton	Yellow Medicine, MN	12.4 miles NE	Turf	1,130

[a] *Distance in miles from the nearest portion of the Blazing Star 2 Wind Project boundary.*
[b] *Runway surface type and condition.*
[c] *Elevation in feet at the highest point on the centerline of the useable landing surface. Measured to the nearest foot with respect to mean sea level.*
[d] *Private airport/heliport*

Air traffic may be present near the Project Area for crop dusting of agricultural fields. Crop dusting is typically carried out during the day by highly maneuverable airplanes or helicopters. The installation of wind turbine towers in active croplands and installation of aboveground collection lines, if needed, will create a potential for collisions with crop-dusting aircraft. However, aboveground collection lines are expected to be similar to existing distribution lines (located along the edges of fields and roadways) and the turbines themselves would be visible from a distance and lighted according to FAA guidelines. Blazing Star 2 has filed applications with the FAA for Determinations of No Hazard for turbine positions. In the FAA's review of Blazing Star 2's proposed layout the FAA identified a potential impact to Tyler Radar.

8.8.2.2 Impacts

The closest public airport to the proposed wind farm is the Tyler Municipal airport, located approximately 6 miles from the Project Area. Blazing Star 2 will coordinate with the Tyler Municipal airport, the FAA, and MN DOT prior to construction to understand potential impacts.

The Project will be reviewed by the FAA, and a "No Hazard" issuance determination is expected. The FAA review will be for turbines with total height of up to 499 feet. If taller turbines are used or if the project layout changes from what had been provided to the FAA, the Project will re-file with the FAA for the changes. The wind and meteorological towers will have lighting to comply with FAA requirements.

The installation of wind turbine towers in active croplands and installation of aboveground collection lines, if needed, will create a potential collision risk with crop-dusting aircraft. However, aboveground collection lines are expected to be similar to existing distribution lines (located along the edges of fields and roadways). The Applicant will notify local airports about the Project including locations of new towers in the area to minimize impacts and reduce potential risks to crop dusters.

The Applicant has prescreened the Project Area using the tools available on the FAA's Obstacle Evaluation website. A potential impact to the operation of the Tyler Radar facility has been identified. As described in further detail below, Blazing Star 2 is working with the Department of Defense ("DoD") on a final mitigation and voluntary contribution agreement for the facility.

8.8.2.3 Mitigative Measures

The Applicant will mark and light the turbines to comply with FAA requirements. The Applicant will paint meteorological towers red at the top to improve visibility and will notify local airports about the Project and new towers in the area to reduce the risk to crop dusters. Blazing Star 2 will work with landowners on coordinating crop dusting activities. Permanent meteorological towers will be freestanding with no guy wires. Temporary meteorological towers will have supporting guy wires which will be marked with safety shields (colored balls) for increased visibility.

Blazing Star 2 has been working with DoD on a final mitigation and voluntary contribution agreement for the Tyler radar facility. Blazing Star 2 and DoD will agree upon a scope of study that will reflect the turbine layout that Blazing Star 2 intends to build. This scope of study will then create the base line for the limitations within the final agreement regarding size and movement of turbines. The DoD's proposed mitigation of the Tyler Radar facility impact includes:

1- Limiting the number of wind turbines in the Project to those filed by the Project on the FAA's 7460-1 Obstruction Evaluation forms and the wind turbine blade tip heights for the Project to no more than 499 feet above ground level.

2- Limiting changes in location to no greater than 500 feet laterally in any direction from those locations filed by the Project on the FAA's 7460-1 Obstruction Evaluation forms without prior written agreement from the DoD and the Air Force.

3- Voluntary contribution of funding to mitigate wind-turbine induced degradation to performance of the Common Air Route Surveillance Radar.

4- Curtail as needed during the DoD's test period and during times of emergency as identified by the DoD to ensure that their radar mitigation is operating properly.

8.8.3 Safety and Security

8.8.3.1 Description of Resource

The Project is located in a rural setting. Construction and operation of the Project will have minimal impacts on the security and safety of the local populace. Blazing Star 2 is gathering information to coordinate with all emergency and non-emergency response teams for the area, including law enforcement agencies, ambulance services, fire departments, and 911 services.

8.8.3.2 Impacts

Project construction and operation will have no significant impact to security and safety of local residents. In some past wind farm projects, wind turbines have posed hazards to human safety from tower collapse and blade throw, typically as a result of seismic events. The Project Area is within a region considered to have low seismic activity (Gomberg and Schweig, 2002). Furthermore, modern turbine technology, in addition to proactive maintenance and inspections, has reduced these risks to insignificant rates.

In the event that emergency services are needed for local residents during construction, construction will stop, and any impeding equipment will be relocated so that emergency vehicles may access the emergency site. Once construction is complete, the Project will not impede emergency services.

8.8.3.3 Mitigative Measures

Blazing Star 2 and its construction team will coordinate with first responders, including but not limited to air ambulance, local sheriff's office(s) and local fire services, to develop a safety plan during construction and operations of the Project. Blazing Star 2 will also be in contact with local first responders to offer information about the Project and to answer any questions response teams may have regarding Project plans and details. Blazing Star 2 will also coordinate with Gopher State One Call and the pipeline companies before construction begins.

The following security measures will be taken to reduce the chance of physical and property damage, as well as personal injury, at the site:

- The towers will be setback from occupied homesteads as described in this Application and the applicable regulations identified herein. These distances are

considered to be safe based on developer experience, and are consistent with prior LWECS site permits.

- Security measures will be taken during the construction and operation of the Project including temporary (safety) and permanent fencing, warning signs, and locks on equipment and wind power facilities.
- Regular maintenance and inspections will address potential blade failures, minimizing the potential for blade throw.
- Turbines will sit on solid steel enclosed tubular towers within which all electrical equipment will be located, except for the pad-mounted transformer where applicable. Access to the interior of the tower is only through a solid steel door that will be locked when not in use.
- Permanent meteorological towers will be free-standing. The guy wires on temporary meteorological towers will have color sleeves at ground level to increase visibility.
- Where necessary or requested by landowners, the Applicant will construct gates or fences.
- Safety training and standardized practices will be conducted for construction crews and on-site personnel.

8.9 Hazardous Materials

8.9.1 Description of Resources

The land within the Project Area is primarily rural and used for agriculture. Potential hazardous materials within the Project Area would be associated with agricultural activities, and include petroleum products (fuel and lubricants), pesticides, and herbicides. Older farmsteads may also have lead-based paint, asbestos shingles, and polychlorinated biphenyls in transformers. Trash and farm equipment dumps are common in rural settings.

As part of the Project financing process, an ASTM E 1527-05 conforming Phase I environmental site assessment (“Phase I ESA”) will be conducted for the Project Area. The Phase I ESA will identify known recognized environmental conditions or historical recognized environmental conditions that may require additional action prior to or during construction.

Three types of petroleum product fluids are necessary for the operation of each turbine and include:

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

These wastes will be managed and, if disposal is necessary, disposed of in compliance with the requirements of applicable laws and regulations

8.9.2 Impacts

The Applicant will conduct a Phase I ESA prior to construction to locate and avoid hazardous waste sites.

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

Spill-related impacts from construction are primarily associated with fuel storage, equipment refueling, and equipment maintenance. To avoid spill-related impacts, the Applicant will develop a Spill Prevention, Control and Countermeasures ("SPCC") Plan that will outline measures that will be implemented to prevent accidental releases of fuels and other hazardous substances and describes response, containment, and cleanup procedures.

8.9.3 Mitigative Measures

Because any potential hazardous waste sites identified will be avoided, no mitigative measures are necessary. If any wastes, fluids, or pollutants are generated during any phase of the operation of the Project, they will be handled, processed, treated, stored, and disposed of in accordance with Minnesota Rules Chapter 7045.

8.10 Land-Based Economies

8.10.1 Agriculture/Farming

8.10.1.1 Description of Resources

The majority of the Project Area is in agricultural use, as shown in Figures 13a-13d. Cultivated land comprises approximately 38,138 acres (66 percent) of the Project Area. Pasture/hay lands comprise approximately 6,010 acres (11 percent) of the Project Area. Corn, soybeans, small grains, and forage crops are grown throughout Lincoln County and represent 68 percent of the agricultural market for the County. While feeding cattle and hogs, raising livestock, and dairy farming are major sources of income they represent a combine 32 percent of the county agricultural market. Within the Project Area, the trend has been toward fewer individual farms and an increase in farms of greater acreage (U.S. Department of Agriculture ("USDA"), 2012). Converting cropland to the Conservation Reserve Program ("CRP") and the RIM program is another source of farm income. CRP and RIM lands are cropland planted to conservation grasses and legumes to protect and improve the soil with limited harvesting or pasturing allowed on CRP land. CRP land is enrolled for 10-year periods, whereas RIM conservation easements are permanent.

Approximately 61% of the soil within the Project Area is prime farmland. The USDA Natural Resource Conservation Service ("NRCS") identifies prime farmland as land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. It could be cultivated land, pasture land, forestland,

or other land. Important farmlands consist of prime farmland, unique farmland, and farmland of statewide or local importance (USDA, 2017).

8.10.1.2 Impacts

The presence of the Project will not significantly impact the agricultural land use or general character of the area. As demonstrated by other wind energy projects in the Midwest, agricultural practices continue during construction and operations.

Land will be taken out of agricultural production where the turbines and access roads are located (approximately 0.5 to 1 acre per turbine). Landowners may continue to plant crops near and graze livestock up to the turbine pads. In some instances, agricultural practices will be impacted by requiring new maneuvering routes around the turbine structures for agricultural equipment.

When construction occurs outside of winter months, temporary impacts to agriculture become more likely. These temporary impacts could include, but are not limited to, loss of planting opportunity, crop damage, drain tile damage, and soil compaction.

Specific impacts to agricultural lands will be determined once turbine model, turbine and road placement, and substation, O&M facility locations have been finalized. Approximately 61 percent of the soil within the Project Area is considered prime farmland. Table 8.20 summarizes the impacts to prime farmland for each turbine model under consideration. Note that the maximum estimate of prime farmland impacts is for the Vestas V110 layout, which has the highest number of turbines. The loss of agricultural land to the construction of the wind farm will reduce the amount of land that can be cultivated. Less than one half of one percent of the Project Area will be converted to non-agricultural land use. This will not significantly alter crop production in the Project Area or Lincoln County.

Table 8.20: Summary of Prime Farmland Impacts

	All Areas Prime Farmland		Prime Farmland if Drained		Farmland of Statewide Importance		Not Prime Farmland		Total Acres Impacted
	# Turbines	Acres	# Turbines	Acres	# Turbines	Acres	# Turbines	Acres	
Gamesa G126	51	13.3	17	4.2	7	1.9	1	0.3	19.7
Gamesa Access Roads	NA	29.6	NA	13.6	NA	3.7	NA	1.0	47.9
Acciona 3.0-132	48	12.2	12	3.2	6	1.7	1	0.3	17.4
Acciona Access Roads	NA	26.2	NA	11.5	NA	3.0	NA	1.00	41.7
GE 2.3-116	58	14.8	14	3.7	7	1.9	1	0.3	20.8
GE Access Roads	NA	29.3	NA	12.6	NA	3.5	NA	0.90	46.3
Vestas V110	71	18.1	18	4.9	9	2.4	2	0.5	26.0
Vestas Access Roads	NA	36.5	NA	15.8	NA	4.5	NA	1.0	57.8

Table 8.20: Summary of Prime Farmland Impacts

	All Areas Prime Farmland		Prime Farmland if Drained		Farmland of Statewide Importance		Not Prime Farmland		Total Acres Impacted
	# Turbines	Acres	# Turbines	Acres	# Turbines	Acres	# Turbines	Acres	
Project Substation	NA	9.8	NA	1.1	NA	0.0	NA	0.0	10.9

[1] *In some instances, turbine pads impact more than one prime farmland type. Number of Turbines represent the prime farmland type most impacted per turbine*
[2] *Acres impacted are based on 60 foot turbine radius*
[3] *The O&M facility location is pending; therefore, prime farmland impacts were not calculated at this time*

Turbine and facility siting will include discussions with property owners to identify features on their property, including drain tile, which should be avoided. Impacts to drain tile due to Project construction and operation are not anticipated. However, in the event that there is damage to drain tile as a result of construction activities or operation of the LWECS, the tile will be repaired according to the agreement between the Applicant and the owner of any damaged tile. The Applicant will also strive to minimize impacts to CRP land and avoid all impacts to RIM lands.

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 the earth 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 currents, EMF, or earth currents. Stray voltage is a particular concern for dairy farms because it can impact operations and milk production. Problems are usually related to the distribution and service lines directly serving the farm or the wiring on a farm affecting confined farm animals. In those instances where distribution lines have been shown to contribute to stray voltage, the electric distribution system directly serving the farm or the wiring on a farm was directly under and parallel to the transmission line. These circumstances are considered in installing transmission lines and can be readily mitigated. Problems related to distribution lines are also readily managed by correctly connecting and grounding electrical equipment. Blazing Star 2 recognizes that this issue may occur, and is committed to siting turbines and power lines to avoid conflicts with dairy farms in the Project Area.

8.10.1.3 Mitigative Measures

Only the land for the turbine, certain electrical equipment, and access roads will be taken out of crop production. Once the wind turbines are constructed, all land surrounding the turbines and access roads may still be farmed. The permanent loss of up to 92 acres of agricultural land will not result in the loss of any agriculture-related jobs and no net loss of income. Revenue lost from the removal of land from agricultural production will be offset by lease payments to landowners hosting the Project facilities.

Blazing Star 2 will coordinate with property owners to identify features on their property, including drain tile, which should be avoided. Any permanent impact to drain tile will be avoided by Blazing Star 2. Although avoidance of drain tile is a goal, Blazing Star 2 recognizes that by the excavation and heavy equipment associated with construction may cause damage to known or unknown drain tiles. In the event that there is damage to drain tile as a result of construction activities or operation of the Project, the Applicant will work with affected property owners to repair the damaged drain tile in accordance with the Land Lease and Wind Easement Agreement between Blazing Star 2 and the landowner.

The Applicant will minimize impacts to CRP land and avoid all impacts to RIM lands. If CRP land is impacted, the Applicant will work with the landowner and the NRCS to remove the impacted portion of the enrolled parcel from the CRP program. There will be no impacts to RIM land; therefore, no mitigation will be necessary.

8.10.2 Forestry

8.10.2.1 Description of Resources

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

8.10.2.2 Impacts

No impacts are anticipated to forestry resources. Since a majority of the woodlots are associated with homesteads, no impacts are anticipated to woodlots.

8.10.2.3 Mitigative Measures

No impacts to forestry resources are anticipated. No mitigation will be necessary.

8.10.3 Mining

8.10.3.1 Description of Resources

Sand and gravel resources occur in glacial till and outwash deposits. Many of the pits are inactive, abandoned, or their use is limited to the landowner. Based on MN DOT County Pit Maps and topographic maps for the Project Area, there are three active gravel pits located within the Project Area (MN DOT, 2015).

8.10.3.2 Impacts

Negative impacts to mining are not anticipated. Sand and gravel operations tend to be small and other occurrences of these materials are likely to be present in nearby areas, including large commercial operations in the general area.

8.10.3.3 Mitigative Measures

Turbines will not be located within sand and gravel operations. No impacts to mining resources are anticipated, and as such, no mitigation will be necessary.

8.11 Tourism

8.11.1 Description of Resources

Tourism in Lincoln County focuses on promoting the area's parks, historical and cultural features (museums, art, and hospitality facilities) and recreation activities (parks, camping, wildlife refuges, snowmobiling, golf courses, swimming pools, and specialty shops). The County hosts a variety of festivities and cultural events throughout the year.

8.11.2 Impacts

As all Project facilities will be located on private lands, there will be no direct impacts to recreational facilities, public lands, or other tourism-related activities. Proposed setbacks from recreational trails, public roads, and non-leased properties (including public lands) will minimize any indirect impacts. The Project is not anticipated to have a significant effect on area tourism.

8.11.3 Mitigative Measures

No impacts to tourism are anticipated. No mitigation will be necessary.

8.12 Local Economies

8.12.1 Description of Resources

According to the Lincoln County 2008 Comprehensive Land Use Plan, the county's economic growth will be supported by two basic approaches. The first is to promote development of exportable commodities through new industrial efforts. The second is to support increased capacities in existing industries (Lincoln County, 2009). The Project will support both facets of economic growth.

According to the 2010 U.S. Economic Census (U.S. Census Bureau, 2010), the largest industries employing residents of Lincoln County are education, health care and social services (combined 25.6%) and agriculture and mining (combined 16.0%). The 2010 per capita income for Lincoln County was $24,922. Four of the seven townships included in the Project Area (Diamond Lake, Hendricks, Marble, and Royal) exhibited a per capita income level greater than that of Lincoln County (Table 8.21). The remaining three townships (Ash Lake, Dramman, and Shaokatan) exhibited a per capita income level lesser than that of Lincoln County. The per capita income level does not appear to impact relative poverty levels for the county. Dramman Township has a lower rate of persons living below the poverty level (3.6%) than Lincoln County as a whole (9.3%). Hendricks Township, however, has a higher percentage of poverty than Lincoln County at 13.4 percent.

Table 8.21: Per Capita Incomes in the Project Vicinity

	2010 Per Capita Income Level	% Above/(Below) County
Lincoln County	**$24,922**	
Ash Lake Township	$21,648	(13.14%)
Diamond Lake Township	$27,616	10.81%
Dramman Township	$24,066	(3.43%)
Hendricks Township	$27,486	10.29%
Marble Township	$31,519	26.47%
Royal Township	$25,990	4.29%
Shaokatan Township	$21,034	(15.60%)

Community benefits associated with Blazing Star 2 closely correspond with Goals 1 and 2 of the Economic and Community Development chapter of the Lincoln County Comprehensive Land Use Plan. Goal 1 promotes the diversification of economic development in the agricultural sector. Goal 2 promotes efforts to attract additional employment opportunities and tax revenues while retaining and growing the existing business base. The Project provides citizens of the county, landowners, and farmers with opportunities for additional, higher revenues by participating in the generation of wind energy; creating jobs and economic opportunities as a result. Hence, wind energy harvesting provides a new investment opportunity in the county. Lincoln County has supported the wind generating component of aforementioned goals by instituting a Wind Energy Conversion System Ordinance for SWECS in anticipation of wind development opportunities within the county.

8.12.2 Tax Payments

Long-term beneficial impacts to the county's tax base as a result of the construction and operation of the Project will contribute to improving the local economy in this area of Minnesota. In addition to the creation of jobs and personal income, the Project will pay a Wind Energy Production Tax to the local units of government of $0.0012 per kWh of electricity produced, resulting in an annual Wind Energy Production of approximately $900,000.

8.12.3 Impacts

Local contractors and suppliers will be used for portions of the construction. Total wages and salaries paid to contractors and workers in Lincoln County will contribute to the total personal income of the region. Additional personal income will be generated for residents in the county and state by circulation and recirculation of dollars paid out by the Applicant for business expenditures and for state and local taxes. Expenditures made for equipment, fuel, operating supplies, and other products and services benefit businesses in the county and the state.

The Project provides landowners and farmers with opportunities for higher agricultural profitability and a more diverse revenue stream. Wind energy is an income-generating opportunity that will provide a long-term, annual benefit to landowners who have chosen to participate in the Project. Landowners having turbine or other Project facilities on their land will receive a royalty or lease payment annually for the life of the Project. This payment diversifies and strengthens the local economy as discussed below.

8.12.4 Mitigative Measures

Socioeconomic impacts associated with the Project will be primarily positive with an influx of wages and expenditures made at local businesses during Project construction and an increase in the counties' tax bases from the construction and operation of the wind turbines.

8.13 Topography

8.13.1 Description of Resources

The Project is located in the Coteau Moraines subsection of the MN DNR's Ecological Classification System (MN DNR, 2009). Subsection boundaries delineate a significant regional change in geology, topography, and vegetation. The Coteau Moraines subsection consists of a high glacial landform occupying portions of southwestern Minnesota and extending into southeastern South Dakota and northwestern Iowa. The highest elevation is 1,995 feet above sea level which is situated at Buffalo Ridge in northern Pipestone County. The maximum elevation is the result of thick deposits of pre-Wisconsin age till which can range to upwards of 800 feet in thickness.

There are two recognized landforms in the Coteau Moraines subsection. The middle Coteau consists of a rolling moraine landscape exhibiting ridges derived of loess mantled late-Wisconsin drift. The outer Coteau is a complex of both terminal and end moraines bordering ground moraine that ranges from gently undulating surfaces to steeply rolling hills. Steep escarpments cut by streams in narrow ravines define the northeast edge of the Coteau Moraines subsection. The escarpment is cut by several streams, which occupy narrow, straight ravines (Albert, 1993). This escarpment fades to the southeast and becomes indistinct on the Iowa border. In the Project Area, elevations range from 1,524 ft to 1,891 ft (465 m to 577 m) above sea level. A topographic map of the Project Area is shown in Figures 9a-9d.

8.13.2 Impacts

No impacts to topography are anticipated. Wind turbines and access roads will not require significant excavation or fill beyond that which will be required for foundations or road bases.

8.13.3 Mitigative Measures

No impacts are anticipated, and as such, no mitigative measures are necessary.

8.14 Soils

8.14.1 Description of Resources

Udoll and Aquoll suborder soil types are dominant in this area. The diverse underlying bedrock is covered by 600 to 800 feet of glacial till. The glacial till is calcareous loamy sediment. Soils tend to be loamy and are generally well-drained (MN DNR, 2017a).

Five soil associations are found within the Project Area (Table 8.22, Figures 14a-14d). A soil association has a distinctive pattern of soils, relief, and drainage. Each is a unique natural

landscape consisting of one or more major soils and other minor soils. The association is named after its major soils.

Table 8.22: Soil Associations in Project Area

Soil Association	Area (acres)
Flom-Barnes (s3542)	34,314
Singsaas-Flom (s3543)	21,583
Langhei-Hamerly-Barnes (s3467)	1,403
Forman-Buse-Aastad (s6894)	339
Vienna-Kranzburg-Hidewood (s3545)	189
Total	**57,831**

The Flom-Barnes Association is a complex of two soils types. Flom soils are silty clay loams on nearly level slopes on a glacial till plain in cultivated fields. Flom soils are poorly to very poorly drained with moderately slow permeability and slow surface runoff. Barnes soils are loams on level to hilly till plains and moraines. Barnes soils are well drained with negligible to high surface runoff, depending on the slope (USDA, 2017).

The Singsaas-Flom Association is a complex of two soil types. Singsaas soils are silty clay loams on nearly level to gently undulating ground moraines. They are very deep, well drained soils with low to high surface runoff. Flom soils are described above (USDA, 2017).

The Langhei-Hamerly-Barnes Association is a complex of three soils types. Langhei soils are fine to loamy, mixed, and superactive soils formed in calcareous glacial till on glacial moraines. They are very deep well drained soils with moderate or moderately slow permeability. Hamerly soils are fine to loamy, mixed, and superactive soils formed in calcareous loamy till. They are very deep, somewhat poorly drained soils with moderate permeability in the upper horizons and moderate or moderately slow permeability in the lower horizons (USDA, 2017). Barnes soils are described above.

The Forman-Barnes Association is a complex of two soils types. Forman soils are clay loams on nearly level slopes on a glacial till plain in cultivated fields. Forman soils are very deep, well drained, moderately slowly permeable soils. Barnes soils are described above (USDA, 2017).

The Barnes-Buse-Flom Association is a complex of three soils types. Barnes soils are described above. Buse soils are a loam with a convex slope of five percent on a glacial moraine in a cultivated field. Buse soils are very deep, well drained soils that formed in loamy glacial till on moraines. Flom soils are described above (USDA, 2017).

There are no soils in the Project Area that are classified as “highly wind erodible.” Approximately four percent of soils in the Project Area are classified as “highly water erodible.”

8.14.2 Impacts

Construction of the wind turbines and access roads will increase the potential for soil erosion during construction and convert prime farmland from agricultural uses to industrial uses. The amount of land that will be converted to wind turbines, transformer pads, and access roads will be determined once the site layout has been finalized. See Section 8.10.1 and Table 8.20 for a discussion of impacts to prime farmland.

8.14.3 Mitigative Measures

A National Pollutant Discharge Elimination System ("NPDES") permit application to discharge stormwater from construction facilities will be acquired by the Applicant from the MPCA. Best Management Practices ("BMP") will be used during construction and operation of the Project to protect topsoil and adjacent resources and to minimize soil erosion. Practices may include containment of excavated material, protection of exposed soil, and stabilization of restored material. A Stormwater Pollution Prevention Plan ("SWPPP") will be developed prior to construction that will include BMPs such as silt fencing, revegetation plans, management of exposed soils to prevent erosion.

8.15 Geologic and Groundwater Resources

8.15.1 Description of Resources

Surficial Geology

Surficial geology of the Project Area consists of glacial deposits associated with the Des Moines Lobe. This Project Area is part of a high glacial landform occupying Southwestern Minnesota topped by Buffalo Ridge (1995 feet above sea level) in northern Pipestone County. The high elevation is caused by thick deposits of pre-Wisconsin age glacial till (up to 800 feet thick). The underlying bedrock is covered by 600 to 800 feet of glacial till, which consists of calcareous loamy sediment (MN DNR, 2017a).

The Altamont and Bemis moraines make up quarternary geology of the Project Area. The Altamont moraine is lower in altitude than that of the Bemis moraine, and is sufficiently clayey making it good agricultural land. The Bemis moraine is loose textured with cobblestones and boulders embedded in the till, also containing gravel knolls and gravel pockets.

Bedrock Geology

The bedrock underlying the glacial material in the Project Area consists of sandstone and shale from the Mesozoic Era and is shown on Figures 15a-15d. This Cretaceous undifferentiated rock consists of largely gray shale and friable sandstone. Most sandstone is quartzose, light gray to pale brown or yellow, and fine-to medium-grained. Dark gray to black, lignitic organic matter is common in both the sandstone and shale.

Aquifers and Wells

Groundwater in the region is supplied by the Cretaceous aquifer. The aquifer consists of thick to thin, discontinuous sandstone beds overlain in places by limestone and shale beds that confine the aquifer. In other places, the aquifer is directly overlain by glacial deposits. In its principal area of use, the Cretaceous aquifer ranges from about 90 to 170 feet in thickness. The water tends to contain large concentrations of dissolved solids; in some areas, wells have small yields of less than two to 10 gallons per minute. The aquifer is buried by glacial deposits to depths of 700 feet or more near the southern Minnesota border. Although the aquifer contains gypsum, which can increase sulfate concentrations in the groundwater, the aquifer is extensively pumped to supply domestic, small-community, and agricultural needs (Olcott, 1992).

There are 42 located wells, and an additional 23 unverified well locations within the Project Area (Minnesota Department of Health, 2016).

8.15.2 Impacts

Impacts to geologic and groundwater resources are not anticipated. Water supply needs will be quite limited and wells will not be impacted. O&M water requirements will be satisfied with either well or rural water service. A temporary batch plant may be needed to supply concrete for the construction of the Project. The batch plant may be able to use rural water service, but is more likely to require well water. The water source will be determined prior to construction when a contractor is selected to construct the Project.

8.15.3 Mitigative Measures

Wind turbine locations will not impact the use of existing water wells because the turbines will be set back from occupied structures according to state and county standards. Use of water for operations will be negligible and will not create an undue burden so no mitigation is proposed. The batch plant operator will obtain the relevant permits and access to water supply and will address supply and drawdown issues in those permits.

8.16 Surface Water and Floodplain Resources

8.16.1 Description of Resources

Surface water and floodplain resources for the Project Area were identified by reviewing U.S. Geological Survey (“USGS”) topographic maps, and Minnesota Public Waters Inventory (“PWI”) maps. The Project Area occurs within the Minnesota River Basin in the La Qui Parle River and Minnesota River-Granite Falls Watersheds (MN DNR, 2017b, Figures 16a-16d). There are several unnamed intermittent and perennial streams, including the Yellow Medicine River, the North and South Branches of the Yellow Medicine River, Norwegian Creek and two county-designated ditches. Figures 16a-16d show the locations of surface waters, 303(d) impaired waters, Minnesota PWI waters, Minnesota’s update to the National Wetlands Inventory (“NWI”) wetlands, and trout streams within the Project vicinity.

Minnesota Public Waters Inventory

Public waters are all waters that meet the criteria set forth in Minnesota Statutes, Section 103G.005, subd. 15 that are identified on PWI maps authorized by Minnesota Statutes, Section 103G.201 (MN DNR, 1984). These watercourses are regulated as public waters under the MN DNR's Public Waters Permit Program. There are ten watercourses, 24 basins, and four wetlands in the Project Area that are listed as MN DNR PWI public waters. All 10 PWI public watercourses are located partially inside the Project Area. The waters shown on the PWIs and located at least partially within the Project Area are presented in Table 8.23.

Table 8.23: Public Waters Inventory

PWI Type	PWI Feature Name
PWI Watercourse	Judicial Ditch 19
	Yellow Medicine River
	Unnamed Stream (M-055-146-049-006)
	Yellow Medicine River, North Branch
	Norwegian Creek
	Unnamed Stream
	Yellow Medicine River, South Branch
	County Ditch 8
	Unnamed Stream (M-055-146-049-006-007-001)
	Unnamed Stream (M-055-146-066)
PWI Basin	Unnamed (41007400)
	Unnamed (41014000)
	Shaokotan
	Steep Bank
	Unnamed (41006300)
	South Ash
	Unnamed (41007300)
	Curtis
	North Ash
	Unnamed (41006500)
	Biggs
	Unnamed (41013500)
	Unnamed (41007200)
	Unnamed (41004700)
	Unnamed (41009200)
	Unnamed (41013900)
	Unnamed (41009100)

Table 8.23: Public Waters Inventory

PWI Type	PWI Feature Name
	Widmark Marsh
	Unnamed (41013800)
	Perch
	Unnamed (41013600)
	Anderson
	Unnamed (41013700)
	Unnamed (41011700)
PWI Wetland	Unnamed (41012300)
	Unnamed (41008500)
	Unnamed (41012400)
	Sowden Marsh

Impaired Waters

Clean Water Act ("CWA") Section 303(d) requires each state review, establish, and revise water quality standards for all surface waters within the state. Waters that do not meet their designated beneficial uses because of water quality standard violations are considered impaired. There are three 303(d) impaired waters within the Project Area: the North Branch Yellow Medicine River, Yellow Medicine River, and an unnamed creek, which is tributary to the South Branch Yellow Medicine River. The North Branch Yellow Medicine River is listed with a turbidity impairment; the Yellow Medicine River is impaired for mercury in fish tissue and turbidity; and the unnamed creed is impaired for fecal coliform (MPCA, 2016). Construction and operation of the Project will not impact any impaired waters.

Wildlife Lakes in and Adjacent to Project Boundary

The MN DNR commissioner may formally designate lakes for wildlife management under the authority of Minnesota Statutes Section 97A.101, subdivision 2. This designation allows the MN DNR to temporarily lower lake levels periodically to improve wildlife habitat and regulate motorized watercraft and recreational vehicles on the lake. There are no MN DNR designated wildlife lakes in Lincoln County (MN DNR, 2014).

Migratory Waterfowl Feeding and Resting Lakes

Migratory waterfowl feeding and resting areas protect waterfowl from disturbance on selected waters of the state by prohibiting motors on these lakes during waterfowl season. These lakes are nominated by a petition process and approved or denied by the MN DNR after public input is received. There are no migratory waterfowl feeding and resting lakes in Lincoln County (MN DNR, 2014).

Federal Emergency Management Agency Floodplains within Project Area

FEMA Flood Insurance Rate Maps have been created for most of the Project Area; FEMA floodplain data is not digitally available for the northwestern portion of the Project Area south of the city of Hendricks (FEMA, 1985). There are 100-year floodplains associated with the Yellow Medicine River and an unnamed tributary to the north of the Yellow Medicine River, Lake Anderson, and Lake Shaokatan which run west to east bisecting the Project Area (Figures 17a-17d).

8.16.2 Impacts

The Project will not require the appropriation of surface water or permanent dewatering. Temporary dewatering may be required during construction for specific turbine foundations and/or electrical trenches.

Project facilities will be designed to avoid impacts on surface water resources to the extent practicable. Wind turbines will be built on uplands to avoid surface water resources in the lower elevations. However, Project facilities, such as underground electrical collector lines, access roads, crane paths, turbine pads, step-up substation and the O&M building, will impact land and, therefore, potentially impact surface water runoff within the Project Area. Ground disturbing construction activities may also cause sedimentation. These impacts are expected to be minimal.

The Project will not impact known floodplain areas.

8.16.3 Mitigative Measures

Turbines will be constructed on relatively high elevation portions of the Project Area to maximize the wind resource, and as such are likely to avoid direct impacts to surface waters and floodplains, which tend to be in lower topographical positions.

Access roads and substations will be designed to minimize impacts on surface waters and floodplains. Temporary impacts associated with crane walkways will also be minimized. Installation of underground utilities is expected to avoid impacts by boring under surface water features as necessary.

Best practices will be used during construction and operation of the Project to protect topsoil, minimize soil erosion and protect surface water and floodplain resources from direct and indirect impacts. Practices may include containing excavated material, using silt fences, protecting exposed soil, stabilizing restored material, and re-vegetating disturbed areas with non-invasive species.

If the Project will permanently or temporarily impact waters of the U.S., Minnesota PWI's or 100-year floodplains, the Applicant will apply for the necessary permits prior to construction (i.e., MnDNR License to Cross Pubic Land and Water or Lincoln County Floodplain Development permit, respectively), and will work with officials to minimize impacts. Access roads constructed adjacent to streams and drainage ways will be designed in a manner such that runoff from the upper portions of the watershed can flow unrestricted to the lower portion of the watershed. A SWPPP will be prepared and an NPDES permit will be obtained prior to the

Project construction. Project activities will avoid crossings of the shorelines, streams, wetlands and rivers to the extent practicable. Any permanent crossings will be permitted by the appropriate authorities (MN DNR, Local Government Unit ["LGU"] under the Wetland Conservation Act ["WCA"] and/or U.S. Army Corps of Engineers ["ACOE"]).

8.17 Wetlands

8.17.1 Description of Resources

Wetlands within the Project Area were identified using Minnesota's update to NWI. Some of the wetlands are associated with creeks and unnamed intermittent streams within the site and some of the wetlands are isolated basins. The Cowardin Classification System wetland types and their acreage within the Project Area are presented in Table 8.24.

Table 8.24: National Wetlands Inventory in the Project Area

NWI Type		NWI Acreage
Palustrine Emergent Wetland	PEM1A	1935.8
	PEM1Ad	4.5
	PEM1Af	1262.4
	PEM1Ah	37.5
	PEM1Ax	0.4
	PEM1B	1024.6
	PEM1Bh	0.7
	PEM1C	1102.1
	PEM1Cd	0.7
	PEM1Ch	86.4
	PEM1Cx	0.4
	PEM1F	816.9
	PEM1Fh	21.3
	PEM1Fx	0.2
	Sub Total	**6294.1**
Palustrine Scrub-shrub Wetland	PSS1A	11.8
	PSS1B	7.2
	PSS1C	14.8
	Sub Total	**33.8**
Palustrine Forested Wetland	PFO1A	74.0
	PFO1Ax	0.4
	PFO1B	23.1
	PFO1C	23.3
	Sub Total	**120.7**

Table 8.24: National Wetlands Inventory in the Project Area

NWI Type		NWI Acreage
Freshwater Pond/Lake	PABF	6.9
	PABFx	1.4
	PABH	5.3
	PUBF	62.2
	PUBFh	9.6
	PUBFx	23.1
	PUBH	140.6
	PUBHh	6.1
	PUBKx	4.7
	L1UBH	163.3
	L2ABH	129.7
	L2UBH	762.3
	Sub Total	**1315.2**
Wetland Total		**7,763.8**

Wetland acreage is calculated using Minnesota's Update to NWI data

There are approximately 7,764 acres of NWI wetlands in the Project Area; approximately 13.4 percent of the Project Area. More than 81 percent (6,294 acres) of the NWI wetland acreage is mapped as palustrine emergent ("PEM") wetlands. Freshwater Pond/Lake or palustrine unconsolidated bottom ("PUB") wetlands comprise of 17 percent (1,315 acres) of the NWI wetland acreage. The remaining two percent are palustrine forested ("PFO") or palustrine scrub-shrub ("PSS") (154 acres). A total of 1,781 acres of PWI wetlands and basins are located within the Project Area, which may overlap with NWI. See Figures 18a-18d for locations of wetlands within the Project site.

8.17.2 Impacts

Turbines, step-up transformers, and meteorological towers will be constructed on high portions of the Project Area to maximize the wind resource, and as such are likely to avoid direct impacts to wetlands, which tend to be in lower topographic positions. Turbine impacts to NWI mapped wetlands are shown in Table 8.25. The maximum estimate of wetland impacts is for the Gamesa G126 layout. All mapped water features will be field verified and final impact calculations will vary based on delineated wetlands. Additionally, after field verification of wetlands, Project facilities may undergo minor shifts so as to avoid wetland features to the extent practicable. There are no turbines sited in PWI wetlands. Access roads, operations facility and substations will be designed to avoid impacts to wetlands whenever feasible. Temporary impacts associated with crane walkways will also be minimized. Installation of underground utilities is expected to avoid impacts by boring under PWI features as necessary and will minimize impacts to wetlands or where possible make them coincident with other impacts (e.g., crane walks).

Table 8.25: Summary of Wetland Impacts based on NWI

	PEM	
	# Turbines	Acres
Gamesa G126	3	0.56
Gamesa Access Roads	NA	1.05
Acciona 3.0-132	1	0.36
Acciona Access Roads	NA	1.01
GE 2.3-116	1	0.26
GE Access Roads	NA	0.94
Vestas V110	3	0.38
Vestas Access Roads	NA	1.08
Project Substation	NA	-

[1] *There are no PFO, PSS, or freshwater pond/lake NWI mapped wetlands that will be impacted by the Project.*
[2] *The O&M facility location is pending; therefore, wetland impacts were not calculated at this time*

8.17.3 Mitigative Measures

Formal wetland delineations of the Project Area will be completed prior to construction, and the layout will be designed to avoid and minimize wetland impacts. Wetlands will be avoided to the extent possible during the construction phase of the Project. If wetland impacts cannot be avoided, the Applicant will submit a permit application to the ACOE for dredge and fill within waters of the U.S. under Section 404 of the CWA, to the LGU for Minnesota WCA coverage and the MPCA for Water Quality Certification under Section 401 of the CWA prior to construction.

Blazing Star 2 will mitigate direct or indirect impacts to wetlands during construction and operation by protecting topsoil, minimizing soil erosion and protecting adjacent wetland resources. Practices may include containing excavated material, use of silt fences, protecting exposed soil, stabilizing restored material, and re-vegetating disturbed areas with non-invasive species.

8.18 Vegetation

8.18.1 Description of Resources

8.18.1.1 Land Cover

Historically, tallgrass prairie covered most of this area and wet prairies covered a smaller proportion of the landscape, restricted to narrow stream margins. Forest was similarly restricted to ravines along a few streams. As a result of settlement in the mid-1800s, the area was converted to farmland, with only a few remnant of pre-settlement vegetation remaining (MN DNR, 2017a). During this process, the wetland areas were frequently ditched and drained. Trees

were planted by landowners for shelter belts or were established by natural means, transported to the area by animals, birds, or wind.

Based on review of aerial photographs and land use database information, the Applicant determined that the majority of the land area at the site is cultivated (refer to Table 8.26). The main crops include corn, soybeans, wheat, and hay (USDA, 2012). The relative abundance of the major habitats in the Project Area is shown in Table 8.26 (Homer et al., 2015).

Table 8.26: Land Cover Types and their Relative Abundance in the Project Area

Land Cover	Acres	Percent of Project Area
Cultivated Crops	38,138.3	65.9%
Grassland/Herbaceous	6,643.4	11.5%
Hay/Pasture	6,009.9	10.4%
Developed, Open Space	2,825.1	4.9%
Emergent Herbaceous Wetlands	2,489.5	4.3%
Open Water	1,249.8	2.2%
Deciduous Forest	344.6	0.6%
Developed, Low Intensity	69.9	0.1%
Woody Wetlands	34.0	0.1%
Barren Land	12.5	<0.1%
Developed, High Intensity	2.4	<0.1%
Developed, Medium Intensity	15.1	<0.1%
Shrub/Scrub	5.6	<0.1%
Total	**57,840**	**100%**

CRP land is discussed in Section 8.10.1 and may be present within the Project Area. CRP land is typically covered by brome grasses, orchard grass, and alfalfa. Land is typically put into CRP for 10-year cycles.

8.18.1.2 Native Plants

The grassland and wetland areas at the site may contain potential remnant native prairie areas. Native prairie is identified as lands that have never been plowed, with less than 10 percent tree cover, and presence of native prairie vegetation. Unplowed fields of native grassland or pasture, with 10 or more prairie plant indicator species, are considered to be prairie for the purposes of this Application. A list of prairie indicator species can be found in the Field Guide to the Native Plant Communities of Minnesota: The Prairie Parkland and Tallgrass Aspen Parklands Provinces (MN DNR, 2005).

The MN DNR's native plant community data for Lincoln County identifies native prairie areas as dry hill or dry sand prairie, mesic prairie, and wet prairie (includes marshes, swamps, wet

meadows, and fens). The data also identifies other community types, including basswood – bur oak – (green ash) forest, spikerush – bur reed marsh, and prairie meadow/carr. Currently, the Project Area is mostly disturbed agricultural lands (see Section 8.10); however, approximately a total of 409.6 acres (0.7% of the Project Area) are identified as native prairie, based on MN DNR native prairie data (refer to Table 8.27 below). Additionally, approximately 53.2 acres (less than 0.1% of the Project Area) are identified as other native plant communities. Similar to wetlands, mapped native prairie and native plant communities will be field verified relative to proposed facilities prior to construction.

Table 8.27: Native Prairie and Native Plant Community Types within the Project Area

Source	Native Plant Community Type	Acres in Project Area
MN DNR Native Prairie	Dry hill prairie (southern)	378.6
	Dry sand – gravel prairie (southern)	23.3
	Mesic prairie (southern)	5.3
	Wet prairie (southern)	2.4
	Subtotal	**409.6**
MN DNR Native Plant Community	Basswood – bur oak – (green ash) forest	17.3
	Prairie meadow/carr	35.0
	Spikerush – bur reed marsh (prairie)	0.9
	Subtotal	**53.2**
Total		**462.8**

Both native prairie and native plant communities are also designated as MN DNR sites of biodiversity significance ("SOBS"). A site's biodiversity rank is based on the presence of rare species populations, the size and condition of native plant communities within the site, and the landscape context of the site. There are four biodiversity significance ranks: outstanding, high, moderate, and below:

- "Outstanding" sites contain the best occurrences of the rarest species, the most outstanding examples of the rarest native plant communities, and/or the largest, most ecologically intact or functional landscapes.
- "High" sites contain very good quality occurrences of the rarest species, high-quality examples of rare native plant communities, and/or important functional landscapes.
- "Moderate" sites contain occurrences of rare species, moderately disturbed native plan communities, and/or landscapes that have strong potential for recovery of native plant communities and characteristic ecological processes.

- "Below" sites lack occurrences of rare species and natural features or do not meet Minnesota Biological Survey standards for outstanding, high, or moderate rank. These sites may include areas of conservation value at the local level, such as habitat for native plants and animals, corridors for animal movement, buffers surrounding higher-quality natural areas, areas with high potential for restoration of native habitat, or open space.

Table 8.28 presents the MBS' Sites of Biodiversity Significance that occur within the Project Area and their Biodiversity Significance Rank.

Table 8.28: Sites of Biodiversity Significance within the Project Area

Site of Biodiversity Significance	Number of Sites Within Project Area	Acres
Below	55	5,065
Moderate	24	3,690
High	0	0
Outstanding	0	0

8.18.2 Impacts

Vegetation will be removed for the installation of turbine pads, access roads, substations and O&M facilities. It is expected that the majority of the turbines will be sited in plowed crop fields that are typically planted in row crops. Access roads in the agricultural landscape are expected to impact crop fields, and potentially grassed areas of ditches and roadsides, or small wooded areas. Depending on the final layout, up to 92 acres of land will be permanently removed from production, and the areas surrounding each turbine will still be able to be farmed, grazed, or otherwise managed as it was prior to installation of the wind farm. Less than one half of one percent will be permanently converted to sites for wind turbines, access roads, and facilities. Temporary vegetation impacts will be associated with crane walkways, the installation of underground collection lines, and contractor staging and lay down areas. With ground disturbance and equipment deliveries from different geographic regions, Blazing Star 2 will work together with all Project construction parties entering the Project Area to control and prevent the introduction of invasive species. To the extent practicable, direct permanent and temporary impacts to natural areas, including wetlands and native prairies, will be avoided and minimized.

A summary of impacts is provided in Table 8.29. The amount of vegetation that will be removed as a result of the Project will be determined once a site layout is finalized, but the vast majority is anticipated to be crop land. Vegetation will be permanently removed and replaced by wind turbines, access roads, and substation components. Additional areas may also be temporarily disturbed for the installation of underground power lines during construction. Approximately 10 acres of land will be temporarily impacted for contractor staging, concrete batch plant, if utilized, and laydown areas. Temporarily disturbed areas will be reseeded to blend with existing

vegetation. The turbines will avoid forests and groves to maximize turbine output and reduce tree removal. Avoidance and minimization of impacts to native prairies and wetlands will reduce impacts to those vegetated areas.

Table 8.29: Summary of Estimated Permanent Impacts to Vegetation (Acres)*

Turbine Model	Cultivated Crops	Grassland/ Herbaceous	Hay/Pasture	Developed, Open Space	Forest	Wetland	Total
Gamesa G126	17.44	1.48	0.81	-	-	-	**19.73**
Acciona 3.0-132	15.10	1.48	0.81	-	-	-	**17.39**
GE 2.3-116	18.27	1.74	0.75	-	-	-	**20.77**
Vestas V110	23.15	2.01	0.81	-	-	-	**25.96**
Access Roads	49.72	2.72	2.92	2.04	0.08	0.31	**57.79**
Project Substation	10.19	-	-	0.68	-	-	**10.87**

**Access road impacts are calculated for Vestas V110 layout, which has the most turbines. If another turbine model is selected, the impacts will be less*
The O&M facility location is pending; therefore, permanent impacts to vegetation were not calculated at this time

8.18.3 Mitigative Measures

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

- Conduct a preconstruction inventory of the Project Area for existing WPAs, WMAs, SNAs, recreation areas, wetlands, native prairie, and forests. The preconstruction inventories will have varying levels of detail with the most specific detail in the vicinity of construction;
- Exclude established WMAs, WPAs, SNAs, and recreation areas from consideration for Project facilities;
- Avoid disturbance of wetlands during construction and operation of the Project. If jurisdictional wetland impacts are proposed, then the Applicant will obtain applicable wetland permits;
- Designed to minimize the need to clear existing trees and shrubs;
- Prepare a construction SWPPP and secure a NPDES Permit;
- Use BMPs during construction and operation of the Project to protect topsoil and adjacent resources and to minimize soil erosion. Practices may include containing excavated material, protecting exposed soil and stabilizing restored material, revegetating non-cropland and range areas with wildlife conservation species and, wherever feasible, planting native tall grass prairie species in cooperation with landowners; and
- The Project Area may include native prairie, as defined by Minn. Stat. § 84.02, subd. 5. Blazing Star 2 will, in consultation with the MN DNR, prepare a prairie protection and management plan. The plan will be submitted to the Commission and MN DNR after issuance of the site permit and prior to construction. The plan

shall address steps to be taken to identify native prairie within the Project Area, measures to avoid impacts to native prairie, and measures to minimize and mitigate for impacts if unavoidable. Wind turbines and all associated facilities, including foundations, access roads, underground cable, and transformers, shall not be placed in native prairie unless addressed in the prairie management plan. Measures to be taken to mitigate unavoidable impacts to native prairie will be agreed to by the Applicant and MN DNR.

8.19 Wildlife

8.19.1 Description of Resources

Regulatory Environment

Migratory Bird Treaty Act

The Migratory Bird Treaty Act ("MBTA") of 1918 (16 United States Code ["U.S.C."] 703-712) regulates the taking, selling, transporting, and importing of migratory birds, their nests, eggs, parts, or products. The MBTA protects more than 800 species of birds that occur within the U.S. A list of federally protected migratory birds may be found in 50 Code of Federal Regulations Part 10.13. Most birds within the Project Area would be afforded protection under this act.

USFWS Land-Based Wind Energy Guidelines

On March 23, 2012, the USFWS issued the Land-Based Wind Energy Guidelines ("WEG"; USFWS, 2012). These voluntary Guidelines provide a structured, scientific process for addressing wildlife conservation concerns at all stages of land-based wind energy development. They also promote effective communication among wind energy developers and federal, state, and local conservation agencies and tribes. The WEG's are founded upon a tiered approach for assessing potential impacts to wildlife and their habitats. The tiered approach is an iterative decision-making process for collecting information in increasing detail, quantifying the possible risks of proposed wind energy projects to wildlife and habitats, and evaluating those risks to make siting, construction, and operation decisions. Subsequent tiers refine and build upon issues raised and efforts undertaken in previous tiers. At each tier, a set of questions is provided to help the developer identify potential problems associated with each phase of a project, and to guide the decision process. The tiered approach is designed to assess the risks of project development by formulating questions that relate to site-specific conditions regarding potential species and habitat impacts. The tiers are outlined briefly as:

- Tier I: Preliminary evaluation or screening of sites (landscape-level screening of possible project sites; generally based on readily available public information)

- Tier II: Site characterization (comprehensive characterization of one or more potential project sites; generally based on consulting with the appropriate agencies/authorities and one or more reconnaissance level site visits by a wildlife biologist)

- Tier III: Field studies to document site wildlife conditions and predict project impacts (site-specific assessments at the proposed project site; quantitative and scientifically rigorous studies; e.g., acoustical monitoring, point count avian surveys, raptor nest surveys, lek surveys, etc.)

- Tier IV: Post-construction mortality studies (to evaluate direct fatality impacts)

- Tier V: Other post-construction studies (to evaluate direct and indirect effects of adverse habitat impacts, and assess how they may be addressed; not done for most projects; e.g., post-construction displacement and/or use studies, curtailment effectiveness studies, etc.)

This tiered approach allows developers to determine whether they have sufficient information, whether and/or how to proceed with development of a project, or whether additional information gathered at a subsequent tier is necessary to make those decisions. The WEGs indicate that wind energy developers who voluntarily adhere to these guidelines will be undertaking a robust level of wildlife impact analysis, and have a shared responsibility with the USFWS to ensure that the scientific standards of the guidelines are upheld and used to make wise development decisions.

It is important to note that not all of the five tiers are recommended or necessary for all projects.

At each tier, potential issues associated with developing or operating a project are identified and questions formulated to guide the decision process. The guidelines outline the questions to be posed at each tier, and recommend methods and metrics for gathering the data needed to answer those questions. If sufficient data are available at a particular tier, the following outcomes are possible based on analysis of the information gathered:

- The project is abandoned because the risk is considered unacceptable,

- The project proceeds in the development process without additional data collection,

- An action, or combination of actions, such as project modification, mitigation, or specific post-construction monitoring, is indicated.

If data are deemed insufficient at a tier, more intensive study is conducted in the subsequent tier until sufficient data are available to make a decision to abandon the project, modify the project, or proceed with and expand the project (USFWS, 2012).

Results of Tier I and II Process

A Tier I and II Site Characterization Study (“SCS”) was completed for the proposed Project in June 2017 (Appendix E). The study was based on off-site resources and a site visit by a qualified biologist on June 27, 2017. Information obtained for the SCS is summarized in Sections 8.18.1 and 8.19.1. Based on the results of the SCS, Tier III studies are in progress for the Project. This decision was reached by answering the following questions from the USFWS guidelines:

Are there known species of concern present on the proposed site, or is habitat (including designated critical habitat) present for these species?

After conducting a desktop analysis of available data, Blazing Star 2 found no known records of federally listed species and one record of a state endangered bird within the Project Area. Critical habitat for the Topeka shiner is designated in Lincoln County; however, this pertains only to the Medary Creek complex in the southwestern portion of the County (USFWS, 2004). Designated critical habitat is not present in the Project area. There are four species of special concern within one mile of the Project Area (two birds and two plants). The majority of the Project Area (more than 65 percent) is in active crop production. Intact natural habitat within the Project Area consists of MN DNR mapped native plant communities which may provide suitable habitat for listed species such as the Dakota skipper and Ottoe skipper. These areas also overlap areas designated as sites of moderate biodiversity significance by the MN DNR. Freshwater emergent wetlands, perennial streams, and open water bodies may provide habitat for protected species. The Prairie Coteau Complex Audubon Important Bird Areas ("IBA") overlaps the southwestern portion of the Project Area (i.e., approximately 4,398.4 acres); another unit is approximately two miles south the Project Area. This area is designated as an IBA due to the presence of high quality habitat for prairie, grassland, and marsh birds (Audubon, 2014).

Does the landscape contain areas where development is precluded by law or designated as sensitive according to scientifically credible information? Examples of designated areas include, but are not limited to: areas of scientific importance; areas of significant value; federally-designated critical habitat; high-priority conservation areas for NGOs; or other local, state, regional, federal, tribal, or international organizations.

There are several protected areas within the Project Area including seventeen state WMAs, one federal WPA, and privately owned conservation areas (see Figures 7a-7d). There will be no direct impacts to the WPAs and WMAs within 1 mile of the Project Area boundary, and setbacks from the Project perimeter will result in a minimum buffer between these resources and any turbines.

Are there plant communities of concern present or likely to be present at the site(s)?

Sites of Biodiversity Significance as defined by the MN DNR are found within the Project area. Sites ranked as "below" (i.e., 4,075 acres; 8.3%) and "moderate" (i.e., 3,287 acres; 6.8%) are present; there are no sites of "high" or "outstanding" biodiversity significance within the Project boundary, as discussed in Section 8.18.2 (Table 8.28). There are also 430 acres of MN DNR mapped native plant communities in the Project boundary, all of which are associated with sites identified as moderate biodiversity. Of the identified native plant communities, 359 acres are mapped as dry hill prairie, 35 acres are mapped as prairie meadow, 17 acres are mapped as basswood-bur oak forest, 17 acres are mapped as dry sand-gravel prairie, five acres are mapped as mesic prairie, three acres are mapped as wet prairie, and less than one acre is mapped as spikerush-bur reed marsh.

Turbines will be sited to avoid mapped native prairie, native plant communities, and sites of biodiversity ranked as moderate. There are seven turbines proposed on three sites below the minimum biodiversity threshold. These grassland areas, and a few additional areas, will be

evaluated in the field for quality native prairie to support grassland breeding birds and two federally listed butterflies (Dakota skipper and Poweshiek skipperling). These surveys will be conducted during late summer/early fall 2017.

Blazing Star 2 will continue coordination with MN DNR and prepare a Native Prairie Protection Plan if there is native prairie within the Project Area, as defined by Minn. Stat. § 84.02, subd. 5.

Are there known critical areas of congregation of species of concern, including, but not limited to: maternity roosts, hibernacula, staging areas, winter ranges, nesting sites, migration stopovers or corridors, leks, or other areas of seasonal importance?

There is some potential for species of wildlife to congregate within the Project Area based on publicly available data, specifically within the state wildlife management areas present within the project or in and around lakes and other open waterbodies during peaks in avian migration through the area. However, the site visit and initial studies conducted to date have not identified rookeries or communal avian roosting spots.

Using best available scientific information, has the relevant federal, state, tribal, and/or local agency independently demonstrated the potential presence of a population of a species of habitat fragmentation concern? If not, the developer need not assess impacts of the proposed project on habitat fragmentation.

Through the consultation process, Blazing Star 2 found no specific species of habitat fragmentation concern has been identified by the USFWS or MN DNR. The area is already highly fragmented and is a mosaic of cultivated cropland, herbaceous areas, pasture, open water and wetlands. Additionally, the site visit indicated that most of the grasslands within the Project Area are relatively small and fragmented, and of low quality due to disturbance, grazing and haying, and/or the presence of introduced/invasive species. As few intact natural communities exist within the Project Area, the risk of additional habitat fragmentation is minimal.

Which species of birds and bats, especially those known to be at risk from wind energy facilities, are likely to use the proposed site based on an assessment of site attributes?

The facility falls within the range of the northern long-eared bat, and potentially suitable habitat is present in for the forested areas of the Project Area. Species presence is possible in these areas in the summer months, and more generally during early fall migration. Acoustic presence/probable absence surveys for northern long-eared bats were conducted in the Project Area in 2016 and 2017. Qualitative analysis of the acoustic results from 2016 did not identify the species as present in the Project Area, and the species was not identified by acoustic software at any survey sites in 2017. As such, it is believed that the northern long-eared bat is absent from the Project Area.

The list of birds observed during the first year of pre-construction surveys in the Project Area during spring migration and the early breeding season (July 2016 – June 2017) is included in Table 8.30. To date, no federal or state-listed threatened and endangered birds have been observed at the Project Area. Two state list special concern birds have been observed including American white pelican and Franklin's gull. The MN DNR recommends post construction

monitoring be conducted for a minimum of two years utilizing scientifically valid protocols. The MN DNR indicated the agency will recommend to the Commission that feathering turbine blades when operating below the cut-in speed and, if bat fatalities are high, operational mitigation may be required.

Summary of Tier I and Tier II Process

Blazing Star 2 initiated Tier III studies in April 2017 to provide baseline avian and bat use data (Appendix F). The Tier I and II questions identified quality habitats in native prairie, WMAs, WPAs, conservation easements, and sites of biodiversity significance within and adjacent to the Project Area. Habitat assessment work has informed the turbine siting process to minimize impacts to quality habitats. Turbines will not be sited in WMAs, WPAs, or sited of biodiversity significance ranked as moderate, high, or outstanding.

Baseline avian and bat data have been incorporated into the Avian and Bat Protection Plan ("ABPP") (Appendix G). Blazing Star 2 will continue to coordinate with USFWS and MN DNR on Tier III data and the ABPP.

Eagle Conservation Plan Guidelines

Wind energy developers and wildlife agencies have recognized a need for specific guidance to help make wind energy facilities compatible with eagle conservation and the laws and regulations that protect eagles. The USFWS has developed the Eagle Conservation Plan Guidance, Module 1 – Land-based Wind Energy, Version 2 ("ECPG") (USFWS, 2013). The ECPG suggest specific questions that should be considered to help place a prospective project site into an appropriate risk category. Blazing Star 2 has considered these questions and provided responses below.

Does existing or historical information indicate that eagles or eagle habitat may be present within the geographic region under development consideration?

Eagles and eagle habitat are present within the geographic region under development consideration. The WMAs and forested lakeshores within the Project Area may provide suitable eagle habitat. However, only one eagle has been recorded within the Project in the eBird database, and suitable habitat is more abundant outside the Project than within it (eBird, 2017). The raptor nest survey did not identify any eagle nests within the Project Area. Initial results of studies at the Project (raptor nest survey and Tier III) do indicate that bald eagles sometimes perch or fly within the Project Area.

Eagles may pass through the Project in a broad-front fashion during migration, especially if there are food sources such as carrion available. Physical features of the landscape that may attract or concentrate eagles are limited within the Project Area. The closest major known migration corridor for bald eagles is the Minnesota River which is approximately 35 miles northeast of the Project Area. The Project Area lacks prominent north/south ridges or valleys that would be likely to funnel migrants through the Project. Trees, shrubs, and open water sources within the Project may provide some stopover habitat for migrating bald eagles, especially in and around WMAs. Additional wetlands, forested areas, and open water are present in the surrounding landscape and

may attract eagles to the region. However, these features are less abundant within the Project Area.

Within a prospective project site, are there areas of habitat known to be or potentially valuable to eagles that would be destroyed or degraded due to the project?

There is some potentially valuable habitat for eagles within or directly adjacent to the Project, but relatively higher eagle use areas can likely be avoided during construction and operation of the Project. Land use within the Project Area is predominantly cultivated cropland, herbaceous areas, and pasture. Initial results of studies at the Project (raptor nest survey and SCS – Tier I/Tier II) do indicate that bald eagles occur in the Project Area. As noted above, it is likely that eagles use the area broadly during migration.

Are there important eagle use areas or migration concentration sites documented or thought to occur in the project area?

There are no known important use areas or migration concentration sites within the Project Area. Initial results of studies at the Project (raptor nest survey and SCS – Tier I/Tier II) do indicate that bald eagles occur in the Project Area, but initial studies have not identified any important eagle use areas in the Project Area to date.

The Project does not contain areas that are likely to concentrate large numbers of migrating bald eagles or other raptors. The WMAs, lakes, and ponds within the Project Area may provide habitat and foraging opportunities that would attract eagles during migration; however these are small areas with relatively few trees and would not be expected to concentrate large numbers of eagles. The majority of the Project Area is composed of cultivated cropland and grassland with very little deciduous forest (<1% of the Project Area). Given their proximity to the Project Area and the shared topography and land cover, it is expected that eagle densities will be similar to those found during studies in the vicinity of the Blazing Star Wind Farm and Red Pine Wind Farms.

While there is likely to be increased bald eagle use associated with forested lakeshore and riparian habitats, bald eagle use throughout the rest of the Project Area will likely be much lower. Ephemeral foraging opportunities in the form of livestock carcasses and road kill may temporarily attract eagles to the more agricultural areas within the Project Area, especially during the winter.

Does existing or historical information indicate that habitat supporting abundant prey for eagles may be present within the geographic region under development consideration?

The WMAs and lakes within the Project Area may provide habitat that supports prey for bald eagles. These resources comprise a relatively small percentage of the total Project Area; the Project Area boundary also excludes some of the larger open water lakes in the vicinity.

For a given prospective site, is there potential for significant adverse impacts to eagles based on answers to above questions and considering the design of the proposed project?

Bald eagles have the potential to occur in the Project Area during all seasons but will likely occur in low numbers. The areas at highest risk of eagle occurrence within the Project are the small lakes, ponds, and WMAs. Avoiding or minimizing turbine siting in proximity to these features will reduce the potential for significant adverse impacts to eagles.

Summary of Eagle Conservation Plan Guidance and 2017 Raptor Nest Surveys

Blazing Star 2 conducted a raptor nest survey in early April 2017, in accordance with guidelines provided in the ECGP. Bald eagle nest surveys focused on locating eyries (large, stick nest structures) in suitable eagle nesting substrate (trees, transmission lines, cliff faces, etc.) within and around the proposed Project Area and a one-mile and a 10-mile buffer area. No occupied or potential bald eagle nests were located within the Project Area. A total of nine occupied active bald eagle nests were observed within the 10-mile buffer area. The distance to the Project Area from the nests ranged from 0.6 mile to 9.3 miles. The 2017 raptor nest survey report is included in Appendix F.

The mean inter-nest distance of all seven bald eagle nests observed (active and likely inactive nests) is 7.1 miles. The ECPG states that eagle pairs at nests within one-half the mean inter-nest distance, in this case 3.6 miles, are susceptible to disturbance take and blade strike mortality. However, it is anticipated that most flight corridors used by nesting bald eagles are located closer than 3.6 miles from the nest. Additionally, the Draft Midwest Wind Energy Multi-Species Habitat Conservation Plan (USFWS, 2017a) lists 1.6 miles as a maximum area for turbine setbacks from bald eagle nests, with potential for turbines to be sited closer if evidence shows they are not located within higher use travel corridors. There are two nests located within two miles of the Project Area; one is located approximately 2.0 miles from the nearest alternate wind turbine, outside of the 1.6 mile maximum setback described above. The other nest is located approximately 1.1 mile from a proposed wind turbine. Flight paths documented in June and July 2017 during follow-up monitoring of this nest were primarily associated with Lake Shaokatan. Eagles associated with this nest may periodically use areas away from the lake, including wetland complexes approximately 0.5 to one mile north of the nest. However, it is anticipated that the higher use areas associated with this nest would likely be within one mile or less of Lake Shaokatan. Additional eagle nest activity studies at these nests are ongoing, and the results will be provided separately. Blazing Star 2 will continue to coordinate with USFWS and MN DNR on eagle conservation plans.

Wildlife

Information on the existing wildlife in the Project Area was obtained from a variety of sources including MN DNR, USFWS, Minnesota Ornithologist's Union County Checklists, and avian and bat preconstruction surveys conducted by Blazing Star 2 (initiated in July, 2016) and supplemented by surveys conducted at Blazing Star Wind Project in 2016, Red Pine Wind Project in 2013-2014 located immediately adjacent to Blazing Star 2, Lakefield Wind Project, in Jackson County, Minnesota in 2010, the proposed Bitter Root Wind Project, immediately adjacent to the north of Project in 2009. Because the Bitter Root and Lakefield Wind Projects are located in close proximity to the Project Area and/or have similar land uses, they provide recent and relevant assessments of wildlife resources in the area as a supplement to current studies of the Project Area. The following sections include a discussion of general wildlife that occurs in

the Project Area. Section 8.20 includes a discussion of wildlife considered by the state to be threatened, endangered, or of special concern.

Wildlife in the Project Area consists of birds, mammals, fish, reptiles, amphibians, and insects, both resident and migratory, which use Project Area habitat for forage, breeding, and/or shelter. The resident species are representative of Minnesota game and non-game fauna that are associated with upland grass, farmlands, and wetland and forested areas. The majority of the migratory wildlife species are birds, including waterfowl, raptors, and songbirds.

Included below is a discussion of migratory and resident birds, mammals, reptiles, amphibians, and insects that are expected to exist in the Project Area.

Birds

Various migratory and resident bird species use the Project Area as a part of their life cycle. Migratory bird species may use the Project Area for resting, foraging, or breeding activities for only a portion of the year. Resident bird species occupy the Project Area throughout the year. A list of migratory and resident bird species documented by WEST during July, 2016 – June, 2017 avian surveys at the Project Area is presented in Table 8.30. The results of the preconstruction avian surveys at Red Pine, Lakefield, and Bitter Root show that the site-specific avian point-count data contain a similar species composition to those observed during spring migration and the early breeding season in the Project Area. Therefore, it is anticipated that the species listed from current surveys, supplemented by pre-construction surveys at nearby wind projects will be representative for bird use in the Project Area. Blazing Star 2 will continue to conduct studies during the state site permit process and will provide the results of those studies to the MN DNR and the Commission.

Birds observed during July, 2016 – June, 2017 include upland game birds (ring-necked pheasant, mourning dove, wild turkey), ducks and geese (Canada goose, mallard, blue-winged teal, canvasback, redhead), raptors (bald eagle, northern harrier, red-tailed hawk, American kestrel), shorebirds (killdeer, upland sandpiper, Wilson's snipe), woodpeckers (downy woodpecker, hairy woodpecker, northern flicker), and songbirds (wrens, sparrows, blackbirds, swallows) (See Appendix F). These species are very similar to those observed during pre-construction surveys at Red Pine, Lakefield and Bitter Root (Table 8.30).

Table 8.30: Comparison of Birds Observed during Pre-construction Surveys

Species	Blazing Star 2	Blazing Star[1]	Red Pine[2]	Lakefield[3]	Bitter Root[4]
Waterbirds and Waterfowl					
Canada Goose	x	x	x	x	x
Greater White-fronted Goose	x	x	x		x
Snow Goose	x	x	x		x
Common Merganser	x	x			
Red-breasted Merganser		x			
Hooded Merganser	x	x			
Wood Duck	x	x	x	x	
Mallard	x	x	x	x	x

Table 8.30: Comparison of Birds Observed during Pre-construction Surveys

Species	Blazing Star 2	Blazing Star[1]	Red Pine[2]	Lakefield[3]	Bitter Root[4]
Blue-winged Teal	x	x	x		x
Green-winged Teal	x				x
Northern Shoveler	x	x	x	x	x
Ring-necked Duck	x	x			
Canvasback	x	x			x
Redhead	x	x			x
Lesser Scaup	x	x			x
Ruddy Duck		x	x		x
Bufflehead		x	x		
Common Goldeneye		x			
American bittern					x
American White Pelican	x	x	x	x	x
Great Blue Heron	x	x	x	x	
Great Egret	x	x	x		
Green Heron		x			
White-faced Ibis		x			
Gadwall	x	x			x
Northern Pintail	x				x
American Wigeon	x	x			x
Shorebirds, Gulls, Coots, and Grebes					
Sora		x			x
American Coot	x	x			x
Sandhill Crane		x			
Black-bellied Plover	x	x			
Killdeer	x	x	x	x	x
Lesser Yellowlegs		x			
Greater Yellowlegs		x			
Least Sandpiper	x				
Solitary Sandpiper				x	
Spotted Sandpiper	x				
Upland Sandpiper	x	x	x		
Wilson's Snipe	x	x			
Common Snipe					x
Bonaparte's Gull	x	x			
Franklin's Gull	x	x	x		
Ring-billed Gull	x	x	x		
Black Tern	x	x			x
Forster's Tern		x			
Common Loon		x			
Pied-billed Grebe		x			x
Western Grebe		x			
Double-crested Cormorant	x	x	x		x
Belted Kingfisher	x				x
Black-crowned Night Heron					x
Raptors and Owls					
Turkey Vulture	x	x	x		x
Bald Eagle	x	x	x		
Golden Eagle	x	x			
Northern Harrier	x	x	x		x

Table 8.30: Comparison of Birds Observed during Pre-construction Surveys

Species	Blazing Star 2	Blazing Star[1]	Red Pine[2]	Lakefield[3]	Bitter Root[4]
Cooper's Hawk	x	x		x	
Ferruginous Hawk	x	x			
Sharp-shinned Hawk		x			
Red-tailed Hawk	x	x	x	x	x
American Kestrel	x	x	x	x	x
Peregrine Falcon		x			
Prairie falcon	x				
Swainson's Hawk	x	x	x		x
Broad-winged Hawk		x			x
Rough-legged Hawk	x	x			x
Merlin	x	x		x	
Osprey	x	x			
Great Horned Owl		x	x		
Barred Owl		x			
Upland Birds, Game Birds, Doves, and Pigeons					
Rock Pigeon	x	x	x		x
Mourning Dove	x	x	x	x	x
Eurasian Collared Dove	x				
Gray Partridge					x
Ring-necked Pheasant	x	x	x	x	x
Wild Turkey	x	x			x
Corvids, Blackbirds, and Jays					
Red-winged Blackbird	x		x		x
Yellow-headed Blackbird	x				x
Blue Jay	x	x	x	x	
American Crow	x	x	x	x	
Rusty Blackbird					
Flycatchers, Woodpeckers, Pewees, and Kingbirds					
Red-headed Woodpecker		x		x	
Hairy Woodpecker	x	x		x	
Downy Woodpecker	x		x		
Northern Flicker	x	x	x	x	
Eastern Wood-Pewee				x	
Least Flycatcher				x	
Great Crested Flycatcher				x	
Eastern Kingbird	x	x			x
Grassland Species, Swifts, Sparrows, Swallows, Finches, and Other Songbirds					
Common Nighthawk		x			
Chimney Swift				x	
Red-eyed Vireo				x	
Warbling Vireo		x			
Horned Lark	x	x	x	x	
Purple Martin				x	
Tree Swallow	x	x		x	
Bank Swallow		x			
Cliff Swallow	x	x	x	x	x
Barn Swallow	x	x	x	x	x
Northern Rough-winged Swallow					x

Table 8.30: Comparison of Birds Observed during Pre-construction Surveys

Species	Blazing Star 2	Blazing Star[1]	Red Pine[2]	Lakefield[3]	Bitter Root[4]
Dark-eyed Junco	x		x		
Snow Bunting	x		x		
Brown Creeper		x			
House Wren	x	x		x	
Sedge Wren	x	x		x	x
Marsh Wren	x	x			
American Robin	x	x	x	x	x
Gray Catbird	x			x	
Brown Thrasher		x		x	
European Starling	x		x	x	
American Pipit				x	
Cedar Waxwing	x			x	
Common Yellowthroat	x	x		x	x
Yellow Warbler		x		x	x
Black-and-white Warbler					x
American Tree Sparrow	x				
Chipping Sparrow		x			
Clay-colored Sparrow		x			
Vesper Sparrow	x	x		x	
Lark Sparrow				x	
Savannah Sparrow	x	x		x	x
Grasshopper Sparrow		x			x
Song Sparrow		x		x	x
White-throated Sparrow				x	
House Sparrow	x				
Harris's Sparrow				x	
Lincoln's Sparrow	x				
Laplund Longspur	x		x	x	
Dickcissel	x	x		x	x
Bobolink		x		x	x
Eastern Meadowlark	x	x			
Western Meadowlark	x	x	x	x	x
White-breasted Nuthatch	x				
Common Grackle	x	x	x	x	x
Brown-headed Cowbird	x	x	x	x	x
Baltimore Oriole		x			x
American Goldfinch	x	x	x	x	x

[1] *2017 Blazing Star 2 Avian Surveys, July 2016 – June 2017 (Appendix F)*
[2] *Blazing Star Wind Farm Year 1 Avian Surveys, April 2017 – March 2017*
[3] *Avian Use Surveys for the Red Pine Wind Resource Area (Derby and Rintz, 2014a)*
[4] *Pre-Construction Avian Surveys, Lakefield Wind Project, 2010 (Westwood, 2010)*
[5] *Bitter Root Wind Project Annual Report, 2009 (Derby and Dahl, 2009)*

Mammals

Mammals that may occur in the Project Area use the food and cover available from agricultural fields, grasslands, farm woodlots, wetland areas, and wooded ravines. Grassland areas and woody vegetation are also habitat for a variety of small mammals. White-tailed deer (*Odocoileus virginianus*), an economically important species, have a strong affinity for agricultural crops and use farm woodlots, wooded ravines, and intermittent stream bottoms for shelter.

Bat species present in Minnesota include the hoary bat (*Lasiurus cinereus*), eastern red bat (*Lasiurus borealis*), big brown bat (*Eptesicus fuscus*), silver-haired bat (*Lasionycteris noctivagans*), northern long-eared bat (*Myotis septentrionalis*), eastern pipistrelle (*Pipistrellus subflavus*), and little brown bat (*Myotis lucifiugus*).

Bat activity studies at the adjacent Red Pine Wind Project in 2013 found that bat activity in the Project Area was greatest near wetland and woodland areas and are likely using these areas for both foraging and roosting; activity was lower in agricultural areas. Low-frequency bat activity was found to be greater than high-frequency bat activity across the Project Area; species such as silver-haired bats, big brown bats, and hairy bats are likely the most common. Surveys recorded between 2.93 ± 0.42 and 15.92 ± 1.62 bat passes per detector night in studies conducted across the Project Area. Bat activity was low in areas of agriculture in comparison to areas with wetland and woodland features (Derby et al., 2014b).

Bat activity studies at the Blazing Star Wind Farm in 2016 found that low frequency bats were the most commonly recorded species in the Project Area, and made up 84-90% of all bat passes recorded; 10-16% of passes were related to high frequency bat activity. Eastern red, evening, tri-colored, big brown, hoary, silver-haired, and varying *Myotis* bat species were detected in the Project Area during surveys. Bat activity was higher in summer months, and activity appeared to be concentrated around detectors in wooded areas near open water (Pickle et al., 2017).

During presence/absence acoustic surveys for northern long-eared bats in the Project Area, big brown, eastern red, hoary, silver-haired, and little brown bats were detected by survey equipment. Surveys to determine the extent of bat activity in the Project Area are on-going until November; it is anticipated that results similar to those at Red Pine and Blazing Star will be found in the Project Area.

Reptiles and Amphibians

Reptile and amphibian species that may be present in the Project Area include many snakes, frogs, and turtles. These species may utilize grasslands, wetlands, and pasture areas.

Insects

While many insect species are important to the cultivated vegetation and wildlife, honeybees are the only species in the Project Area that are economically important. Honeybees are considered a small but important part of central Minnesota's economy. Pollination is essential for apples, Minnesota's top fruit crop, valued at $11.8 million. Historically, honey production has contributed an average of $9-13 million annually towards the state's agricultural economy

(Pesticide Action Network, 2015). Butterfly species are associated with native prairie plants. The federally-listed Dakota skipper and Poweshiek skipperling and the state-listed Ottoe skipper are known to occur in Lincoln County. See Section 8.20 for more information on listed species.

8.19.2 Impacts

Development of the Project, including the construction and operation, is expected to produce a minimal impact to wildlife. Based on studies of existing wind power projects in the United States and Europe, the impact to wildlife would primarily occur to avian and bat populations. While Blazing Star 2 preconstruction surveys are ongoing, it can be expected that, similar to other wind developments, there is a high likelihood that individual bird fatalities will occur at the Project, but that it is unlikely to affect populations of most species, especially at a regional scale.

Few recent studies are available in comparable landscapes that provide both pre- and post-construction data from which to draw correlative inferences about potential impacts. Lakefield Wind Project has both pre- and post-construction data; pre-construction studies were conducted in 2010 and post-construction studies were conducted in 2012 and 2014. Prairie Rose Wind Project, located in Rock County, Minnesota, has post-construction data from studies conducted in 2014. Additionally, the Minnesota DOC commissioned a bat fatality study at wind farms in south-central Minnesota in 2013. These recent studies provide the most recent and relevant data available for potential impacts at the Project. However, studies conducted at other wind facilities in the Midwest during the early 2000s can also be instructive and provide useful comparisons. The purpose of these post-construction studies was to estimate the avian and bat fatality rates and identify any patterns related to habitat or conservation lands. The Lakefield Project is located approximately 80 miles southeast from the Project Area and comprised of predominately agricultural and grassland. There are no wildlife lands within the Lakefield Project Area, but several WMAs, WPAs, and two large lakes located adjacent to the Lakefield Project Area. The Prairie Rose Wind Project is located approximately 40 miles south and comprised of predominately agricultural land. There are no wildlife lands in or adjacent to the Prairie Rose Wind Project. All three projects, Lakefield, Prairie Rose, and Blazing Star, have similar land cover types, as shown in Table 8.31.

Table 8.31: Land Cover Types at Blazing Star 2, Lakefield, and Prairie Rose Wind Projects

Land Cover	Blazing Star 2	Lakefield	Prairie Rose
Cultivated Crops	65.9%	88.8%	77.9%
Grassland/Hay/Pasture	21.9%	2.8%	21.8%
Wetland/Water	6.6%	0.9%	0.01%
Forest/shrub-scrub	0.6%	1.0%	0.2%
Developed, open space	4.9%	5.4%	-
Developed land	0.1%	1.2%	-

Note: this table shows approximate land cover types based on data in Site Permit Applications, which, in some cases, use varying data sources. Blazing Star 2, and Lakefield land cover data utilize 2011 NLCD; Prairie Rose utilize 2009 USGS GAP.

The Lakefield studies identified the following impacts:

- Pre-construction studies aimed to address wildlife agency concerns of a potential local waterbird flight path corridor between Boot Lake and South Heron Lake, both large lakes located outside the project area. The study was also designed to see what, if any, effect the proximity of wildlife areas had on breeding bird diversity. The study found no apparent waterbird flight path corridor through the project area between Boot Lake and south Heron Lake. Additionally, breeding bird diversity was not significantly higher at proposed turbine locations closer to water resources and wildlife lands than at distant turbines. The study concluded that turbines were sited in agricultural land and an adequate distance from water features and wildlife lands that harbor a higher diversity of birds due to better quality habitat.

- Post-construction fatality monitoring at Lakefield in 2012 (Westwood, 2013) estimated 2.75 birds fatalities per MW and 19.87 bats per MW. Searchers found 15 species of birds and four species of bat, none of which were state or federally endangered, threatened, or special concern species. Fatalities attributable to wind turbines did not include any raptors or waterfowl. Bat species identified included big brown bat, little brown bat, eastern red bat, and hoary bat. Additionally, the study found no significant differences in the number of fatalities at turbines located < 1.25 miles from protected conservation lands than those greater than 1.25 miles.

- Post-construction fatality monitoring at Lakefield in 2014 (Westwood, 2015) estimated 1.07 bird fatalities per MW and 20.19 bat fatalities per MW. Three of the fatalities were waterbirds: one mallard, one American coot, and one American White Pelican. Most of the bat fatalities (65%) were solitary tree roosting bats (eastern red bat, hoary bat) with fatalities being observed during the migration (last week of July – mid-September) when bats are most at risk. Additionally, the study found no statistically significant relationship between number of fatalities and surrounding habitats or turbine proximity to conservation lands. The 2014 fatality rates are consistent with the 2012 fatality estimates. Avian fatality estimates fall in the low-range and bat fatality rates trend toward the mid-range when compared to fatality studies at other wind energy facilities (Westwood, 2015).

The Prairie Rose post-construction study (Chodachek et. al, 2015) identified the following impacts:

- Post-construction fatality monitoring was conducted during spring (April 15 to June 15) and fall (August 15 to October 31) in 2014. Additionally, there was an operational shut-down during part of the fall monitoring period (August 18 – August 28, 2014), a time when bat fatalities have been shown to be associated with fall migration. Post-construction fatality estimates provided for Prairie Rose are defined per study period (i.e., eight weeks during spring migration and 10

weeks during fall migration) and not extrapolated to per year that many other studies report.

- Post-construction fatality monitoring in 2014 estimated 0.44 bird fatality per MW per study period. The estimated bird fatality rate of 0.44 bird fatality per MW per study period at Prairie Rose is low compared to 33 other wind projects in the Midwest. Although, most of these studies typically included at least three seasons or an all year survey, it is unlikely that the bird fatality rate would change much with a summer survey as songbirds are the most common fatality reported at wind energy facilities, particularly during spring and fall migration.

- Post-construction fatality monitoring in 2014 estimated 0.41 bat fatality per MW per study period.

Studies at Buffalo Ridge Wind Resource Area in 2001 and 2002 (Johnson et al., 2002; Johnson et al., 2003) estimated avian and bat fatality, while also assessing impacts to grassland breeding birds:

- Following construction of the wind turbines, there was a reduction in use of the area within 100 meters of the turbines by about 32 percent of species of grassland breeding birds. It was hypothesized that lower avian use may be associated with avoidance of turbine noise, maintenance activities, and less available habitat. The researchers stated that "on a large scale basis, reduced use by birds associated with wind power development appears to be relatively minor and would not likely have any population consequences on a regional level" (Johnson et al., 2002).

- Avian mortality appeared to be low in the vicinity of the project area at nearby Buffalo Ridge WRA compared to other wind facilities in the United States. They found an overall avian mortality of 0.98 birds per turbine per year. Avian mortality is primarily related to nocturnal migrants. Resident bird mortality was very low and involved common species. The researchers stated that "based on the estimated number of birds that migrate through Buffalo Ridge each year, the number of wind plant related avian fatalities at Buffalo Ridge is likely inconsequential from a population standpoint" (Johnson et al., 2002).

- Bat mortality was studied at the Buffalo Ridge WRA in 2001 and 2002 by WEST. They found an overall mortality average of 2.16 bats/turbine/year. Approximately 82 percent of the bat mortality occurred from mid-July to the end of August. WEST found that "both the bat detector and mist net data indicate there are relatively large breeding populations of bats in close proximity to the wind plant that experienced little to no wind plant related collision mortality" (Johnson et al., 2003). It appeared that most bat mortality at Buffalo Ridge involved migrating bats. Researchers highlighted that bat mortality increased with reduced distance between turbines and wetlands or woodlands. Turbines in this study were 750 KW turbines with a 50 meter tower and RD of 46 or 48 meters, depending on blade length. Turbines will be larger at the Project.

Studies at the Big Blue, Grand Meadow, and Oak Glen Wind Farms in 2013 (Chodachek et al., 2014) focused on bat fatality, observing impacts to birds:

- Post-construction fatality monitoring in 2013 estimated a range of adjusted range of bat fatalities between 3.1 to 6.3 bat fatalities per MW per year for the three wind farms studied. Bat fatalities tended to peak twice; once in late July/early August and again in late August/early September. Fatalities were primarily composed of migratory tree-roosting bats, including the eastern red bat and the hoary bat.

- Post-construction fatality monitoring in 2013 estimate less than one bird fatality per MW per study period for the three wind farms included in the study. The overall fatality rate was 0.3 to 0.5 bird fatality per MW per study period. No large bird fatalities or threatened/endangered species fatalities were observed.

Results of post-construction mortality monitoring at Top of Iowa WRA also indicated low impacts to waterfowl species. Similar to the Project Area, the Top of Iowa wind development is located in an agricultural area with several WMAs interspersed through and adjacent to the Top of Iowa WRA, providing wetland, grassland, and woodland habitat. During pre-construction surveys, the Top of Iowa WRA had high shorebird, passerine, and migrant and resident waterfowl utilization. However, no waterfowl fatalities were found during extensive post-construction searches (Jain, 2005).

Ranges of estimated avian mortality (resident and migratory) observed for a sample of wind-energy projects in the U.S. (National Research Council, 2007) are from one to 12 birds per MW per year, which is higher than found at the Buffalo Ridge WRA. However, many of these estimates are based on older generation wind energy facilities which typically have higher MW/year fatality rates compared to newer generation turbines, which, while taller and having more wind-swept area, also have rotor-blades that move slower, are easier to see, and have other features that apparently reduce avian mortality (Erickson et al., 2002, Smallwood and Karas, 2009). Post-construction mortality studies at other sites, including the Buffalo Ridge WRA, indicated that collision events will likely be much lower than national averages.

Based on the results of previous studies, the land cover types within the Project Area, and the similarity of species composition between the Lakefield Wind Project, Prairie Rose Wind Project, Buffalo Ridge WRA, and the Project Area, the impact of the proposed Project on wildlife is expected to be minimal. There is potential for avian and bat collisions with Project turbines or meteorological towers, but those impacts are likely to be consistent with impacts found at Lakefield Wind Project, Prairie Rose Wind Project and Buffalo Ridge WRA. Additional impacts may include a small reduction in the available habitat that some wildlife uses for forage or cover; however, operation of the Project will not significantly change the existing land use.

8.19.3 Mitigative Measures

The Applicant will implement the following measures to the extent practicable to help avoid potential impacts to wildlife in the Project Area during selection of the turbine locations and subsequent Project development and operation:

- Avoid and minimize siting turbines in mapped native prairie, native plant communities, and sites of biodiversity significance ranked moderate, high, or outstanding.

- Maintain, at a minimum, the three by five times the RD setback from WMAs and WPAs to reduce risk to waterfowl/waterbirds and grassland-associated birds when siting turbines in the Project Area.

- Avoid or minimize disturbance of individual wetlands or drainage systems during Project construction. Wetland delineations will be conducted prior to construction to identify the limits of wetland boundaries in the vicinity of Project activities.

- Avoid or minimize placement of turbines in high quality native prairie tracts. Turbines will not be placed in sites of biodiversity significance ranked moderate, high, or outstanding. Blazing Star 2 has removed one turbine from the layout and four others are alternate turbines in all four layout scenarios. One turbine remains proposed in cropland.

- Protect existing trees and shrubs by avoiding tree removal for turbines, access roads, and underground collector lines. These will be identified based on aerial photos and during field surveys.

- Avoid construction activities within deer-wintering yards during winter.

- Maintain sound water and soil conservation practices during construction and operation of the Project to protect topsoil and adjacent resources and to minimize soil erosion. To minimize erosion during and after construction, BMPs for erosion and sediment control will be used. These practices include silt fencing, temporary seeding, permanent seeding, mulching, filter strips, erosion blankets, grassed waterways, and sod stabilization.

- Construct wind turbines using tubular monopole towers.

- Light turbines according to FAA requirements. Blazing Star 2 will consider the Project's lighting protocols to minimize potential impacts to wildlife while maintaining safe construction and operations. Some of the Project's goals pertaining to lighting include minimizing the number of lights, minimizing the duration of the light flash, maximizing the light-off period between flashes, and maintaining synchronized flashing among all turbines. In addition, non-turbine facility lighting will be minimized by various means, including only lighting the facilities when necessary, using downward facing lights and other means.

- Revegetate non-cropland and pasture areas disturbed during construction or operation with an appropriate native seeding mix.

- Inspect and control noxious weeds in areas disturbed by the construction and operation of the Project.

- Prepare and implement an ABPP during construction and operation of the Project. A draft ABPP is attached to this Application as Appendix G. This ABPP consists of Geronimo's corporate standards for minimizing impacts to avian and bat species during construction and operation of wind energy projects. The ABPP has been developed in a manner that is consistent with the guidelines and recommendations of the USFWS WEG (USFWS, 2012). It includes Blazing Star 2's commitments to wind farm siting and transmission route suitability assessments, construction practices and design standards, operational practices, permit compliance, and construction and operation worker training. It also includes additional avoidance and minimization measures that may be implemented in consultation with the USFWS and MN DNR if avian and bat mortalities exceed an acceptable level.

The Applicant is committed to minimizing wildlife impacts within the Project Area. Blazing Star 2 will design their facility to minimize avian impacts by avoiding high use wildlife habitat (woodlands adjacent to farmsteads and WMAs/WPAs), using tubular towers to minimize perching, placing electrical collection lines underground as practicable, and minimizing infrastructure. Blazing Star 2 continues to consult with the Commission, USFWS, and MN DNR regarding appropriate mitigation measures for wildlife impacts.

8.20 Rare and Unique Natural Resources

8.20.1 Description of Resources

Federal Regulations

Endangered Species Act

Section 7 of the Endangered Species Act ("ESA") of 1973 (16 USC 1531-1544) requires that all federal agencies consider and avoid, if possible, adverse impacts to federally listed threatened or endangered species or their critical habitats, which may result from their direct, regulatory, or funding actions. USFWS is responsible for compiling and maintaining the federal list of threatened and endangered species. Section 7 of the ESA also prohibits the taking of any federally listed species by any person without prior authorization. The term "taking" is broadly defined at the federal level and explicitly extends to any habitat modifications that may significantly impair the ability of that species to feed, reproduce, or otherwise survive. While the prohibition of "taking" federal species applies to anyone, the prohibition of the destruction or adverse modification of designated critical habitat only applies to federal agencies.

Bald and Golden Eagle Protection Act

While the bald eagle has been recently delisted from the ESA, it is still protected by the MBTA and the Bald and Golden Eagle Protection Act ("BGEPA") of 1940 (16 U.S.C. 668-668d). The BGEPA makes it illegal to kill, harass, possess (without a permit), or sell bald eagles.

State Regulations

Minnesota's endangered species law (Minn. Stat. § 84.0895) and associated rules (Minn R. Chs. 6212, 1800, 2300, and 6134) regulate the taking, importation, transportation, and sale of state endangered or threatened species. The MN DNR administers the state list of rare, threatened, and endangered species.

Threatened and Endangered Species

The Applicant reviewed the USFWS's Information for Planning and Conservation website (USFWS, 2017b) for a list of species and critical habitat that may be present in the Project Area (Table 8.32).

Table 8.32: Federally Listed Species Known to Occur in the Proposed Project Area

Species	Federal Status
Northern long-eared bat (*Myotis septentrionalis*)	Threatened
Dakota skipper (*Hesperia dacotae*)	Threatened
Poweshiek skipperling (*Oarisma poweshiek*)	Endangered
Topeka shiner (*Notropis topeka*)	Endangered
Topeka shiner (*Notropis topeka*)	Designated Critical Habitat
Rufa red knot (*Calidris canutus rufa*)	Threatened
Western prairie fringed orchid (*Platanthera, praeclara*)	Threatened

Presence/absence acoustic surveys for the northern long-eared bat were conducted in the Project Area in July 2016 and June 2017. The species was not qualitatively verified at any of the four acoustic stations surveyed in 2016. The species was also not identified by acoustical software at any of the six sites surveyed in 2017. As such, this species is considered likely absent from the proposed Project. Surveys are considered complete for all four survey stations at the two sites, and no further action is recommended to confirm NLEB bat absence pursuant to USFWS Northern Long-eared Bat Interim Conference and Planning Guidance (USFWS, 2014) and Range-Wide Indiana Bat Summer Survey Guidelines (USFWS, 2016).

Two records of the federally endangered Topeka shiner were identified within five miles of the Project Area. The species primarily occurs in small to mid-size prairie streams in the central United States (i.e., South Dakota, Minnesota, Kansas, Iowa, Missouri and Nebraska) where it is usually found in pool and run areas containing clear, clean water. Typical Topeka shiner streams are perennial, but the species may be found in those which lose flow seasonally (USFWS, 2017c). Critical habitat for the Topeka shiner is designated in Lincoln County; however, this pertains only to the Medary Creek complex in the southwestern portion of the County (USFWS, 2004). Designated critical habitat is not present in the Project Area.

The USFWS, the MN DNR Natural Heritage Program, and the MN DNR Division of Ecological Resources were contacted to review the Project for threatened and endangered species and unique habitats. The response letter from the MN DNR is included in Appendix D. As of the date

of this Application, the MN DNR Natural Heritage Program and USFWS have yet to provide written comments.

The MN DNR March 22, 2017 response letter from Ecological Services included the following comments:

- They note 17 WMAs within or adjacent to the Project Area, with some containing multiple parcels. They recommend no direct impacts occur to these public recreational lands from turbine construction, transmission lines, substations, or access roads. They also recommend a wind access buffer of 5 RD (prevailing wind direction) and 3 RD (non-prevailing wind direction) be applied to these lands.

- They identify a portion of the Project Area that may have higher bird and bat use. This avoidance area contains habitat associated with a RIM easement, WMAs, pasture, lakes, wetlands, and streams; MN DNR stated that turbines should not be located in this area. Some of these features are located outside the Project Area.

- They recommend that scientifically rigorous fatality monitoring be conducted at the Project for a minimum of two years. Reporting of fatalities should include per MW and facility wide on a yearly basis.

- They recommend 10 alternate turbine locations be included to provide an opportunity to avoid or minimize potential impacts to natural resources and to work around other issues that arise during project development.

The MN DNR maintains an Natural Heritage Information System ("NHIS") database through their Natural Heritage Program and Nongame Game Research Program, which is the most complete source of data on Minnesota's rare, endangered, or otherwise significant plant and animal species, plant communities, and other rare natural features (MN DNR, 2017c). NHIS data show that there is one record of the state-endangered loggerhead shrike in the Project Area, last observed in 1995. To date, loggerhead shrike has not been observed during on-going pre-construction avian studies. The results of the Tier I and II studies are included in Section 8.19.1.

There are also two avian and two plant species of state special concern within the Project area (Table 8.33). There are documented occurrences of one bird and one insect, and one plant within five miles of the Project Area that are state-listed endangered or threatened. In addition, 15 species of special concern (2 birds, 1 insect, 1 fish, 4 mammals, and 5 plants) and two watchlist birds that do not have a legal status, but are being tracked by the MN DNR, have been documented within five miles of the Project Area. Lastly, there is one colonial waterbird nesting site, last observed in 1994, at a WMA located outside the Project Area within 5 miles.

Table 8.33: NHIS Species Recorded within Five Miles of the Project Area

Type	State Status	Scientific Name	Common Name	No. of NHIS Records within the Project Area	No. of NHIS Records within Five Miles of Project Area Boundary	Year of Most Current Observation
Bird	E	*Lanius ludovicianus*	Loggerhead shrike	1	0	1995
	E	*Ammodramus henslowii*	Henslow's sparrow	0	1	2007
	SPC	*Sterna forsteri*	Forster's Tern	1	0	1979
	SPC	*Pelecanus erythrorhynchos*	American White Pelican	0	1	2005
	SPC	*Empidonax virescens*	Acadian Flycatcher	0	1	2006
	SPC	*Progne subis*	Purple Martin	1	1	2007
	W	Phalacrocorax auritus	Double-crested Cormorant	0	1	2006
	W	*Bartramia longicauda*	Upland Sandpiper	0	1	2007
Insect	E	*Hesperia ottoe*	Ottoe Skipper	0	1	1978
	SPC	*Speyeria idalia*	Regal fritillary	0	2	2008
Fish	SPC	Notropis topeka	Topeka Shiner	0	2	2014
Mammal	SPC	Eptesicus fuscus	Big Brown Bat	0	1	2015
	SPC	*Urocitellus richardsonii*	Richardson's ground squirrel	0	1	2007
	SPC	*Microtus ochrogaster*	Prairie vole	0	2	2007
	SPC	*Onychomys leucogaster*	Northern grasshopper mouse	0	4	2007
Plant	SPC	Aristida purpurea var. longiseta	Red Three-awn	0	1	2008
	SPC	*Eleocharis coloradoensis*	Dwarf spikerush	0	1	1929
	SPC	Solidago mollis	Soft Goldenrod	0	1	1891
	SPC	*Desmanthus illinoensis*	Prairie Mimosa	0	1	1929

Table 8.33: NHIS Species Recorded within Five Miles of the Project Area

Type	State Status	Scientific Name	Common Name	No. of NHIS Records within the Project Area	No. of NHIS Records within Five Miles of Project Area Boundary	Year of Most Current Observation
	SPC	*Botrychium campestre*	Prairie Moonwort	0	1	2007
	SPC	*Astragalus flexuosus* var. *flexuosus*	Slender Milk-vetch	1	3	2009
	SPC	*Dalea candida* var. *oligophylla*	Western White Prairie-clover	2	5	2013

Source: MN DNR, 2017c

As part of its NHIS database, the MN DNR also maps rare and unique plant communities. These records may represent relatively rare habitats (e.g., prairie) or higher quality or good examples of more common plant communities (e.g., wet meadow). While most native plant communities have no legal protection in Minnesota, these areas may have the potential to contain undocumented populations of rare plant species, which may be protected under Minnesota's state endangered species law (Minn Stat. § 84.0895). Many of these native communities also provide essential habitat for rare species of fauna, such as those listed in Table 8.33 above. There are no NHIS records of native plant communities within the Project Area and one record (Dry Hill Prairie, southern) within five miles of the Project Area (MN DNR, 2017c). See Section 8.18.1.2 for a discussion on other native prairie and native plant communities.

8.20.2 Impacts

Based on preliminary site assessments, the Project Area is mostly cropped or heavily grazed pasture. No records of federal- or state-listed plant species occur within the Project boundary. As discussed in Section 5.18, turbines have been sited to avoid mapped native prairie, native plant communities, and sites of biodiversity significance ranking moderate, high, or outstanding. Blazing Star 2 will continue to coordinate with USFWS and MN DNR on native prairie. Although no impacts to rare or unique natural resources are anticipated by the Project, a pre-construction inventory of existing native prairie, woodlands, and wetlands will be conducted in the Project Area. The Applicant will avoid the rare and unique resources identified to the extent practicable.

8.20.3 Mitigative Measures

The Applicant will implement the following measures to avoid potential impacts to federal- and state-listed species and rare or sensitive habitat in the area during site selection for the wind turbines and access roads and the subsequent Project development and operation:

- If the Project will impact native prairie, as defined by Minn. Stat. § 84.02, subd. 5, Blazing Star 2 will complete a Native Prairie Protection Plan in coordination with the MN DNR;

- Avoid or minimize disturbance of individual wetlands or drainage systems during Project construction;
- Avoid or minimize placement of turbines in high quality native prairie;
- Setback the turbines from the WPAs and WPAs in adjacent properties by at least one-quarter mile because of the Project perimeter setback; and
- Continue to coordinate with the USFWS and MN DNR as the Project layout is developed.

9.0 Site Characterization

9.1 Site Wind Characteristics

Access to quality wind resources has guided the site selection. However, other factors, including environmental concerns, relative interest from communities and landowners, and access to cost effective transmission, play a part in the selection of a site. This process allows Blazing Star 2 to maximize the use of Minnesota's wind resource in a cost-effective manner.

The United States Department of Energy and the DOC have conducted wind resource assessment studies in Minnesota since 1982. In 2014, the National Renewable Energy Laboratory released the Wind Integration National Dataset that provides modeled wind resource and power production data for over 100,000 grid points across the continental United States (Draxl, et al. 2015). Model data includes predicted wind speeds at hub heights of 80 and 100 meters above ground level. Near the Project Area, the mean annual wind speed at 80 meters (262 feet) above ground level is predicted to be 8.2 to 8.5 m/s.

Blazing Star 2 initiated its wind resource assessment campaign in 2015 and has three temporary meteorological towers monitoring weather data in the Project Area.

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 Blazing Star 2'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 at airports in the vicinity. Based on analysis of weather stations and model data in the vicinity of the Project, the annual variation of wind speed is expected to be five percent or approximately 0.4 m/s.

9.1.2 Seasonal Variation

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

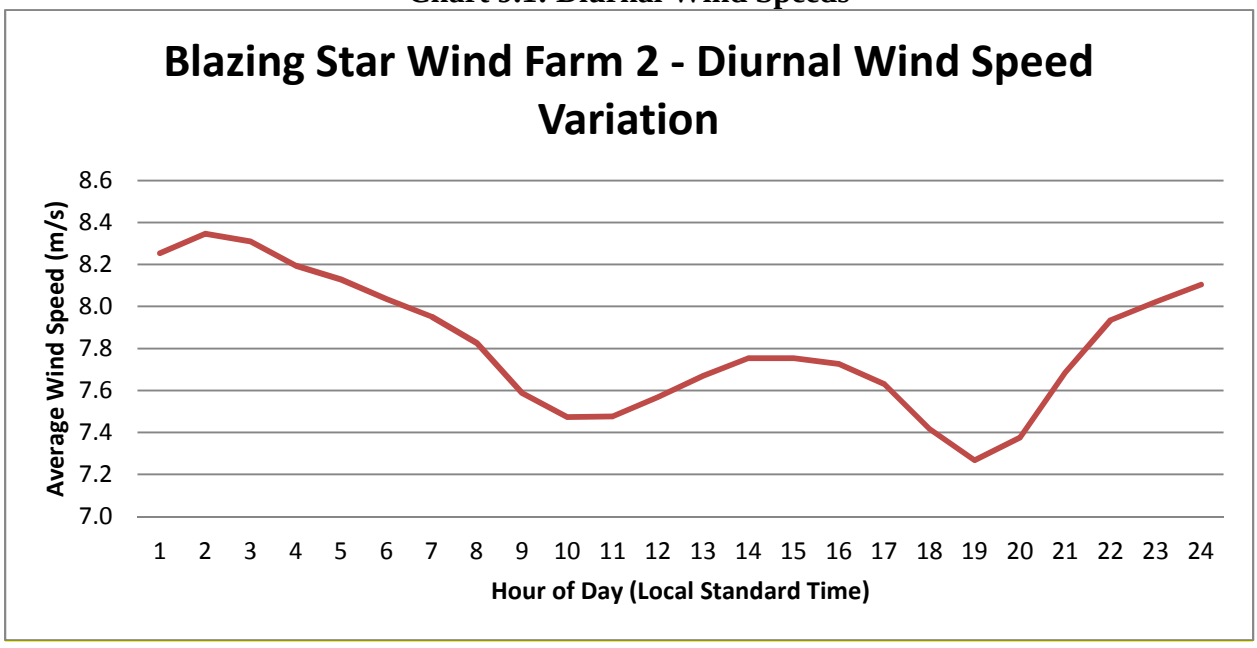
Table 9.1: Average Wind Speed

Month	Wind Speed (m/s)
January	7.5
February	8.2
March	8.0
April	8.5
May	7.7
June	6.7
July	6.8
August	7.6
September	8.1
October	7.9
November	8.6
December	8.2
Annual Average	**7.8**

9.1.3 Diurnal Conditions

Diurnal variation occurs through the shift in day and nighttime weather patterns. Chart 9.1 shows the expected variation in wind speeds at the Project Area. On average, the wind speeds are higher in the evening and nighttime hours, and lower in the morning and at midday.

Chart 9.1: Diurnal Wind Speeds



9.1.4 Atmospheric Stability

The atmospheric stability is defined by lateral fluctuation of the wind, or sigma theta. Stability level is characterized by sigma theta 0 to 2.5 degrees as stable, 2.5 to 7 as moderately stable, 7 to 9 as neutral, 9 to 15 as moderately unstable, and greater than 15 degrees as very unstable (Slade, 1968). The atmospheric stability based on the Blazing Star 2 meteorological tower sites at the 60 meter level is 6.5 degrees, or moderately stable.

9.1.5 Hub Height Turbulence

The Turbulence Intensity ("TI") is defined as the measured standard-deviation of wind speed over an hour, divided by the mean for the same time period. For 15 m/s wind speeds, the average TI is 10 percent at the lower hub heights and is nine percent for the higher hub heights. For 15 m/s wind speeds, the representative TI is 12 percent at the lower hub heights and is 11 percent at the higher hub heights. Representative TI accommodates the natural variation in TI associated with the variability of wind speed by being the normal TI plus 1.28 standard deviations of the TI at 15 m/s second.

9.1.6 Extreme Wind Conditions

The maximum hourly wind speed measured at the Blazing Star 2 meteorological tower sites was 26.3 m/s. Site extreme wind events for a one-year event will likely be 41.4 m/s. Table 9.2 provides the 20- through 100-year maximum means and gusts for the Project Area based on the data collected by the three meteorological towers at the Project Area. To extrapolate from the three year data record at the Project Area to the longer periods, a Gumbel distribution was fit to the observed maximum wind speeds in each year of the Project data record (Harris 1999). The result is a plot of the wind speed versus the probability of exceedance; the return period is the inverse of the probability of exceedance (i.e. a 1% probability of exceedance translates to a 100-year return period).

Table 9.2: Extreme Wind Events at 80m

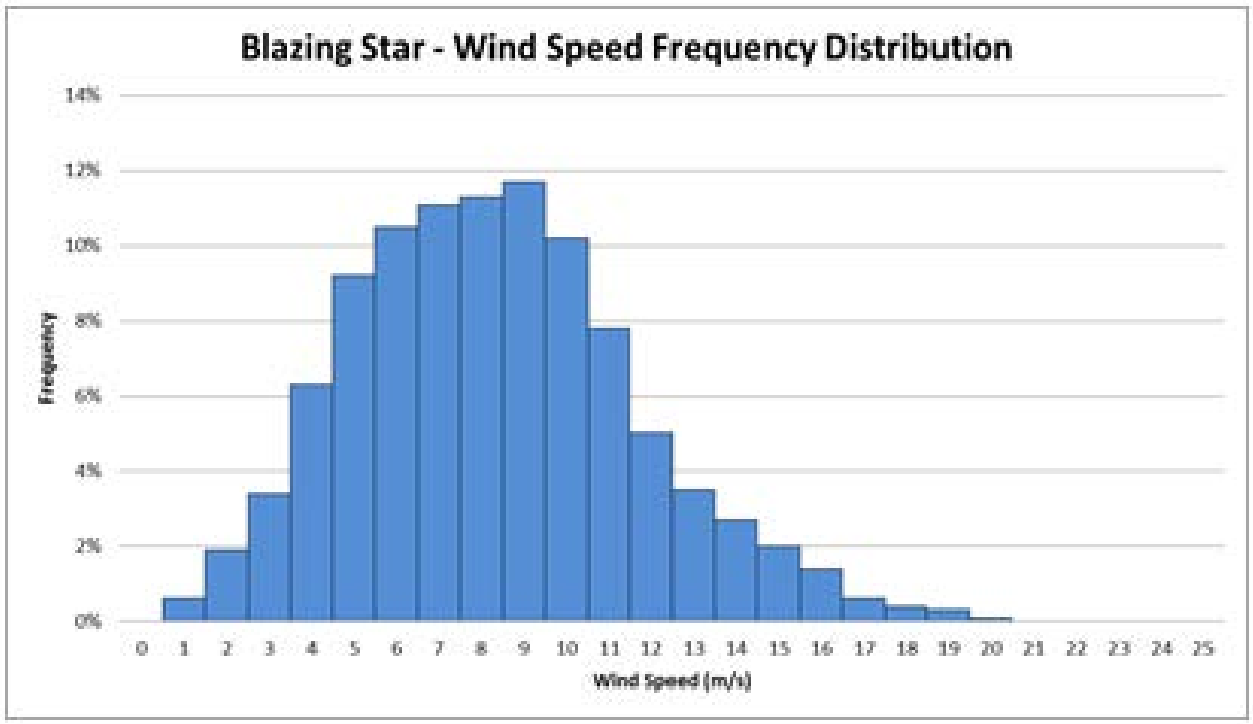
Extreme Wind Speed (m/s)		
Period (yr)	**10 min means**	**Gust**
20	29.1	42.4
25	29.8	42.8
50	32.3	43.5
100	34.1	49.9

9.1.7 Wind Speed Frequency Distribution

Chart 9.2 shows the wind speed frequency distribution calculated from hourly 50-meter data at the nearest member grid point of the NASA Modern Era Retrospective Analysis for Research and Applications dataset (Rienecker, et al., 2011). A majority of the winds occur between three

m/sec and 13 m/s. The characteristics of this distribution are consistent with wind regimes observed elsewhere in Minnesota.

Chart 9.2: Wind Speed Frequency Distribution



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 $S/S_o = (H/H_o)^{\alpha}$, where S_o and H_o are the speed and height of the lower level and α 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. The vertical variation with height or shear coefficient, based on the 32 to 60 meter level at one Blazing Star 2 meteorological tower site that is representative of the Project, is approximately 0.21.

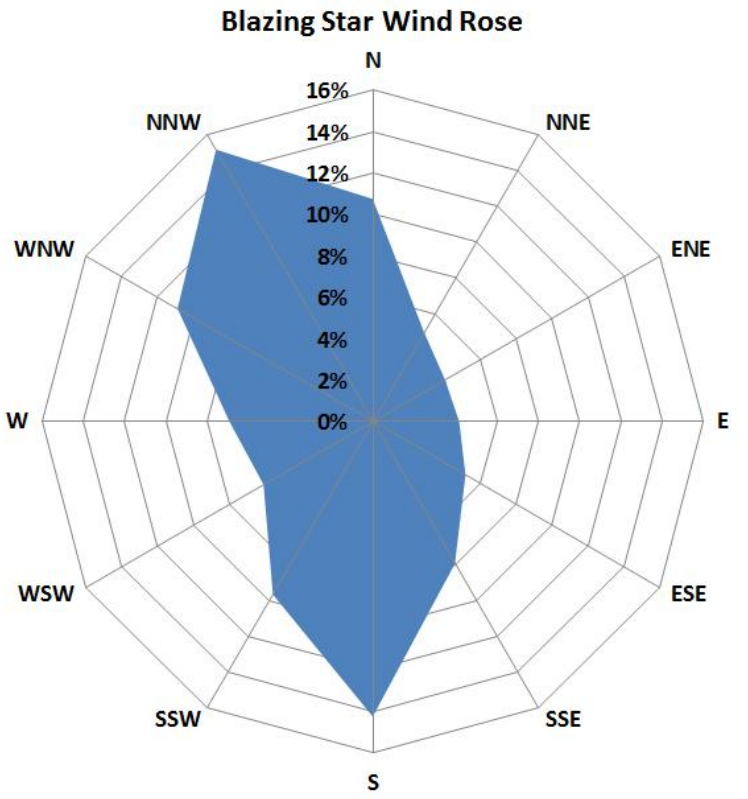
9.1.9 Spatial Wind Variation

As noted above, the DOC's wind resource analysis program estimates that the spatial variation in wind speed across the Project Area is between eight and nine m/s. This estimate is confirmed by the onsite data and the analysis performed by Blazing Star 2.

9.1.10 Wind Rose

A wind rose is a graphical representation of wind speeds based on the direction the wind comes from and the frequency it comes from each direction. Chart 9.3 shows a composite wind rose from the three Blazing Star 2 meteorological tower locations.

Chart 9.3: Blazing Star 2 Wind Rose



9.1.11 Other Meteorological Conditions

9.1.11.1 Average and Extreme Weather Conditions

Long term average temperatures and precipitation were evaluated from the Midwest Regional Climate Center (2016) Canby Station (211263) located approximately 12 miles north of the Project Area. The average minimum temperature in the Project Area ranges from 5.8 degrees Fahrenheit in January to 61.8 degrees in July; the average maximum temperature ranges from 24.9 degrees in January to 84.1 degrees in July. Average precipitation in the Project Area ranges from 0.80 inches in January to 4.20 inches in June.

Extreme weather events for the Project Area include thunderstorms, tornadoes, hail, heavy snow and ice, extreme cold, heat waves, flash floods/floods, heavy rain, lightning, and drought. Tornadoes, thunderstorms, and extreme winds strike occasionally. The state of Minnesota experiences approximately 15 to 20 tornadoes per year. (NOAA, National Climatic Data Center 2014)

National Climatic Data Center records in and near the Project Area include 164 thunderstorms, eight high wind events, and 39 tornadoes from January 1950 to February 2010. Such storms are usually of short duration and localized, leading to damage in small geographic areas. Wind turbines are built to withstand hail and lightning, but are not designed to survive tornado-force winds of 89 + m/s (200+ mph).

Turbines under consideration for this Project are capable of withstanding most of the extreme weather conditions that occur in the area. All turbines being considered have lightning protection systems, turbine blades that "feather" into the prevailing wind direction during high wind events to minimize the risk of damage, and turbines that shut down above the cut-out wind speed (generally 45-55 mph). During the winter, there is potential for icing events to result in ice accumulation on turbine blades with variable frequency. Although the turbines are not equipped with specific ice-sensing equipment, the turbine will stop turning if significant ice accumulation causes an imbalance. The mechanical safeguards and turbine setbacks mitigate the potential hazard associated with ice throw, and minimize the potential that ice thrown from turbine blades could reach public roads and residences. Ice throw is not expected to be a hazard for this Project.

9.2 Location of Other Wind Turbines within Ten Miles of Project Boundary

Based on the FAA obstacle database (FAA, 2016), ABB Velocity Suite GIS data (ABB, 2016) and State of Minnesota data on wind turbine locations, there are existing wind turbines to the west, south, southwest and northwest of the Project Area. Figure 19 shows the location of existing wind turbines and wind energy projects. There are 261 identified commercial-scale wind turbines in operation within 10 miles of the Project Area with 150 of those in Minnesota (two of which are within the Project Area) and 111 in South Dakota. Within 20 miles of the Project Area, there are 529 identified wind turbines, with 350 of them located in Minnesota.

Blazing Star 2 constructed a search across the Lincoln County for wind energy projects that are not built but for which LWECS Site Permit Applications have been submitted to the Commission. The Blazing Star Wind Farm is located in Lincoln County and received a CN and site permit from the Commission in August 2017. The Red Pine Wind Project is also located in Lincoln County and received a site permit from the Commission in June 2017. (Minnesota DOC, Energy Environmental Review and Analysis 2017).

10.0 Project Construction

Land will be graded for the turbine pads, drainage systems, access roads, the O&M building and additional facilities as necessary. Drainage systems, access roads, storage areas, a concrete batch plant, and shop facilities will be installed or utilized on site, if necessary, to fully accommodate all aspects of the construction, operation, and maintenance of the Project.

Several activities must be completed prior to the proposed commercial operation date. The majority of the activities relate to equipment ordering lead-time, as well as design and construction of the Project. Below is a preliminary schedule of activities necessary to develop the

Project. Preconstruction, on-site construction, and post-construction activities for the Project include:

- Order all necessary components including towers, nacelles, blades, foundations, transformers, etc.
- Finalize turbine micro-siting
- Complete survey to establish locations of structures and roadways
- Complete soil borings, testing, and analysis for proper foundation design and materials
- Complete construction of access roads, to be used for construction and maintenance
- Construct aboveground or underground collection and feeder lines and communication cables
- Design and construct the metering station adjacent to the interconnection substation
- Design and construct the step-up substation
- Determine potential upgrades to the interconnection substation as determined by MISO
- Install tower foundations
- Place towers and set wind turbines
- Complete Project acceptance testing
- Commence commercial production

Blazing Star 2 and its engineering contractor will perform or manage all development activities. Specifically, Blazing Star 2 will:

- Perform site resource analysis
- Undertake environmental review
- Obtain specific permits and licenses for the Project

Under the oversight of Blazing Star 2's staff, the engineering and construction contractors will:

- Perform civil engineering for access roads and turbine foundations
- Construct foundations, towers, and transformers
- Assemble and install turbines
- Install the communication system, including telephone and fiber-optic cable, and SCADA software and hardware
- Construct the Project substation
- Construct the electrical feeder and collection system

- Construct radial interconnection

10.1 Roads and Infrastructure

During the construction phase, several types of light, medium, and heavy-duty construction vehicles will travel to and from the Project Area, as well as private vehicles used by construction personnel. The Applicant estimates that there will be 375 large truck trips per day and up to 875 small-vehicle (pickups and automobiles) trips per day in the area during peak construction periods. That volume will occur when the majority of the foundation and tower assembly is taking place. Prior to construction, the Applicant will coordinate with local jurisdictions (counties and townships) in order to obtain the necessary road access and overwidth/overweight permits. At the completion of each construction phase, this equipment will be removed from the Project Area or reduced in number.

Improvements to existing access roads may include re-grading and filling of the gravel surface to allow access in inclement weather and widening of select intersections to accommodate truck traffic. No asphalt or other paving is anticipated. Blazing Star 2 will coordinate with the county and the townships road authorities to develop a road agreement prior to construction.

10.2 Access Roads

Constructing the Project will require approximately up to 26 miles of gravel access roads, depending on the size of turbine selected and final design. They will be located to facilitate both construction access (cranes) and access by operation and maintenance crews while inspecting and servicing the wind turbines. The access roads will be between towers, with one road required for each string of wind turbines. The roads will be approximately 5.5 meters (18 feet) wide and of low profile to allow cross-travel by farm equipment.

The Applicant will work closely with landowners to locate access roads to minimize land-use disruptions. Siting of access road connections to public road right-of-way will be completed in accordance with state and local requirements. Siting roads in areas with unstable soil will be avoided whenever possible. All roads will include appropriate drainage and culverts and will allow for farm equipment crossing.

The roads will be approximately 5.5 meters (18 feet) wide and will be improved with class-5 (gravel) cover, which is adequate to support the size and weight of maintenance vehicles. The specific turbine locations will determine the amount of roadway that will be constructed for this Project. In addition, an up to 9.1-meter (30-foot) diameter gravel work area will surround each turbine base.

The roads will consist of graded dirt overlaid with geotechnical fabric or other suitable sub-base (if needed) covered with gravel. To facilitate crane movement and equipment delivery, an additional 1.0 to 3.7 meter (3.5 to 12 feet) of gravel roadway will be temporarily installed on either side of the permanent roadway (12.1 meter [40 foot] total width).

After construction, temporary construction laydown areas adjacent to turbine pads will be restored, and access roads will be restored to their permanent 5.5 meter (18 foot) width. The site

will be graded to natural contours, soil will be loosened if needed, and the site will be re-seeded if needed. Once construction is completed, the access roads will be regraded, filled, and dressed as needed.

Blazing Star 2 will repair or replace any existing fences or gates that are impacted during construction, and will coordinate with participating landowners to provide suitable fencing or gates if access roads cross into existing pastures.

10.3 Associated Facilities

10.3.1 Operation and Maintenance Facility

An O&M building will be constructed in or near the Project Area and will provide access and storage for Project maintenance and operations. Such buildings are typically 3,000 to 5,000 square feet and house the equipment to operate and maintain the Project. The parking lot adjacent to the building is expected to be approximately 3,000 square feet. Blazing Star 2 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 substation will consist of switch gear, metering, transformers, electrical control and communications systems, and other high voltage equipment needed to convert the electricity generated by the Project from 34.5 kV to 345 kV. Final specification of the substation will be determined by the agreements the Project has with MISO, as well as the transmission owner and power purchaser. The Project substation will be approximately 10 acres in size including the graded area, which may be larger than the area actually fenced.

10.3.3 Laydown and Staging Areas

The laydown and staging areas will be temporary disturbed and used during construction of the Project. They will be the primary location for construction and delivery activities for the Project as well as provide office space for the construction management team. Each laydown and staging area will be approximately 10 acres in size and will have temporary structures for the offices and storage of equipment. Each area will be comprised of 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

Blazing Star 2 also proposes to install up to four permanent meteorological towers to maintain the performance of the Project, conform to grid integration requirements and validate wind turbine power curves.

10.4 Turbine Site Location

Construction of the turbines will include temporary impacts of approximately an additional 12 to 15 ft (3.6 to 4.6 m) of gravel roadway on either side of the permanent roadway (48 ft [14.6 m]

total width), a 40-ft-by-120-ft (12.2-m-by36.6-m) gravel crane pad extending from the roadway to the turbine foundation which will be graded to a minimum of one percent, and a component laydown and rotor assembly area centered close to the turbine foundation which will be graded to a minimum of five percent. The component laydown area will range from approximately 260 by 260 feet to 335 by 335 feet (79 by 79 meters to 102.1 by 102.1 meters), depending on the turbine size selected. 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 will be equipped with a lightning protection system. The turbine will be 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 wind turbines' freestanding tubular towers will be connected by anchor bolts to a concrete foundation. Turbine foundations will use a pad-and-pier tower mounting system consisting of top and bottom templates. These templates consist of anchor bolts and reinforcing steel bar (rebar); they are placed within the excavated portion of the turbine footing and filled with concrete. The anchor bolts protrude from the concrete pad surface and the turbine base is fastened to these bolts. The excavated portion of the concrete turbine pad ranges from approximately 291 to 737 cubic yards depending on soil requirements and turbine size. The turbine pad dimensions are approximately twenty feet in above-ground diameter and typically range in depth from four to six feet. An approximate height of two to three feet of the turbine pad remains above grade. Geotechnical surveys, turbine tower load specifications, and cost considerations will dictate final design parameters of the foundations.

In addition, turbine assembly will require a 40 by 120 foot gravel crane pad extending from the access road to the turbine foundation, which will be graded to a maximum of one percent, and an approximate 260 by 260 feet to 335 by 335 feet area for component laydown and rotor assembly centered close to the turbine foundation, which will be graded to a maximum of five percent.

10.4.2 Tower

The towers are conical tubular steel with a hub height of eighty (80) to ninety-five (95) meters (262 to 311 ft). The turbine towers, where the nacelle is mounted, consist of three to four 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 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 Clean-up and Site Restoration

After construction, temporary construction areas, such as crane pads adjacent to the turbine pad and access road additional width areas, will be restored. The temporary disturbance areas will be graded to natural contours and soil will be loosened and seeded if necessary. Once construction is completed, the permanent access roads will be regraded, filled, and dressed as needed. Although few, if any, temporary roads will be constructed with the Project, all temporary roads, staging areas, batch plant and the laydown area will be decommissioned and restored upon completion of construction of the Project. Erosion control methods will depend on the contours of the land, as well as requirements of the general contractor and relevant permits. Blazing Star 2 anticipates that the post-construction clean-up and site restoration process will last approximately thirty days.

10.6 Operation of Project

Each wind turbine in the Project will communicate directly with the SCADA system for performance monitoring, energy reporting, and trouble-shooting. The SCADA system will also provide the overall control of the Project.

The Applicant will augment its O&M staff as needed with appropriate contractors to service and maintain the Project.

10.6.1 Project Control, Management, and Service

In addition to providing Project control, the SCADA system offers access to wind turbine generation or production data, availability, and meteorological and communications data, as well as alarm and communication error information. Performance data and parameters for each machine (generator speed, wind speed, power output, etc.) can be viewed, and machine status can be changed. There is also a snapshot facility that collects frames of operating data to aid in diagnostics and problem troubleshooting.

The primary functions of the SCADA are to:

- Control and monitor the Project
- Alert operations personnel to Project conditions requiring resolution
- Provide a user/operator interface for controlling and monitoring wind turbines
- Collect performance data from turbines
- Monitor field communications
- Provide information on wind turbine performance for operators and maintenance personnel
- Collect data on wind turbine and Project maintenance
- Serve as an information archive
- Provide spare parts inventory control

- Generate O&M reports

General Maintenance Duties

The O&M field duties include performing all scheduled and unscheduled maintenance including periodic operational checks and tests, regular preventive maintenance on all turbines, related plant facilities and equipment, safety systems, controls, instruments, and machinery, including:

- Maintenance on the wind turbines and on the mechanical, electrical power, and communications system
- Performance of all routine inspections
- Maintenance of all oil levels and changing oil filters
- Maintenance of the control systems, all structures associated with the Project, access roads, drainage systems, and other facilities necessary for the operation of the Project
- Maintaining all O&M field maintenance manuals, service bulletins, revisions, and documentation for the Project
- Maintaining all parts, price lists, and computer software
- Maintenance and operation of interconnection facilities
- Providing all labor, services, consumables, and parts required to perform scheduled and unscheduled maintenance on the Project, including repair and replacement of parts and removal of failed parts
- Assisting as needed with avian, bat, and other environmental studies and compliance activities
- Management of lubricants, solvents, and other hazardous materials as required by local and/or state regulations
- Maintenance of all appropriate levels of spare parts in order to service equipment
- Obtaining all necessary equipment including the rental of industrial cranes for removal and reinstallation of turbine components
- Hiring, training, and supervising a work force necessary to meet Project general maintenance requirements
- Maintaining site security

Maintenance Schedule

Equipment will be monitored by local O&M staff and remotely by the Applicant's operations and power scheduling desk, which is staffed 24 hours a day. When needed during off hours, local personnel will be dispatched to the site by the remote monitoring staff. Performance testing is done during the early months of operation to see that the Project is operating within expected parameters.

Project inspection and maintenance is performed on the following intervals:

A. **First Service Inspection.** The first service inspection will take place one to three months after the turbines have been commissioned. At this inspection, particular attention is paid to tower bolt tensioning and equipment lubrication.
B. **Semi-Annual Service Inspection.** Regular service inspections commence six months after the first inspection. The semi-annual inspection consists of lubrication and a test of the turbine trip system.
C. **Annual Service Inspection.** The yearly service inspection consists of a semi-annual inspection plus a full component check. Bolts are checked with a torque wrench. The check covers 10 percent of the bolts. If any bolts are found to be loose, all bolts in that assembly are tightened and the event is logged.
D. **Two Year Service Inspection.** The two-year service inspection consists of the annual inspection, plus checking and tightening of electrical terminal connectors.
E. **Five Year Service Inspection.** The five-year inspection consists of the annual inspection, an extensive inspection of the wind braking system, checking and testing of oil and grease, balance check, and tightness of terminal connectors.

10.7 Costs

10.7.1 Capital and Operational Costs

The total Project-installed capital costs are estimated to be approximately $330 million, including wind turbines, associated electrical and communication systems, and access roads. Ongoing O&M costs and administrative costs are estimated to be approximately $6.5-7.5 million per year, including royalties to landowners for wind lease and easement rights.

10.7.2 Site and Design Dependent Costs

The overall cost of developing the Project will depend primarily on site selection and construction timing. Site-dependent costs will include: the relative ease of access to the individual wind turbine locations, site-specific subsurface conditions that determine foundation design, access road design and layout, ease of underground work, and the layout of the turbine arrays which affects road and electrical cable cost. Both underground and aboveground cable may be employed to connect turbines, transformers, and the interconnect point. The underground placement of the cables is preferable.

10.8 Schedule

10.8.1 Land Acquisition

The Applicant will be responsible for all land acquisition and will obtain the necessary easements, leases or purchase agreements from landowners. Blazing Star 2 may either lease, secure easements or purchase the necessary parcels for the substation, O&M facilities, and temporary laydown and staging areas. The expected timeline for land acquisition completion is third quarter 2017.

10.8.2 Sale of Power

The Project is part of Xcel Energy's 1,550 MW wind generation portfolio that was approved by the Commission in September 2017.[8] The Project is one of the four projects that Xcel Energy intends to build, own, and operate.[9] Under the terms of the Purchase and Sale Agreement, Xcel Energy will acquire the Project prior to construction, which may begin as early as 2nd Quarter 2018.

10.8.3 Equipment Procurement, Manufacture and Delivery

Blazing Star 2 is in the process of procuring turbines for the Project. Turbines will be allocated to the Project after meteorological and economic studies are completed to achieve the best match of turbines for the Project. Turbines could arrive on site as early as third quarter 2017.

10.8.4 Construction

Blazing Star 2 personnel will oversee the primary contractors performing onsite Project construction, including, but not limited to, roads, wind turbine assembly, electrical, and communications work. The construction will take approximately twelve months to complete; however, depending upon seasonal or weather-related constraints (i.e., minimal work would occur during winter months) it may take less time.

10.8.5 Construction Financing

The Applicant will be responsible for financing all predevelopment, development, and construction activities. The Applicant anticipates financing the cost of all predevelopment activities through internal funds. Construction will be financed with internal funds or a combination of internal funds and third-party sources of debt and equity capital.

10.8.6 Permanent Financing

Permanent financing will be provided with the Applicant's internal funds or a combination of internal funds and third-party sources of debt and equity capital.

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[8] *See* Order Approving Petition, Granting Variance, and Requiring Compliance Filing, *In the Matter of the Petition of Xcel Energy for Approval of the Acquisition of Wind Generation from the Company's 2016-2030 Integrated Resource Plan* (Sept. 1, 2017), at p. 2.

[9] *See* Order Approving Petition, Granting Variance, and Requiring Compliance Filing, *In the Matter of the Petition of Xcel Energy for Approval of the Acquisition of Wind Generation from the Company's 2016-2030 Integrated Resource Plan* (Sept. 1, 2017), at p. 2.

10.8.7 Expected Commercial Operation Date

The Applicant anticipates that the Project would begin commercial operation by fourth quarter 2018. The commercial operation date is dependent on the completion of the interconnection process, permitting and other development activities.

10.9 Energy Projections

10.9.1 Proposed Array Spacing for Wind Turbines

Wind turbines will be placed on lands in the Project Area that are leased by Blazing Star 2. The turbines will be installed in relatively high elevation areas to access the best wind resource in the Project Area. The Proposed internal array spacing for the Project's turbines is a minimum of three (3) RD in a crosswind spacing (non-prevailing direction) and a minimum of five (5) RD in a downwind spacing (prevailing direction), with up to twenty percent (20%) of the turbines spaced closer to each other. The internal turbine spacing is dependent upon the selected equipment and the site topography. Blazing Star 2 developed the Project to maximize the wind resource and minimize array wake losses.

10.9.2 Base Energy Projections

The Project will have a nameplate generation capacity of up to 200 MW and a net capacity factor of between 45 to 50 percent. Blazing Star 2 estimates an average annual output of between approximately 788,400 and 876,000 MW hours. Annual energy production output will depend on final design, site specific features, and the equipment selected for the Project. Gross to net calculations take into account, among other factors, energy losses in the gathering system, mechanical availability, array losses, and system losses. An industry-wide estimate of energy losses ranges from eight to ten percent (8-10%) of maximum output.

10.10 Decommissioning and Restoration

The Project decommissioning and restoration plan will be developed in accordance with the requirements of Minnesota Rule Ch. 7836.0500, subp. 13. A decommissioning plan will be developed by Blazing Star 2 prior to the Project's pre-operation meeting with the DOC. At the end of commercial operation, Blazing Star 2 or the Project owners will be responsible for removing wind facilities, and removing the turbine foundations to a depth of four feet below grade. Blazing Star 2 reserves the right to extend operations instead of decommissioning at the end of the site permit term. As necessary, Blazing Star 2 may apply for an extension of the LWECS Site Permit to continue operation of the Project. In this case, a decision may be made on whether to continue operation with existing equipment or to retrofit the turbines and power system with upgrades based on newer technologies.

10.10.1 Anticipated Life of the Project

The anticipated Project life is approximately thirty (30) years beyond the date of first commercial operation.

10.10.2 Cost to Decommission

The estimated decommissioning cost in current dollars is expected to be around $34,000 per turbine after salvage value, including associated facilities. Blazing Star 2 will be responsible for all costs to decommission the Project and associated facilities. The cost to decommission will depend upon the prevailing rates for salvage value of the equipment and labor costs.

Because of the uncertainties surrounding future decommissioning costs and salvage values, Blazing Star 2 will review and update the cost estimate of decommissioning and restoration for the Project every five years after Project commissioning. This revised cost estimate of decommissioning and salvage value will be submitted to the Commission for review and comment.

10.10.3 Method of ensuring funds will be available for decommissioning and restoration

Beginning in year 15 of the Project's operational life, the Applicant will either create a reserve fund, enter into a surety bond agreement, create an escrow account, or provide another form of security that will ultimately fund decommissioning and site restoration costs after Project operations cease, to the extent that the salvage value does not cover decommissioning costs. The exact amount to be allocated for decommissioning will be determined by a third party study in year 14 that will assess the difference between estimated decommissioning costs and the salvage value

10.10.4 List of Decommissioning and Restoration Activities

Consistent with the terms of the Site Permit and the wind lease and easement agreements with individual landowners, Blazing Star 2 will complete the following list of decommissioning and restoration activities:

Turbine removal - Access roads to turbines will be widened to a sufficient width to accommodate movement of appropriately-sized cranes, trucks and other machinery required for the disassembly and removal of the turbines. Control cabinets, electronic components, and internal cables will be removed. The rotor, nacelle and tower sections will be lowered to the ground where they may be transported whole for reconditioning and reuse, or disassembled/cut into more easily transportable sections for salvageable, recyclable, or disposable components.

Turbine and substation foundation removal - Topsoil will be removed from an area surrounding the foundation and stored for later replacement, as applicable. Turbine foundations will be excavated to a depth sufficient to remove all anchor bolts, rebar, conduits, cable, and concrete to a depth of 48 inches below grade. The remaining excavation will be filled with clean subgrade material of quality comparable to the immediate surrounding area. The sub-grade material will be compacted to a density similar to surrounding sub-grade material. All unexcavated areas compacted by equipment used in decommissioning shall be de-compacted in a manner to adequately restore the topsoil and sub-grade material to the proper density consistent and compatible with the surrounding area.

Underground collection cables - The cables and conduits contain no materials known to be harmful to the environment. As part of the decommissioning, these items will be removed to a depth of at least 48 inches. All cable and conduit buried greater than 48 inches will be left in place and abandoned.

Substation and interconnection facilities - Disassembly of the substation and interconnection facilities will include only the areas owned by Blazing Star 2. Components (including steel, conductors, switches, transformers, fencing, control houses, etc.) will be removed from the Project Area and reconditioned and reused, sold as scrap, recycled, or disposed of appropriately, at Blazing Star 2's sole discretion. To remove foundations and underground components without damaging or impacting adjacent facilities to the extent possible, such foundations and underground components will be removed to a depth of 48 inches and the excavation area filled, contoured and re-seeded, if necessary (e.g., the area will not be subject to row crop agriculture after restoration).

Access roads - Unless otherwise requested by the landowner, permanent access roads constructed to accommodate the Project will be removed. Ditch crossings connecting access roads to public roads will be removed unless the landowner requests they remain in place. Improvements to township and county roads that were not removed after construction will remain in place.

Blazing Star 2 will restore and reclaim the site to its pre-Project topography and topsoil quality using BMPs consistent with those outlined by *2012 USFWS Land- Based Wind Energy Guidelines*. Blazing Star 2 will also have a Native Prairie Protection Plan that will provide further BMPs to be used in areas where native prairie, as defined by Minn. Stat. § 84.02, subd. 5, based on specific site data collected in the Project Area. The goal of decommissioning will be to restore natural hydrology and plant communities to the greatest extent practical while minimizing new disturbance and removal of native vegetation. The decommissioning BMPs that will be employed on the Project to the extent practicable with the intent of meeting this goal include:

1. Minimize new disturbance and removal of native vegetation to the greatest extent practicable.

2. Remove foundations to four feet below surrounding grade, and cover with soil to allow adequate root penetration for native plants, and so that subsurface structures do not substantially disrupt ground water movements.

3. Stockpile topsoil that is removed during construction and use as topsoil when restoring plant communities. Once decommissioning activity is complete, restore topsoils to assist in establishing and maintaining pre-construction native plant communities to the extent possible, consistent with landowner objectives.

4. Stabilize soil and re-vegetate with native plants appropriate for the soil conditions and adjacent habitat, and use local seed sources where feasible, consistent with landowner objectives.

5. Restore surface water flows to pre-disturbance conditions, including removal of stream crossings, roads, and pads, consistent with storm water management objectives and requirements.

6. Conduct survey, using qualified experts, to detect populations of invasive species, and implement and maintain comprehensive approaches to preventing and controlling invasive species as necessary.

7. Remove any unnecessary overhead electrical lines and associated poles.

8. After decommissioning, install erosion control measures in all disturbance areas where potential for erosion exists, consistent with storm water management objectives and requirements.

9. Remove fencing unless the landowner will be utilizing the fence.

10. Remediate any petroleum product leaks and chemical releases prior to completion of decommissioning. Decommissioning and restoration activities will be completed within 12 months after the date the Project ceases to operate.

11.0 Identification of Other Potential Permits

The Applicant will be responsible for undertaking all required environmental review and will obtain all permits and licenses that are required following issuance of the LWECS Site Permit. The potential permits or approvals that have been identified as being required for the construction and operation of the Project are shown in Table 11.1.

Table 11.1: Permits and Approvals

Regulatory Authority	Permit/Approval
Federal Approvals	
U.S. Army Corps of Engineers	Wetland Delineation Approvals
	Jurisdictional Determination
	Federal Clean Water Act Section 404
U.S. Fish and Wildlife Service	Review for Threatened and Endangered Species
Environmental Protection Agency (region 5) in coordination with the Minnesota Pollution Control Agency	Spill Prevention Control and Countermeasure Plan
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)
Department of Defense	Agreement related to impact mitigation

Table 11.1: Permits and Approvals

Regulatory Authority	Permit/Approval
	for Tyler Radar facility
National Historic Preservation Act	Class I Literature Review / Class III Cultural Field Survey (and Federal Section 106 Review, if necessary)
U.S. Department of Agriculture	Conservation / Grassland / Wetland Easement and Reserve Program releases and consents
Federal Communications Commission	Non-Federally Licensed Microwave Study
	NTIA Communication Study
Federal Energy Regulatory Commission	Exempt Wholesale Generator Self Cert.
	Market-Based Rate Authorization
Federal Emergency Management Agency	Flood Plain Designation
State of Minnesota Approvals	
Minnesota Department of Labor and Industry	Electrical Plan Review, Permits, and Inspections
Minnesota Public Utilities Commission	Site Permit for Large Wind Energy Conversion System
	Route Permit for electric transmission line
Minnesota State Historic Preservation Office	Cultural and Historic Resources Review and Review of State and National Register of Historic Sites and Archeological Survey
Minnesota Pollution Control Agency	Section 401 Water Quality Certification
	National Pollutant Discharge Elimination System Permit – MPCA General Stormwater Permit for Construction Activity
	Very Small Quantity Generator License – Hazardous Waste Collection Program
	Aboveground Storage Tank Notification Form
Minnesota Department of Health	Environmental Bore Hole
	Water Supply Well Notification
	Plumbing Plan Review
Minnesota Department of Natural Resources	License to Cross Public Land and Water
	Native Prairie Protection Plan
	Biological Surveys

Table 11.1: Permits and Approvals

Regulatory Authority	Permit/Approval
	General Permit for Water Appropriations (Dewatering)
	Public Waters Work Permit
Minnesota Department of Transportation	Utility Permits on Trunk Highway Right-of-way
	Oversize/Overweight Permit for State Highways
	Access Driveway Permits for MnDOT Roads
	Tall Structure Permit
Local Approvals	
Lincoln County	Right-of-way permits, crossing permits, driveway permits for access roads, building and/or zoning permit for O&M building, oversize/overweight permits for County Roads
Townships	Right-of-way permits, crossing permits, driveway permits for access roads, building and/or zoning permit for O&M building, oversize/overweight permits for township roads
Lincoln County Soil and Water Conservation District	Wetland Conservation Act Approvals
Watershed Districts	Land/Water Alteration Permits
Other	
MISO	Turbine Change Study
	Generator Interconnection Agreement

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