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

Noble Flat Hill Windpark I, LLC
Clay County, MN

Prepared for:
Noble Flat Hill Windpark I, LLC

Noble
ENVIRONMENTAL POWER

Docket No: IP6687/WS-08-1134

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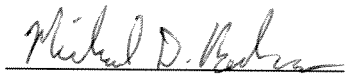
Signature: 

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1.0 Introduction

Noble Flat Hill Windpark I, LLC ("Noble" or the "Applicant"), an indirect wholly-owned subsidiary of Noble Environmental Power, LLC ("NEP"), is submitting this application for a site permit to construct and operate the Noble Flat Hill Windpark I Project (the Project) to the Minnesota Public Utilities Commission (PUC). The Project is a Large Wind Energy Conversion System (LWECS), as defined by the Wind Siting Act, Minnesota Statutes §216F.01. The Project is located in Clay County, Minnesota, and will be up to 201 megawatts (MW) in size, consisting of up to 134, 1.5 megawatt (MW) General Electric (GE) wind turbine generators. The Project is depicted on Figure 1 and Figure 2 in Appendix A. Associated facilities include access roads, a Substation, an Operations and Maintenance (O &M) building, a wind electrical collection system, and a new 230 kilovolt (kV) transmission line. A Route Permit Application has been submitted to the PUC for the 230 kV transmission line, under PUC Docket No. IP6687/TL-08-988. The Project is expected to be in operation by 2010.

The Applicant is an independent power developer and leading renewable energy company founded in 2004 in response to growing demand for clean, renewable sources of energy. NEP has approximately 3,850 MW of windparks in operation or under development in eight states, including New York, New Hampshire, Vermont, Maine, Michigan, Minnesota, Texas, and Wyoming. NEP is based in Essex, Connecticut, and is majority-owned by JPMorgan Partners Fund, which is managed by CCMP Capital.

Consistent with PUC objectives, the Applicant is committed to optimizing the wind resources for the Project. All decisions with respect to equipment selection, site layout, and spacing are designed to make the most efficient use of land and wind resources. The Applicant will evaluate the site to optimize wind resources, transmission interconnection opportunities, and economic factors, while avoiding and minimizing impacts to environmental resources.

1.1 Project Summary

The Project is located in Clay County, Minnesota, and will be a LWECS with a nameplate capacity of up to 201 MW in size. The Project depicted on Figure 1 and Figure 2 in Appendix A, includes approximately 20,000 acres. The Applicant has obtained land leases for approximately 11,500 acres within the Project boundary.

The Project for which a permit is being requested includes the following associated facilities:

1. A wind turbine layout consisting of 134, 1.5 MW GE wind turbine generators;
2. Approximately 27 miles of new access roads;
3. Approximately 30 miles of electrical collection system;
4. The new Project substation at 70th Avenue North and 120th Street North, northeast of Glyndon in Clay County, Minnesota;
5. The new Operations and Maintenance (O & M) building at 70th Avenue North and 120th Street North, northeast of Glyndon in Clay County, Minnesota;
6. A new single circuit 230 kV transmission line to capture energy generated by the Project, and connect to the Otter Tail Power Company (OTP) Sheyenne-Audubon 230 kV transmission line southeast of Glyndon, Minnesota;

7 The new switching station along the existing OTP Sheyenne-Audubon 230 kV transmission line southeast of Glyndon, Minnesota. Information on the switching station can be found under the Route Permit Application that has been submitted to the PUC for the 230 kV transmission line, under PUC Docket No. IP6687/TL-08-988.

The Applicant is currently in discussions with various counterparties regarding the potential execution of a Power Purchase Agreement ("PPA") or a financial energy hedge by the Project. The applicant expects it would execute a PPA or financial hedge at or before commencement of construction of the Project. The Applicant's goal is to complete the construction of the Project and achieve a commercial operation date of December 2010.

1.1.1 Proposed Site

The Noble Flat Hill Windpark I Project is located in Clay County, Minnesota. The Project boundary encompasses approximately 20,000 acres. As of the date of this application, the Applicant has obtained lease and easement agreements with landowners for approximately 11,500 acres. The Project lies approximately 12 miles northeast of Moorhead, Minnesota. The proposed Project falls within the following townships (Table 1-1).

Table 1-1
Project Location

County	Township Name	Township	Range	Section
Clay	Spring Prairie	139N	R46W	4-6, 7-9, 16-18, 19-21, 28-30
Clay	Moland	139N	R46W	1-5, 8-12, 13-17, 20-24, 25-29

1.1.2 Projected Output

The Project will have a nameplate capacity of up to 201 MW. Assuming net capacity factors of between 30 to 40 percent, projected average annual output will be between approximately 528,000 and 704,000 megawatt hours (MWh). This amount of power is sufficient power to supply approximately 50,000 to 66,000 homes. As with all wind projects, output will be dependent on final design, site-specific features, and equipment.

1.1.3 Siting Plan

The turbines and associated facilities will be sited primarily on agricultural land in Clay County, Minnesota. The Applicant will prepare the final siting layout to optimize wind resources while minimizing the impact to land resources and potentially sensitive resources. The topography of the site and the selected turbine technology will dictate turbine spacing. A description of the turbine technology is presented in Section 4.2.

The wind turbines will have a rotor diameter (RD) of 77 meters (253 feet). The minimum turbine spacing within the Project area would range from 3.5 RD to 9.5 RD. If required during final micro siting of the turbine towers, up to 20 percent of the towers may be sited closer than the above spacing. However, the Applicant will maintain minimum turbine spacing for all turbines

within the Project of 3 RD in the east-west direction and 5 RD in the north-south direction (prevailing wind direction), consistent with previous guidance from the PUC.

The Applicant proposes a 5.1 RD setback from the perimeter along the north-south axis (downwind spacing) and a 3.2 RD setback from the perimeter on the east-west axis (crosswind spacing). Wind turbine towers shall not be placed less than 5 RD from the perimeter of the site on the north-south axis and 3 RD on the east-west axis, without the approval of the PUC.

Table 1-2 shows the proposed turbine spacing distances for the proposed Project wind turbines.

Table 1-2
Proposed Turbine Spacing Distances

Rotor Diameter	Internal East-West Spacing	Internal North-South Spacing	North-South Perimeter Setback	East-West Perimeter Setback
	3.5 RD	9.5 RD	5.1 RD	3.2 RD
77 m	270 m (884 ft)	732m (2,400 ft)	396 m (1,300 ft)	244m (800 ft)

1.1.4 Operation and Maintenance

The Project is expected to be completed with a commercial operation date of December 2010. The Applicant will be responsible for the operation and maintenance (O & M) of the windpark for the life of the Project, which is anticipated to be a minimum of 20 years. The Applicant will manage the O & M of the Facility. The Applicant anticipates building a new O & M facility for the Project.

1.1.5 Site Control

The Applicant has site control on approximately 11,500 acres of land within the site boundaries, which is more than sufficient to support the Project. The Applicant is currently negotiating the lease of more land within the site boundaries.

1.1.6 Permits and Licenses

The Applicant will obtain all permits and approvals that are necessary and not covered by this LWECS Site Permit. Permits and approvals needed for the Project are identified in Section 7.0.

1.1.7 Development and Construction

The Applicant and associated engineering and construction contractors will perform all development and installation activities. The Applicant will be responsible for performing site resource analysis and facility siting; conducting environmental review; and obtaining specific permits and licenses for the Project.

Under the oversight of the Applicant's engineering and construction management staff, the engineering and construction contractors will be responsible for performing a site evaluation; performing civil engineering for roads and turbine foundations; constructing foundations and associated wind energy facilities; assembling and installing wind turbines; and installing a communication system, including supervisory control and data acquisition software and

hardware, telephone and fiber-optic cable, and constructing the electrical feeder and collection system.

The Applicant's engineering and construction contractors will build an O&M building located northwest of the intersection of 70th Avenue North and 120th Street North, northwest of Glyndon, Minnesota. The buildings typically used for this purpose are 3,000 to 5,000 square feet, and house the equipment to operate and maintain the windpark. The parking lot adjacent to the building typically takes up an additional 3,000 square feet.

1.2 Compliance with the Wind Siting Act and Minnesota Rules 7836

The Wind Siting Act requires an application for a site permit for a LWECS to meet the substantive criteria set forth in Minnesota Statute §216E.03, subd. 7. This application provides information necessary to demonstrate compliance with these criteria and the Minnesota Rules Chapter 7836. The siting of LWECS is to be made in an orderly manner compatible with environmental preservation, sustainable development, and the efficient use of resources (Minnesota Statute §216F.03).

The Wind Siting Rules (Minnesota Rules Chapter 7836) govern the contents and treatment of applications for LWECS site permits under the Wind Siting Act. The Applicant has presented information, to the extent possible, required by the Wind Siting rules. In addition, sufficient project design, wind resource, and technical information have been provided for a thorough evaluation of the reasonableness of the proposed site as a location for the Project.

1.2.1 Certificate of Need

The Project is a "large energy facility," as defined by Minn. Stat. § 216B.2421, Subd. 2(1) (2008). Under Minnesota Rules 7836.0500 subp. 2, a Certificate of Need (CON) is required from the PUC for the Noble Flat Hill Windpark I. Pursuant to Minn. Stat. § 216B.243, subd. 2, and Minn. R. Part 7849.0200, Subp. 6, the Applicant filed a Petition for Exemption from Certain Certificate of Need Filing Requirements for the Noble Flat Hill Windpark I with the PUC on August 8, 2008, in Docket No. IP-6687/CN-08-951. A copy of the petition is included in Appendix B. A Certificate of Need application has been filed with the PUC concurrently with this Site Permit Application.

1.2.2 State Policy

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

1.3 Ownership of the Proposed Facility

It is anticipated the Project will be developed, owned, and managed by Noble Flat Hill Windpark I, LLC (the Applicant), an indirect wholly-owned subsidiary of NEP. The Applicant and its

engineering and construction contractors will design, construct, finance, operate, and maintain the Project.

The standard practice that has been utilized by NEP on previous, similar projects has been to transfer ownership and operation of the new transmission line to the local utility company upon the completion of construction. For the proposed Project, the Applicant would pursue transferring ownership of the 230 kV transmission line to OTP for the entire length from the Noble Flat Hill Windpark I substation to the point of interconnection. Discussions have been initiated between the Applicant and OTP, but no ownership agreement has been reached. An ownership arrangement for the transmission line will be pursued by the Applicant as part of the Interconnection Agreement once the final route has been determined for the proposed Project.

2.0 General Description of the Proposed Facility

2.1 Wind Power Technology

As wind passes over the blades of a wind turbine, it creates lift and causes the rotor to turn. The rotor is connected by a hub and a main shaft to a gearbox, which is connected to a generator. Exact turbine models are subject to change to ensure selection of a turbine that is both cost effective and optimizes land and wind resources. The Applicant is proposing to use 134, GE 1.5 MW SLE wind turbines.

The hub height for the GE 1.5 MW SLE turbine is 80 meters (about 262 feet) and the rotor diameter (RD) for the turbine is 77 meters (253 feet). Table 2-1 shows specifications for the proposed turbine model (also see Appendix C for GE 1.5 MW SLE wind turbine specifications).

Table 2-1
Wind Turbine Specifications

Characteristic	GE 1.5 MW Turbine
Nameplate Capacity	1,500 kW
Hub Height	80 m (262 ft)
Rotor Diameter	77 m (253 ft)
Total Height[1]	119 m (389 ft)
Cut-in wind speed[2]	3.5 m/s (7.8 mph)
Rated capacity wind speed[3]	14.5 m/s (32.4 mph)
Cut-out wind speed[4]	25 m/s (55.9 mph)
Maximum sustained wind speed[5]	55 m/s (123 mph)
Rotor speed	10 to 20 rpm
Distance to 50 dBA noise level for a single wind turbine	650 to700 ft

[1]Total height = the total turbine height from the ground to the tip of the blade in an upright position
[2]Cut-in wind speed = wind speed at which turbine begins operation
[3]Rated capacity wind speed = wind speed at which turbine reaches its rated capacity
[4]Cut-out wind speed = wind speed above which turbine shuts down operation
[5]Maximum sustained wind speed = wind speed up to which turbine is designed to withstand

Each tower will be secured by a concrete foundation that can vary in design depending on the soil conditions and loadings. A control panel at the base of each turbine tower houses communication and electronic circuitry. Each turbine is electromechanically driven and is equipped with a wind direction sensor that communicates to the turbine's control system to signal when sufficient

winds are present for operation. The turbines also have variable-speed control and independent blade pitch to assure aerodynamic efficiency.

The electricity generated by each turbine is stepped up by a 545/34.5 kV pad-mounted transformer at the base of each turbine to a power collection voltage of 34.5 kV. The electricity is collected by a system of underground power collection lines within the Project area. Both power collection lines and communication cables will be buried in trenches. In cases where such infrastructure must be sited on property that is not governed by the existing wind easement and land lease options, the Applicant will obtain easements necessary for the Project.

Each wind turbine will be accessible via access roads that will provide access to the turbines via public roads. At the point where access and public roads meet, the communication and power lines will continue as underground lines. The collection system will deliver power to the substation. At the substation the power will be transformed from 34.5 kV to 230 kV via a new transformer installed as part of the Project for delivery to the transmission grid. The power will be transmitted from the substation via a new 230kV overhead line to the existing OTP Sheyenne-Audubon's 230 kV transmission line southeast of Glyndon, Minnesota. The Midwest Independent Transmission System Operator, Inc. ("MISO") is currently performing the necessary studies to interconnect the Project to the transmission system. An Interconnection Agreement is currently in progress and will be in place before the Project is operational.

2.2 Windpark Project Layout

The Applicant will develop a site layout that optimizes wind resources while minimizing the impact on land resources. The Project will consist of 134 wind turbines of 1.5 MW in size. A preliminary 201 MW site layout is presented in Figure 2 in Appendix A.

Wind-powered electric generation is entirely dependent on the availability of the wind resource at a specific location. The energy available from the wind is proportional to the cube of the wind velocity. In other words, a doubling of the wind velocity will increase the available energy by a factor of eight times. Analysis of wind direction data suggests that the optimal turbine string alignments are from west to east. Turbine rows in the north-south direction are staggered. Turbine placement was designed to provide 3.5 RD crosswind spacing and 9.5 RD downwind spacing between turbines with up to a 20 percent variance from this standard. Design of the turbine array and collection system will minimize energy loss due to wind turbine wakes, turbulence, and electrical line losses.

In accordance with previous LWECS Site Permit requirements, the Applicant has incorporated setbacks of at least 500 feet from inhabited (not vacant or abandoned) residences and 250 feet from public roads. The Applicant will maintain an appropriate setback from inhabited residences to stay below the MPCA Nighttime Noise Limit of 50 dBA. To accommodate the anticipated GE 1.5 MW turbines, the setback from residences would be at least 700 feet (see Section 5.3 for further discussion of the noise analysis). Establishing a setback which is greater than the minimum of 500 feet (required by PUC) will create greater public acceptance within the Project site and create a positive working relationship with nearby homeowners. The Applicant proposes a 5.1 RD setback from the perimeter along the north-south axis (downwind spacing) and a 3.2 RD setback from the perimeter on the east-west axis (crosswind spacing). Wind turbine towers shall not be placed less than 5 RD from the perimeter of the site on the north-south axis and 3 RD on the east-west axis, without the approval of the PUC. Table 2-2 identifies the most conservative setbacks applicable to the Project, based on using the 1.5 MW GE turbines.

Table 2-2
Setback Distances for a Single Wind Turbine

Turbine Description	N-S Perimeter Setback	E-W Perimeter Setback	Occupied Residence	Un-leased Residence	Public Roads	Transmission	Pipelines
	5.1 RD	**3.2RD**	**500 ft minimum**	**800 ft minimum**	**250 ft minimum**	**400 ft minimum**	**100 ft minimum**
1.5 MW Turbine with 77 m RD	**1300 ft**	**800 ft**	**700 ft**	**1300 ft**	**300 ft**	**400 ft**	**100 ft**

2.3 Associated Facilities

In addition to the wind turbines and the step-up transformers, the Project will include permanent access roads that allow for easy access to the wind turbines year round. The roads will be approximately 16 feet (4.88 meters) wide and low profile to allow cross-travel by farm equipment. The Applicant will work closely with landowners in locating access roads to minimize land use disruptions to the greatest extent possible. Consideration will be taken in locating access roads to minimize impacts to current or future agriculture and environmentally sensitive areas.

A substation and an O &M building will likely be constructed within the Project area. Please see Section 4.5.4 for a description of these facilities.

The electricity generated by each turbine is stepped-up by a pad-mounted transformer at the base of each turbine to power collection line voltage of 34.5 kV. The electricity generated at each turbine is collected by a system of underground collection lines within the Project area and brought to the substation. The power collection lines from the turbines will be plowed or trenched underground. The electric energy collected at the turbines will be transmitted via underground lines to the substation location. At the substation the power will be transformed from 34.5 kV to 230 kV via a new transformer installed as part of the Project for delivery to the transmission grid. The power will be transmitted from the substation via a new 230 kV overhead line to the existing OTP Sheyenne-Audubon's 230 kV transmission line southeast of Glyndon, Minnesota. Detailed descriptions of the new 230 kV line and the anticipated switching station are included in the Noble Flat Hill Windpark I Route Permit Application, available under PUC Docket No. IP6687/TL-08-988.

The Applicant has constructed one temporary meteorological tower within the Project area that was installed in December 2007. It is anticipated that the site will include four additional temporary meteorological towers and one long-standing meteorological tower to house anemometers. The towers will be painted red on top and will comply with applicable Federal Aviation Administration (FAA) guidelines.

2.4 Land Rights

The Applicant has obtained wind rights and easements to support the Project. Within the approximately 20,000 acre Project boundary, the Applicant has land rights for approximately

11,500 acres at the time of this application. Land rights will encompass the proposed windpark and all associated facilities, including, but not limited to wind and buffer easements, wind turbines, access roads, underground collector lines, overhead transmission lines, and a substation.

3.0 Proposed Site

3.1 Identification of Project Area

In addition to wind resource considerations, the Project area was selected based on its close proximity to available transmission infrastructure and landowners' interest in participating in the Project. Land-use patterns and environmentally sensitive features were factored into the site selection criteria. The site boundary encompasses an area of approximately 20,000 acres, which includes land for 134 turbines, access roads, and 20 acres that is anticipated to be required for the substation and O & M building (10 acres each).

3.2 Location of Existing Wind Turbines in the Vicinity of the Project Area

The City of Moorhead started a program called "Capture the Wind" which is meant to generate electricity by using wind turbines. Under this program, residents and other customers (i.e., Moorhead State University) have agreed to purchase a certain amount of electricity generated by wind energy.

To begin its wind energy program, the City of Moorhead constructed two wind turbines (0.75 MW each) in 1999 and 2001, respectively. These turbines are currently owned and operated by Moorhead Public Service. In addition, there are three 750 kW (1.98 MW total) turbines operating in rural Clay County on the western edge of Keene township, northeast of the Project area. These turbines are currently owned and operated by Northern Alternative Energy (NAE) and feed into the Xcel Energy grid, providing an alternative energy resource for the area.

These existing turbines are located a sufficient distance from the Project area to avoid any wind wake interference.

3.3 Wind Resource Areas – General

The United States Department of Energy (DOE) and the Minnesota Department of Commerce (DOC) have conducted wind resource assessment studies in Minnesota since 1982. In October 2002, the DOC published the latest "Wind Resource Analysis Program" (WRAP) report that presents wind analysis data from monitoring stations across the state of Minnesota. The Sabin meteorological tower is the nearest tower located approximately 10.6 miles southwest of the Project area. Analysis of this data demonstrates the mean annual wind speed in the vicinity of the Project area (at an elevation of 50 m or 164 ft) is mapped as 6.2 m/s (13.8 mph). At an elevation of 70 m (230 ft) above ground level, the mean annual wind speed is mapped as 6.8 m/s (15.2 mph).

3.4 Wind Characteristics in Project Area

The Project is located in Clay County, Minnesota, and is sited in an area suitable for wind energy development. As a result of uniform topography and agricultural land use, there are few trees or structures to retard wind as it passes over the area. The Applicant retained the services of WindLogics, Inc. to analyze the wind characteristics of the Project area. The objective of the study was to provide an analysis of the overall wind regime within the Project area, including a long-term estimation of the wind resource and initial turbine layout.

The Applicant has one meteorological tower in the Project area that has been collecting data since December 2007. To supplement the data from the project site, 12.5 years of historical data from the Automated Surface Observing Station (ASOS) site in Fargo, located approximately 11 miles west of the Project area, were compared to the wind data from the Project area. The fact that only six months of on-site meteorological data were available for this correlation introduces some uncertainty in the relationship; however, the uniformity of the site should minimize error. Further correlations will be completed as additional on-site data is collected. The Fargo ASOS site is at an elevation of approximately 895 feet and the meteorological tower at the Project area is at an elevation of 938 feet.

In addition, WAsP and WindFarmer software were used to analyze the statistical characteristics and spatial variability of onsite wind characteristics. This information was used to prepare a normalized wind speed/direction occurrences map (wind rose).

Various site layouts and wind turbine generator parameters can be tested to predict the energy production and array efficiency to optimize the site layout and turbine selection. Project area data has been compared to the long term Fargo data and other regional wind measurements using a parallel time period. There is a good correlation between the long-term wind measurements and the short-term Project area wind measurements.

3.4.1 Interannual Variation

Based on adjusted data from the Fargo ASOS site, the estimated mean annual wind speed at the Project area from 1995 to 2008 was deemed suitable for development of a windpark. The estimated average annual wind speed at the Project area from 1995 to 2008 was 7.2 m/s, with a range of 5.8 to 8.6 m/s. Windspeed varied by 35 percent between the lowest and highest monthly values.

3.4.2 Seasonal Variation

The expected seasonal wind speed in the Project area at 80 meters is shown in Table 3-1 and illustrated in Figure 3 in Appendix A. The strongest winds are during the months of April and May. The summer months of July and August have the lowest average wind speeds and less interannual variability.

Table 3-1
Est. Long-Term Mean Wind Speed (m/s) at 80 Meters in Project Area

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1995											7.7	7.3	7.5
1996	6.9	8.6	7.6	7.7	7.2	6.8	6.4	7.2	6.5	8.3	7.1	7.9	7.3
1997	8.0	7.3	7.6	7.2	8.1	7.0	6.3	5.9	7.1	7.8	7.6	7.1	7.3
1998	6.8	7.0	7.4	7.1	6.9	6.8	5.8	6.0	6.7	7.1	6.8	6.9	6.8
1999	7.6	8.4	7.3	7.4	8.0	7.2	6.3	6.4	7.1	7.1	6.9	7.5	7.3
2000	7.1	6.9	7.3	7.9	7.2	7.1	5.8	6.7	7.0	7.1	7.4	7.4	7.1
2001	7.2	7.4	7.0	8.2	7.9	6.8	6.4	6.5	6.3	7.8	7.4	7.5	7.2
2002	7.0	8.0	7.9	7.9	8.1	6.8	6.3	6.8	7.1	6.8	7.2	6.9	7.2
2003	7.3	7.7	7.5	7.6	7.6	6.4	6.4	6.6	7.4	6.8	7.5	7.7	7.2
2004	7.0	7.5	8.2	7.8	8.0	6.8	6.1	6.4	7.5	8.0	6.8	7.8	7.3
2005	7.1	6.7	7.1	8.2	8.1	7.0	6.8	6.6	7.1	7.4	7.7	6.7	7.2
2006	7.1	7.2	7.4	7.3	7.6	6.5	6.4	6.3	6.7	7.7	6.9	6.7	7.0
2007	7.3	6.5	7.6	7.4	7.9	7.2	6.3	5.8	7.2	6.9	7.4	6.3	7.0
2008	6.6	7.1	7.2	7.9	7.4	6.4							7.1
Mean of the means	7.1	7.4	7.5	7.7	7.7	6.8	6.3	6.4	7.0	7.4	7.3	7.2	7.2

3.4.3 Diurnal Variation

Figure 4 in Appendix A shows the expected diurnal variation of wind speeds at 50 meters. This is based on data collected from December 2007 – August 2008 and shows how wind speeds vary over the course of a day. Wind speeds are generally greatest during mid-afternoon and just after sunset and lowest around sunrise.

3.4.4 Atmospheric Stability

Atmospheric stability has not been calculated and the current wind reports do not include information on atmospheric stability. This information will made be available upon request.

3.4.5 Turbulence

The Characteristic Turbulence Intensity (TI) is defined as the measured standard deviation of wind speed over a ten minute period, divided by the mean for the same time period. Manufacturers evaluate the turbulence intensity for purposes of estimating the suitability of their turbine for an application and estimating maintenance costs. For wind speeds greater than 5 m/s the expected TI is 13.0 percent. For wind speeds greater than 15 m/s, the expected TI is 12.0 percent. The proposed Project TI is well within the normal limits.

3.4.6 Extreme Wind Conditions

The maximum 10-minute wind speed measured at the meteorological tower from December 2007 through August 2008 was 20.2 m/s. Using the expected wind shear as described in Section 3.4.8, this would correspond to an 80 m, 10-minute wind speed of 33 m/s. Using a gust factor of 1.1, the expected highest gust is predicted at 37 m/s. Extreme temperature range is expected to be between +40 and -40° C.

3.4.7 Wind Speed Frequency Distribution

Figure 5 in Appendix A presents a wind speed frequency distribution, at a 50 meter height, for the Project area from December 2007 through August 2008. Wind speeds range between 4 and 25 m/s (operating range) at 50 meters approximately 75 percent of the time and would be expected in that range approximately 80 percent of the time at an 80 meter height. As a result, the turbines will be operating and producing power approximately 75 to 80 percent of the time.

3.4.8 Wind Variation with Height

Wind shear is the relative change in wind speed as a function of height. Wind shear is typically calculated using a power-law function based upon the relative distance from the ground. The general equation used for calculating wind shear is $S/S_0 = (H/H_0)^{\alpha}$, where S_0 and H_0 are the speed and height of the lower level and α is the power coefficient. The power coefficient can vary greatly due to the terrain roughness and atmospheric stability. The power coefficient will also change slightly with variation in height. The vertical variation with height or shear coefficient is 0.17 based on the 30 to 50 meter level at the on-site meteorological tower.

3.4.9 Spatial Wind Variation

A map of the spatial variation of the wind for the State of Minnesota was initially used to perform wind flow modeling for the Project area. The model takes into account the statistical characteristics of the wind and surface roughness characteristics. Topography of the Project area was not available for this initial run; however, topography varies very little across the Project area. As such, little variation is expected in the wind resource across the Project area because of the relatively flat, open terrain. Wind speeds should be quite similar at all turbine locations proposed for this Project.

3.4.10 Wind Rose

A wind rose is a graphical presentation showing the various compass points and specifying the frequency that the wind is observed to blow from a given compass point. Small-scale variations are expected at the proposed site depending on individual turbine height and exposure.

The prevailing wind direction is south to southeast (SSE) with significant frequency of wind from the northwest (NW) sector as well. Figure 6 in Appendix A shows the measured wind rose for the Project meteorological tower with data collected from December 2007 through August 2008. The data shown in Figure 6 is consistent with data collected at the nearby Fargo ASOS site.

3.5 Other Meteorological Conditions

3.5.1 Average and Extreme Weather Conditions

The Project area's climate is characterized by cold winters and hot summers. The climate in the Project area is quite uniform because there are no large bodies of water or sharply marked differences in topography within the area.

There are no existing long-term data available specifically for the Project area. Data from Hawley, Minnesota, located approximately 13 miles southeast, was used to represent meteorological conditions at the site. Based on National Climatic Data Center (NCDC)

information (1971-2000), the average temperature for the region ranges from approximately 70 degrees Fahrenheit (°F) in July to approximately 4°F in January, although individual locations in the region can have average low temperatures several degrees cooler due to local effects. Extreme summer temperatures can routinely exceed 80°F, while winter temperatures can routinely drop below -7°F (Table 3-2).

Typical summers (June-August) provide abundant rainfall (from 2 to 4 inches per month). Average snowfall in winter ranges from 0.3 to 1.0 inches per month. The average total annual precipitation falls in the low to mid 20-inch range.

The NCDC has records of 393 extreme weather events for Clay County for the period June 20, 1957 to May 31, 2008. These events include thunderstorms, hail, heavy snow and ice, extreme cold, heat waves, and drought. Tornadoes, blizzards, flash floods, and severe thunderstorms strike occasionally. The NCDC has records of 100 thunderstorm and high wind events, 28 tornado events, and 25 flooding events in Clay County. The thunderstorms and high wind events are local in extent and of short duration. They result in damage to small geographic areas. Furthermore, neither hail nor lightening from severe storms represents a problem for operation of the proposed development. Wind turbines, however, are not designed to survive tornado force winds of 89+ m/s (200+ mph). The state of Minnesota experiences approximately 15 to 20 tornadoes a year. Clay County has experienced 28 tornadoes over a 51 year period. Therefore, tornadoes are not expected to be a problem for the proposed Project. Most flooding occurs in the floodplain regions of Clay County along the Buffalo River. The proposed turbine construction will occur outside of the floodplains. In the winter, icing events are variable in frequency. It is expected that the average annual energy loss will be approximately 1 percent or less due to icing. Furthermore, the proposed turbines are expected to operate between -4 and 104 °F.

The turbines being considered for this Project are designed to withstand extreme weather conditions. In high winds, the turbine blades "feather" into the prevailing wind to reduce energy capture, and the turbines shut down above the cut-out wind speed (45 mph). The turbines being considered for the Project also have lightning protection systems which include lightning receptors in the blade tips and surge protection in the electrical components.

Table 3-2
Temperature and Precipitation
(Recorded in the Period 1971-2000 at Hawley, Minnesota)

Month	Average Daily Temperature	Average Daily Minimum Temperature	Average Daily Maximum Temperature	Average Precipitation (inches)
January	3.8	-7.1	14.6	0.51
February	11.7	1.1	22.3	0.34
March	25.2	15.8	34.5	0.95
April	41.8	30.8	52.7	1.40
May	56.2	44.5	67.9	2.26
June	64.8	53.2	76.3	3.65
July	69.8	58.0	81.5	4.11
August	68.1	55.9	80.3	2.57
September	56.8	45.0	68.6	2.43
October	43.2	31.7	54.7	2.03
November	26.4	17.4	35.4	0.85
December	10.0	0.0	19.9	0.46
Yearly				
Average	39.8	28.9	50.7	
Total				21.56

3.6 Energy Projections

3.6.1 Proposed Array Spacing for Wind Turbines

The proposed internal array spacing for the turbines at the Project is a minimum of 3.5 RD in an east-west direction (crosswind spacing) and 9.5 RD in a north-south direction (downwind spacing) with up to 20 percent of the turbines spaced closer. The spacing is dependent upon the selected equipment and the topography of the site. The Applicant will microsite the location of turbines during construction to minimize array wake losses and to optimize efficient use of wind and land resources.

3.6.2 Base Energy Projections

The Project will have a nameplate capacity of up to 201 MW. Assuming net capacity factors of between 30 to 40 percent, projected average annual output will be between approximately 528,000 and 704,000 MWh. As with all wind projects, output will be dependent on final design, site-specific features, and equipment. 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 10 to 15 percent of maximum output.

3.7 Cost Analysis

The Applicant has estimated the cost for a large mid-continent windpark to be approximately $1,900 to over $2,200 per kW, pending final interconnection costs. The largest component in the total cost of the Project will be the wind turbines; however, infrastructure costs for access road construction and electrical collection systems also are factors.

4.0 Engineering and Operational Design Analysis

This section provides a summary description of the Project, which includes a description of the Project layout, turbines, electrical system, and associated facilities. Additional information addressed in this section includes Project construction, schedule, operation, and decommissioning at the site.

4.1 Noble Flat Hill Windpark I Project Layout and Associated Facilities

The Project will consist of an array of wind turbines, collection system, transformers, access roads, a transmission line, a substation, laydown areas, and an O&M building. The turbines will be interconnected by communication and electric power collection cable within the windpark. In addition, the windpark facilities will include electrical collection lines that deliver the electricity to the substation, which is connected via a new transmission system associated with the Project.

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

The Project includes a computer-controlled communications system that permits automatic, independent, and remote supervision, thus allowing simultaneous control of the wind turbines. The Applicant will be responsible for the operation and maintenance of the Project. The Applicant will maintain a computer program and database for tracking each wind turbine's operational history.

4.2 Description of Wind Turbines

The Applicant anticipates using up to 134 1.5 MW turbines (Figure 7 in Appendix A) for a total nameplate capacity of 201 MW. The Applicant will update the site layout, consistent with the parameters laid out in the LWECS Permit, if additional constraints are encountered or if information regarding the wind resource identifies opportunities to further optimize the site.

4.2.1 Turbine

Table 2-1 and Appendix C provide details on the hub heights, rotor diameters (RDs), and wind speed operation parameters for the GE 1.5 MW turbine. The 1.5 MW turbine has active yaw and pitch regulation and asynchronous generators. The turbines use a bedplate drive train design where all nacelle components are joined in common structures to improve durability.

The 1.5 MW turbine has Supervisory Control and Data Acquisition (SCADA) communication technology to control and monitor the windpark. The SCADA communication system permits automatic, independent operation and remote supervision, thus allowing the simultaneous control of the wind turbines (see Section 4.5.1 for more detail on SCADA).

Operations, maintenance and service arrangements between the turbine manufacturer and the Applicant will be structured to provide for timely and efficient operations. 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 specifications of the turbine 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;
- electromechanically driven yaw systems; and
- force-flow bedplates (nacelle components joined on a common structure to improve durability).

4.2.2 Rotor

The rotor consists of three blades mounted on a rotor hub. The hub is attached to the nacelle, which houses the gearbox, generator, brake, cooling system, and other electrical and mechanical systems. The 1.5 MW turbine design contains a 77 m (253 ft) RD which would be a 4,778 m^2 (51,472 ft^2) swept area. The rotor speed would be 10.1 to 20.4 revolutions per minute (rpm).

4.2.3 Tower

The towers are conical tubular steel with a hub height of 80 meters (262 feet). 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 (ANSI) specifications. All surfaces are sandblasted and multi-layer coated for protection against corrosion. Access to the turbine is through a lockable steel door at the base of the tower. Four platforms are connected with a ladder and a fall arresting safety system for access to the nacelle.

4.2.4 Lightning Protection

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

4.3 Description of Electrical System

At the base of each turbine a 545/34.5 kV step-up transformer will be installed to raise the voltage to power collection line voltage which is 34.5 kV. Electricity generated by the turbines will run through an underground collection system to the substation and eventually to the point of interconnection at the existing OTP line. The collection system will be designed and constructed to meet or exceed the latest revision of the National Electric Code (NEC), National Electric Safety Code (NESC), American National Standard Institute (ANSI), Institute of Electrical and Electronics Engineers (IEEE), Underwriters Laboratories (UL), National Electrical Manufacturers Association (NEMA), and Occupational Safety and Health Administration (OSHA). Furthermore, all underground collection system and facilities will be constructed to allow safe operation of the Project, ease of maintenance, and will be cost effective.

Generally, the electrical lines will be buried in trenches and run to the edge of a farm field. At the public road, the power collection lines will continue as underground lines. At the substation, the electric voltage will be stepped up to transmission level voltage via new 34.5 / 230 kV main power transformers. The substation will also consist of back-up station service, a station auxiliary transformer, circuit breakers, air disconnect switches, surge arrestors, protective relaying, ground grid, lightening protection, 230 kV transmission line dead-end structures, and control facilities including a control room. The substation will be designed in accordance with the industry prudent windpark practices and the requirements of the Interconnection Agreement. The substation will be designed to meet voltage and frequency response requirements at the point of interconnection as defined in the Interconnection Agreement. The interconnection details will be determined as a result of studies and discussions and agreements with MISO.

Fiber optic cables will interconnect the wind turbines, Project substation, and the permanent meteorological tower with the Project SCADA panel located inside the substation control building. The SCADA fiber optic cable will be laid in the same trench as the collection system power cable.

4.4 Noble Flat Hill Windpark I Construction

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 facility. Below is a preliminary schedule of activities necessary to develop the Project. Pre-construction, construction, and post-construction activities for the Project include:

- Odering of all necessary components including towers, nacelles, blades, foundations, transformers, etc;
- Final turbine micro-siting;
- Complete survey to establish locations of structures and roadways;
- Soil borings, testing and analysis for proper foundation design and materials;
- Complete construction of access roads, to be used for construction and maintenance;
- Construction of underground feeder lines;
- Design and construction of the new project substation;
- Installation of tower foundations;
- Installation of underground cables;
- Tower placement and wind turbine setting;
- Acceptance testing of facility; and
- Commencement of commercial operation.

Access roads will be built adjacent to the towers, allowing access both during and after construction. The permanent roads will be approximately 16 feet (4.88 meters) and have a gravel cover adequate to support the size and weight of maintenance vehicles. These roads will meet state and local requirements. The specific turbine locations will determine the amount of roadway that will be constructed for this Project.

Temporary disturbances during construction of the Project include installation of crane pads at each turbine site, temporary access roads for the cranes, temporary laydown areas around each turbine, trenching for the underground electrical collection system, and storage/stockpile area. Construction of the turbines will include temporary impacts of approximately an additional 12 ft of temporary gravel roadway on either side of the permanent roadway (40 ft total temporary road width), a 60 ft by 80 ft gravel crane pad extending from the roadway to rotor assembly area centered close to the turbine foundation which will be graded to a minimum of one percent. The component lay down area will be approximately 260 ft by 260 ft. In addition to the disturbances associated with the temporary access roads for the cranes, it is likely that temporary impacts will occur when cranes move cross country between turbines.

During the construction phase, several types of light, medium, and heavy-duty construction vehicles will travel to and from the site, as well as private vehicles used by the construction personnel. The Applicant estimates that there will be 75 large truck trips per day and up to 200 small-vehicle (pickups and automobiles) trips per day during peak construction periods. Those maximum volumes are expected during foundation and tower assembly. At the completion of each construction phase equipment will be removed from the site or reduced in number. Prior to construction, the Applicant will coordinate with local jurisdictions (county and township) to obtain the necessary road access and overwidth/overweight permits.

Construction Management

The civil contractor will be responsible for the construction management of the Project. The primary civil, erection and electrical contractors will use, where possible, the services of local

contractors to assist in the construction of the windpark. The contractors, in coordination with local contractors, will undertake the following activities:

- Secure building, electrical, grading, road, and utility permits;
- Perform detailed civil, structural, and electrical engineering;
- Schedule execution of construction activities;
- Complete surveying and geotechnical investigations; and
- Forecast Project labor requirements and budgeting.

The primary contractors also serve as key contacts and interface for subcontractor coordination. The Applicant has a site construction manager who is responsible for the overall coordination between contractors. The electrical contractor will oversee the installation of communication and power collection lines as well as the substation. The civil contractor will oversee the installation of roads and foundations, as well as the coordination of aggregate and concrete materials receiving, inventory, and distribution. The construction consists of the following tasks:

- Site development, including roads;
- Foundation excavation;
- Concrete foundations;
- Electrical and communications installation;
- Tower assembly and machine erection; and
- System testing.

The contractors will be on site to handle materials purchasing, construction, and quality control. The primary contractors will select and manage their local subcontractors to complete all aspects of construction.

Throughout the construction phase, ongoing coordination occurs between the Project development and the construction teams. The Applicant on-site manager helps to coordinate all aspects of the Project, including communications with local officials, citizens groups and landowners. The construction manager and the O&M staff manager work together continuously to ensure a smooth transition from construction to windpark commissioning and, finally, operations.

4.4.1 Foundation Design

The wind turbines' freestanding 80 meter (262 foot) tubular towers will be connected by anchor bolts to a concrete foundation. Geotechnical surveys, turbine tower load specifications, and cost considerations will dictate final design parameters of the foundations. The base portion of the foundation for a 1.5 MW turbine is an octagon approximately 40 to 60 feet in diameter and 5 feet thick (bearing approximately 7 feet below grade). The pedestal of the foundation (the top portion on which the turbine tower base rests) is approximately 16 to 17 feet in diameter and 2 to 3 feet thick.

4.4.2 Civil Works

Completion of the Project will require various types of civil works and physical improvements to the land. These civil works include the following:

- Improvement of existing access roads to the Project area;
- Construction of roads adjacent to the wind turbine strings to allow construction and continued servicing of the wind turbines;
- Clearing and grading for wind turbine tower foundation installations;
- Trenching for underground cabling for connecting the individual wind turbines;
- Installation of an on-site feeder system for connecting wind turbine strings for delivery to the electricity collection/metering location;
- Clearing and grading for pad-mount transformers and other installations;
- Clearing and grading for Substation and O&M building; and
- Installation of any site fencing and security.

Any improvements to existing access roads will consist of re-grading and filling of the gravel surface to allow access even in inclement weather. No asphalt or other paving is anticipated.

Access roads will be constructed along turbine strings or arrays. These roads will be sited in consultation with local landowners and completed in accordance with state and local requirements. They will be located to facilitate both construction (cranes) and continued operation and maintenance. Siting roads in areas with unstable soil will be avoided wherever possible. All roads will include appropriate drainage and culverts while still allowing for the crossing of farm equipment. The access roads will be approximately 16 feet (4.88 meters) wide and will be covered with road base designed to allow passage under inclement weather conditions.

The roads will consist of compacted native subgrade material, overlaid with geotextile fabric (if needed) and covered with gravel. To facilitate crane movement and equipment delivery, an additional 12 feet of gravel roadway will be temporarily installed on either side of the permanent roadway (40 ft total temporary road width). In addition, turbine assembly will require a 60 ft by 80 ft gravel crane pad extending from the access road to the turbine foundation which will be graded to a minimum of one percent, and an approximate 260 ft by 260 ft area for component lay down and rotor assembly centered close to the turbine foundation which will be graded to a minimum of 5 percent. After construction, the temporary construction areas adjacent to the turbine pad and access road will be restored. The site will be graded to natural contours, soil will be loosened if needed, and the site will be seeded if needed. Once construction is completed, the access roads will be regraded and dressed as needed.

4.4.3 Commissioning

The Project will be commissioned after completion of the construction phase. The Project will undergo detailed inspection and testing procedures. Inspection and testing occurs for each component of the wind turbines, as well as the communication system, meteorological system, high-voltage collection and feeder system, and the SCADA system. Once the interconnection is established, the Applicant will commission each turbine to generate electricity after completion of inspection and testing.

4.5 Project Operation and Maintenance

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

system also provides the overall control of the windpark. The Applicant also monitors its generating assets remotely, 24/7 from its National Operations Center (NEPNOC).

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

4.5.1 Project Control, Management, and Service

One of the SCADA systems' primary functions is as the primary control and monitor of each turbine. The SCADA system also offers access to wind turbine generation or production data, meteorological, and communications data, as well as alarms and communication error information. Performance data and parameters for each machine (generator speed, wind speed, power output, etc) can also 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 troubleshooting problems.

The primary functions of the SCADA are to:

- Control and monitor the windpark;
- Alert operations personnel to windpark 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 windpark maintenance;
- Serve as an information archive;
- Provide spare parts inventory control; and
- Generate operations and maintenance reports.

4.5.2 Maintenance schedule

Equipment will be monitored by local O&M staff and remotely by NEPNOC which is staffed 24 hours per day. When needed, 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 windpark 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 Years Service Inspection. The two years service inspection consists of the annual inspection, plus checking and tightening of electrical terminal connectors.

E) Five Years Service Inspection. The five years 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.

4.5.3 General Maintenance Duties

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

- Maintenance of the wind turbines and on the mechanical and electrical power, and communications system;
- Performance on all routine inspections;
- Maintenance of all oil levels and changing oil filters;
- Maintenance of the control systems, all structures associated with the windpark, access roads, drainage systems, and other facilities necessary for windpark operation;
- Maintenance of field maintenance manuals, service bulletins, revisions, and documentation for the windpark;
- Maintenance of all parts, price lists, and computer software;
- Maintenance and operation of interconnection facilities;
- Provide all labor, services, consumables, and parts required to perform scheduled and unscheduled maintenance on the windpark;
- Assist as needed with avian and other wildlife studies;
- Manage lubricants, solvents, and other hazardous materials as required by local and/or stat regulations;
- Maintain appropriate levels of spare parts in order to service equipment;
- Obtain all necessary equipment including the rental of industrial cranes for removal and reinstallation of turbine components;
- Hire, train, and supervise a work force necessary to meet the general maintenance requirements;
- Maintain plant installations, service roads and entrances; and
- Maintain site security.

4.5.4 Operations and Maintenance Facility

The O&M facility will be located northwest of the intersection of 70th Avenue North and 120th Street North, northwest of Glyndon, Minnesota. The buildings typically used for this purpose are 3,000 to 5,000 square feet and house the equipment to operate and maintain the windpark. The parking lot adjacent to the building typically takes up an additional 3,000 square feet.

4.6 Project Schedule

4.6.1 Land Acquisition

The Applicant will be responsible for all land acquisition and will obtain the necessary easements from the landowners. Currently, approximately 11,500 acres of land have been leased for the windpark.

4.6.2 Permits

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

4.6.3 Equipment Procurement, Manufacture and Delivery

The Applicant has procured the necessary turbines for the Project. Turbines are expected to arrive on-site as early as November 2009.

4.6.4 Construction

Noble Construction Management personnel will oversee the primary contractors performing Project construction. This will include construction of roads, wind turbine assembly, electrical, and communications work. The construction is expected to take no more than 6 to 12 months to complete.

4.6.5 Construction Financing

The Applicant will be responsible for financing all pre-development, development, and construction activities. The Applicant anticipates financing the cost of all pre-development 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.

4.6.6 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. The Applicant typically retains a long-term interest in its wind projects.

4.6.7 Expected Commercial Operation Date

The Applicant anticipates the Project would begin commercial operation in the fourth calendar quarter of 2010. The commercial operation date is dependent on the completion of the interconnection, permitting, and other development activities. The Applicant is currently in discussions with various counterparties regarding the potential execution of a Power Purchase Agreement (a "PPA") or a financial energy hedge by the Project. The applicant expects it would execute a PPA or financial hedge at or before commencement of construction of the Project. However, given the market structure and tariff provisions of MISO, the Project would be able to generate and deliver energy to its point of interconnect and sell such energy into the MISO real time energy markets even without the execution of such a PPA or financial hedge.

4.7 Decommissioning and Restoration

The Project decommissioning and restoration is in accordance with the requirements of Minn. Rules part 7836.0500, subp. 13. Megawatt-scale wind turbine generators have a life expectancy of 20 years; therefore, the Applicant anticipates the life of the Project will be no less than 20 years. The Applicant reserves the right to explore alternatives regarding Project decommissioning at the end of the Project Site Permit term. One option the Applicant may explore is to re-apply for a Site Permit and continue operation of the Project.

4.7.1 Decommissioning and Restoration

The Applicant will begin decommissioning the facility within 8 months from the time the facility ceases to operate. Decommissioning will be completed within 15 months from the time the facility ceases to operate.

The Applicant also reserves the right to explore alternatives regarding Project decommissioning at the end of the Project Site Permit term. One such option may be to re-apply for a Site Permit and continue operation of the Project, providing energy under a new long-term contract or on a merchant basis. Retrofitting, repowering or replacing the turbines and power system with upgrades based on new technology may allow the windpark to produce efficiently and successfully for many more years.

4.7.2 Estimated Decommissioning Costs in Current Dollars

The cost of decommissioning wind turbines is offset by the salvage value of the towers and the turbine components. The estimated decommissioning costs per turbine, provided below, were prepared using available information from a variety of credible industry sources.

The Applicant will be responsible for all costs to decommission the Project and associated facilities. Based on estimated costs of decommissioning and the salvage value of decommissioned equipment, the salvage value of the windpark will not exceed the costs of decommissioning, which are estimated at $56,209 per turbine in current dollars. This methodology provides a conservative estimate of the Project's residual value. Because of the uncertainty surrounding future decommissioning cost and salvage values, the Applicant will review and update the cost estimate of decommissioning and restoration for the Project in December 2022, 15 years after Project commissioning. This revised cost estimate of decommissioning and salvage value will then be submitted to the PUC for review and comment.

4.7.3 List of Decommissioning Activities

For this Project, all decommissioning and restoration activities will adhere to the requirements set by the PUC and will be in accordance with all applicable federal, state, and local permits.

The decommissioning and restoration process comprises removal of above-ground structures; removal of below-ground structures to a depth of 48 inches; restoration of topsoil, re-vegetation and rock picking. Access roads, fencing and residual minor improvements need not be removed if the underlying landowner requests that they remain in place and this request is approved by the PUC.

Above-ground structures include the turbines, transformers, overhead collection lines, windpark-owned portions of the substation, maintenance buildings, and access gates. Below-ground structures include turbine foundations, collection system conduits, and drainage structures. Access road sub-base material may be removed upon landowner request.

The process of removing structures involves evaluating and categorizing all components and materials into categories of recondition and reuse, salvage, recycling, and disposal. In the interest of increased efficiency and minimal transportation impacts, components and material may be stored on-site in a pre-approved location until the bulk of similar components or materials are ready for transport. The components and material will be transported to the appropriate facilities for reconditioning, salvage, recycling or disposal.

Turbine Removal
Access roads to turbines may be widened to sufficient width to accommodate movement of appropriately sized cranes or other machinery required for the disassembly and removal of the turbines. The turbine components will be reduced to shippable dimension and transported off site for proper disposal. Control cabinets, electronic components and internal cables will be removed. The blades, hub and nacelle will be lowered to grade for disassembly. Each tower section will be disassembled and will be lowered to the ground where they will be further disassembled into transportable sections. The blades, hub, nacelle and tower sections will either be transported whole for reconditioning and reuse or dissembled into salvageable, recyclable or disposable components. All debris related to construction will be removed.

Turbine Foundation Removal
Topsoil will be removed from an area surrounding the foundation and stored for backfill material. 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. After removal of all noted foundation materials, the hole will be filled with clean sub-grade material 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. All debris related to construction will be removed.

Underground Electrical Collection System
The cables and conduits contain no materials known to be harmful to the environment and will remain in place.

Overhead Collection Lines
An overhead transmission line will run from the Project's substation for approximately 11 miles to connect to the Otter Trail Power (OTP) Sheyenne-Audubon 230 kV transmission Line. The majority of the new transmission line will be installed on the existing poles carrying Xcel's existing transmission line along MN Highway 9. Only a 2.5 mile portion will require the installation of new poles (from the Project's substation up to Route 9); and therefore, decommissioning will be required for that portion only. All poles/structures and associated lines will be removed from site and will be stored/disposed off at an offsite location. This area will be cleaned, all debris removed and site restoration will be done to bring back to original conditions or as per owner.

Substation and Switching Station
Disassembly of the substation and switching station, if required, will include only the areas owned by the Applicant. Steel, conductors, switches, transformers, etc. will be reconditioned and reused, sold as scrap, recycled or disposed of appropriately depending upon market value. Foundations and underground components will be removed to a depth of 48 inches and the excavation filled, contoured and soil stabilized. 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. All debris related to construction will be removed.

Access Roads and Construction Pads
After decommissioning activities of a turbine site are completed, construction pad removal will begin. Access roads may also be removed at this time per landowner/the Applicant preference. Gravel will be removed from access roads and construction pads and transported to a pre-approved disposal location. The disposal location will be approved by the appropriate governing authority prior to the start of the decommissioning program. Geotextile fabric, if required for road construction purposes, will be recovered and hauled offsite to an appropriate disposal site. Drainage structures integrated with the access road or construction pad will be removed and backfilled with sub-grade material, the topsoil replaced and the surface contoured and stabilized.

Access security gates shall remain operational until completion of decommissioning, at which time they will be removed unless the landowner requests that they remain. Ditch crossings connecting access roads to public roads will be removed unless the landowner requests that they remain. All debris related to construction will be removed.

Site Restoration Process Description
Topsoil will be removed prior to removal of structures from all work areas and stockpiled in a designated area. Prior to topsoil replacement, all rocks three (3) inches or greater will be removed from the surface of the subsoil. The topsoil will be de-compacted to match the density and consistency of the immediate surrounding area. The topsoil will be replaced to original depth, and original surface contours reestablished where possible. All rocks three (3) inches or larger will be removed from the surface of the topsoil. Any trench settling shall be backfilled with imported topsoil consistent with the quality of the affected site.

Following decommissioning activities, the sub-grade material and topsoil from all areas will be de-compacted and restored to a density and depth consistent with the surrounding area or to a depth of 18 inches. The affected areas will be inspected, and all debris related to construction will be removed.

All disturbed soil surfaces will be stabilized using methods agreed upon with the landowner in order to maintain consistency with the surrounding land uses. Restoration activities may include leveling, terracing, mulching, and other necessary steps to prevent soil erosion, to ensure establishment of suitable grasses and forbs, and to control noxious weeds and pests.

5.0 Environmental Analysis

This section provides a description of the environmental conditions that exist within the Project area. Consistent with PUC procedures on siting LWECS and applicable portions of the Power Plant Siting Act, various exclusion and avoidance criteria were considered in the selection of the Project area.

5.1 Description of Environmental Setting (Introduction)

The Project area is approximately 20,000 acres and is situated within the Red River Prairie Subsection, which covers 3,985,620 acres (6,173 square miles) in northwestern Minnesota, representing approximately 7 percent of Minnesota. The western boundary of this subsection is formed by the Red River. The eastern boundary follows the eastern limits of continuous tall grass prairie vegetation at the time of Euro-American settlement. Portions of a till plane are included. The southern boundary follows the southern end of the till plain and the Glacial Lake Agassiz basin.

The majority of the Red River Prairie Subsection is a glacial lake plain with silty, sandy, and clayey lacustrine deposits. It is level, uniform, and featureless, interspersed with wetlands, meandering waterways, and old beach ridges. Drainage is to the north via the Red River and its tributaries. The major landform is a large lake plain (Glacial Lake Agassiz). Minor landforms include till plain, beach ridges, sand dunes, and water-reworked till. The greatest depth of lake laid sediments is present along the Red River, which forms the western boundary. Lacustrine origin sediments thin to the east, where glacial till was leveled and reworked with little deposit of lacustrine sediments. Topography is flat to gently rolling with some steeper topography along drainages and adjacent to Lake Traverse.

The majority of land use in this area is agriculture. Due to the extensive agricultural use in the area, the lake plain has been extensively ditched. Some native flora persists east of the Project area. Native flora consists of tallgrass prairie and wet prairie that is dominated by bluestems (*Andropogon scoparius* and *A. geradii*), Indian grass (*Sorghastrum nutans*), bluejoint grass (*Calamagrostis canadensis*), cordgrass (*Spartina pectinata*), cattails (*Typha spp.*), rushes (*Juncus spp.*), and sedges (*Carex spp.*). Narrow forested areas that consist of cottonwood (*Populus deltoids*), elm (*Ulmus spps*.) and willow (*Salix spp*.) are common south of the Project area along larger streams and rivers.

5.2 Socioeconomic Information

5.2.1 Demographics

The Project is located within a lightly populated rural area in west-central Minnesota. Information on demographics and housing for this section was taken from the U.S. Census Bureau.

The Project area is located in Clay County. In 2000, Clay County had a population of 51,229 (an increase of 1.6 percent from the 1990 census), and in 2006, the estimated population was 54,476 (an increase of 6.3 percent from the 2000 census). Statewide, Minnesota's population in 2000 was over 4.9 million (an increase of 12.4 percent from the 1990 census), and in 2006, the estimated population was more than 5.1 million (an increase of 5 percent from the 2000 census). Clay County encompasses 1,053 square miles, averaging 48.7 persons per square mile. The

statewide average population density was 61.8 persons per square mile, covering 87,014 square miles. The total number of housing units in Clay County in the year 2000 was 19,746, averaging 18.9 housing units per square mile. The Project is located in parts of Spring Prairie and Moland townships (U.S. Census Bureau 2000).

5.2.2 Economy

According to the Bureau of Economic Analysis, Minnesota's per capita personal income (PCPI) was $38,859 in 2006. This represents 106 percent of the national average PCPI. In comparison, Clay County's PCPI was $28,312 in 2006. This represents 73 percent of the state average PCPI and 77 percent of the national average PCPI.

The economic base of Clay County consists primarily of management, professional, and related occupations (31.9 percent); sales and office occupations (27.9 percent); and educational, health, and social services (27.4 percent). In comparison, the economic base of Minnesota consists primarily of management, professional, and related occupations (35.8 percent); sales and office occupations (26.5 percent); and 20.9 percent in educational, health, and social services (US Census Bureau 2007a). The economic base of the proposed Project area is primarily rural agricultural production.

5.2.3 Environmental Justice

The proposed Project would be located in Clay County in west-central Minnesota. This section identifies any minority and low-income populations that may be affected by the proposed Project.

Minority populations are persons of Hispanic or Latino origin, Blacks or African Americans, American Indians or Alaska Natives, Asians, and Native Hawaiian and other Pacific Islanders. Minority populations for 2000 are identified in Table 5-1. The Council on Environmental Quality (CEQ) identifies these groups as minority populations when either (1) the minority population of the affected area exceeds 50 percent or (2) the minority population percentage in the affected area is meaningfully greater than the minority population percentage in the general population or appropriate unit of geographical analysis (CEQ 1997). As shown in Table 5-1, the proposed Project is not expected to create disproportionately high or adverse human health or environmental effects on the minority population.

The two largest minority groups reported in Clay County in 2005 were persons of Hispanic or Latino origin (3.3 percent) and American Indian and Alaska Native persons (1.6 percent), followed by Asian persons (1.1 percent), persons reporting two or more races (1.1 percent), and black persons (0.7 percent). Compared to the state, Clay County has a minority population totaling 6.8 percent, whereas Minnesota's minority population totals 12.6 percent (US Census Bureau 2007a).

Table 5-1
Minority Populations 2005

Minority Group	Clay County	State of Minnesota
Total Population	54,476	5,167,101
Percent: White persons	95.4%	89.9%
Percent: Minority, composed of*	**6.8%**	**12.6%**
Persons of Hispanic or Latino origin	3.3%	3.6%
American Indian and Alaska Native persons	1.6%	1.2%
Black or African American persons	0.7%	4.3%
Asian persons	1.1%	3.4%
Native Hawaiian and other Pacific Islander persons	0.1%	0.1%

Source: US Census Bureau 2007a
*Totals may not add to Percent Minority because of reporting classifications and/or the value is greater than zero but less than one-half unit of measurement

According to the Department of Housing and Urban Development, low-income neighborhoods are those where more than 50 percent of the population has an income less than 50 percent of the median per capita income for the whole community. Low-income populations for 2004 are illustrated in Table 5-2.

Low-income populations are defined by environmental justice guidance by using the statistical poverty threshold of the US Census Bureau. In 2004, the poverty-weighted average threshold for a family of four was $19,307 and $9,645 for an unrelated individual (US Census Bureau 2007b). The national poverty level was over 12 percent. For a low-income population to be classified as having meaningfully greater poverty levels, CEQ recommends a formula describing the environmental justice low-income threshold as being 10 percent above the national rate (or 22.7 percent) as applied to local poverty rates (CEQ 1997).

Table 5-2
Low-Income Populations 2004

Jurisdiction	Percent Below Poverty Level
United States	12.7%
State of Minnesota	8.1%
Clay County	9.7%

Source: US Census Bureau 2007b

5.2.4 Impacts to Socioeconomics

The proposed Project would not result in economic losses to property owners. Short-term negative impacts to socioeconomic resources will be relatively minor. Although the proposed Project would permanently remove approximately 65 acres of agricultural land (approximately 0.3 percent of the total available acreage within the Project area) from production; the landowners will be compensated by the Applicant for their loss of production through easements. The areas surrounding the turbines and permanent access roads will remain available for continued farming

operation. The construction, operation, and maintenance of the wind project will not have an effect on the socioeconomic resources in the area.

The proposed Project would most likely benefit the economy of the surrounding communities. In the short-term, there would likely be positive economic impacts associated with construction. Revenue might increase for local businesses due to increased spending from workers associated with project construction. Additionally, temporary jobs will become available as a result of project construction.

The local property taxes generated from this windpark through the state production tax are estimated to be in excess of $800,000 per year. The establishment of this area of Minnesota as an important producer of alternative energy may also encourage the development of wind related businesses in the area, and thus contribute to economic growth in the region.

The proposed Project is not expected to create disproportionately high or adverse human health or environmental effects on low income populations.

5.2.5 Mitigative Measures for Socioeconomics

Socioeconomic impacts associated with the Project will be primarily positive with an influx of wages and expenditures made at local businesses during Project construction. Additionally, there will be an increase in the county's tax bases from the construction and operation of the wind turbines. Since impacts resulting from the Project are expected to be beneficial to the community, specific mitigation is not required.

5.3 Noise

5.3.1 Description of Resources

Noise is generally defined as unwanted or excessive sound. Some land uses are considered more sensitive to intrusive noise than others due to the type of activities typically involved at the sensitive human noise receptors. Specifically, sensitive human noise receptors normally include residences, schools, libraries, religious institutions, hospitals and nursing homes, daycare centers, and other businesses within the vicinity of the proposed Project.

Managing noise is complicated by the varied character and amount of sources in a particular area. The ambient sound pressure level in a particular region is comprised of a variety of natural and manmade sources. Sound levels are determined by small variations in air pressure, and these pressures are referenced to a logarithmic scale in the units of decibels. Human response to sound is a function of the magnitude of pressure variations and the frequency distribution of the sound energy.

Community noise levels are measured in terms of the A-weighted decibel (dBA) scale, which was developed to approximate the human ear's sensitivity to certain frequencies by emphasizing the middle frequencies and de-emphasizing lower and higher frequencies. This scale, expressed as dBA, best correlates the human response to sound and is commonly used as a descriptor for ambient sound levels. The threshold of human hearing is 0dB at 1000Hz, while noise above 140 dBA can cause damage to hearing after just one exposure. Table 5-3 presents typical sound levels for common conditions or activities referenced to the dBA scale.

Table 5-3
Typical Sound Levels for Common Conditions and Activities

Type of Noise	Sound Level (dBA)
Rifle	163 dBA
Chainsaw; Hammer on Nail	120 dBA
Tractor	90 dBA
Construction of Wind power project	85 to 88 dBA (distance of 50 feet)
Freeway Traffic	70 dBA
Refrigerator	50 dBA
Operation of Wind power project	45 to 50 dBA (distance of 1,000 feet)
Quiet Residential Area	40 dBA
Quiet Bedroom at Night	30 dBA

Source: League for the Hard of Hearing 2006; Tipler 1991

Presently, noise in the proposed Project area is dominated by traffic on local roads and agricultural and equipment operations. The heaviest traveled roadway in the Project area is MN Highway 9 South. Secondary noise in the area persists from general low-density, rural neighborhoods and farming-related activities. Ambient noise levels in the proposed Project area are typical of noise levels experienced within a predominantly rural area.

The Minnesota Pollution Control Agency (MCPA) has a statewide noise regulation (Minn. Rule 7030.0050) which specifies daytime and nighttime noise levels that can not be exceeded by any source. These standards are consistent with speech, sleep, annoyance, and hearing conservation requirements for receivers within areas grouped according to land activities by the noise area classification (NAC). The NAC for household units (including farm houses) is identified as NAC 1. The daytime standards state that a sound level of 60 dBA may not be exceeded for more than 50 percent of the time for a one hour survey, and a sound level of 65 dBA may not be exceeded for more than 10 percent of the time for a one hour survey. The nighttime standards state that 50 dBA many not be exceeded for more than 50 percent of a one hour survey, and 55 dBA may not be exceeded for more than 10 percent of a one hour survey. Table 5-4 presents the regulated noise levels from the State of Minnesota statutes. The L50 is the noise level exceeded for 50 percent of the time during any measurement duration, and represents the median sound level. The L10 is the sound level exceed for 10 percent of the time during any measurement duration.

Table 5-4
State of Minnesota Noise Standards [db(a)]*

Noise Area Classification (as Identified in Minn. Rule 7030.0050)	Daytime	Daytime	Nighttime	Nighttime
	L50	L10	L50	L10
1	60	65	50	55
2	65	70	65	70
3	75	80	75	80

* A-weighted decibels
Source: Minnesota Rule 7030.0040

5.3.2 Impacts for Noise

The wind turbines will create additional sources of noise. When in motion, the wind turbines emit a perceptible sound. The level of this noise varies with the speed of the turbine and the distance of the listener from the turbine. On relatively windy days, the turbines create more noise; however, the ambient natural wind noise levels tend to override the turbine noise as distance from the turbine increases.

Noise levels provided by the turbine manufacturer (GE) included a 104.5 dBA sound power level at the turbine hub and a 2dB K-safety factor. The K factor describes GE's uncertainty in the 104 dBA sound power level described in their noise specification. Using the above noise specifications it was determined that the setback for an isolated single 1.5 MW GE turbine is approximately 650 to 700 feet to ensure compliance with the 50 dBA limit.

The results of the screening noise level impact analysis demonstrate the feasibility of the Project to operate in full compliance with the environmental noise regulatory limits as developed by the state of Minnesota for residential areas. The proposed Project will maintain a setback distance of approximately 700 feet. Establishing a setback which is greater than the minimum of 650 feet (discussed above) will create greater public acceptance within the Project site and create a positive working relationship with nearby homeowners.

Operation of the Project may result in periodically audible sound within the adjacent communities under certain operational and meteorological conditions. Specifically, the Project will be audible at the closest residential areas in relation to the Project footprint when the residences are downwind, background levels are low, and wind speeds are high enough for turbine operation. Residents outside their houses and with a direct line of sight to an operating wind turbine may hear a gentle "swooshing" sound characteristic of wind turbines. Audible sound from the Project will likely not be deemed excessive. Furthermore, sound generated within the Project area will be consistent with sound generated at similar wind energy projects that have been successfully sited throughout the United States where similar noise criteria limits exist.

The level of noise generated by the transmission line conductors depends on conductor conditions, voltage level, and weather conditions. In foggy, rainy, and wet conditions, transmission conductors can create a crackling sound due to the small amount of electricity ionizing the moist air near the wires (less than 50 dBA, which is below the most restrictive permissible noise level from NAC 1 (Table 5-3)). During a heavy rain general background noise is generally greater than the noise from a transmission line. During dry weather noise from the transmission line is faintly audible or inaudible (less than 20 dBA, which is comparable to the level of a whisper).

The main source of audible noise from a substation is due to the operation of the transformers. Transformers produce noise whenever they are energized, and the level of the noise depends on transformer size, voltage level, and weather conditions. Substation noise is generally minimal and nearly constant with slight variation because of operating conditions (cooling fans on or off, etc.). The Noble Flat Hill Windpark I substation and its transformers will be designed and constructed to comply with state noise standards. The substation parcel is surrounded by rural land uses and should not have significant noise impacts on nearby receptors. In addition, a ten acre parcel will be acquired to accommodate the 2.5 acre substation. The larger parcel size will allow for buffer land between the electrical equipment and the adjacent properties.

5.3.3 Mitigative Measures for Noise

Impacts to nearby residents and other potentially affected parties in terms of noise will be taken into consideration as part of the siting of the turbines. The Applicant proposes minimum setbacks for turbines from occupied residences of 700 feet to avoid exceeding 50 dBA at occupied residences. The Applicant will ensure compliance with MPCA noise standards.

The noise levels from the transmission line are comparable to the existing noise environment and will have no significant impact on humans or the environment.

The substation parcel is surrounded by rural land uses and should not have significant noise impacts on nearby receptors. The nearest noise receptors to the substation and O & M building locations are more than 1,000 meters away. In addition, a ten-acre parcel will be acquired to accommodate the 2.5 acre substation. The larger parcel size will allow for buffer land between the electrical equipment and the adjacent properties. No additional mitigation is necessary, since there will be minimal noise impacts resulting from the substation.

5.4 Visual Impacts

5.4.1 Description of Resources

The visual setting of the Project area is low-density, predominantly rural, and consists of an altered landscape with views ranging from scattered residences in an agricultural setting to roadways. The characteristic natural landscape of the Project area consists of flat topography with marked elevation increases associated with the Glacial Agassiz beach ridges to the east of the Project area. Intermittent drainages enter the Project area, and some scattered wetlands are present throughout the area.

The colors of the landscape are seasonally variable and include green cropland during spring and summer, brownish-yellow fields during fall, and white during winter months. There are some wooded areas present to the south of the Project area around the Buffalo River which is typically green to brown throughout the year.

Within the Project area local vegetation is predominately agricultural crops and pasture. Crops include corn, soybeans, wheat, and sugar beets, which usually create a visually low uniform cover. A mix of deciduous and coniferous trees planted for windbreaks typically surround farmsteads. Generally, the forested areas are isolated groves or windrows established by the landowner/farmers to prevent wind erosion and shelter dwellings. Native flora can be found in patches throughout the Project area and consists of tallgrass prairie and wet prairie that is dominated by bluestems (*Andropogon scoparius* and *A. geradii*), Indian grass (*Sorghastrum nutans*), bluejoint grass (*Calamagrostis canadensis*), cordgrass (*Spartina pectinata*), cattails (*Typha spp.*), rushes (*Juncus spp.*), and sedges (*Carex spp.*). Land use/land cover within the Project area is shown in Figure 8 in Appendix A.

The settlements in the Project area are primarily residences and farm buildings (inhabited and uninhabited) scattered along the rural county roads. These structures contrast the open space character of the surrounding area. The turbines are most visually apparent from Highway 9 and county roads in the vicinity of the Project.

5.4.2 Visual Impacts

Visual sensitivity is dependent on viewer attitudes, the types of activities in which people are engaged when viewing the site, and the distance from which the site will be seen. Overall, higher degrees of visual sensitivity are correlated with areas where people live, are engaged in recreational outdoor pursuits, or participate in scenic or pleasure driving. Conversely, visual sensitivity is considered low to moderate in industrial or commercial areas where the scenic quality of the environment does not affect the value of the activity.

Turbines will affect the visual character of the landscape within the Project area. However, discussion of the aesthetics of the proposed windpark is based on subjective human responses. For some viewers, the Project could be perceived as a visual intrusion to the natural aesthetic value of the landscape. However, windparks have their own aesthetic quality and appeal. Visual impacts would be greatest for those residences located nearest to the Project and would be greatly reduced with significant distance from the Project.

The proposed land use would not involve any ongoing industrial use of non-renewable resources or emissions into the environment. Although the turbines are high-tech in appearance, they are compatible with the rural, agricultural heritage and the other existing wind turbines within the Project area (see Section 3.2 for a description of existing wind turbines in the area).

The windpark will contrast with the open agricultural areas and will be visible to travelers along MN Highway 9. Buffalo Ridge State Park and The Nature Conservancy land are within 6 miles of the Project area. It is possible that the transmission lines and wind turbines will be visible from some vantage points in these areas.

Essentially, the installation of the Project will alter the land use and visual quality of the site. The topography in the vicinity of the Project is generally flat and the vegetation cover is uniformly low, making the landscape highly vulnerable to disruptions. Therefore, the installation of an 80 meter wind turbine will introduce a linear element to the landscape foreground. However; wind turbines, a transmission line, and houses already exist near the Project area and have altered the landscape in the area. The proposed Project will cumulatively contribute to the visual character imposed by the existing infrastructure.

The FAA requires obstruction lighting or marking of structures over 200 feet above ground surface because they are considered obstructions to air navigation (U.S. Department of Transportation (DOT) FAA Advisory Circular 70/7460-IJ dated 11/29/95). The FAA released guidance (DOT/FAA/AC 70/7460-1K Chg2 dated 02/07) on standards for obstruction lighting for wind turbine farms. The Applicant will use this guidance when applying to the FAA for approval of a lighting plan that will light the Project as one large obstruction versus every other structure over 200 feet in height. This will limit the number of lights required to be placed on turbines in the Project. In addition, the FAA now requires synchronized red strobe lights, further minimizing the nighttime disturbance.

The presence of turbines within the viewshed of wildlife management areas (WMAs), waterfowl production areas (WPAs), Buffalo State Park, Scientific and Natural Areas (SNAs), and TNC's Bluestem prairie may diminish the natural quality of those areas and the experience of those persons utilizing the areas (Figure 9 in Appendix A). While it may be true to some extent that the ability to see the turbines in the background intrudes upon the purity of that experience, the same can be said of other infrastructure such as distribution lines and telephone lines in the area.

5.4.3 Mitigative Measures

Proposed mitigative measures include: locating turbines in areas that are not considered visually sensitive areas such as State Parks, WMAs, WPAs, or wetlands; illuminating turbines to meet the minimum requirements of the FAA regulations; using existing roads for construction and maintenance where possible; and locating access roads on gentle grades to minimize erosion and visible cuts and fills. Furthermore, siting of the wind turbines will be designed to minimize visual impacts to the surrounding area. The Applicant will also create a turbine design in which all turbines will be off white and uniform in color to minimize the visual obtrusiveness of the windpark.

To attain maximum efficiency, wind power technology requires as much exposure to wind resources as possible. Measures that would result in shorter towers have not been considered because they would result in less efficiency per unit.

5.5 Public Services and Infrastructure

5.5.1 Description of Resources

The phrase "Public Services" generally refers to services provided by government entities to its citizens and that are used to benefit public health and safety, such as education, emergency services (fire, ambulances, and police), potable water, waste management, and utilities. The Project is located in a sparsely populated, rural area in west-central Minnesota. There is an established transportation and utility network that provides access and necessary services to the industry, homesteads, and farms in the Project area. Many of the public services available to residents in Clay County are associated with the larger city of Moorhead, located approximately 12 miles southwest of the Project area. Outside the city, landowners are typically serviced with privately-owned septic systems and wells. The proposed Project would facilitate provision of electrical service to OTP utility and other utility company customers in Clay County and throughout Minnesota and the Upper Midwest.

In general, the existing roadway infrastructure in and around the Project area is characterized by county and township roads that provide access to the proposed site. Access to the Project area also includes two-lane paved and gravel roads. Furthermore, many landowners use private single-lane farm roads and driveways on their property.

There is one U.S. Highway south of the Project area. U.S. 10 is three miles south of the Project area and provides east-west access towards Moorhead. MN Highway 9 is located within the eastern edge of the Project area and provides north-south access. There are two County State Aid Highways (CSAHs) within the Project area. CSAH 26 runs east-west along the northern boundary of the Project area. CSAH 19 runs north-south through the middle of the Project area. There are also five County Roads (CRs) within the Project area (CR 68, 93, 91, 88, and 92).

The existing traffic volumes on the area's county highways were obtained from Minnesota Department of Transportation (MnDOT) 2005 traffic volume maps and are documented in Table 5-5 and shown in Figure 10 in Appendix A. The highest existing Annual Average Daily Traffic (AADT) near the Project area is 15,100 vehicles per day along US Highway 10. The highest existing AADT within the Project area is 1,750 along MN Highway 9. Along the CSAHs within the Project area, the AADTs are below 2,000 vehicles per day. Along the CRs within the Project area, the AADTs are below 300 vehicles per day indicating very low traffic volumes.

Table 5-5
Existing Daily Traffic Levels Within The Project Area

Roadway Description	2005 Existing Annual Daily Traffic (AADT)
MN Highway 9	1750
CSAH 26	1600/1100
CSAH 19	75
CR 68	45
CR 93	245
CR 91	90
CR 88	15
CR 92	25

Highway access to the Project area is provided by MN 9 (which runs north-south along the Project area) and U.S. 10 (which runs east-west just south of the Project area). MN 9 intersects I-94 approximately 15 miles south of Glyndon, near the town of Barnsville, Minnesota.

The Clay County area includes a major east-west railroad facility, with minor routes branching out of its cities in a number of directions. A major intermodal terminal facility is located in Dilworth (approximately nine miles from the Project area). The Burlington Northern Santa Fe Railroad owns the majority of the tracks. The Amtrak trains provide daily passenger rail service to the area and also express service for packages and mail.

Electrical utilities are present within the Project area, with numerous aboveground distribution lines running along roadways. Xcel Energy has a 23.5 kV electrical distribution line running north-south along MN Highway 9.

5.5.2 Impacts on Public Services and Infrastructure

This Project is expected to have minimal impact on the existing infrastructure. The following is a brief description of the impacts that may occur during the construction and operation of the Project at the proposed site.

- **Electrical Service**: Construction of the Project will consist of 134 wind turbines, a pad-mounted transformer at the base of each turbine, and an underground and above ground electrical collection system. The power will then be transmitted via an overhead transmission line to a point of interconnection at the existing OTP power line where it will enter the grid.
- **Roads**: Construction and operation of the Project will require the installation of new access roadways. The access roads will connect the towers to existing roadways. The Applicant will work closely with the landowners to locate these access roads to minimize land-use disruptions. Construction traffic will use the existing county and state roadway system to access the Project area and deliver construction materials and personnel. Construction traffic relating to the Project will be perceptible and will add to local traffic, but this will be minimal and temporary. Construction is not anticipated to result in adverse traffic impacts.
- **Railroads**: The Project will not affect the operation of the railroads.
- **Water Supply**: Construction and operation of the proposed Project will not affect the area's water supply. No installation or abandonment of any wells is anticipated for the Project. However, in the event wells are abandoned they will be capped as required by

Minnesota law. Temporary dewatering may be required during construction for specific turbine foundations and/or electrical trenches. The Project will not require the appropriation of surface water or permanent dewatering. A water supply will be necessary for the operations and maintenance facility. The preferred source is Rural Water Services. Water usage during the operating period will be similar to household volume. The Applicant will avoid impacts to any water pipelines running through the Project area.

- **Telephone**: Construction and operation of the windpark will not impact the telephone service in the Project area. Gopher One Call will be contacted prior to construction to locate and avoid all underground facilities. To the extent the 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.
- **Federal Communications Commission (FCC) Registered Towers**: The Applicant will conduct a microwave beam path analysis of the Project area prior to construction. The Applicant will not operate the windpark so as to cause microwave, radio, telephone, or navigation interference contrary to FCC regulations or other law. In the event the windpark or its operation causes such interference, the Applicant will take the steps necessary to correct the problem.

5.5.3 Mitigative Measures

Construction and operation of the proposed wind Project will be in accordance with all associated federal and state permits and laws, as well as industry construction and operation standards. The majority of local public infrastructure, including roads, telephone service, and the water supply, are located in Moorhead, MN. Therefore, no public services provisions are anticipated to be impacted by the Project, and no mitigation for public services is recommended. Minor impacts are expected on the existing infrastructure during Project construction; however, extensive mitigation measures are not anticipated.

5.6 Cultural and Archaeological Resources

5.6.1 Description of Resources

The heritage of the Project area is manifested in its archaeological record, architectural history, and Native American and European-American communities. These resources represent aspects of the physical environment that relate to culture, society, and institutions that bond communities together and link them to their environmental and social surroundings. In this context, cultural resources can include but are not limited to prehistoric and historic archaeological sites, buildings, structures, objects, districts, natural features, and biota; all of which can be deemed significant to a culture or community for scientific, social, traditional, religious, or other reasons.

Tetra Tech conducted a record search and review of existing records contained at the Minnesota State Historic Preservation Office (SHPO) in the Minnesota Archaeology Inventory database and the Standing Structures Inventory database. The records search was conducted to determine if significant archeological, architectural history, or tribal resources have been documented within the proposed Project area or the vicinity. If resources are present, the likelihood of impacts from Project development is identified. Search parameters for the cultural resources records search are listed in Table 5-6.

Table 5-6
Search Parameters for Cultural Resources Records Inventory

Inventoried Records	Search Parameters
Archaeological Sites	1 mile from the proposed Project area.
Architectural History Properties	1 mile from the proposed Project area.
Previous Surveys	1 mile from the proposed Project area.

Cultural History

Minnesota's prehistory has been divided into three broad cultural periods: Pre-Contact (9,500 B.C. to A.D. 1650), Contact (A.D. 1650 to 1837), and Post-Contact (1837 to 1945). The Pre-Contact Period includes several traditions such as Paleoindian (9,500-7,000 B.C.), Archaic (7,000-500 B.C.), Woodland (500 B.C.-A.D.1650), Plains Village (A.D.900-1300), Mississippian (A.D.1300 to 1650), and Oneota (A.D.1300-1650 B.P.). By A.D. 1650, the first French explorers had reached Minnesota, ending Minnesota's prehistory and initiating the Contact Period. This period is further broken down based on Euro-American influences in the state including: French (1650-1803); British (1763-1816); and the Initial United States Presence (1803-1837). At that time, the Native American tribes present in the state included the Chiwere Siouan language groups, Eastern Dakota, Western Dakota, and Ojibwe Indians, all of which were in constant interaction with Euro-Americans in search of animal furs. The Contact Period lasted until around 1837 when Native Americans were forcibly divided into communities and put onto reservations, and Euro-American settlement expanded and new ways of life (i.e., lumbering and intensive agriculture) overtook the region.

The Post-Contact Period began with the intensive settlement of Minnesota by Euro-Americans and the resettlement of Native Americans to reservations. The waterways in the state initially served as the primary means for commerce, travel, and sustenance for the first Euro-Americans to permanently settle the state and played a major role in the development of the state by providing a means to transport raw materials from Minnesota on barge traffic down the Mississippi River from the port at Duluth to industries in the eastern United States. Three of Minnesota's earliest Post-Contact traditions directly related to the early use of waterways for transportation and include the Early Agriculture and River Settlement (1830s-1870), St. Croix Triangle Lumbering (1837-1920), and Settlement and Fishing on Minnesota's North Shore (1854-1930). As railroad transportation grew and expanded throughout Minnesota, so did the settlement of these previously unpopulated areas and with it came more intensive agriculture (Railroads and Agricultural Development [1870-1940]), lumbering (Northern Minnesota Lumbering [1870-1930]), tourism and recreation (North Shore Tourism and Recreation [1870-1945]), development of large urban centers (Urban Centers [1870-1945]) and mining (Iron Ore Industry [1880s-1945]). These cultural resources represent some of the state's most interesting and complex cultural resources. The Original Public Land Surveyor Maps from 1870 and 1872 indicated that the proposed Project area was mostly prairie with some wet prairie at the time of initial development. The only timber in the area was located along the Buffalo River.

5.6.2 Documented Cultural Resources

Cultural Resources Surveys

No cultural resources surveys have been conducted within one mile of the Project area (Table 5-6).

The cultural traditions previously documented within the proposed Project area as described in Section 5.6.1 are summarized in Table 5-7.

Table 5-7
Cultural Traditions Previously Documented in the Study Area

Cultural Tradition	Time Span	Characteristics
Archaic	7000-500 B.C.	A continued reliance on large game hunting and increasingly diversified technologies. Stemmed and notched projectile points dominate the tool kit, along with the use of pecked and ground stone implements. Copper implements are apparent late in the period. Habitation areas often located along the margins of lakes and major rivers.
Woodland	500 B.C.-A.D.1650	Introduction of ceramic technology and cultivated plants. Subsistence and movement patterns tied to seasonal availability of resources. Mound construction and elaborate mortuary practices. Extensive trade networks.
Post Contact	A.D. 1650-present	Intensive settlement of Minnesota by Euro-Americans and the resettlement of Native Americans to reservations. The growth of railroad transportation leads to the settlement of previously unpopulated areas.

Archaeological Sites

Three archaeological sites have previously been documented within the proposed Project area and two archaeological sites are within the 1-mile buffer. Sites within the proposed Project area include a structural ruin and associated artifact scatter (21CY0011), an Archaic period lithic scatter (21CY0027), and a Woodland period artifact scatter (21CY0028). None of the sites within the proposed Project area have been evaluated for NRHP eligibility.

Previously identified archaeological sites within 1-mile of the proposed Project area include a Woodland period artifact scatter (21CY0029) and a Pre-Contact lithic scatter (21CY0052). Neither of these sites has been evaluated for NRHP eligibility.

Historical Properties

Two architectural history properties have been identified within the proposed Project area, and three properties have been identified within the 1-mile buffer. Properties within the proposed Project area include the Thordtvedt Homestead (CY-MOL-001) and a church (CY-MOL-002). These properties have not been evaluated for NRHP eligibility.

Architectural history properties within 1-mile of the proposed Project area include the Concordia Lutheran Church (CY-MOL003), Moland Town Hall (CY-MOL-004), and the Spring Prairie Township Hall (2Y-SPR-001). None of these properties have been evaluated for listing on the NRHP.

National Register Eligible Properties

According to SHPO file search of archaeological sites and architectural history properties performed on August 18, 2008, no properties evaluated for the National Register have been identified within the Project area.

5.6.3 Impacts to Cultural and Archaeological Resources

Cultural resources could be affected directly during the construction of a wind energy facility. Construction within the turbine footprint, cable trenching, access roads, and borrow areas could impact cultural resources. In addition, construction of turbines may impact viewshed integrity from existing standing structures.

Given the moderate number of previously documented archaeological sites and architectural history properties within the Project area, it is likely that undocumented cultural resources exist within the proposed Project area. Once a final design for the windpark is determined, the Applicant will conduct a Phase IA pedestrian survey within the Project area.

5.6.4 Mitigative Measures

The Applicant will conduct a Phase IA pedestrian survey within the Project area. Upon completion of the Phase IA report, recommendations for subsurface testing will be made for areas of low surface visibility and/or increased potential for buried archaeological resources. In addition, a more detailed review of previously documented cultural resources (which have not been evaluated in terms of NRHP eligibility) will be conducted as necessary to determine significance and potential impacts from Project development. Avoidance of archaeological sites and architectural history properties is always the preferred mitigation method; however, if sites cannot be avoided, then further investigations may be needed to evaluate significance and recover data.

Once final locations for turbines and associated facilities have been chosen, the Applicant will complete an intensive review of the unevaluated archaeological sites within the proposed Project area. This review will include a field evaluation to determine the significance of the resources and potential impacts from project development. If impacts to sites can be avoided, no further action is required.

The Applicant will initiate consultation with the Minnesota SHPO specifically regarding any adverse direct effects the turbines may have to properties within the proposed Project area or adverse visual effects the turbines may have to architectural properties in the vicinity of the proposed Project area (see Section 6.1.2 for details on SHPO correspondence to date). Current Project plans describing the approximate location of the turbines and the estimated height of these structures will be presented to the SHPO in an attempt to mitigate potential adverse visual effects to these historic properties.

5.7 Recreational Resources

5.7.1 Description of Resources

Park and recreation areas provide opportunities for both active and passive recreation for Clay County residents and visitors. The amount of land in Clay County used for recreation is approximately 3 percent (19,756 acres). There are many existing recreational resources in the vicinity of the proposed Project area, including golf courses, public hunting grounds, shooting preserves, trails, rivers, wildlife management areas and parks, and state-owned lands such as nature preserves. Figure 9 in Appendix A depicts locations of scientific and natural areas (SNA), Buffalo River State Park, WPA parks, and Bluestem Prairie nature preserve owned by Minnesota Department of Natural Resources (MDNR) and The Nature Conservancy (TNC). Popular

activities include camping, fishing, hunting, bird watching, swimming, biking, hiking, and nature observation. The Buffalo River State Park and the Bluestem Prairie nature preserve provide opportunities for viewing wildlife and intact ecosystems.

Minnesota wildlife management areas (WMAs) are managed to provide wildlife habitat, improve wildlife production, and provide public hunting and trapping opportunities. These MDNR 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 no WMAs within the Project area. WMAs located within six miles of the Project include: Gruhl WMA located approximately 6 miles east; and Jeral WMA located approximately 4.5 miles east of the Project area. .

SNAs are areas designated to protect rare and endangered species habitat, unique plant communities, and significant geological features that possess exceptional scientific or educational values. There are no SNAs within the Project area. The Bluestem Prairie SNA is located 6 miles south-east of the Project area. The Bluestem Prairie provides opportunity for hiking, wildlife viewing, and viewing of some of Minnesota's remnant prairie (a rare and unique natural resource).

USFWS Waterfowl Protection Areas (WPAs) protect breeding, forage, shelter, and migratory habitat for waterfowl or wading birds, such as ducks, geese, herons, and egrets. WPAs provide opportunities for viewing wildlife and intact ecosystems. There are no WPAs within the Project area. The closest WPAs to the Project area are Hatchet Lake WPA and Jarvis WPA which are located approximately 4.5 miles east of the Project area.

Buffalo State Park is located approximately 5.5 miles south-east of the Project area along the Buffalo River. It provides opportunities for camping, canoeing, fishing, picnicking, and hiking.

5.7.2 Impacts on Recreational Areas

The Applicant will construct all Project related facilities on the west side of MN Highway 9 to avoid affecting WMAs, SNAs, Buffalo State Park, and Bluestem Prairie SNA and TNC lands. In general, recreational impacts will be visual in nature affecting individuals using public land near the Project. See Section 5.4 for additional discussion of visual impacts and proposed mitigation. Visual impacts will be most evident to visitors using WMAs, SNAs, and WPAs within one to four miles of the site. However, there are currently two turbines already operating within one mile of the WPAs and WMAs near the Project area and approximately six miles from the Bluestem Prairie and Buffalo State Park. Due to the presence of tree cover and/or altered landscapes within the area no direct impacts are anticipated to SNA or State Park lands. The Applicant will continue to work with MDNR, USFWS, and TNC to avoid and minimize impacts to waterfowl and other natural resources (see Section 6.0 for details on agency contacts). The Project will not impede on land heavily used for recreation in this area.

5.7.3 Mitigative Measures

Project turbines and facilities will not be located within public parks, WMAs, SNAs, USFWS lands, or TNC lands, therefore no mitigation is anticipated.

5.8 Human Health and Safety

5.8.1 Description of Resources

5.8.1.1 Air Traffic

There are no airports located within the vicinity of the Project area. The nearest airport is the Moorhead Municipal Airport located approximately seven miles southwest of the Project area. The Moorhead Municipal Airport was constructed in 1996 to serve the area's industrial and business needs. Currently, it has one runway that is 4,000 feet long and 75 feet wide. The airport provides 28 conventional hangers and one maintenance hanger. Nighttime landings are possible with pilot activated lights on the runway. The airport also has a helicopter-landing pad and a chemical loading facility is provided for crop-dusting aircraft. Crop dusting is typically carried out during the day by highly maneuverable airplanes or helicopters. The installation of wind turbine towers in croplands and installation of overhead collection lines will create a potential for collisions with crop-dusting aircraft. However, overhead collection lines are expected to be similar to existing distribution lines (located on the edges of fields or roadways) and the turbines would be visible from a distance and lighted according to the 2007 revised FAA guidelines.

5.8.1.2 Electromagnetic Fields

The term electromagnetic fields (EMF) refers to electric and magnetic fields that are present around any electrical device. Electric fields arise from voltage or electric 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 current flow through the conductors (wire). There are no discernible health impacts from power lines. Wind turbine generators will be no closer than 700 feet from occupied residences where EMF will be at background levels.

Corona on the transmission line conductors can generate electromagnetic noise at the frequencies at which radio and television signals are transmitted. This noise can cause interference (primarily with AM radio stations and the video portion of TV signals) with the reception of these signals depending on the frequency and strength of the radio and television signal. The Applicant does not anticipate any impacts from the operation of the new line. Although this type of interference can occur, the Applicant will investigate these problems and correct those caused by the Applicant's facilities. Additionally, the transmission line will be routed along existing transmission corridors and will avoid close proximity to residences along or near the route.

For more information on EMF of transmission lines please see the Noble Flat Hill Windpark I 230 kV transmission line Route Permit Application, PUC Docket No. P6687/TL-08-988.

5.8.1.3 Security

The proposed windpark is located in an area that has low population density. Construction and operation of the Project will have minimal impacts on the security and safety of the local population.

5.8.1.4 Traffic

The existing traffic volumes are discussed in detail in Section 5.5 and shown in Table 5-5 and Figure 10 in Appendix A.

5.8.2 Impacts to Pubic Health and Safety

5.8.2.1 Air Traffic

The proposed windpark will have no impacts on air traffic in the region because there are no airports in the vicinity. The wind and meteorological towers will have lighting to comply with FAA requirements. The Applicant will notify local airports about the Project and new towers in the area to reduce the risk to crop dusters.

5.8.2.2 Electromagnetic Fields

Electromagnetic fields likely cause no risk to humans; however, there is much research and debate pertaining to this subject. Based on the most current research on electromagnetic fields, and the distance between any turbines or collector lines and residences, the Project is not expected to have any affects on human health and safety due to EMF.

5.8.2.3 Security

The Project is located in a rural area with relatively low population density. Construction and operation of the Project would have minimal impacts on the security and safety of the local populace.

5.8.2.4 Traffic

The maximum construction workforce is expected to generate approximately 275 additional vehicles per day (75 truck trips/day and 200 small vehicle trips/day). The addition of these vehicles will be perceptible; however, the increase will be similar to seasonal variations such as those due to the autumn harvest.

Truck access to the Project is generally served by MN Highway 9 and U.S. Highway 10. Specific additional truck routes will be dictated by the location required for delivery. Additional operating permits will be obtained for over-sized/overweight trucks and cranes.

The operations phase of the Project will require a multi-person maintenance crew driving through the area to monitor and maintain the wind turbines. The maintenance crew will monitor the wind turbines as needed. There would be a slight increase in roadway traffic for occasional turbine and substation repair.

5.8.3 Mitigative Measures

5.8.3.1 Air Traffic

The Applicant will mark and light the turbines to comply with the most recent FAA requirements. The Applicant will paint the tops of meteorological towers red to improve visibility and will notify local airports about the Project and new towers in the area to reduce risk to crop dusters. Permanent meteorological towers will be free-standing with no guy wires or will have supporting guy wires which will be marked with safety shields (colored balls) for increased visibility.

5.8.3.2 Electromagnetic Fields

While the general consensus is that electric fields pose no risk to humans, the question of whether exposure to magnetic fields potentially can cause biological responses or even health effects continues to be the subject of research and debate. Based on the most current research on electromagnetic fields, the facilities such as those comprising the Project are not expected to have impacts to public health and safety due to EMF. The addition of the turbines, substation, and underground collectors is not expected to add significantly to the presence of EMF exposure in the vicinity. Furthermore, the Applicant will place the new 230 kV transmission line at least 100 feet from residences. All wind turbines will be at least 700 feet from residences. No additional mitigation due to electromagnetic fields is necessary.

5.8.3.3 Security

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 placed 300 feet from public roads and a minimum of 700 feet from occupied residences. 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 all 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 in which all electrical equipment will be located, except the pad-mounted transformer. Access to the tower is only through a solid steel door that will be locked when not in use;
- Permanent meteorological towers will be free-standing or will have supporting guy wires which will have color sleeves at ground level to increase visibility to people at ground level; and
- The Applicant will construct gates or fences where necessary or requested by landowners.

5.8.3.4 Traffic

No impacts to traffic are anticipated, therefore no mitigation is necessary.

5.9 Hazardous Materials

5.9.1 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. These include: petroleum products (fuels and lubricants), pesticides, and herbicides. Older farmsteads may also have lead-based paint, asbestos siding/shingles, and polychlorinated biphenyls (PCBs) in transformers. Trash and farm equipment dumps are common in rural settings.

A Phase I Environmental Site Assessment (ESA) is expected to be completed by the end of December 2008. A government database search and review of historical aerial photos was initiated on October 1, 2008. Tetra Tech will complete a site visit by October 31, 2008. Landowner questionnaires will be issued by November 1, 2008. Before project completion or within 180 days of a real estate closing, the Applicant will complete the Phase I ESA in accordance to ASTM (ASTM E 2247-02).

Three types of petroleum products are necessary for the operation of the wind turbines and include synthetic gear box oil, hydraulic fluid, and gear grease.

5.9.2 Impacts from Hazardous Materials

The Applicant will avoid all recognized environmental conditions (RECs) found in the Phase I ESA.

Turbine hydraulic oils and lubricants will be contained within the wind turbine nacelle. In the case of car, truck, and equipment fuel and lubricants, petroleum products will be contained 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.

5.9.3 Mitigative Measures

Because there are no proposed impacts to hazardous waste sites, no mitigation 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, and disposed of in accordance with Minnesota Rules Chapter 7045.

5.10 Effects on Land-Based Economics

5.10.1 Agriculture/Farming/Forestry/Mining

5.10.1.1 Description of Resources

Agriculture/Farming

The majority of the Project area is farmland and grassland (Figure 8 in Appendix A). According to the 1997 Census of Agriculture, the number of farms has decreased over the past ten years in

Clay County. However, the average size of farms has increased from 579 acres in 1987 to 655 acres in 1997. According to the 2002 Agricultural Census, approximately 90.46 percent of farmland is used for crop production. Crops include wheat, soybean, and sugarbeets. Sales from these crops in 2002 were $112,696,000. Livestock sales accounted for $22,228,000 of the total sales in 2002. The top livestock inventory for Clay County includes turkeys, hogs, pigs, cattle, and calves. Converting cropland to the Conservation Reserve Program (CRP) is another source of farm income. CRP lands are grassland and legume croplands that are planted to protect and improve the soil and cannot be harvested or pastured. These areas are enrolled in the CRP for 10-year periods.

Forestry

The proposed project corridor occurs in what was historically the Red River prairie region in Minnesota. The primary tree cover in the proposed Project area is associated with waterways and homesteads. None of these areas are economically significant production areas.

Mining

Large deposits of glacially derived sediments are present east of the proposed Project area. As a result, aggregate mining operations are present in the vicinity, but not within, the Project area. According to MNDOT county pit maps for Clay County, there are no active or inactive aggregate pits or rock quarries within a mile of the Project area.

5.10.2 Impacts to Land-based Economics

5.10.2.1 Agriculture/Farming

Specific impacts to agricultural lands will be determined once turbine and road placement has been finalized. Most of the soil within the Project area is considered prime farmland. The loss of agricultural land to the construction of the windpark will reduce the amount of land that can be cultivated. However, a maximum of approximately 65 acres of land will be converted to non-agricultural land use, so the Project is not expected to significantly alter crop production in Clay County.

The impacts to agricultural land will be minimal along the transmission line due to its location within an existing roadway right-of-way (R-O-W). Most of the impact to farmland will be limited to possible pole placement within the field production areas. No farm fields will be bisected by the proposed transmission corridor. During construction, temporary impacts such as soil compaction and crop damage within the R-O-W are likely to occur.

Wherever possible, transmission line poles will be placed so they fall within existing R-O-W, minimizing permanent impacts to agricultural land. The Applicant will compensate landowners for crop damage and soil compaction that occurs during Project construction.

The substation location and the O & M building location will each be located on ten acre private properties that are currently used for agricultural purposes. Approximately 2 acres of these parcels would be removed from agricultural production to accommodate the substation and O & M station equipment and other necessary facilities. The Applicant proposes to allow agricultural production to continue on the substation and O & M building parcels so long as the farmer maintains a buffer of 400 feet from the Project facilities. The proposed Project will minimize agricultural impacts.

All turbine and facility siting will include discussions with property owners to identify features on their property, including drain tile, which should be avoided. Based on consultation with landowners, six quarter sections are known to be tiled within the Project area. Impacts to drain tile due to Project construction and operation will be avoided where possible; however, some damage may be unavoidable. 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.

The Applicant will minimize or avoid impacts to CRP land.

5.10.2.2 Forestry

The proposed Project will not affect forest production resources.

5.10.2.3 Mining

Negative impacts to mining are not anticipated. Sand and gravel operations in the area are located to the east of the Project area, thus the Project avoids impacts to mining operations.

The proposed transmission line and substation would be built largely within or adjacent to existing public road R-O-W areas which are already unavailable for mining activities. Therefore, the proposed Project would not result in mining impacts.

5.10.3 Mitigative Measures

5.10.3.1 Agricultural/Farming

The wind turbines and access roads will be located so that most of the productive farmland will be avoided as much as possible. Only land for the turbine, substation/switching station, O&M building, and access roads will be taken out of crop production. Once the turbines are constructed, all land surrounding the turbines and access roads may still be farmed. Transmission lines will be located along existing R-O-W, therefore impacts to farmland are anticipated to be minimal and/or temporary impacts associated with construction. The Applicant will compensate landowners for crop damage and soil compaction that occurs during project construction.

In the event there is damage to drain tile as a result of construction activities or operation of the LWECS, the Applicant will work with affected property owners to repair the damaged drain tile in accordance with an agreement between the Project owner and the owner of the damaged tile.

If the facilities are proposed to be located on CRP land, the Applicant will work with landowner to remove the impacted parcel from the CRP program if necessary.

5.10.3.2 Forestry

No impacts are anticipated; therefore no mitigation will be necessary.

5.10.3.3 Mining

Turbines and associated facilities will not be located within sand and gravel operations, therefore no mitigation is necessary.

5.11 Tourism and Community Benefits

5.11.1 Description of Resources

Much of the tourism in this region is associated with either the City of Moorhead or the Red River Valley. Moorhead is the County seat and contains the Clay County courthouse. There are many cultural attractions and historic sites in Moorhead including art galleries and museums, theater, opera and symphony, science and history exhibits, and the Heritage Hjemkomst Center.

Several state parks and nature preserves are located in this area of the Red River Valley including: Buffalo River State Park and the adjacent Bluestem Prairie Preserve which is one of the largest tracts of native prairie in the state. Buffalo State Park and the Bluestem Prairie preserve are located approximately south-east end of the Project area along the proposed transmission line.

Wind development in Minnesota is becoming a significant tourism attraction, bringing more visitors to the community. Increased visits and economic activity relating to wind development will benefit the community by increasing revenue related to tourism.

5.11.2 Impacts for Tourism and Community Benefits

The proposed Project is not anticipated to impact tourism.

5.11.3 Mitigative Measures

The proposed Project is not anticipated to impact tourism; therefore no mitigation is necessary.

5.12 Topography

5.12.1 Description of Resources

The Red River Valley is one of the flattest land surfaces in North America. The topography of the proposed Project area is level to gently rolling and consists of a large lake plain from Glacial Lake Agassiz. There is some steeper topography along drainages and adjacent to Lake Traverse. Areas east of the proposed Project (i.e. the Agassiz Beach Ridges) have topography with noted elevation increases. Elevations range from approximately 910 to 1,117 feet above mean sea level.

5.12.2 Impacts on Topography

The Project would not require substantive excavation or fill. Local soil disturbance and excavation to install structures will be required; however, there will be no impacts to regional topography. Any areas where soil is disturbed or excavation is required will be restored to existing conditions to the extent practicable.

5.12.3 Mitigative Measures

No impacts are anticipated; therefore no mitigation is necessary.

5.13 Soils

5.13.1 Description of Resources

Soils within the Project area are poorly, somewhat poorly, and moderately well-drained lacustrine clays, silts, and sands. They are primarily Mollisols or Aquolls. Borolls (cold, dry Mollisols) are also common. Other soils in the proposed Project area include saline soils which are present in localized areas and dry, sandy and gravelly soils which are characteristic of the beach ridges to the east of the proposed Project area (Clay County 2002).

5.13.2 Impacts on Soils

Surface soils would be disturbed by site clearing, grading, and excavation activities at structure locations, as well as during transport of construction materials and machinery. This disturbance is minimal and is generally less invasive than typical agricultural practices such as plowing and tilling. No permanent impacts to soil are anticipated during the construction of the turbines and associated facilities.

5.13.3 Mitigative Measures

The Applicants will attempt to utilize existing disturbed areas where possible. Where disturbance and excavation can not be avoided entirely, it would be minimized by using Best Management Practices (BMPs). BMPs are implemented during construction to protect topsoil and adjacent resources and to minimize soil erosion. Soil compaction would be treated and restored through tillage operations. In addition, the placement of wind turbines and access roads will be planned so that the conversion of prime farmland will be minimized.

5.14 Geologic Resources

5.14.1 Description of Resources

Data on the geology of the Red River Valley were obtained from the Department of North Dakota State University. The proposed Project area is located within the Red River Valley subsection of Northwestern Minnesota. The Red River Valley is the youngest major land surface in the contiguous United States, with Glacial Lake Agassiz draining only about 9,200 years ago. The geology of Clay County is a direct result of the glaciers once covering the area. The western portion of the County is made up of glacial drift (ground moraine) and the eastern part of the County is made up of terminal moraine.

Underlying the Red River Valley are soils that support agricultural activity. These soils consist of developed clays derived from the late-glacial erosion and reworking of Cretaceous shales dispersed as fine grained sediments into Lake Agassiz. Pre-glacial topography is still present in this area, but is buried underneath several hundred feet of this glacial drift and glacial lake sediments. PreCambrian granitic and gneissic basement rock (greater than 2.5 billion years in age) exists at a depth of approximately 200-300 feet. Overlying this rock at about 100-200 feet is

glacial sediment (predominantly till with some localized zones of outwash sands and gravels). Over this layer at approximately 85 feet are slickensided fat clays and silty clays.

5.14.2 Impacts to Geology

The Project would not require substantive excavation, and minimal grading is anticipated to construct the facilities. Surficial deposits are more than 200 feet deep, thus conflicts with bedrock are not anticipated. The proposed Project would not impact the geology of the Project area.

5.14.3 Mitigative Measures

No impacts to geology are anticipated; therefore no mitigation is necessary.

5.15 Groundwater Resources

5.15.1 Description of Groundwater Resources

The Buffalo, Moorhead, and Kragnes aquifers are the three primary aquifers in Clay County. The Buffalo aquifer is the primary source of groundwater in the County. It is about one to eight miles wide and thirty two miles long and lies five miles east of Moorhead. Glacial sediments overlay more than half the aquifer at a depth from 20 to 120 feet. The thickness of the aquifer ranges from 0 feet at the edges to around 200 feet at the center with the flow generally northward toward adjacent streams. A direct link between the Buffalo River and the aquifer has been identified, indicating a potential for pollution of the aquifer from inputs to the River.

The composition of surficial aquifers is typically a calcium bicarbonate type with dissolved solid concentrations of 300 to 700 milligrams per liter (mg/l). As water moves toward the Red River or west, these concentrations tend to increase. At the present time, groundwater quality is thought to be good.

Intense irrigation occurs on the agricultural land in Clay County. This is a concern for the groundwater quality as most irrigation occurs in the eastern part of the region in sandy soil where aquifers are recharged and easily contaminated. Furthermore, there are concerns about contaminating the Buffalo Aquifer during industrial development and land use.

There are approximately 40 transient public water supply wells in Clay County. The Clay County Environmental Health Office offers a comprehensive water well testing program for nitrates and coliform bacteria, two known contaminants found in potable water. The Minnesota Pollution Control Agency (MPCA) and MDNR have also been conducting groundwater tests in the County.

5.15.2 Impacts to Groundwater Resources

Permanent impacts to groundwater resources will not occur as a result of the proposed Project. The proposed Project will be located on the west side of MN Highway 9 and will avoid the beach ridges to the east of the Project area where the Buffalo Aquifer has the potential to be contaminated. No impacts to the aquifer are expected due to construction. Any impacts to the Buffalo River are temporary and will not result in degradation of the aquifer. The Applicant will maintain sound water and soil conservation practices during construction and operation of the

proposed Project to protect adjacent water resources and minimize soil erosion. The Project will not impact municipal or private water sources in the Project area.

5.15.3 Mitigative Measures

The Project is not expected to result in impacts to groundwater quality, therefore no mitigation is necessary.

5.16 Surface Water and Floodplain Resources

5.16.1 Description of Resources

Surface/Public Waters

The Department of the Army, acting through the U.S. Army Corps of Engineers, has authority over the waters of the U.S. under Section 404 of the Clean Water Act (CWA) and Sections 9 and 10 of the Rivers and Harbors Act of 1899 (RHA). Public waters are water basins and watercourses in Minnesota with significant recreational or natural resource value as defined by Minnesota Statute 103G.005. The MDNR has regulatory jurisdiction over these waters. The major watersheds in the County include the Red River, Buffalo River, and Wild Rice/Marsh River Watersheds. These watersheds drain the western, central, and northern parts of the county, respectively.

The Minnesota Public Waters (PWI) map indicates the Buffalo River is a primary tributary to the Red River and is located west and south of the Project area (see Figure 1 and Figure 11 in Appendix A).

Due to the lack of natural drainage in the Lake Agassiz Plain an extensive network of manmade drainage systems or public ditches are located within the Project area. The Buffalo-Red River Watershed District's online ditch mapping inventory was utilized to determine County ditches located within the Project area (see Figure 11 in Appendix A). Clay County Ditch Numbers 2, 3, 39, 63, and 65 are located within the project area.

Water Quality

The MPCA oversees water quality studies and regulations in Minnesota. The Buffalo River is the only major water resource within the vicinity of the Project area and has been judged impaired by the MPCA. Pollution sources include sediment, feedlots, agricultural chemicals, urban runoff, animal holding areas, and septic systems.

Floodplains

Floodplains are low-lying areas that are subject to periodic inundation due to heavy rains or snow melt. These areas are generally adjacent to lakes and rivers. Federal Emergency Management Agency (FEMA) maps were reviewed to determine whether 100-year or 500-year floodplains are present in the proposed Project area. Mapped floodplains were identified within Clay County, and the southwest corner of the Project area appears to intersect the 100-year floodplain adjacent to the Buffalo River (FEMA 2007). A floodplain map depicting the FEMA 100-year and 500-year floodplain within the proposed Project area are shown on Figure 12 in Appendix A.

5.16.2 Impacts to Surface Water and Floodplain Resources

Surface/Public Waters

Impacts to surface water are not likely to occur to public waters basins or County ditches as a result of the Project. The transmission line associated with the Project will cross the Buffalo River near the junction of Highway 9 and Highway 10. However, the Applicant will span the Buffalo River using the existing Xcel Energy R-O-W; therefore impacts to the river will be minimal. Detailed information regarding the new 230 kV line and the anticipated switching station are included in the Noble Flat Hill Windpark I Route Permit Application, available under PUC Docket No. P6687/TL-08-988.

Water Quality

There is a possibility of sediment reaching surface waters while the ground is disturbed by excavation, grading, and construction traffic. However, once the Project is complete the disturbed areas will be restored with the impervious surfaces or planted with crops or grass, and there will be little sediment runoff.

Floodplains

Most of the Project area is located north of the Buffalo River floodplain area, but a small portion in the southwest corner of the Project area does appear to intersect the 100 year floodplain. The Applicant will avoid placing any windpark facilities in the identified floodplain areas; therefore no impacts to floodplains are anticipated.

5.16.3 Mitigative Measures

If the Project is determined to affect waters of the US or Minnesota Public Waters, the Applicant will apply for the necessary permits prior to construction. The Applicant will maintain sound water and soil conservation practices during construction and operation of the proposed Project to protect adjacent water resources and minimize soil erosion. A Storm Water Pollution Prevention Plan (SWPPP) will be prepared and implemented during construction as required by National Pollution Discharge Elimination System (NPDES) permitting The Project will use Best Management Practices to ensure the proposed Project has no permanent water quality impacts.

5.17 Wetlands

5.17.1 Description of Resources

Wetlands and riparian areas are important resources in part because they provide habitat for both resident and migratory wildlife. They are also unique because of their hydrologic conditions and their role as ecotones between terrestrial and aquatic systems (Mitsch and Gosselink 1993). Wetlands have many distinguishing features, the most notable of which are the presence of standing water or saturation within 12 inches of the surface, unique wetland soils, and vegetation adapted to or tolerant of saturated soils. There are many definitions and terms describing wetlands. The legal definition of a wetland, as outlined in the 1987 United States Army Corps of Engineers (USACE) Wetlands Delineation Manual (Wetland Training Institute, Inc 1995), is given as follows:

> The term “wetlands” means those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted

> for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas (33CFR328.3(b); 1984).

Ecologically, wetlands are recognized by three parameters: wetland hydrology, hydric soils, and wetland vegetation. Hydric soils are soils that are wet frequently enough to periodically produce anaerobic conditions, thereby influencing the species composition or growth of plants on those soils. Under most circumstances at least one positive field indicator of each parameter will be apparent at any given wetland. Information obtained from the NRCS Websoil Survey indicates hydric soils are located within the proposed Project area (NRCS Websoil Survey 2008).

Numerous federal, state, county, and local regulations currently affect construction and other activities in wetlands. The principal laws in Minnesota affecting wetlands and streams are Sections 404 and 401 of the Federal Clean Water Act (CWA), the public waters laws administered by the MDNR, and the Minnesota Wetlands Conservation Act (WCA). Section 404 (regulation of discharge of dredge/fill materials into wetlands) is implemented by USACE. The public waters laws regulate work in public waters, including wetlands listed on the MDNR inventory of protected waters and wetlands. The Minnesota WCA was first passed in 1991. The local government unit (LGU) has the primary responsibility for administration of the WCA and for making key determinations to wetlands. Generally, the LGU is the local watershed or County. The Clay County Soil and Water Conservation District is the identified LGU for the proposed Project area. In many instances multiple jurisdictions overlap the same wetland feature.

The National Wetland Inventory (NWI) database indicates the general location of wetlands based on changes in vegetation patterns as observed from aerial photography. Tetra Tech reviewed aerial photographs with the NWI maps to determine the presence of wetland habitat within the proposed Project area. This search indicated that several wetland areas are located within the Project area. The wetland and other water features observed within the Project area through review of high-resolution aerial photography and the NWI dataset are listed in Table 5-8.

NWI mapping indicates a total of 33.1 acres of wetlands within the Project area (see Figure 11 in Appendix A, and Table 5-8). During several site visits the Project area was observed to be primarily agricultural land with scattered, isolated wetlands. The delineation of wetlands in the Project area will be conducted during the growing season of 2009 to define wetland boundaries and minimize wetland impacts.

Two types of wetland are found within the Project area. A Type 1 wetland is a seasonally flooded basin or flat, while a Type 3 wetland is defined as a shallow marsh. Wetlands within the Project area are classified as PEMA or PEMC under the Cowardin classification system. The "P" indicates that the wetland system is palustrine (shallow ponds, marshes, swamps, sloughs), "EM" means its class is emergent vegetation (erect, rooted, and herbaceous vegetation adapted to wet soil conditions), and its hydrology indicator is "A" (temporarily flooded) or "C" (seasonally flooded) (Cowardin 1979).

Table 5-8
NWI Wetland Type and Acreage

Circular 39	Type 1	Type 3
Cowardin Classification	PEMA, PEMAd	PEMC, PEMCd
Number	45	4
Acres[1]	28.4	4.7

[1] Wetlands acreage is calculated using USFWS NWI data.

5.17.2 Impacts for Wetlands

Impacts to wetlands area anticipated to be minimal. The wind turbine locations, substation, operations and maintenance center, and access roads will be designed to avoid or minimize wetland impacts to the extent practicable. If proposed locations of turbines and ancillary facilities indicate that a wetland may be impacted, a wetland determination and delineation will completed for those areas and avoidance strategies will be considered to the extent practical.

5.17.3 Mitigative Measures

Wetlands will be avoided to the greatest extent possible during the design and construction phase of the Project. If wetland impacts cannot be avoided, the Applicant will submit a pre-construction notification to the federal, state, and local jurisdictions. If necessary, the Applicant will submit Section 404 and Minnesota Wetland Conservation Act permit applications to the U.S. Army Corps of Engineers and the Local Government Unit prior to construction.

5.18 Vegetation

5.18.1 Description of Resources

The map of the natural vegetation of Minnesota (Coffin and Pfannmuller, 1988) identifies the area of Clay County as historically upland prairie and prairie wetland. The upland prairie vegetation includes bluestems, Indian grass, needle grass, grama grasses, composites, and other forbs. The prairie wetland vegetation includes blue-joint grass, cord grass, cattails, rushes, and sedges. Tallgrass prairie developed with periodic fires, drought, and extreme temperature.

As a result of settlement in the mid-1800s, the rich prairie soils of the Red River Valley were converted into farmland. During this process, the wetland areas were frequently ditched and drained. Only a small fraction of the original prairie and wetlands remain as relic habitats. With the settlement of the area, periodic burning of the land was halted. Fires were suppressed and trees could now grow in the area. Trees were planted by landowners for shelter belts (windrows and homestead groves) or were established by natural means (i.e. transported to the area by animals, birds or winds).

Today, native prairie and wetland managed areas in the vicinity of the Project area are located adjacent to the east of the Project area on the ancient Lake Agassiz beach ridges. According to the MDNR Natural Heritage Database (MDNR 2007) numerous prairie types have been identified in lands adjacent to the east of the Project area that include; Dry Sand – Gravel Prairies, Mesic Prairies, Wet Bush Prairies, Wet Prairies, Wet Saline Prairies, Wet Seepage Prairies, and several undetermined native plant communities. These areas are Wildlife Management Areas (WMAs) managed by the U.S. Fish and Wildlife Service (USFWS). The Buffalo River State Park and Scenic and Natural Areas (SNAs) are managed by the MDNR. There are remnant prairie and wetland areas owned and managed by The Nature Conservancy southeast of the Project area. According to the Clay County Comprehensive Plan these resources vary in quality from low, modest, medium, and high significance. The prairie with medium or high significance represents the least disturbed and best example of native prairie in the State. It is possible that small tracts of native prairie are located on private lands within the Project area.

Land cover information was acquired from Minnesota Land Management Information Center (LMIC 1999) that was derived through aerial photographs, US Geological Survey (USGS) GAP land cover data (Figure 8 in Appendix A), the USFWS NWI field maps, and Landsat satellite images. According to these resources and site reconnaissance, the Project area is comprised primarily of cultivated lands, scattered wetlands, and rural residential and farmstead properties. Other land cover types observed in the vicinity of the project area include deciduous forest, gravel pits and open mines.

The relative abundance of the major habitats in the Project area is shown in Table 5-9.

Table 5-9
Major Habitat and their Relative Abundance in the Project Area

Habitat[1]	Acreage	Percent of Project Area
Cultivated Land	19,646	98.2%
Grassland	55.6	0.28%
Wooded	147.1	0.74%
Aquatic	2.2	0.01%

[1]Habitat identification and acreage determined using USGS Level 3 GAP Land Cover (resolution 1 acre).

Major crops include corn, soybeans, alfalfa, wheat, sugar beets, and hay. Range and pasture lands are used to graze cattle, sheep, and horses. Heavily grazed range/pasture lands contain Kentucky bluegrass, quack grass, and brome grasses. Lightly grazed or undisturbed range land may contain native grass species including big blue stem, needle grass, and grama grass. CRP land is typically covered by brome grasses, orchard grass, and alfalfa. Land is typically put into CRP for 10-year cycles. Additional information on agriculture and farming can be found in Section 5.10.

Approximately 147 acres of the site is wooded, according to US Geological Survey (USGS) GAP land cover data. This can be further broken down as 87 acres of oak, 32 acres of aspen/white birch, and 28 acres of lowland deciduous forest. Generally, the wooded areas are isolated groves or windrows established by the landowner/farmers to prevent wind erosion and shelter dwellings. Typical tree species include bur oak, cottonwood, American elm, silver maple, poplar, and willow.

5.18.2 Impacts to Vegetation

The amount of vegetation that will be removed as a result of the Project will be determined once a permanent site layout is determined. It is anticipated that approximately 65 acres of the Project area will be permanently affected by the Project facilities. The vegetation will be permanently removed and replaced by wind turbines, access roads, and transformers. The Project will also involve building a new substation and operations and maintenance facility, which would involve temporarily disturbing approximately 8 acres of land and permanently disturbing approximately 2 acres of land. Additional areas may also be disturbed for underground collector lines during construction. Approximately 465.2 acres of land will be temporarily affected for contractor staging and lay down areas. Temporarily disturbed agricultural areas will be reseeded with a stabilizing crop such as wheat or rye. The Applicant will leave other areas to naturally revegetate to allow new vegetation to blend in with existing vegetation. The turbines will be constructed at a certain distance from forests and groves to maximize turbine output and reduce tree removal.

Avoidance and minimization of impacts to wetlands and native prairies will reduce impacts to those vegetated areas.

5.18.3 Mitigative Measures

The following measures will be used to avoid and minimize potential impacts to the vegetation of the Project area during siting, construction, and operation:

- Conduct a pre-construction inventory of the Project area for existing wildlife management areas, scientific and natural areas, recreation areas, wetlands, native prairie, and forests;
- Exclude established wildlife management, recreation and scientific and natural areas from consideration for wind turbine, access road, or electrical line placement;
- Avoid disturbance to wetlands during construction and operation of the Project. If jurisdictional wetland impacts are proposed, then the Applicant will apply for wetland permits;
- Minimize the need to clear existing trees and shrubs;
- 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
- If native prairie impacts are necessary, the Applicant shall, with the advice of the MDNR, and any others selected by the Applicant, prepare a prairie protection and management plan. The plan will be submitted to the PUC and MDNR 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. Project facilities including wind turbines, foundations, access roads, underground collector lines, 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 MDNR.

5.19 Wildlife

5.19.1 Description of Resources

This section identifies commonly-found wildlife species known to occur or that potentially occur within the Project area. Information on the existing wildlife was obtained from a variety of sources including a field reconnaissance performed by Tetra Tech, MDNR, USFWS, and Minnesota Ornithologist's Union County Checklists. Section 5.20 includes a discussion of wildlife that are considered by the state to be threatened or endangered or of special concern. Table 5-10 identifies those species observed in the proposed Project area during a December 18th and 19th, 2007 site visit.

Table 5-10
Wildlife Species Observed in the Proposed Project Area

Common Name	Scientific Name
Birds	
Ring-necked pheasant	*Phasianus colchicus*
American crow	*Corvus brachyrhynchos*
Ruffed grouse	*Bonasa umbellus*
Mammals	
White-tailed deer	*Odocoileus virginianus*
Eastern cottontail	*Sylvilagus floridanus*
Eastern fox squirrel	*Sciurus niger*

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

Two WMAs, 3 WPAs, and one SNA are located within six miles of the Project area (see section 5.7.1 for a description of WMAs, WPAs, and SNAs). These areas provide increased habitat, breeding grounds, and food supply for many types of wildlife. Animal populations, including bird and bat populations, may be denser in these areas as a result of management efforts. Please see Section 5.7 for further discussion on WMAs in the Project area.

5.19.1.1 Birds

Avian Migration and Potential Occurrence in the Proposed Project Area

The proposed Project area lies within the Mississippi Flyway, Mississippi Flyway, which is heavily utilized by numerous species of birds during the spring and fall migrations. These include many species of waterfowl (i.e., ducks, geese and swans), shorebirds, songbirds, and raptors. Waterfowl, raptors, shorebirds, and grassland bird species are likely to migrate through the area in the vicinity of the proposed Project on a seasonal basis. Bird/wind turbine interactions are determined by a number of factors including visibility and weather, with increased bird collisions occurring at night and in inclement weather. Inclement weather and low cloud ceilings force migrating birds to fly at reduced altitudes, thereby putting them at greater risk for adverse interactions with turbines (National Wind Coordinating Committee [NWCC] 2004).

Based on the number and types of wetlands present in the vicinity of the proposed Project area, particularly to the east, these habitats are likely to provide nesting and migration stopover habitat for large numbers of breeding waterfowl or shorebirds. Most migrating waterfowl fly several thousand feet above ground level. The greatest risk would be for those birds that would be flying at lower altitudes, such as birds that stop over within the vicinity of the Project area and nocturnal migrants that fly at reduced altitudes during inclement weather. Observed areas of shrub/woodland habitats within the proposed Project area serve as important habitat for resident and migratory bird species. The diversity of raptor species possibly occurring within the vicinity of the proposed Project area coupled with known migration routes suggests there is the potential for raptors to migrate through.

Raptors

A variety of raptor species are common spring and fall migrants, winter residents, and residents during the breeding season. Raptor species likely to occur or known to occur within the proposed Project area are the broad-winged hawk (*Buteo platypterus*), red-tailed hawk (*Buteo jamaicensis*), American kestrel (*Falco sparverius*), and great horned owl (*Bubo virginianus*). Some species that are known to occasionally be within the area during spring, fall, and/or winter and take residence during the breeding season include the northern harrier (*Circus cyaneus*), Cooper's hawk (*Accipiter cooperii*), red-shouldered hawk (*Buteo lineatus*), bald eagle (*Haliaeetus leucocephalus*), merlin (*Falco columbarius*), osprey (*Pandion haliaetus*), northern goshawk (*Accipiter gentilis*), Swainson's hawk (*Buteo swainsoni*), ferruginous hawk (Buteo regalis), golden eagle (*Aquila chrysaetos*), peregrine falcon (*Falco peregrinus*), prairie falcon (*Falco mexicanus*), Eastern screech owl (*Megascops asio*), barred owl (*Strix vari*), and northern saw-whet owl (*Aegolius acadicus*) (Minnesota Ornithological Union [MOU] 2007). Given the topography and natural setting of the proposed Project area, a number of different species may be present. Potential wildlife issues within the proposed Project area are summarized on Table 5-11.

5.19.1.2 Mammals

Mammals which may be present in the Project vicinity include: the Red fox (*Vulpes vulpes*), Badger (*Taxidea taxus*), Coyote (*Canis latrans*), Striped skunk (*Mephitis mephitis*); White-tailed deer (*Odocoileus virginianus*); Raccoon (*Procyon* lotor); Eastern cottontail rabbit (*Sylvilagus floridnus*) and White-tailed jackrabbit (*Lepus townsendi*). These species use the food and cover available from agricultural fields, grasslands, farm woodlots, wetland areas and ravines. Grassland areas and woody vegetation are also habitat for a variety of small animals including: the Plains pocket mouse (*Perognathus flavecenus*), Prairie vole (*Microtus ochrogaster*), Eastern fox squirrel (*Sciurus cardinensis*), House mouse (*Mus* musculus), and Northern grasshopper mouse (*Onychomys leucogaster*). Beavers (*Castor canadensis*) can be seen along the river and Moose (*Alces alces*) have been observed moving through the area.

Due to the timing of the initial site reconnaissance, no bats were observed within the proposed Project area. However, bats are likely present in the vicinity of the proposed Project area. Some potentially occurring bat species known to reside or migrate through Clay County includes the big brown bat (*Eptesicus fuscus*), silver-haired bat (*Lasionycteris noctivagans*), hoary bat (*Lasiurus cinereus*), eastern red bat (*Lasiurus borealis*), eastern pipistrelle (*Pipistrellus subflavus*), little brown bat (*Myotis lucifugus*), and northern myotis (*Myotis septentrionalis*). Little is known about the migration corridors used by these species. It is possible that portions of the proposed Project area could provide a migratory pathway for any of the species above.

Bats typically utilize farm buildings and dead and dying trees with cavities and loose bark as roosting and maternity habitat. Bats typically use forests, riparian corridors and wetlands as feeding habitats due to higher nocturnal insect densities in these areas. In the proposed Project area, these habitats are present. Due to the lack of data concerning bat/wind turbine interactions, actual effects to bat populations with the proposed Project area cannot be predicted (Keely 2001).

5.19.1.3 Reptiles and Amphibians

Reptile and amphibian species, which may be present in the Project vicinity (but are not confirmed in the Project vicinity), include the American toad (*Bufo americanus*), Western chorus frog (*Pseadacris triseriata*), Northern leopard frog (*Rana pipiens*), Great Plains toad (*Bufo cognatus*), Canadian toad (*Bufo hemiophrys*), Gray treefrog (*Hyla versicolor*), Snapping turtle

(*Chelydra serpentine*), Western painted turtle (*Chyrsemys picta*), Northern prairie skink (*Eumeces septentrionalis*), Eastern tiger salamander (*Ambystoma trigrinum*), Red-bellied snake (*Storeria occipitomaculata*), Western plains garter snake (*Thamnophis radix*), Red-sided garter snake (*Thamnophis sirtalis*), Western hognose snake (*Heterodon nasicus*), and Western smooth green snake (*Opheodrys vernalis*).

5.19.1.4 Insects

The Project area contains many insect species that are important to the indigenous vegetation and wildlife including butterflies, moths, grasshoppers, dragonflies, beetles, bees, and wasps.

Table 5-11
Summary of Potential Wildlife Issues

Issue	Potential [1]			Comments
	H	M	L	
Potential for Raptor Nest Sites		X		Tree nesting habitat was observed within the proposed Project area as well as adjacent lands. Marsh and grassland habitat in the vicinity of the proposed Project area could also provide habitat for ground-nesting species (i.e. the Northern Harrier).
Potential Migration Pathways		X		The proposed Project area provides some migratory stopover habitat (wetlands, grassland, forest, etc.) for waterfowl, raptors, and songbirds, primarily along the eastern portion and adjacent lands to the east of the proposed Project area. Larger water bodies including several tailings ponds and other wetland areas according to the NWI maps reviewed are located within the proposed Project area.
Potential Raptor Flight Collisions		X		Use of the proposed Project area by raptors is likely to occur during migration periods in the spring and fall. Some raptors would be expected to reside in proposed Project area during spring and summer.
Potential for Raptor Prey Species		X		No large concentrations of prey species were observed during the initial or numerous subsequent site visits, however small mammals and other prey are likely present in wetlands, marshes and forest areas.
Uniqueness of Habitat in the Project Area		X		Most habitat in the proposed Project area is not unique to the surrounding landscape or region. However, the proposed Project area is located near several native state protected prairie natural areas.
Potential For Use by Bats		X		Woody vegetation that would provide suitable maternity and roosting habitat is present throughout the proposed Project area. Tailings ponds and wetlands provide high quality foraging habitat as they produce large numbers of insect prey.
Potential for Federal and State Game Issues			X	White-tailed deer and ruffed grouse are some examples of game species within the proposed Project area. Habitat loss will likely marginally impact these species.
1 Potential Ratings: H = High; M = Medium; and L = Low				

5.19.2 Impacts to Wildlife

Although development of renewable energy sources is generally considered environmentally friendly, there is potential for impact to wildlife and loss of habitat from construction of the

proposed Project. 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. Mortalities resulting from collision with wind turbines and displacement from native habitat are the two primary potential impacts on avian and bat populations from wind energy development.

Collision Mortality

Early wind energy facilities were often sited without an understanding or regard for local intensity of avian use and consequently resulted in high annual levels of avian mortality. However, due to increased awareness of potential impacts on avian populations and improved turbine design, newer facilities typically have low levels of avian mortality. A recent review of avian mortality studies reported that wind turbines are estimated to cause only 0.01-0.02 percent of avian collision fatalities in the United States (Johnson et al. 2002).

Avian collision fatalities at wind energy sites have been largely attributed to reduced visibility and inclement weather. Inclement weather and low cloud ceilings force migrating birds to fly at reduced altitudes, thereby putting them at greater risk for adverse interactions with turbines (National Wind Coordinating Committee [NWCC] 2004). In addition, nocturnal species and species which habitually fly at dawn or dusk are perhaps less likely to detect and avoid wind turbines (Drewitt and Langston 2006). Fatalities due to electrocution can also occur when birds with large wingspans either come in contact with two conductors or a conductor and a grounding device. The transmission lines for this project will provide adequate spacing to eliminate the risk of electrocution.

Recent bat-specific studies have found large numbers of bat fatalities at utility-scale wind energy facilities across the United States; however, no fatalities of state or federally listed bat species have been recorded to date. Reviews of bat fatality studies have indicated that the highest fatality levels typically occur at wind energy facilities located in the eastern United States, particularly along forested ridges. Conversely, levels of bat collision mortality are lowest in relatively open landscapes in Midwestern states such as the landscape of the proposed Project area (Kunz et al. 2007).

Migrating bats typically fly at low altitudes (46 to 140m), and are therefore susceptible to collision with turbines (Johnson et al. 2004). Why bats do not detect and avoid moving turbine blades is currently unknown. However, there is evidence that some migrating bats may not echolocate, and during times of reduced visibility those bats may be particularly subject to collision. Other hypotheses for bat collision mortality have also been presented including the roost attraction hypothesis (wind turbines may attract bats because they are perceived as potential roosts), the acoustic attraction hypothesis (bats are attracted to audible and/or ultrasonic sound produced by wind turbines), and the visual attraction hypothesis (bats are attracted to the insects drawn by FAA lighting on turbines) (Kunz et al. 2007).

Fatality trends for both avian and bat species at the wind plant on Buffalo Ridge Wind Resource Area in southwest Minnesota were recorded by Johnson et al. (2002, 2004). These trends may be particularly relevant to the proposed Project due to proximity and similarities in the majority of the habitat between the two sites (i.e. both sites primary habitat is agriculture). Avian species composition in the proposed Project area is also expected to be similar to the Buffalo Ridge site as both areas have been subjected to intensive agricultural practices.

Buffalo Ridge is currently the largest windpark outside California with a total of 354 wind turbines in operation and is located in Lincoln and Pipestone Counties in southwest Minnesota

and Brookings County, South Dakota. Habitats in the study area were characterized as being primarily of agricultural crops including corn, soybeans, small grains and hay; pasture; and Conservation Reserve Program (CRP) fields. Much of the land enrolled in the CRP program at the start of the study in 1996 was put back into crop production during the 4-year study period. Relatively minor vegetation types in the study area include deciduous woodlots associated with farmsteads, wooded ravines, and wetlands.

Avian collision fatalities at Buffalo Ridge were assessed from 1996 to 1999 and bat collision fatalities in 2001 and 2002 (Johnson et al. 2002, 2004). During those respective time periods, 55 avian and 151 bat collision fatalities were documented. Overall fatality rates were estimated to be 0.98-2.71 bird fatalities/turbine/year and 1.9 bat fatalities/turbine/year. Both avian and bat collision fatalities were largely composed of migratory species (>70 percent). This finding is congruent with other studies which have found that the primary at-risk species were those that were non native and had migration routes corresponding to wind energy site locations (Drewitt et al. 2006; Arnett et al. 2007; Kunz et al. 2007). In addition, Johnson et al. observed that of the 55 recovered avian carcasses, 42 were passerines, 5 waterbirds, 3 ducks, 3 upland game birds, 1 raptor, and 1 shorebird. The species composition of recovered bat carcasses was 74 percent hoary bats (*Lasiurus cinereus*), 14 percent eastern red bats (*Lasiurus borealis*), 5 percent big brown bats (*Eptisecus fuscus*), 3 percent silver-haired bats (*Lasionycteris noctivagans*) and 2 percent little brown bats (*Myotis lucifugus*).

In contrast to the Buffalo Ridge site, the proposed Project area lies within the Mississippi Flyway, which is heavily utilized by numerous species of birds during the spring and fall migrations. These include many species of waterfowl (i.e., ducks, geese and swans), shorebirds, songbirds, and raptors. Waterfowl, raptors, shorebirds, and grassland bird species are likely to migrate through the area in the vicinity of the proposed Project on a seasonal basis. Bat species composition at the proposed Project area is likely to be similar to Buffalo Ridge, with hoary bats being the primary at-risk species. It is unlikely that any resident bat species will spend significant time foraging near the wind energy facilities of the proposed Project area, as the facilities will be located in the interiors of agricultural fields (Johnson et al. 2004)..

Despite differences in geography, trends in avian and bat fatalities at Buffalo Ridge and the proposed Project area can be expected to be reasonably similar due to proximity and habitat type. However, the effects of a wind energy facility on avian and bat species are highly variable and depend on a wide range of factors including the exact specifications of the development, the topography of the surrounding land, the habitats affected, and the number of species of birds present. With so many variables, additional research will be required to adequately evaluate possible impacts to birds and bats and likelihood of turbine collisions at the Project.

Displacement

There has been some recent evidence suggesting that habitat displacement of avian species resulting from wind energy development may also be an issue. Displacement can occur as a result of direct habitat loss, visual intrusion, and physical disturbance, and may force birds into less suitable habitat.

Leddy et al. (1999) studied the effects of wind energy development on densities of upland nesting birds in CRP grasslands at Buffalo Ridge. They found a significant linear relationship between bird density and distance from wind turbines, indicating that birds were selecting for areas without human disturbance, turbine noise, and physical movements of turbines. However, the study also indicated that birds were only affected within 180m of turbines. Given the area and

habitat type of the proposed Project, affected upland nesting birds would likely have the ability to relocate to an area of similar habitat quality outside of the 180m.

Research focused on displacement of raptorial species has found, in general, that disturbance of raptors at wind energy facilities is negligible (Madders and Whitfield 2006). Two studies involving the Golden Eagle (*Aquila chrysaetos*) and one involving the Northern Harrier (*Circus cyanus*) in the United States found no evidence of displacement due to wind energy development (Johnson et al. 2000; Kerlinger 2002; Schmidt 2003).

Overall, the body of research regarding avian displacement resulting from wind energy development indicates impacts of proposed Project would likely be minimal. Again, however, it should be noted that many variables control the effects of wind energy development on avian species, and additional research will be required to adequately evaluate possible avian displacement at the Project.

5.19.3 Mitigative Measures

The Applicant will implement the following avoidance and minimization 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:

- Conduct a pre-construction inventory of existing biological resources, native prairie, and wetlands in the Project area;
- Exclude established wildlife management, recreation, and scientific and natural areas from consideration for wind turbine, access road, or feeder/collector line placement;
- Avoid or minimize disturbance of individual wetlands or drainage systems during construction of the Project;
- Avoid or minimize placement of turbines in high quality native prairie tracts;
- Protect existing trees and shrubs that are important to the wildlife present in the area;
- 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 utilized. These practices include temporary seeding permanent seeding, mulching, filter strips, erosion blankets, grassed waterways, and sod stabilization;
- Minimally light turbines according to FAA requirements;
- Revegetate non-cropland and pasture areas disturbed during construction or operation with an appropriate seeding mix; and
- Inspect and control noxious weeds in areas disturbed by the construction and operation of the Project.

Where overhead lines are constructed, the USFWS recommends that potential for bird electrocutions and bird strikes be reduced through implementation of measures outlined in the Avian Protection Plan (APP) guidelines (APLIC 2006). The Applicant will conduct monitoring of avian use and occurrence in appropriate seasons prior to Project construction as recommended by USFWS and MDNR. The Applicant will conduct point count surveys in the spring and fall throughout the proposed Project area to document general avian use and migration through the area. The Applicant has also initiated an eight-week monitoring survey of avian use and

occurrence in the proposed Project area to document the intensity of resident bird use and identify sites where effects could be further minimized as practicable. The survey of avian use was completed at the end of August 2008; however data is unavailable as it is currently being analyzed. The expected completion of the point count surveys is in October 2008. Such surveys will be used to either make decisions regarding development or document changes in use resulting from the facility's construction.

Because bat use is unknown, and potentially suitable habitat for bats is present in the shrubby areas and near draws, lakes and wetlands, the Applicant has initiated an acoustic survey to gather information on bat passage rates in the various habitats of the proposed Project area. If the results clearly indicate that use is higher in some types of habitat and/or landforms, this information can be used to site turbines, transmission lines, and associated structures in areas with lower bat use.

The Applicant is committed to minimizing wildlife impacts within the Project area. The Applicant will design their facility to minimize avian impacts by avoiding high use wildlife habitat, using tubular towers to minimize perching, placing electrical collection lines underground as practicable and minimizing infrastructure.

5.20 Rare and Unique Natural Resources

5.20.1 Description of Resources

5.20.1.1 Rare and Unique Flora

USFWS and MDNR maintain a list of federal and state threatened and endangered plant species. Species listed by one of these two agencies require protective measures for their perpetuation due to low populations (threatened, endangered, sensitive), sensitivity to habitat alteration, or cultural significance.

Observations made during the December 2007 site reconnaissance indicate that some clearing of potential native vegetation may be required for construction of the proposed windpark. Thus, due to the disturbance of potential native species, the Applicant will conduct a comprehensive onsite biological assessment of the proposed Project area prior to construction activities, to confirm that sensitive species are not impacted. This survey would be conducted concurrent with the wetland determination survey.

The Applicant submitted a request to the USFWS and the MDNR to identify federal and states species of concern that could potentially occur within the proposed Project area (see Appendix B). The USFWS has stated in correspondence to date that there are several high quality resources, including native prairie remnants that are required habitats for several protected and sensitive species that occur in the vicinity of the proposed Project area. The MDNR responded in a letter dated January 9, 2008, stating that based on its review, there are 157 known occurrences of rare plant species or native plant communities in the area searched. The area searched by the MDNR and USFWS included areas outside the proposed Project area. A more detailed discussion of agency contacts and responses is included in Section 6. Responses from the USFWS, MDNR, and other environmental correspondence are attached as Appendix B. The MDNR has also stated that the native plant communities are the required habitats for several protected and sensitive species that occur in the vicinity of the proposed Project area. The state threatened and endangered plant species or plant species of concern listed by MDNR and the USFWS potentially occurring in the vicinity of the proposed Project area are shown in Table 5-

12. Specific information about these species and the potential for them to occur within the proposed Project area is described below.

Federal Protected Species

The USFWS lists four threatened and endangered plant species within the state of Minnesota (USFWS 2007). Only one of the four species identified, the western prairie fringed orchid (*Platanthera praeclara*), is known to occur within prairie remnants in the vicinity of the proposed Project area. Specific information about this species and the potential for it to occur within the proposed Project area is described below.

Western prairie fringed orchid (Federal Threatened, State Endangered)

The western prairie fringed orchid is a federal threatened and state endangered species in Minnesota. Historically, the western prairie fringed orchid has been found in Minnesota where mesic to wet tallgrass prairies and sedge meadows occurred west of the Mississippi. The orchid blooms from mid-June to late July in Minnesota. Threats to this species include loss of prairie habitats, invasion of non-native plants, haying, over-grazing, and habitat fragmentation. The western prairie fringed orchid may be found in suitable sites within the proposed Project area.

State Protected Species

The MDNR lists over 250 threatened and endangered plant species in the state of Minnesota. According to the MDNR Natural Heritage Database, ten plant species on this list are recorded to have occurred within the proposed Project area or vicinity (Appendix B). Species occurrence and distribution information is often based on documented occurrences where surveys have taken place, so a lack of records does not necessarily indicate that species are absent from a particular area.

Plains reedgrass (State Species of Concern)

The plains reedgrass (*Calamagrostis montanensis*) is common on dry, open prairies, mostly in native range and associated with clay slopes. The plains reedgrass is a cool season grass beginning growth in mid-April, flowering and setting seed from June through July in Minnesota. The species has been recorded in areas to the east of the proposed Project area.

Hall's sedge (State Species of Concern)

Hall's sedge (*Carex hallii*) is known to occur in wet meadows, springs, and seepage areas. Blooming occurs in Minnesota between June and July. The Hall's sedge has been recorded to occur in areas to the east of the proposed Project area.

Northern singlespike sedge (State Species of Concern)

The northern singlespike sedge (*Carex scirpoidia*) prefers dry soil types and is considered to be widespread throughout its region. This species has been recorded to occur south of the proposed Project area.

Sterile sedge (State Threatened)

The sterile sedge (*carex sterilis)* is a characteristic sedge of calcareous fens and other inland fresh meadows supported by stable, calcareous groundwater seepages. The sterile sedge has been recorded to occur in areas to the north and northeast of the proposed Project area.

Small white lady's-slipper (State Species of Concern)

The small white lady's-slipper (*Cypripedium candidum*) prefers mesic blacksoil prairie, wet blacksoil prairie, glacial till prairie, sedge meadows, and calcareous fens. The small white lady's

slipper blooms from mid-May to early June during hot weather. The small white lady's-slipper has been recorded to occur in areas to the east of the proposed Project area.

Northern gentian (State Species of Concern)
The northern gentian (*Gentiana affinis*) is mostly restricted to the northern half of the state in cool northern prairies. Clumps of northern gentian usually bloom during August. The northern gentians do not tolerate heavy grazing. The northern gentian has been recorded to occur in areas to the east of the proposed Project area.

Nuttall's sunflower (State Species of Concern)
The Nuttall's sunflower (*Helianthus nuttallii ssp.rydbergii*) is found along the banks of streams and ponds, wet meadows, and other wet places. The Nuttall's sunflower blooms in Minnesota from July to September. The Nuttall's sunflower has been recorded to occur in areas to the east of the proposed Project area.

Oat-grass (State Species of Concern)
Oat-grass (*Helictotrichon hookeri*) prefers prairies and plains, often dominating sandhill prairie regions associate with drier upland sites. Oat-grass is a warm season grass that flowers in late July and sets seed through September. Oat-grass has been recorded to occur in areas to the east of the proposed Project area.

Clustered broomrape (State Species of Concern)
The clustered broomrape (*Orobanche fasciculate*) is found to occur in prairies and flowers from May to August in Minnesota. The clustered broomrape has been recorded to occur in areas to the east of the proposed Project area.

Louisiana broomrape (State Species of Concern)
The Louisiana broomrape (*Orobanche ludoviciana*) is considered a dry prairie species that is parasitic on many kinds of plants, especially Artemisia. This species has been recorded to occur in areas to the northeast of the proposed Project area.

Prairie Moonwort (State Species of Concern)
The prairie moonwort (*Botrychium campestre*) may be found in dry prairies and sand dunes as well as sandy, dry disturbed sites such as roadsides and old fields. This species is known to breed from May through early June possibly through July in more northern sites. This species has been recorded to occur in areas to the northeast of the proposed Project area.

Least Moonwort (State Species of Concern)
The least moonwort (*Botrychium simplex*) may be found in terrestrial meadows, barrens, and woods in usually subacid soil. This species has been recorded to occur in areas to the northeast of the proposed Project area.

Table 5-12
State Listed Flora Potentially Occurring Near the Project Area

Species	Scientific Name	Status	Likelihood of occurrence in Proposed Project area*	Habitat Association
VASCULAR PLANTS				
Plains reedgrass	*Calamagrostis montanensis*	State Species of Concern	Low	Common on dry, open prairies, mostly in native range and associated with clay slopes. The plains reedgrass is a cool season grass beginning growth in mid April, flowering and setting seed from June through July in Minnesota.
Hall's Sedge	*Carex hallii*	State Threatened	Low	Known to occur in wet meadows, springs, and seepage areas. Blooming occurs in Minnesota in June and July.
Northern Singlespike Sedge	*Carex sciropoidea*	State Species of Concern	Low	Prefers dry soil types and is considered to be widespread throughout its region.
Sterile Sedge	*Carex sterilis*	State Threatened	Low	Is a characteristic sedge of calcareous fens and other inland fresh meadows supported by stable, calcareous groundwater seepages.
Small While Lady's-slipper	*Cypripedium candidum*	State Species of Concern	Low	Prefers mesic blacksoil prairie, wet blacksoil prairie, glacial till prairie, sedge meadows, and calcareous fens. The small white lady's slipper blooms from mid-May to early June during hot weather.
Northern Gentian	*Gentinana affinis*	State Species of Concern	Low	Mostly restricted to the northern half of the state in cool northern prairies. Clumps of northern gentian usually bloom during August. The northern gentians do not tolerate heavy grazing.
Nuttall's Sunflower	*Helianthus nuttallii ssp. Rydbergii*	State Species of Concern	Low	Found along the banks of streams and ponds, wet meadows, and other wet places. The Nuttall's sunflower blooms in Minnesota from July to September.
Oat-grass	*Helictotrichon hookeri*	State Species of Concern	Low	Prefers prairies and plains, often dominating sandhill prairie regions associate with drier upland sites. Oat-grass is a warm season grass that flowers in late July and sets seed through September.
Clustered Broomrape	*Orobanche fasciculate*	State Species of Concern	Low	Found to occur in prairies and flowers from May to August in Minnesota.
Louisiana Broomrape	*Orobanche ludoviciana*	State Species of Concern	Low	Found in dry prairies. This species is parasitic on many kinds of plants, especially Artemisia
Prairie Moonwort	*Botrychium campestre*	State Species of Concern	Low	Found in dry prairies and sand dunes as well as sandy, dry disturbed sites such as roadsides and old fields. This species is known to senesce from May through early June possibly through July in more northern sites.
Least Moonwort	*Botrychium simplex*	State Species of Concern	Low	Found in terrestrial meadows, barrens, and woods in usually subacid soil.

*"Likelihood of Occurrence" based on MDNR Natural Heritage Database element occurrences of species within a 1 mile radius of proposed Project area and last observed date reported.

5.20.1.2 Rare and Unique Fauna

USFWS and MDNR maintain a list of federal and state threatened and endangered animal species. Species listed by one of these two agencies require protective measures for their perpetuation due to low populations (threatened, endangered, sensitive), sensitivity to habitat alteration, or cultural significance.

Observations made during the December 2007 site reconnaissance indicate that some clearing of potential native vegetation and wildlife habitat may be required for construction of the proposed windpark. Thus, due to the disturbance of potential native species, the Applicant will conduct a comprehensive onsite biological assessment of the proposed Project area prior to construction activities, to confirm that sensitive species are not impacted. This survey would be conducted concurrent with the wetland determination survey.

Based on issues identified with other windparks throughout the United States, those species of greatest concern are federally or state-protected avian species and bats that may occur in the vicinity of the proposed Project area. Other species of conservation concern are those directly associated with sensitive or unique habitats. The Applicant submitted a request to the USFWS and the MDNR to identify federal and states species of concern that could potentially occur within the proposed Project area. The USFWS has stated in correspondence to date that there are several high quality resources, including native prairie remnants that are required habitats for several protected and sensitive species that occur in the vicinity of the proposed Project area. The MDNR responded in a letter dated January 9, 2008 stating that based on its review, there are 157 known occurrences of rare species or native plant communities in the area searched. The area searched by the MDNR and USFWS included areas outside the proposed Project area. A more detailed discussion of agency contacts and responses is included in Section 6. Responses from the USFWS, MDNR, and other environmental correspondence are attached as Appendix B. Just as stated by the USFWS, the MDNR has stated that the native plant communities are the required habitats for several protected and sensitive species that occur in the vicinity of the proposed Project area. The state threatened and endangered animal species or animal species of concern listed by MDNR and the USFWS potentially occurring in the vicinity of the proposed Project area and potentially affected areas are shown in Table 5-13.

Federal Protected Species

The ESA requires protection of species federally listed as threatened or endangered. Significant changes to the habitats of these species and projects that have potential to result in a "take" will require close scrutiny by USFWS and may require special permitting or mitigation measures to lessen or mitigate effects. The Dakota skipper (*Hesperia dacotae*) is the one federally listed candidate species that could potentially occur in the proposed Project area (USFWS 2007). Specific information about this species and the potential for it to occur within the proposed Project area is described below.

Dakota skipper (Federal Candidate Species, State Species of Concern)

The Dakota skipper is found in relatively flat and moist native bluestem prairies and within upland, dry prairies located on ridges or hillsides. The current distribution of this species straddles between tallgrass and mixed grass prairie regions. Threats to this species include fragmentation, loss of habitat, over grazing, inappropriate fire management, and woody plant invasions. This species has been recorded to occur in areas to the east of the proposed Project area.

State Protected and Other Species of Conservation Concern

MDNR has identified 250 animal species in decline at the national, regional or state level, or species whose population status is not well known, but thought to be in decline. These species are listed as "species of concern" or as threatened or endangered based on such factors as known status, funding available for conservation, and presence of breeding habitat. The Applicant submitted a request to query the MDNR Natural Heritage Database, which maintains recorded sightings of species of concern within the state of Minnesota. According to the Natural Heritage Database there are nine records of threatened, endangered, or species of concern found to occur within the proposed Project area or vicinity (Appendix B). However, because survey work for animals is less exhaustive, and because there has not been an on-site survey of all areas of the county or the proposed Project area, ecologically significant features for which the MDNR has no record of may exist within the proposed Project area. Of the state threatened and endangered species or species of concern listed by MDNR, those birds, butterflies and moths potentially occurring in the vicinity of the proposed Project area and potentially affected are shown in Table 5-13. Specific information about these species and the potential for them to occur within the proposed Project area is described below.

Henslow's sparrow (State Endangered)

Henslow's sparrow (*Ammodramus henslowii*) is very uncommon in west-central Minnesota as it is known to mostly occur in southeastern Minnesota during the breeding season. This species prefers large, flat fields with no woody plants and with tall, dense grass and standing dead vegetation. This species has been recorded to occur in areas to the northeast of the proposed Project area.

Uhler's arctic (State Endangered Species)

The Uhler's arctic (*Oeneis uhleri varuna*) can be found in slopes in dry, open bunchgrass habitat; tundra; and openings in pine forests. Flight peak for this species occurs from June to early July. Western Minnesota represents the eastern edge of its distribution. This species has been recorded to occur in areas to the east of the proposed Project area.

Assinibo skipper (State Endangered)

The Assiniboia skipper (*Hesperia comma assiniboia*) is found in native short grass prairie, and open, sandy areas. Peak flight activity occurs in August but ranges from late July to late September. Species loss has been contributed to habitat loss due to agriculture and development. This species has been recorded to occur in areas to the northeast of the proposed Project area.

Loggerhead shrike (State Threatened)

The Loggerhead shrike (*Lanius ludovicianus*) is found in Minnesota during the breeding season, from late March to September. This species prefers "edge" habitat, nesting along roadsides and hedgerows in agricultural regions. Causes of decline are unknown but may be related to pesticide use. This species has been recorded to occur in areas to the east of the proposed Project area.

Wilson's phalarope (State Threatened)

Wilson's phalarope (*Phalaropus tricolor*) can be found breeding in fresh-water marshes and wet meadows and wetlands. In Minnesota, this species can be found from late April to August. This species has been recorded to occur in areas to the east and northeast of the proposed Project area.

Marbled godwit (State Species of Concern)

The marbled godwit (*Limosa fedoa*) is found in Minnesota during the breeding season in marshes and flooded plains nesting in June and July. The declining numbers of this species have been

attributed to habitat loss. This species has been recorded to occur in areas to the east of the proposed Project area.

Greater prairie-chicken (State Species of Concern)
The greater prairie-chicken (*Tympanuchus cupido*) prefers undisturbed tallgrass prairies. The prairie chicken was almost extinct in the 1930s due to hunting pressure and habitat loss. Currently, human interactions are the greatest threat to this species. This species has been recorded to occur in numerous areas to the east and northeast of the proposed Project area.

Powesheik skipper (State Species of Concern)
The Powesheik skipper (*Oarisma powesheik*) requires wet mesic prairie habitat with native grasses, sedges, and a significant component of plants in the sunflower family. This species has declined in numbers due to poor fire management and habitat loss. This species has been recorded to occur in areas to the east and southeast of the proposed Project area.

Regal fritillary (State Species of Concern)
The Regal fritillary (*Speyeria idalia*) has historically been found in Minnesota in the extent of native prairie and savanna. This species can be found in upland prairies and sometimes wetland prairies. Declines in numbers are unclear but may be related to insecticide use. This species has been recorded to occur in areas to the east of the proposed Project area.

Table 5-13
State Listed Fauna Potentially Occurring Near the Project Area

Species	Scientific Name	Status	Likelihood of occurrence in Proposed Project area*	Habitat Association
BIRDS				
Henslow's Sparrow	*Ammodramus henslowii*	State Endangered	Low	Very uncommon in west-central Minnesota as it is known to mostly occur in southeastern Minnesota during the breeding season. This species prefers large, flat fields with no woody plants and with tall, dense grass and standing dead vegetation.
Loggerhead Shrike	*Lanius ludovicianus*	State Threatened	Moderate	Feeds primarily on large insects, also other invertebrates, small birds, lizards, frogs, and rodents; sometimes scavenges. Nests in open country with scattered trees and shrubs, savanna, and, occasionally, open woodland; often perches on poles, wires or fenceposts.
Marbled Godwit	*Limosa fedoa*	State Species of Concern	Low	Found in Minnesota during the breeding season in marshes and flooded plains nesting in June and July.
Wilson's phalarope	*Phalaropus tricolor*	State Threatened	Moderate	Eats insects (larvae and adults), especially mosquitoes and crane flies. Feeds as it walks along muddy shores, wades in shallow water, or swims in whirls. Nests in shallow freshwater and saline ponds, marshes and wet meadows.
Greater Prairie – Chicken	*Tympanuchus cupido*	State Species of Concern	Moderate	Prefers undisturbed tallgrass prairies.
BUTTERFLIES AND MOTHS				
Assiniboia Skipper	*Hesperia comma assiniboia*	State Endangered	Low	Found in native short grass prairie, and open, sandy areas. Peak flight activity occurs in August but ranges from late July to late September.
Dakota Skipper	*Hesperia dacotae*	State Threatened	Low	Occurs in flat and moist native bluestem prairie and dry prairies that often are located on ridges and hillsides. Bluestem grasses and needle grasses dominate these habitats as well as three wildflowers in the most suitable sites that include; pale purple (*Echinacea pallida*), upright coneflowers (*E. angustifolia*) and blanketflower (*Gaillardia spp.*).
Powesheik Skipper	*Oarisma powesheik*	State Species of Concern	Low	Requires wet mesic prairie habitat with native grasses, sedges, and a significant component of plants in the sunflower family.
Uhler's Arctic	*Oeneis uhleri varuna*	State Endangered	Low	Found in slopes in dry, open bunchgrass habitat; tundra; and openings in pine forests. Flight peak for this species occurs from June to early July. Western Minnesota represents the eastern edge of its distribution.
Regal Fritillary	*Speyeria idalia*	State Species of Concern	Low	Historically been found in Minnesota in the extent of native prairie and savanna. This species can be found in upland prairies and sometimes wetland prairies.

*"Likelihood of Occurrence" based on MDNR Natural Heritage Database element occurrences of species within a 1 mile radius of proposed Project area and last observed date reported.

5.20.2 Impacts to Rare and Unique Resources

Wildlife impacts are anticipated to be variable (low to high) for state and federally listed wildlife species in the proposed Project area due to the natural setting and diversity of resources located within and in the vicinity of the proposed Project area, the diversity of wildlife species, and subsequent utilization of the proposed Project area. The summary of potential wildlife impacts is based on known occurrence records and from correspondence with the MDNR and USFWS (agency correspondence is explained further in Section 6 and contact letters are included in Appendix B). The impacts are dependent on the final determined design for the proposed Project.

The construction of the windpark could result in temporary, construction-related, and long-term loss of habitat in the small patches of grassland habitat, woodlands, and agricultural fields within the proposed Project area. In addition, activities such as road construction and tree clearing can result in the loss of or disruption to habitats and allow for the introduction of unwanted plant species. However, after discussion with USFWS and MDNR, the Applicant moved the windpark to the west side of MN Highway 9 in order to exclude the eastern portion of Clay County where federally listed vascular plant species and wildlife species were likely to occur. As a result, no impacts are expected to occur to rare or unique resources from the construction of the windpark.

Due to the known presence of several Greater prairie-chicken booming grounds in the vicinity of the proposed Project area, the MDNR recommended close coordination with the MDNR Area Wildlife Manager to obtain the most recent data on prairie chicken use in the area. Based on a review of this data, the proposed Project is not anticipated to directly impact any known prairie-chicken booming grounds. Due to the known presence of sensitive habitat and endangered, threatened, or special concern species in the vicinity of the proposed Project, the Applicant will conduct a comprehensive onsite biological assessment of the proposed Project area prior to construction activities to confirm that sensitive species are not impacted. Similarly, as discussed in the Section 5.19, the Applicant will conduct avian and bird field surveys in the proposed Project area to document the intensity of resident and migratory bird and bat use and identify sites where effects could be further minimized as practicable.

According to the MDNR, several mussel species of concern have been documented in the Buffalo River in the vicinity of the proposed Project area and could potentially be impacted during construction of the transmission line.

5.20.3 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 selection of the wind turbines and access roads and the subsequent development and operation:

- Conduct a pre-construction inventory of existing biological resources, native prairie, and wetlands in the Project area;
- Avoid or minimize disturbance of individual wetlands or drainage systems during construction of the Project; and
- Avoid or minimize placement of turbines in high quality native prairie.

Erosion and sediment control practices will be implemented and maintained for any work conducted near the river or stream areas. As described previously, sound water and soil conservation practices will be maintained during construction and the operation of the Project to protect topsoil and adjacent water resources and minimize soil erosion.

5.21 Summary of Impacts

Included below is a summary of the impacts to key resources found within the Project area, including visual resources, land use, noise, and wildlife.

The wind turbine arrays will be prominent features in the landscape. By design, these structures are placed in open areas. Some mitigative measures, as described in Section 5.4, can be

implemented to somewhat limit visual impacts. However, there is no way to make these structures unnoticeable. The degree to which the visual impacts are considered adverse is subjective and can be expected to vary depending, for example, on how often the viewer sees the turbines or how close the viewer is to the turbines.

The Project area includes a total of 20,000 acres of land. Of the 20,000 acres, less than one-half of one percent will be permanently converted from natural vegetation or agricultural field for siting wind turbines, access roads, and transformer pads. Approximately 63 acres of land will be converted for the 1.5 MW turbines and access roads. An additional 2 acres of land will be used for the O&M facility and substation. The existing land use will continue on the remainder of the land.

When in motion, the wind turbines emit a perceptible sound. The level of this noise varies with the speed of the turbine and the distance of the listener to the turbine. On relatively windy days, the turbines create more noise. However, the ambient or natural noise level from the wind tends to override the turbine noise as distance from the turbines increases. Turbines will be located at least 700 feet from occupied homes to meet the MPCA noise standard.

Birds and bats occasionally collide with wind turbines. However, the mortality associated with these collisions is thought to be relatively low. In addition, turbines may result in reduced use of habitat by grassland bird species nearby the turbine. See Section 5.19.2 for a more detailed discussion on potential avian and bat impacts.

The impact of the proposed Project on wildlife is expected to be minimal. Roughly 63 acres of land will be converted for the access roads, turbine pads, maintenance facility, and substation. This will reduce available habitat that some of the wildlife uses for nesting, forage or cover.

5.22 Summary of Preconstruction Inventories and Assessments

The Applicant will conduct the following resource inventories for the Project area prior to construction. The Applicant will submit copies of these preconstruction inventories to the PUC at the preconstruction meeting:

- Biological Preservation Survey – inventory of existing WMAs, SNAs, recreation areas, wetlands, native prairies, forests, and other biologically sensitive areas within the Project area;
- Fall and Spring Avian Point County Survey for the Project area;
- Acoustical Bat Survey for the Project area;
- Phase I Environmental Site Assessment (ESA);
- Archaeological Reconnaissance Survey; and
- Electromagnetic Interference Study – inventory of microwave beams and television signal reception within the Project area.

5.23 Exclusion and Avoidance Criteria and Site Designation Summary

State law governing the siting of traditional electric generating facilities requires that certain environmental features be avoided. These requirements will be applied in determining the location of the proposed wind turbines and related appurtenances on the Project site. Table 5-14

identifies these features to be avoided and whether or not such features exist within the Project area. For those categories where these exclusion/avoidance features are present within the site boundaries, the final locations of the turbines will be selected to not interfere with them.

Table 5-14
Exclusion/Avoidance Features Relative to Project Area

Exclusion/Avoidance Feature	Presence in Project Area
National Parks	None
National Historic Sites	None
National Historic Districts	None
National Wildlife Refuges	None
National Monuments	None
National Wild, Scenic and Recreational Riverways	None
National Wilderness Areas	None
State Wild, Scenic and Recreational Rivers	None
State Parks	None
Nature Conservancy Preserves	None
State Scientific and Natural Areas	None
State Wilderness Areas	None
Registered Historic Sites/Districts	None
State Wildlife Management Areas	None
County and Municipal Parks	None
State and Federal Recreational Trails	None
Designated Trout Streams	None
DNR Canoe/Boating Routes	None
Prime Farmlands	Present
Wetlands	Present (Figure 12)
Streams Within Site Boundaries	Present (Figure 12)
Residences	Present

6.0 Agency and Public Contacts

6.1 Agency Contacts

Agency interactions for the Noble Flat Hill Windpark I and the associated transmission line began in November 2007 with initial information requests sent to the USFWS, MDNR, and MN SHPO. These requests were components of a 'Fatal Flaw Analysis' that was conducted by Noble to guide the placement of the wind energy facility and the proposed transmission line.

The area searched as part of the Fatal Flaw Analysis included sections of Clay County within Spring Prairie and Riverton Townships. This area incorporated land currently outside the Project area, as it is defined in Section 1.1, which included numerous areas of sensitive habitat. These resources are associated with the Agassiz Beach Ridge formations to the east of the proposed Project area and included prairie remnants, natural areas managed by The Nature Conservancy, and segments of Bluestem Prairie Scientific and Natural Area (SNA).

The details of this initial correspondence and subsequent communications between Noble and the various agencies are detailed below. Refer to Appendix B for copies of all agency correspondence letters.

6.1.1 Minnesota Department of Natural Resources

The Minnesota DNR Natural Heritage and Nongame Research Program were contacted to request a review of the Minnesota Natural Heritage database for listings located within the search area. The request was submitted on November 30, 2007, and was responded to on January 9, 2008. In their initial response, the MDNR identified 157 known occurrences of rare species or native plant communities in the search area. In addition, they noted several areas of special concern including native plant communities that provide habitat for numerous rare features (as discussed previously in Sections 5.1.5, 5.1.6, 5.2.5, and 5.2.6).

Due to the presence of these unique habitats and the known occurrences of sensitive flora and fauna in these areas, the MDNR encouraged Noble to consider project alternatives that would avoid direct or indirect impacts to these ecologically significant areas. Their response also recommended that Noble communicate with the Nature Conservancy's Northern Tallgrass Prairie Office, the Buffalo River State Park, the MDNR Area Wildlife Manager, and the MDNR Prairie Management Specialist regarding the details of the proposed wind project and transmission line.

Subsequent communications were sent to all the recommended parties. The responses from these individuals and organizations are included in Appendix B. Specifically, the most recent field data identifying Greater prairie chicken booming grounds in the vicinity of the proposed Project area was obtained from the MDNR Area Wildlife Manager.

A meeting was also held between Noble, USFWS, Minnesota State Parks, and MDNR staff on April 8, 2008. Noble presented modifications to their proposed wind project and transmission line based on the feedback that had been received from the various agency contacts. Specific modifications to the project included placement of all turbine, substation, and electrical collection system facilities to the west of MN Highway 9 (as specifically recommended in the Nature Conservancy response letter dated March 11, 2008, Appendix B), and aligning the proposed transmission line along the MN Highway 9 corridor.

Based on these modifications to the proposed Project, it is not anticipated that any of the rare species or habitats identified by the MDNR would have the potential to be adversely affected by the proposed Project. The details of any potential impacts and associated mitigation procedures are explained in Sections 5.17, 5.18, 5.19, and 5.20 of this application.

6.1.2 Minnesota State Historic Preservation Office (SHPO)

A letter was sent to SHPO requesting their review of the Minnesota Archaeological Inventory and Historic Structures Inventory database for the project area for previously-known resources that could potentially be impacted by the proposed Project. Their response to this request was received via e-mail on November 30, 2007 (see Appendix B). Their search revealed no previously-known historic resources within the project search area. A supplementary review of the Minnesota Archaeological Inventory and Historic Structures Inventory database was requested in August 2008 due to the time lapse between the original request and the submittal of the site permit application. Their response to this request was received via e-mail on August 19, 2008 (see Appendix B). Their search revealed no previously-known historic resources within the project search area.

6.1.3 United States Fish and Wildlife Service

An inquiry was sent to the United States Fish and Wildlife Service (USFWS) to identify federally listed species within the search area. The request was submitted on November 30, 2007, and responded to on February 13, 2008. The USFWS identified several Wildlife Management Areas and Waterfowl Production Areas located to the east of the search area, as well as suitable habitat for the Western prairie fringed orchid, a plant species listed as threatened under the Endangered Species Act. The letter included six recommendations considered essential for evaluation of environmental resources and potential mitigation measures for the proposed wind project and transmission line, including:

- Locating turbines outside sensitive habitat areas, including grasslands, prairie, and wetlands
- Burying collection system transmission line and using existing poles and alignments to the maximum extent possible
- Pre-and post-project monitoring methodology to focus on avian resources most likely to be affected by the project.

A meeting was also held between Noble, USFWS, Minnesota State Parks, and MDNR staff on April 8, 2008. The Applicant presented modifications to their proposed wind project and transmission line based on the feedback that had been received from the various agency contacts. Specific modifications to the project included placement of all turbine, substation, and electrical collection system facilities to the west of MN Highway 9 (as specifically recommended in the Nature Conservancy response letter dated March 11, 2008, Appendix B), and aligning the proposed transmission line along the MN Highway 9 corridor.

A response letter was received on July 8, 2008, in response to the April 8th meeting, and on-going discussions between Noble and the USFWS regarding the proposed Noble Flat Hill Windpark I and the associated transmission line stating that "the revised project has met these [six] criteria, including avoidance of potential Western prairie fringed orchid habitat." Details of additional monitoring and mitigation measures that will be pursued by the Applicant in accordance with USFWS guidance are included in Sections 5.17, 5.18, 5.19, and 5.20 of this application. Copies of all USFWS correspondence are included in Appendix B.

6.1.4 Minnesota State Park Service

The Buffalo River State Park was contacted via telephone on February 6, 2008 and via email on February 8, 2008, to discuss the siting of the proposed wind energy facility and transmission line. A response letter was received from Brian Nelson, Park Manager for the Buffalo River State Park on February 11, 2008, stating that park staff had reviewed the map of the proposed Project and saw no immediate concerns regarding the proposed Project and Buffalo River State Park.

A meeting was also held between Noble, USFWS, Minnesota State Parks, and MDNR staff on April 8, 2008. Noble presented modifications to their proposed wind project and transmission line based on the feedback that had been received from the various agency contacts. Specific modifications to the project included placement of all turbine, substation, and electrical collection system facilities to the west of MN Highway 9 (as specifically recommended in the Nature Conservancy response letter dated March 11, 2008, Appendix B), and aligning the proposed transmission line along the MN Highway 9 corridor. Jade Templin, a representative from the Minnesota State Parks, was present at the meeting and stated that he did not have any additional comments on the proposed Project as it appeared the newly proposed turbine layout and transmission corridor did not appear to have significant impacts to State Parks.

6.1.5 Clay County/Township Officials

The following meetings regarding the proposed Project were conducted by Noble with Clay County and Township officials:

- Two meetings were held with Jerry Waller, Clay County District 2 Commissioner – August 2007 and July 2008
- A meeting was held with Spring Prairie Township Board – November 2007
- A meeting was held with one member of the Moland Township Board – July 2008
- A meeting was held with two members of the Riverton Township Board – July 2008
- A public hearing was held for Spring Prairie Township – October 2007
- A public hearing was held for Clay County – October 2007

6.2 Landowners

The Applicant has conducted the following public outreach efforts regarding the proposed Project.:

- A public hearing was held for Spring Prairie Township – October 2007
- A public hearing was held for Clay County – October 2007

- Noble presented a wind energy seminar and a project update at the Glyndon Senior Center – May 2008
- Noble presented a wind energy seminar and a project update at the Moorhead Senior High School – July 2008
- Noble held a public information booth at the Clay County Fair – July 2008
- Noble will publish a quarterly newsletter to be distributed to all residents within the proposed Project area – the first newsletter was sent in September 2008.

6.3 The Nature Conservancy

The Nature Conservancy (TNC) was contacted via telephone on February 6, 2008, to discuss the siting of the proposed wind energy facility and transmission line. A response letter was received from TNC on March 11, 2008, which included a list of suggestions for ways in which the proposed Project could be improved, including:

- Site project in areas away from native prairie
- Site project away from greater prairie chicken leks
- Investigate wind turbine impacts on bat species in the Project area
- Make wind turbines more visible to birds and bats
- Avoid introduction and spread of invasive species during all phases of construction

Due to the sensitive natural resources identified in the greater Project area, the letter specifically recommended placement of all turbine, substation, and electrical collection system facilities to the west of MN Highway 9 and aligning the proposed transmission line along the MN Highway 9 corridor or further to the west. Copies of all TNC correspondence are included in Appendix B.

Noble presented modifications to their proposed wind project and transmission line based on the feedback that had been received from the TNC and various agency contacts. Specific modifications to the project included placement of all turbine, substation, and electrical collection system facilities to the west of MN Highway 9, and aligning the proposed transmission line along the MN Highway 9 corridor.

A second response letter was received from TNC on October 8, 2008, in response to on-going discussions between Noble and TNC regarding the proposed Noble Flat Hill Windpark I and the associated transmission line stating that "TNC has expressed a strong preference for this revised layout, and appreciates the efforts of NEP and Tetra Tech to make the changes. We appreciate the coordination and cooperation expended thus far by NEP to ensure a final product which addresses all the environmental concerns raised during the project review phase." Details of additional monitoring and mitigation measures that will be pursued by the Applicant in accordance with TNC guidance are included in Sections 5.17, 5.18, 5.19, and 5.20 of this application. Copies of all TNC correspondence are included in Appendix B.

7.0 Identification of Required Permits/Approvals

The potential federal and state permits or approvals that have been identified as being required for the construction and operation of the Project are shown in Table 7-1.

Table 7-1
Permits and Approvals

Agency	Type of Approval
Federal Permits	
U.S. Army Corps of Engineers	Section 404 Permit
Federal Aviation Administration	Notice of proposed construction or alteration
	Determination of no hazard
Federal Energy Regulatory Commission	Exempt wholesale generator status and market based rate authorization
State of Minnesota Permits	
Minnesota Public Utilities Commission	LWECS Site Permit
Minnesota Public Utilities Commission	Route Permit
Minnesota Public Utilities Commission	Certificate of Need for LWECS
Minnesota Board of Water and Soil Resources	Wetland Conservation Act Approval
Minnesota Department of Natural Resources	Public Water Works Permit
	License to Cross Public Land and Waters
Minnesota Pollution Control Agency	NPDES Permit: Construction
	License for Very Small-Quantity Generator of Hazardous Waste
	Section 401 Water Quality Certification
	Above ground storage tank (AST) notification form
Minnesota Department of Health	Water Well Permit
	Plumbing Plan Review
Minnesota Department of Transportation	Utility Access Permit
	Highway Access Permit
	Oversize and Overweight Permit
Local Permits	
Clay County	Building Permits
	Individual Septic Tank Permit
	Driveway Permit
	Utility Permit
	Moving Permit
	Overwidth/Overweight Permits
Townships	Road Access Permits

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9.0 Abbreviations

AADT	Annual Average Daily Traffic
ANSI	American National Standards Institute
APP	Avian Protection Plan
APLIC	Avian Power Line Interaction Committee
ASOS	Automated Surface Observing Station
ASTM	American Society for Testing and Materials
BMP	Best Management Practices
CEQ	Council on Environmental Quality
CR	County Road
CRP	Conservation Reserve Program
CSAH	County State Aid Highway
CWA	Clean Water Act
dBA	A-Weighted Decibels
DNR	Department of Natural Resources
DOC	Department of Commerce
DOE	Department of Energy
DOT	Department of Transportation
EMF	Electromagnetic fields
ESA	Environmental Site Assessment
FAA	Federal Aviation Administration
FCC	Federal Communications Commission
FEMA	Federal Emergency Management Agency
ft	Feet
GE	General Electric
Hz	Hertz
IEEE	Institute of Electrical and Electronics Engineers
kV	Kilovolt
kW	Kilowatt
LGU	Local Government Unit
LMIC	Land Management Information Center

LWECS	Large Wind Energy Conversion System
m	Meter
m/s	Meters per second
MDNR	Minnesota Department of Natural Resources
MISO	Midwest Independent Transmission System Operator
MNDOT	Minnesota Department of Transportation
MOU	Minnesota Ornithological Union
MPCA	Minnesota Pollution Control Agency
mph	Miles per hour
MW	Megawatt
MWh	Megawatt hour
NAC	Noise Area Classification
NAE	Northern Alternative Energy
NCDC	National Climatic Data Center
NEC	National Electric Code
NEMA	National Electrical Manufacturer's Association
NEP	Noble Environmental Power
NEPNOC	Noble Environmental Power National Operations Center
NESC	National Electric Safety Code
NHD	National Heritage Database
NPDES	National Pollution Discharge Elimination System
NRCS	Natural Resources Conservation Program
NRHP	National Register of Historic Places
NWCC	National Wind Coordinating Committee
NWI	National Wetland Inventory
O & M	Operations and Maintenance
OTP	Otter Tail Power
OSHA	Occupational Safety and Health Administration
PCB	Polychlorinated Biphenyls
PCPI	Per Capita Personal Income
PPA	Power Purchase Agreement

PUC	Public Utilities Commission
PWI	Public Waters and Wetlands Inventory
RD	Rotor Diameter
REC	Recognized Environmental Condition
RHA	Rivers and Harbors Act of 1899
R-O-W	Right-of-Way
rpm	Revolutions per minute
SCADA	Supervisory Control and Data Acquisition System
SHPO	State Historic Preservation Office
SNA	Scientific and Natural Area
SWPPP	Storm Water Pollution Prevention Plan
TI	Turbulence Intensity
TNC	The Nature Conservancy
UL	Underwriters Laboratory
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WCA	Wetlands Conservation Act
WMA	Wildlife Management Areas
WPA	Waterfowl Production Areas
WRAP	Wind Resource Analysis Program