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November 3, 2011

Minnesota Public Utilities Commission
c/o Dr. Burl Haar
121 7th Place East, Suite 350
St. Paul, MN 55101-2147

Re: In the Matter of a Site Permit Application for a Large Wind Energy Conversion System for the Ellerth Windpark in Marshall County, Minnesota
MPUC Docket No. IP6855/WS-11-608

Dear Dr. Haar:

Ellerth Wind LLC (Ellerth Wind), a wholly owned subsidiary of TCI Renewables Limited (TCI), is submitting a Site Permit Application (Application) for a Large Wind Energy Conversion System for the Ellerth Windpark in Marshall County, Minnesota. The Application is being submitted via the Minnesota Public Utilities Commission's (PUC) e-filing system as well as in hard copy under MPUC Docket No. IP6855/WS-11-608.

Ellerth Wind seeks a Site Permit authorizing construction and operation of up to a 98.9 Megawatt (MW) Large Wind Energy Conversion System for the Ellerth Windpark. Associated facilities will include, but not limited to, gravel access roads, an electrical collection system, project grid interconnection facilities and permanent meteorological towers.

Please note that this is a refilling of the Site Permit Application for Ellerth Wind replacing the version submitted on June 29, 2011.

No confidential information is included in this Application. Therefore, only a public version is being filed electronically. Hard copies of the Application are being distributed as indicated below.

Thank you for your consideration

Sincerely,

Brett O'Connor
Operations Director

Enclosure:
(3) Three Hard copies via courier

cc:
Mr. Larry Hartman at Department of Commerce, Energy Facility Permitting (4 Hard copies via courier)

SITE PERMIT APPLICATION FOR A LARGE WIND ENERGY CONVERSION SYSTEM

ELLERTH WINDPARK
MARSHALL COUNTY, MINNESOTA

NOVEMBER 4, 2011

PREPARED FOR:
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APPLICATION TO THE MINNESOTA PUBLIC UTILITIES COMMISSION SITE PERMIT FOR A LARGE WIND ENERGY CONVERSION SYSTEM

ELLERTH WINDPARK
MARSHALL COUNTY, MINNESOTA

MPUC Docket Number: IP6855/WS-11-608

Prepared for:

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Prepared by:

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November 4, 2011

Project Name:	Ellerth Windpark
Project Location:	Marshall County, Minnesota
Applicant:	Ellerth Wind LLC
Authorized Representative:	Brett O'Connor, Operations Director
Signature:	_____
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1.0 APPLICANT INFORMATION

Ellerth Wind LLC (Applicant, or Ellerth Wind), a wholly-owned subsidiary of TCI Renewables Limited (TCI), is submitting this application to the Minnesota Public Utilities Commission (PUC) for a site permit to construct and operate the Ellerth Windpark (the Project) in Marshall County, Minnesota. The proposed Project is a Large Wind Energy Conversion System (LWECS), as defined in the Wind Siting Act, Minnesota Statutes Chapter 216F. The Project will be up to 98.9 megawatts (MW) in nameplate capacity, consisting of up to 61 wind turbine generators (depicted with 9 alternate turbine locations) in the 1.6 to 2.3 MW range. Anticipated construction is scheduled to begin in May 2012 with an expected date of commercial operation of November 2012.

Ellerth Wind first commenced development activity related to the project in early 2007 and has obtained a Large Generator Interconnection Agreement (LGIA) with the Midwest Independent System Operator (MISO). The proposed interconnection point for the Project is within the northeastern portion of the Project boundary.

The Project as currently planned will involve Ellerth Wind overseeing and administering the aspects of Project execution including, but not limited to, design, solicitation and award of construction balance of plant (BOP) contracts, construction, construction monitoring and oversight, third party quality assurance, and final commissioning and acceptance. Major equipment procurement including turbine supply agreements (TSA) will be negotiated by Ellerth Wind in conjunction with external legal counsel. Agreements for design engineering, construction and other Project service providers will be between Ellerth Wind and those respective parties. Ellerth Wind will manage the Agreements and other aspects of the Project. Contracts for design, construction, third party oversight and monitoring will be bid and awarded in phases to qualified service providers. The Project as currently planned will be operated by Ellerth Wind with vendor contracts for equipment maintenance and service.

Ellerth Wind is committed to using Minnesota's wind resource wisely and efficiently, consistent with the State of Minnesota PUC and Statutory objectives. Ellerth Wind has evaluated and will continue to evaluate the site to optimize its wind resource while avoiding and minimizing impacts to human and natural environments.

2.0 CERTIFICATE OF NEED

Under Minnesota Statutes §§216B.2421 and 216B.243, subd. 2, and Minnesota Rules Chapter 7849, a Certificate of Need (CON) is required for the Project because it has a combined capacity of larger than 50 MW. Ellerth Wind plans to follow parallel review paths for its Site Permit and CON applications.

The CON for the Ellerth Windpark is filed under Docket CN-11-112. An Exemption Filing has been drafted for the Project and is pending submission to the PUC. It should be noted that this is not an exemption from the entire CON process, rather an exemption from certain CON data requirements that are inapplicable and unnecessary to determine the need for the Project. Ellerth Wind LLC has requested these exemptions pursuant to Minn. R. 7849.200, subp. 6.

The Project CON Exemption Filing was submitted in the first half of February 2011. Following this, the CON was formally submitted to the PUC on May 27, 2011.

On June 22, 2011, the Minnesota Department of Commerce (DOC) filed comments recommending that the PUC find the application complete upon the Applicant's submission of specific supplemental information. On June 29, 2011, the Applicant filed reply comments and supplemental information intended to meet the DOC's requirements.

On August 11, 2011, the filing came before the PUC for a determination on completeness. At that time the DOC concurred with the Applicant that the supplemental filing had made the application substantially complete. The PUC has examined the record and concurs with the Department that the application is substantially complete and ready for evidentiary development as of June 29, the date of the supplementary filing.

3.0 STATE POLICY

The Wind Siting Act requires an application for a site permit for a LWECS to meet the substantive criteria set forth in Minn. Stat. §216E.03, subd. 7. This application provides information necessary to demonstrate compliance with these criteria and Minn. Rule 7854. The siting of a LWECS is to be made in an orderly manner compatible with environmental preservation, sustainable development, and the efficient use of resources (Minn. Stat. § 216F.03). Ellerth Wind is designing the Project to comply with the PUC's existing wind turbine setback and siting requirements.

4.0 PROJECT DESCRIPTION AND OVERVIEW

4.1 Project Location

The Project Area site is located west of the town of Newfolden in Marshall County, Minnesota. Table 1 and Map 1a and Map 1b identify the townships and sections in which the Project is located.

4.2 Size of the Project Area in Acres

The Project Area encompasses approximately 33,709 acres of mostly agricultural land. The Project Area will allow siting flexibility in the event proposed turbine locations prove unsuitable

while also providing sufficient buffers and setbacks required for infrastructure and natural resources.

Table 1: Project Location

County	Township Name	Township	Range	Section
Marshall	Wright	157N	46W	E1/2 SE1/4 36
Marshall	West Valley	157N	45W	S1/2 30, 31-35
Marshall	Foldahl	156N	46W	1, 2, 11-13, 24, 25, 36
Marshall	Marsh Grove	156N	45W	1-13, 19-23, 26-35
Marshall	Comstock	155N	46W	1
Marshall	Viking	155N	45W	2-6

4.3 Rated Capacity

The rated capacity of the Ellerth Windpark is 98.9 MW.

4.4 Number of Turbine Sites

Ellerth Wind has not made a final selection of wind turbine generators for the Project and proposes to permit the Project for a range of wind turbines sized from 1.6 to 2.3 MW. This permit application uses three turbines to span the spectrum of typical turbine models in the 1.6 to 2.3 MW range (General Electric [GE] 1.6 MW, Vestas 1.8 MW V90, and the Siemens 2.3 MW SWT-101 turbines). Associated Project facilities include gravel access roads, a step-up substation, a wind electrical collection system, and an Operations and Maintenance (O&M) building. The area where Project facilities will be developed (including turbines, electrical collection lines, project substation, etc.) will hereafter be referred to as the "Project Area". The preliminary layout is depicted on Map 2.

This preliminary site layout represents the largest number of turbines to be considered and includes 61 turbines (depicted on Map 2 along with 9 alternates) and is based on the GE 1.6 MW turbine model. Should one of the other turbine models be chosen, the number of turbine locations will be reduced to 54 for the Vestas 1.8 MW V90 and 43 for the Siemens 2.3 MW SWT-101 to meet the nameplate threshold of 98.9 MW. Locations to be dropped will be determined by potential environmental constraints, wind resource considerations, plant optimization and/or construction design optimization. Preliminary turbine locations are subject to relocation based on site permit conditions or other permitting requirements. Additional information regarding turbine models can be found in Section 5.2.

4.5 Meteorological Towers

Once the Project has been constructed, the Applicant will install one to three permanent meteorological towers within the Project Area that will remain for the duration of the Project. As currently planned, the permanent meteorological tower(s) will be free standing and made of galvanized steel, with medium dual-intensity day and night lights as required by the FAA. Additional information regarding the permanent meteorological towers can be found in Section 6.3.2.

4.6 Percent of Wind Rights Secured

Ellerth Wind currently has agreements with landowners over approximately 18,870 acres of private land within the Project Area, representing 56% of the Project Area, and has agreements for the land required for placement of the actual Project (i.e. land rights required to host the Project have been secured).

4.7 Ownership Statement

Ellerth Wind does not have ownership or other financial interest in any other LWECS located in Minnesota.

5.0 PROJECT DESIGN

This section provides a summary description of the Project, which includes a description of the layout, turbines, electrical system, and substation.

5.1 Description of Project Layout

The Project has been designed to site wind turbines and associated facilities primarily on agricultural land (approximately 75%); however, small amounts of other land types may be affected (see Section 8.10 for a description of land types within the Project Area). Turbine siting and spacing is dictated by the selected turbine model, setback requirements, proximity to existing residences, interconnection with available transmission, and proximity to natural resources.

The Project has been designed to ensure consistency with standards established by the Commission and previous PUC actions. Project setbacks are included in Table 2 below and are depicted on Map 3.

While turbine procurement efforts have not been finalized, the preliminary site layout on Map 2 depicts 61 turbines (depicted with 9 alternates) based on the GE 1.6 MW turbine model. Turbine locations are subject to minor adjustment based upon final turbine model selection, environmental micrositing, and constructability reviews.

Table 2: Ellerth Windpark Project Setbacks

Resource Category	Ellerth Windpark Project Design
Wind Access Buffer (setback from lands and/or wind rights not under Permittee's control)	5 RD on the prevailing wind directions 3 RD on the non-prevailing wind directions
Internal Turbine Spacing	5 RD on the prevailing wind directions 3 RD on the non-prevailing wind directions
Residential Dwellings	1,000 ft (305 m) and sufficient distance to meet state noise standard
Public Roads	250 ft (76 m) from edge of public road right of way
State Parks and WMAs	5 RD (1,657 ft, 505 m) from Old Mill State Park and WMAs
Reinvest in Minnesota (RIM) Land	164 ft (50 m)
Native Prairie	To be determined based on surveys
Sand and Gravel Operations	Active sand and gravel operations have been avoided.

5.2 Description of Turbines and Towers

Ellerth Wind proposes a range of wind turbines sized from 1.6 to 2.3 MW. This site permit application uses three turbines to span the spectrum of typical turbine models in the 1.6 to 2.3 MW range (GE 1.6 MW, Vestas 1.8MW V90, and Siemens 2.3MW SWT-101 turbines). Ellerth Wind may select a different turbine model than those specified; these three turbines are only used to represent the spectrum of available designs for the specified product range. Regardless of the turbine model selected, the hub heights would range from 80 m to 100 m (262.5 ft to 328.1 ft) and the RD would range from 90 m to 101 m (295.3 ft to 331 ft). Table 3 shows the range of characteristics for the three representative turbines.

The Applicant anticipates using up to 61 1.6 MW turbines, up to 54 1.8 MW turbines, or up to 43 2.3 MW turbines to attain a Project nameplate capacity of no greater than 98.9 MW. The Applicant seeks the flexibility to select the most appropriate technology at the time of the Project to ensure optimization of wind and land resources and cost efficiency. The preliminary site layout is 97.6 MW, based on 61 1.6 MW wind turbines (as depicted with 9 alternates on Map 2). This preliminary site layout represents the greatest number of turbines to be considered. Should one of the other turbine models be chosen, the number of turbine locations will be reduced to 54 for the Vestas 1.8 MW V90, while the Project capacity will be 97.2 MW, and potentially a

further reduction in turbine locations to 43 for the Siemens 2.3 MW SWT-101 to meet the nameplate capacity of 98.9 MW. Locations to be dropped will be determined by potential environmental constraints, wind resource considerations, plant optimization and/or construction design optimization. Preliminary turbine locations are subject to relocation based on site permit conditions or other permitting requirements.

Table 3: Wind Turbine Characteristics

Characteristics	Turbine Model		
	GE 1.6 MW	Vestas 1.8 MW	Siemens 2.3 MW
Nameplate capacity	1,600 kW	1,800 kW	2,300 kW
Hub height	80 m (262.5 ft) 100 m (328.1 ft)	80 m (262.5 ft) 95 m (311.7 ft)	80 m (262.5 ft) 100 m (328.1 ft)
Rotor diameter	100 m (328.1 ft)	90 m (295 ft)	101 m (331 ft)
Total height[1]	130 m – 150 m (426.5 ft – 492.1 ft)	125 m – 140 m (410.1 ft – 459.3 ft)	130.5 m – 150.5 m (428.1 ft – 493.8 ft)
Cut-in wind speed[2]	3 m per second (m/s) (6.7 mph)	4 m/s (8.9 mph)	4 m/s (8.9 mph)
Rated capacity wind speed[3]	12 m/s (26.8 mph)	12 m/s (26.8 mph)	12-13 m/s (26.8 to 29.1 mph)
Cut-out wind speed[4]	25 m/s (55.9 mph)	25 m/s (55.9 mph)	25 m/s (55.9 mph)
Rotor speed	9.75 to 16.2 rpm	9.0 to 14.9 rpm	6 to 16 rpm

[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 at which turbine shuts down operation

The towers are conical tubular steel with a hub height of between 80 m (262.5 ft) and 100 m (328.1 ft). The turbine towers, where the nacelle is mounted, consist of three to five sections manufactured from certified steel plates. Welds are made in automatically controlled power welding machines and ultrasonically inspected during manufacturing per American National Standards Institute specifications. All surfaces are sandblasted and multi-layer coated for protection against corrosion. Access to the turbine is through a lockable steel door at the base of the tower.

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

5.3 Description of Electrical System

At the base of each turbine a step-up transformer will be installed to raise the voltage to power collection line voltage of 34.5 kV; it should be noted that one of the turbine models under consideration for the Project (Vestas 1.8MW) houses the step-up transformer in the nacelle of the turbine (see Section 5.2 for the turbine models under consideration). Power will be run through an underground collection and aboveground feeder system to the Ellerth Substation, which will raise the voltage to 115 kV. Alternatively, the entire electrical system from the turbines to the substation would be located underground as collection lines. From the step-up substation, the power will be handed off to a short 115 kV line and to an existing 115kV aboveground line (see Section 6.1).

6.0 DESCRIPTION AND LOCATION OF ASSOCIATED FACILITIES

6.1 Transmission and Project Substations

The electricity generated by each turbine will be stepped-up by a pad-mounted transformer at the base of each turbine or within the nacelle to power collection line voltage of 34.5 kV. The electric energy collected at the turbines will be transmitted via underground collection lines and then passed to overhead feeder lines along rights-of-way to the substation location (see Section 6.2 for additional information on collector and feeder lines). Alternatively, the entire electrical system from the turbines to the substation would be located underground as collection lines. At the substation, the power will be transformed from 34.5 kV to 115 kV via a new transformer installed as part of the Project for delivery to the transmission grid. The power will be transmitted from the Project substation to an existing Otter Tail Power Company 115 kV overhead transmission line through a new 115kV line of approximately 200 feet. This short 115kV line falls below the threshold for state permitting. Exact details on this short 115kV line are pending negotiations with Otter Tail Power Company.

Ellerth Wind first commenced development activity related to the project in early 2007 and has obtained an LGIA with MISO. The interconnection specifics are detailed in the Project LGIA published on the MISO website. The proposed point of interconnection (POI) for the Project is within the northeastern portion of the Project Area (see Map 2). It should be noted that the Project interconnection facilities will be located adjacent to the POI.

6.2 Collector Lines and Feeder Lines

As currently planned, the electrical lines will be buried in trenches from the turbine location to the edge of the farm field and once they reach the edge of the public road right of way, the power collection lines will either rise from underground collection lines to an aboveground feeder or else continue on as underground collection lines. The collection lines will occasionally require an aboveground junction box when the collection lines from separate spools need to be spliced together. At the base of each turbine, a step-up transformer will be installed to raise the voltage to the power collection line voltage of 34.5 kV; it should be noted that one of the turbine models under consideration for the Project houses the step-up transformer in the nacelle of the turbine (Vestas 1.8MW). Power will be run through an underground and/or aboveground collection system to the Ellerth Substation, which will raise the voltage to 115 kV. The preliminary layout depicted on Map 2 shows approximately 19.76 miles of overhead feeder lines and approximately 18.84 miles of underground collection lines. Alternatively, the layout would include approximately 38.6 miles of underground collection lines.

6.3 Other Associated Facilities

6.3.1 O&M Facility

An O&M facility will be constructed within or near the Project Area and will provide access and storage for project maintenance and operations. This facility will be permitted locally at a location to be determined. The buildings typically used for this purpose are 3,000 to 5,000 square ft and house the equipment to operate and maintain the wind farm. The parking lot adjacent to the building is typically 3,000 square ft.

6.3.2 Permanent Meteorological Towers

Ellerth Wind has installed two temporary 196.9 ft (60 m) meteorological towers within the Project Area that were installed in May 2008 and June 2010. It is anticipated that the site will include between one and three permanent 328.1 ft (100 m) meteorological towers to house anemometers and related instruments to monitor Project meteorological conditions. The locations of these permanent meteorological towers have not been determined at this time but will be located within the Project Area. Meteorological tower site selection is based upon coordination with the final turbine locations to ensure proper operation of the wind assessment equipment. They will be placed no closer than 250 feet from the edge of the road rights-of-way and outside of the wind access buffer. The towers will be painted red on top and will comply with applicable Federal Aviation Administration (FAA) guidelines.

6.3.3 Turbine Access Roads

The Project contains up to approximately 17.8 miles of proposed access roads that will be approximately 16 ft (4.88 m) wide and low profile to allow cross-travel by farm equipment with

the installation of culverts within ditches where necessary. Ellerth Wind 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. Some existing roads within the Project Area will be used to navigate between turbine access roads during construction as well as during operation and maintenance phases of the Project.

6.4 Associated Facilities Permitting

The Applicant will be responsible for undertaking all required environmental review and will obtain all permits and licenses required following issuance of the LWECS Site Permit. Ellerth Wind will apply to Marshall County for building permits, individual addresses for the towers, as well as a Conditional Use Permit for the project substation.

7.0 WIND RIGHTS

The Project Area boundary encompasses approximately 33,709 acres, of which approximately 18,870 acres are under site control. This represents 56% of the Project Area and the land required for placement of the actual Project facilities is included in this 56% (i.e. land rights required to host the Project have been secured).

8.0 ENVIRONMENTAL ANALYSIS

In accordance with Minnesota Rules Chapter 7854, Ellerth Wind provides the following description of the environmental conditions that exist within the Project Area. Various exclusion and avoidance criteria were considered in the selection of the Project Area in accordance with PUC procedures on siting LWECS and applicable portions of the Power Plant Siting Act. Ellerth Wind sent letters to various regulatory and governmental authorities to request a review of the Project Area for applicable comments and concerns. A list of the agencies who received a request and responses from agencies are included in Appendix A.

The Project Area is located in northwestern Minnesota approximately five miles west of the town of Newfolden in Marshall County. Marshall County has a predominately agricultural-based economy, which is reflected in the agricultural land use of the Project Area (see section 8.10 for a description of land use within the Project Area). Major crops in Marshall County and the Project Area consist of wheat, soybeans, sugar beets, barley, and sunflower seeds (USDA 2009). The landscape in the 33,709 acre Project Area is relatively flat, with elevations ranging from 968 to 1,099 ft above mean sea level.

8.1 Demographics

8.1.1 Description of Resources

The Project Area is located within a lightly populated rural area in Marshall County, Minnesota. With a land area of 1,772 square miles, Marshall County makes up approximately two percent of Minnesota's total land area of 79,610 square miles. However, at a population of 9,439, Marshall County has less than one percent of the statewide population. The U.S. Census Bureau (USCB) estimates that Marshall County experienced moderate population declines from 2000 to 2010 compared to a moderate statewide increase. Household income is approximately 20 percent less than the statewide average; however, the percentages of persons below poverty level are comparable. The largest industries employing residents of Marshall County are the retail trade, accommodation and food services, health care, and agriculture. Table 4 provides a summary of Marshall County and statewide demographics.

Table 4: Demographic Characteristics of Marshall County, Minnesota

Metric	Marshall County	Minnesota
Population, 2000	10,155	4,919,492
Population, 2010	9,439	5,303,925
Percent Population Change, 2000-2010	-7.1	7.8
Persons per Square Mile, 2010	5.3	66.6
Median Household Income (dollars), 2009	46,242	55,621
Percentage of Persons Below Poverty Level, 2009	9.7	10.9

Source: United States Census Bureau 2010

The Project Area is located in parts of Wright, West Valley, Foldahl, Marsh Grove, Comstock, and Viking townships. There are no municipalities within the Project Area. Two incorporated municipalities are located within five miles of the Project Area: Newfolden (population 326) and Viking (population 84). Most residences within the Project Area are rural farmsteads, and there are typically two to four farmsteads per section of land within the Project Area with many sections containing no farmsteads for an average of 1.5 farmsteads per section. The largest population center nearby is the City of Warren with a population of approximately 1,877. The eastern extent of Warren is situated approximately 12 miles southwest of the Project Area.

According to USCB American Community Survey (ACS) data from 2005-2009, the largest industries employing residents in Marshall County are educational services/health care/social

assistance, manufacturing, agriculture, retail, and construction, which comprise over 70% of the workforce. The estimated median household income for the period between 2005 and 2009 was $46,316.

8.1.2 Impacts

Short-term negative impacts to socioeconomic resources will be relatively minor. Although the proposed Project would permanently remove up to approximately 75 acres of agricultural land (less than one 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 leases. The areas surrounding the turbines and permanent access roads will remain available for continued farming operation. The construction, operation, and maintenance of the Ellerth Windpark will not have an effect on the socioeconomic resources in the area.

Project construction will not cause additional impacts to leading industries within the Project Area. There is no indication that any minority or low-income population is concentrated in any one portion of the Project Area, or that the wind turbines will be placed in an area occupied primarily by any minority group.

8.1.3 Mitigation

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

Long-term beneficial impacts to the counties' tax base as a result of the construction and operation of the wind farm will contribute to improving the local economy in this area of Minnesota (see section 8.12.2).

Socioeconomic impacts associated with the Project will be primarily positive with an influx of wages and expenditures made at local businesses during Project construction and an increase in the county's tax bases from the construction and operation of the wind turbines. The Applicant proposes minimum setbacks for turbines from occupied residences to comply with Minnesota noise standards. The Applicant will also adhere to a minimum setback of 250 feet from the edge of public road rights-of-way.

8.2 Land Use

8.2.1 Local Zoning and Comprehensive Plans

Marshall County has zoning and land development ordinances related to feedlots, management of all terrain vehicles, sewage and wastewater treatment, shoreland development, and floodplain management. Existing Marshall County land development ordinances are not expected to apply to Project development. Marshall County has a comprehensive land-use plan that was adopted in September 2000. There are no other land-use plans or urban growth boundaries for county or local governments within or adjacent to the Project Area.

To date, Marshall County has not assumed authority to permit projects in the 5 to 25 MW range under Minnesota Statue §216F and has no ordinance regarding wind energy conversion systems at this time. Ellerth Wind is committed to working with the county to address local concerns and obtain applicable local permits, including, for example, building permits for the O&M building and substation. Ellerth Wind and Marshall County intend to formalize a Development Agreement between both parties in relation to the LWECS development activities. Marshall County has provided a letter of support for the Project that is included in Appendix A.

8.2.2 Conservation Programs and Easements

The United States Fish and Wildlife Service (USFWS), Marshall County Soil and Water Conservation District (SWCD) and the Natural Resource Conservation Service (NRCS) offer conservation programs that encourage setting aside wetlands and grasslands for conservation purposes, or implementation of conservation practices on private land. These programs can provide another source of income for local farms and landowners. Some of these programs include the Conservation Reserve Program (CRP), Reinvest in Minnesota (RIM), Wetland Reserve Program (WRP), and the Environmental Quality Incentive Program (EQIP). These programs vary in their requirements, payments, and the length of time for which a piece of property must be enrolled.

According to the NRCS, there are approximately 11,707 acres of land enrolled in CRP located within the Project Area; approximately 2,026 acres with contracts expiring in 2011 and approximately 3,280 acres with contracts expiring in 2012. There is one RIM easement of approximately 79 acres located in the northeastern portion of the Project Area that has been designated a wetland restoration area.

Under the CRP, landowners are compensated for taking agricultural land out of production for a set contract period, and payments are made on a per-acre basis. While wind development is allowed within CRP parcels, coordination with landowners and the NRCS is necessary to withdraw the impacted areas from the CRP contract, and to compensate the NRCS for any payments already distributed for those areas. The RIM program encourages landowners to retire environmentally sensitive land from agricultural production and provides assistance to restore

these areas to grass, trees, or wetlands. CRP is enrolled for 10-year periods, whereas RIM easements are permanent conservation easements.

If CRP land is impacted, the Applicant will work with the landowner to remove the impacted portion of the parcel from the CRP program. There will be no impacts to RIM land; therefore no mitigation will be necessary.

8.3 Noise

The ambient acoustic environment refers to the outdoor noise levels within a given community. According to the United States Environmental Protection Agency (US EPA), an ambient noise level of 55 decibels is identified for outdoor areas where human activity takes place. Typical existing ambient noise sources may exist near roads, farmsteads and other areas of human activity and in rural areas are ambient noise levels are often dominated by agriculture related activities, existing wind conditions, and proximity to other noise sources. Table 5 shows noise levels associated with common, everyday sources, and places the magnitude of the noise levels discussed here in context.

Table 5: Typical Sound Levels for Common Noise Sources

Type of Noise	Sound Level dB(A)
Jet Engine (at 25 meters)	140 dB(A)
Jet Aircraft (at 100 meters)	130 dB(A)
Rock Concert	120 dB(A)
Pneumatic Chipper	110 dB(A)
Jackhammer (at one meter)	100 dB(A)
Chainsaw or Lawn Mower (at one meter)	90 dB(A)
Heavy Truck Traffic	80 dB(A)
Business Office, Vacuum Cleaner	70 dB(A)
Conversational Speech, Typical TV Volume	60 dB(A)
Library	50 dB(A)
Bedroom	40 dB(A)

Type of Noise	Sound Level dB(A)
Secluded Woods	30 dB(A)
Whisper	20 dB(A)

Source: Minnesota Pollution Control Agency 1999

8.3.1 Wind Turbine Noise Estimates

The Minnesota Pollution Control Agency (MPCA) has a statewide noise standard (Minn. Rule 7030.0040) which specifies daytime and nighttime noise levels that cannot 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 dB(A) may not be exceeded for more than 50 percent of the time for a one-hour survey, and a sound level of 65 dB(A) may not be exceeded for more than 10 percent of the time for a one-hour survey. The nighttime standards state that 50 dB(A) many not be exceeded for more than 50 percent of a one- hour survey, and 55 dB(A) may not be exceeded for more than 10 percent of a one-hour survey. Table 6 presents the regulated noise levels from the State of Minnesota statutes. The L_{50} is the noise level exceeded for 50 percent of the time during any measurement duration, and represents the median sound level. The L_{10} is the sound level exceed for 10 percent of the time during any measurement duration.

Table 6: State of Minnesota Noise Standards [db(A)]*

Noise Area Classification (as Identified in Minn. Rule 7030.0040)	Daytime	Daytime	Nighttime	Nighttime
	L_{50}	L_{10}	L_{50}	L_{10}
1	60	65	50	55
2	65	70	65	70
3	75	80	75	80

* A-weighted decibels
Source: Minnesota Rule 7030.0040

The operation of wind turbines will contribute to sound levels in the area. The sound associated with the wind farm will vary based on wind speed, distance from the turbines, number of turbines in operation, weather, and topography of the area. On relatively windy days, turbines generally produce more sound; however, the ambient natural wind sound levels also increase.

The wind turbine manufacturers provide warranted turbine noise emission data in terms of maximum sound power levels or sound pressure levels, as shown in Table 7 below.

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 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. 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.

Table 7: Maximum Noise Emission Data Provided by Turbine Manufacturers

Turbine Make and Model	Sound Level dB(A) - L_w
GE 1.6	105.0
Vestas V90 1.8MW	103.7
Siemens 101 SWT 2.3 MW	107.0

Acoustic modeling was performed using CadnaA, the Computer Aided Noise Abatement software program. CadnaA was used to calculate received sound levels at identified noise sensitive receptors within the vicinity of the Project Area. CadnaA conforms to the Organization for International Standardization's standard ISO 9613-2 "Attenuation of Sound during Propagation Outdoors", which has engineering algorithms that incorporate such factors as geometric divergence, atmospheric absorption, reflection from surfaces, screening by topography and obstacles, terrain complexity and ground effects, source directivity factors, seasonal foliage effects, and meteorological conditions (ISO 1996).

Topographical information was imported into the acoustic model using the official USGS digital elevation dataset to accurately represent terrain in three dimensions. Terrain conditions, vegetation type, ground cover, and the density and height of foliage can also influence the absorption that takes place when sound waves travel over land. The ISO 9613-2 standard accounts for ground absorption rates by assigning a numerical coefficient of 0 for acoustically hard, reflective surfaces and 1 for absorptive surfaces and soft ground. If the ground is hard-packed dirt, typically found in industrial complexes, pavement, or for sound traveling over water, the absorption coefficient is defined as G=0 to account for reduced sound attenuation. In contrast, ground covered in snow (common at the Project site during the winter season), vegetation, including suburban lawns, livestock and agricultural fields (both fallow with bare soil and planted with crops), will be acoustically absorptive and aid in sound attenuation, i.e., G=1.0.

For the acoustic modeling analysis, a conservative ground absorption rate of 0.5 was selected, accounting for a semi-reflective ground surface.

Sound propagation in the atmosphere is not strongly dependent on temperature and humidity; however, the temperature of 50° Fahrenheit (10° Celsius) and 70 percent relative humidity parameters were selected as reasonably representative of conditions favorable to sound propagation. Calculations were completed for meteorological conditions corresponding to downwind propagation, or equivalently, propagation under a well-developed moderate ground-based temperature inversion and for the purposes of this screening level analysis have been assumed to be regulatory "worst case". Sound attenuation through foliage and diffraction around and over existing anthropogenic structures such as buildings was ignored under all acoustic modeling scenarios. The results are therefore representative of a defoliate (leaf-off) winter time period. The acoustic model assumes that all wind turbines are operating continuously and concurrently at the maximum rated sound level, per manufacturer specifications, at the given operational condition.

The results of the screening-level acoustic modeling analysis indicate that the proposed Project layout has been designed to operate in compliance with the applicable MPCA 50 dB(A) sound limit at all identified residences. Cumulative noise isopleths are depicted in Map 4a, 4b, and 4c. It should be noted that the model incorporates all 70 potential turbine locations, and the final Project layout will consist of fewer than 70 turbines, with the number of turbines dependent on the turbine model selected.

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 Ellerth Windpark 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 roadways and should not have significant noise impacts on nearby receptors such as residences and is located approximately 1,000 ft from the closest identified receptor.

8.3.2 Mitigative Measures

Ellerth Wind has taken considerable effort to site turbines carefully and responsibly and is maintaining a minimum setback distance of 1,000 ft (305 m) from occupied dwellings. According to conservative modeling estimates, this setback is greater than what is necessary to account for worst case scenario noise propagation for the L_{50} limit.

8.4 Visual Impacts

The topography in the vicinity of the Project is generally flat and the vegetation cover is uniformly low. Vegetation is predominantly agricultural crops and pasture within the Project

Area. Currently, the only prominent vertical components of the visual landscape in the Project Area are trees and manmade structures. A mix of deciduous and coniferous trees planted for windbreaks surround most farmsteads within the Project Area. Generally, these forested areas are isolated groves or wind rows established by the landowner/farmers to prevent wind erosion and shelter dwellings. Structures within the Project Area primarily include residences and farm outbuildings. Bethania Church is located in the northern portion of the Project Area along 340th Street NW (Township 156N, Range 45W, Section 5); which is over one mile from the closest turbine location. No other wind farms are present within the viewshed of the Project Area.

The Federal Communications Commission (FCC) antenna registration system database depicts one tower in the Project Area located in Township 156N, Range 45W (Marsh Grove Township), Section 5. The FCC land mobile private database depicts two additional towers within the Project Area. There are two tower structures on the FCC antenna registration system database within five miles of the Project Area, potentially including microwave, AM, FM, and other FAA permitted towers that have slightly altered the landscape from being strictly agricultural (see Section 8.5).

8.4.1 Visual Impacts on Public Lands

It has been noted that the presence of turbines within the viewshed of natural areas may diminish the natural quality of those areas and the experience of the persons utilizing those areas. The public lands that exist within the viewshed of the Project are typical of public lands in agricultural settings and are not classified as designated wilderness areas. The Minnesota Department of Natural Resources (DNR) has indicted there is one Wildlife Management Area (WMA) within the Project Area (Adolf Elseth) and one WMA adjacent to the Project Area (Wright). In addition, there is one RIM parcel within the Project Area. The Project Area does not contain any tracts of Waterfowl Production Areas or easements (Conservation, Wetland or Grassland) managed by the USFWS.

Visual impacts will be noticeable for users of two snowmobile trails located within 5 miles of the Project Area. MC Snowmobile Trail 106 runs north-south through Old Mill State Park, approximately 1 mile west of the Project Area boundary. The Middle River/Strathcona Driftskippers Trail runs north-south just east of the Project Area boundary. Map 6 depicts recreational resources within the Project Area vicinity.

Visual impacts will be noticeable for users of Old Mill State Park, located within one mile of the Project Area; the Minnesota State Historic Preservation Office (SHPO) has expressed concern that visitors to historic properties within the park may experience visual impacts due to the presence of turbines nearby (see section 8.6.2 for further discussion of the SHPO correspondence regarding Old Mill State Park). Further information regarding recreational resources in relation to the Project Area is found in Section 8.7.

Ellerth Wind will consider visual impacts in the final design and siting of the Project and will work with landowners to identify concerns related to Project aesthetics in order to avoid or minimize visual impacts. In keeping with this approach, Ellerth Wind proposes the following mitigative measures:

- Turbines will be uniform in color;
- Turbines will not be located in biologically sensitive areas such as parks, WMAs, or wetlands and a 3 by 5 RD setback from public lands will be applied;
- Turbines will be illuminated to meet the minimum requirements of FAA regulations;
- Existing roads will be used for construction and maintenance where possible to minimize the amount of new roads constructed;
- Access roads created for the wind farm facility will be located on gentle grades to minimize erosion, visible cuts, and fills; and,
- Temporarily disturbed areas will be converted back to cropland or otherwise reseeded with native seed mixes appropriate for the region.

Ellerth Wind has taken considerable effort to site turbines carefully and responsibly to minimize the impact of shadow flicker to the area. The potential for shadow flicker will continue to be considered during development, construction, and operation of the Project (see Section 8.4.3). A 1,000-ft (305 m) minimum setback from residences will be used. Additional mitigation options for the Project may be considered including visual screening such as trees, awnings, curtains or blinds.

8.4.2 Visual Impacts on Private Lands and Homes

Visual sensitivity is dependent on viewer perceptions, 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. The visual contrast added by wind farms may be perceived as a visual disruption or as points of visual interest with their own aesthetic quality and appeal. Post construction operation of the Project will not generate much traffic or significantly increase day-to-day human activity in the area. In addition, the proposed Project would not involve ongoing industrial use of non-renewable resources or emissions into the environment with the exception of routine and unscheduled O&M activities.

Despite subjectivity regarding the nature of visual effects, the installation of the Project will inarguably alter the visual landscape. The topography in the vicinity is generally flat and the vegetation cover is uniformly low, making the Project Area vulnerable to visual disruptions.

Visual impacts will be most evident to people traveling east and west along County Highway 28 and County Highway 4 and will be greatest for those residences located nearest to the Project. Visual impacts will be greatly reduced with distance from the Project.

The FAA requires obstruction lighting or marking of structures over 200 ft above ground to provide safe air navigation. The Applicant will apply to the FAA for approval of a lighting plan that is compliant with FAA requirements. To mitigate the visual impact of such lighting, Ellerth Wind will use FAA guidance and standards when applying to the FAA for approval of a lighting plan that will light the Project, and will follow the approved plan to meet the minimum requirements of FAA regulations for obstruction lighting. The Applicant will also apply for tall structure permits from the Minnesota Department of Transportation (MnDOT).

8.4.3 Shadow Flicker

Shadow flicker with regard to wind turbines is a recurring change in light intensity perceived by a receptor (such as a residence, school, hospital, park, or place of business) and caused by the shadow cast by moving turbine blades. Like any tall structure, wind turbines will cast a shadow when the sun is visible. As wind turbine blades rotate, they can cast a shadow upon the ground and objects below. A flickering or flashing effect may occur where the shadows of the rotating blades cause rapid changes in light intensity. This change in light intensity is commonly referred to as shadow flicker.

Multiple independent conditions must be met in order for shadow flicker to occur. These conditions are further described below:

- Number, size, and position of windows: In order for shadow flicker to be perceived within a building, windows must be facing the sun, and an operating turbine blade must be between the window and the sun.

- Ambient lighting conditions: If inside, having lights on may significantly diminish the perception of shadow flicker.

- Cloud cover: When the sunlight is obscured by clouds shadow flicker is reduced or eliminated.

- Time of day: It must be daytime for shadow flicker to occur. Very early and very late in the day, when the sun is very low to the horizon, the turbine's shadow is long and diffuse such that the perception of flicker is diminished. In the middle of the day the shadow does not extend far from the base of the turbine and is generally confined to areas within setback distances and away from homes.

- Season: The sun travels further from the horizon during the summer and closer to the horizon during the winter. As the seasons change the shape and location of a turbine's shadow will

also change significantly. This limits the number of consecutive days a home may receive shadow flicker.

- Visual Screening: Objects such as trees, buildings, awnings, blinds and drapes can all reduce or eliminate the potential for shadow flicker.

- Location of wind turbines: Because Minnesota is in the northern hemisphere, the sun is in the southern sky which causes turbine shadows to occur mostly to the north of the turbines.

- Operation of the wind turbine: A wind turbine that is not spinning cannot cause shadow flicker. Turbines may not be spinning because the wind is above or below its operating speeds, or they may be offline for maintenance.

- Orientation of the wind turbine: A wind turbine faces into the wind, which may or may not be into the sun. The shape and size of a wind turbine's shadow changes based on which direction it is facing relative to the sun. If the turbine is facing directly into or away from the sun, it will cast the largest shadow. If it is facing directly perpendicular to the sun, it will cast the smallest shadow.

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

Impacts

WindFarm software version 4.0.2.3 was used to model the preliminary Project layout for potential shadow flicker at residences in and around the Project Area. The model is a worst-case-scenario analysis based on a 1.0 m square horizontal window at 2.0 m above ground level with a full, unimpeded view of the turbine in daylight hours.

Sunshine probability assumptions are based on 30 years of data for the Minneapolis/St. Paul Airport, and are shown in Table 8.

Table 8: Expected Percent Sunshine by Month

Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
53%	59%	57%	58%	61%	66%	72%	69%	62%	55%	39%	42%

WindFarm uses the above assumptions to simulate the turbine shadows throughout a year and determine the expected amount and location of shadow flicker. Local obstacles such as trees and specific window configurations were not included in the model and may further reduce the noticeable shadow.

As detailed above, the potential for shadow flicker is based on varying degrees and combinations of multiple independent conditions. Table 9 shows the average expected hours of shadow flicker in a typical year for homes within the Project Area. Based on the preliminary Ellerth Windpark turbine layouts and turbine model choices, the most shadow flicker expected on any one home is 46.7 hours in a year, or less than 1% of all daytime hours.

Mitigation

Ellerth Wind has taken considerable effort to site turbines carefully and responsibly to minimize the impact of shadow flicker to the area. The potential for shadow flicker will continue to be considered during development, construction, and operation of the Project. A 1,000 ft (305 m) minimum setback from residences has been incorporated in turbine layout design. Although unlikely to occur, specific cases of documented excessive shadow flicker will be addressed on a case by case basis. Additional mitigation options the Project may consider include visual screening such as trees, awnings, curtains or blinds, adjusting the operation and orientation of the turbine during flicker periods. Some wind turbine manufacturers being considered for the Project also offer a shadow control option which monitors and mitigates this unlikely condition if controlled curtailment becomes necessary.

Table 9: Summary of Shadow Flicker at Receptors within the Project Area

Receptor	Shadow (hours/year)		
	GE 1.6 MW (RD 100 m 328.1 ft)	Vestas 1.8 MW (RD 90 m 295.3 ft)	Siemens 2.3 MW (RD 101 m 331.4 ft)
R1	8.1	6.6	8.1
R2	29.1	18.6	29.6
R3	27.5	17.1	27.8
R4	41	28.1	40.8
R5	17.7	15.	18.7
R6	27.2	15.7	26.1
R7	10.9	8.9	10.7
R8	44.5	37.7	43.9
R9	32.8	27.3	32.5
R10	12.6	10.2	12.6
R11	8.2	6.8	8.2
R12	44.8	26.8	43.6
R13	46.7	38.5	45.6

Receptor	Shadow (hours/year)		
	GE 1.6 MW (RD 100 m 328.1 ft)	Vestas 1.8 MW (RD 90 m 295.3 ft)	Siemens 2.3 MW (RD 101 m 331.4 ft)
R14	26.9	16.2	26.2
R15	19.6	12.7	17.5
R16	12.4	9.7	15.1
R17	15.2	13.9	16.3
R18	29	25.7	31
R19	14.5	11.8	14.3
R20	36.2	26.9	36.2
R21	33.4	27.7	32.7
R22	14.6	11.7	13.6
R23	9.1	7.5	9.2
R24	28.3	9.6	28.4
R25	43.6	38	45.4
R26	18.3	13.3	16.7

8.5 Public Service and Infrastructure

The phrase "Public Services" generally refers to services provided by government entities to its citizens 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 lightly populated, rural area in northwestern 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 Marshall County are associated with the larger city of Warren, located approximately 12 miles southwest of the Project Area. Outside the city, landowners are typically serviced with privately-owned septic systems and wells.

The closest hospital services are in Warren and Thief River Falls. The nearest fire departments are within the cities of Newfolden, Viking, Argyle, and Warren. Law enforcement is serviced by the Marshall County Sheriff's department, which is based out of Warren.

The Project is expected to have a minimal effect on the existing community infrastructure. The following is a brief description of public service resources and impacts that may occur during the construction and operation of the Project.

8.5.1 Roads

In general, the existing roadway infrastructure in and around the Project Area is characterized by county and township roads that generally follow section lines (see Map 7). Various County State Aid Highways (CSAH)s, County Roads (CR)s, and township roads provide access to the Project Area. Access to the Project Area also includes two-lane paved and gravel roads. Many landowners use private single-lane farm roads and driveways on their property.

U.S. Highway 59 runs northwest-southeast approximately 5 miles from the eastern edge of the Project boundary. There are eight CSAHs within the Project Area: CSAH 4, 11, 14, 28, 31, 3, 37, and 38. There are two CRs within the Project Area: CR 114 and CR 115.

The existing traffic volumes on the area's county highways are documented in Table 10 and depicted on Map 7. For purposes of comparison, the functional capacity of a two-lane paved rural highway is in excess of 5,000 vehicles per day, or Annual Average Daily Traffic (AADT). The highest existing AADT in or near the Project Area is 570 vehicles per day along CSAH 28. Along the remaining county highways, the AADTs are generally below 500 vehicles per day (MnDOT 2003).

Constructing the Project will require approximately 17.8 miles of gravel access roads, depending on the size of turbine selected and final design. In addition, during operation of the Project, the access roads will be used by operation and maintenance crews while inspecting and servicing the wind turbines. The access roads will be between towers and one road will be required for each tower string. Proposed access 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 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.

During the construction phase, several types of light, medium, and heavy-duty construction vehicles will travel to and from the Project Area, as well as private vehicles used by the construction personnel. The Applicant estimates that there will be approximately 75 large truck trips per day and up to approximately 175 small-vehicle (pickups and automobiles) trips per day in the area during peak construction periods. That volume will occur during the peak time when the majority of the foundation and tower assembly is taking place. At the completion of each construction phase, this equipment will be removed from the Project Area or reduced in number. Prior to construction, the Applicant will coordinate with local jurisdictions (county and township) in order to obtain the necessary road access and overwidth/overweight permits.

Traffic control measures and coordination with local authorities will be implemented to ensure public health and safety is protected with respect to this Project. Construction is not anticipated to result in adverse traffic impacts. Operation and maintenance activities will not noticeably increase traffic in the Project Area.

Table 10: Existing Traffic Volumes within the Project Area

Roadway	Existing Annual Average Daily Traffic (AADT)
CSAH 4	495
CSAH 11	210
CSAH 14	70
CSAH 28	570
CSAH 31	40
CSAH 37	20
CSAH 38	85
CR 114	10
CR 115	70

There is currently one high voltage transmission line in the Project Area. The Otter Tail Power Company has a 115 kV transmission line running north to south through the center of the Project Area. Two 69 kV transmission lines (owned by Minnkota Power Cooperative, Inc and Otter Tail Power Company) also run east to west through the Project Area.

8.5.2 Telecommunications

Telephone service in the area is provided to farmsteads, rural residences and businesses by Frontier Communications, Wikstrom Telephone Company, and Polar Communications. Construction and operation of the proposed wind farm is not expected to impact telephone service to the Project Area. Prior to construction, a utility locate service will be contacted to locate underground facilities so they can be avoided. The Applicant will coordinate collector line placement with local telecommunications providers and avoid installing collection lines parallel or in close proximity to existing copper telephone lines if concerns exist regarding the

possibility of magnetic field interaction and telephone circuit noise. The Applicant will comply with and satisfy all Institute of Electrical and Electronics Engineers, Inc. (IEEE) standards applicable to this Project including, but not limited to, IEEE 776 [Recommended Practice for Inductive Coordination of Electric Supply and Communication Lines], IEEE 519 [Harmonic Specifications], IEEE 367 [Recommended Practice for Determining the Electric Power Station Ground Potential Rise and Induced Voltage from a Power Fault], and IEEE 820 [Standard Telephone Loop Performance Characteristics] provided the telephone service provider(s) have complied with any obligations imposed on the provider(s) pursuant to these standards. At this time, no impacts are anticipated to telephone service, however to the extent Project facilities cross or otherwise affect existing telephone lines or equipment, the Applicant will enter into agreements with service providers to avoid interference with their facilities.

8.5.3 Communication Systems

Microwave Beam Paths

The Applicant completed an internal evaluation of licensed non-federal government microwave beam paths in the vicinity of the Project Area and requested a GeoPlanner report from Comsearch (Appendix C). Both evaluations determined that a single active beam path exists within the Project vicinity (see Map 7). A setback of 200 m (656 ft) was applied around each beam path to ensure the Worst Case Fresnel Zone would not be encroached on by any portion of the turbine infrastructure including blades.

Additionally, through discussions with operators active in the vicinity of the Project Area, an additional beam path operated by Unicel (see Map 3) was identified and buffered by 150 m (492 ft) to ensure service was not disrupted.

The Applicant also reviewed anticipated microwave beam paths in Marshall County and identified an anticipated Minnesota Department of Transportation (MnDOT) tower network in the vicinity of the Project Area. Ellerth Wind contacted MnDOT about the tower network and received a letter from MnDOT dated September 27, 2011 stating that there will not be any towers within the Project Area and the Project will have no adverse affect on MnDOT's microwave beam paths (Appendix A).

AM/FM Radio

The Applicant undertook a search of all AM & FM broadcast stations within the vicinity of the Project and requested an AM/FM Radio report from Comsearch (Appendix C). Within a 30km (18.6 mile) radius of the turbine locations, 7 FM records and 1 AM record were identified. The closest FM and AM records are over 16 miles from the nearest turbine.

According to the Comsearch AM/FM Report, FM stations' coverage when they are at distances greater than 4 km (2.5 miles) from wind turbines are not subject to degradation. As long as all

wind turbines in the Project are not located closer than 4 km (2.5 miles) from the FM stations' antennas, signal degradation should not occur. As a result no FM interference is expected.

According to the Comsearch AM/FM Report, the potential for interference with AM broadcast coverage attributable to wind farms is only anticipated when broadcast stations with directive antennas are within 3.2 km (2 miles) of turbine towers and broadcast stations with non-directive antennas are within 0.8 km (0.5 miles). As a result no AM interference is expected.

Although a structure depicted as "Radio Tower" is depicted on the topographic map on Map 1b, according to the FCC data reviewed by the applicant and by Comsearch, the only FCC licensed system currently on this tower is a 2-way radio land-based system (WQMF620).

Fixed Land Mobile Stations

The Applicant undertook a search of the FCC Wireless Telecommunications Bureau's Land Mobile database (last updated August 8, 2010) for land mobile stations. Within the Project Area, one commercial land mobile record and two private land mobile records were identified (FCC 2010). Fixed land mobile stations can provide critical telecommunications services such as emergency response, public safety, and local government communications.

Land mobile sites are typically unaffected by the presence of wind turbines as the frequencies of operation for these services have characteristics that allow the signal to propagate through wind turbines. As a result, change in their coverage associated with wind turbine installation is not expected. In the unlikely event a land mobile licensee believes their coverage has been compromised by the presence of the Project, there are options to improve signal coverage through optimization of a nearby base station or adding a repeater site. Utility towers, meteorological towers or even the turbine towers within the wind Project Area can serve as the platform for a land mobile base station or repeater sites.

8.5.4 Television

The Applicant requested a report of television records from Comsearch for television stations in the vicinity of the Project (Appendix C). According to the report from Comsearch, there are 13 database records within 65 km (40 miles) of the Project Area. Of these 13 records, six are currently licensed and operating, two of which are low-power TV stations or translators. Translators receive signals from distant broadcasters and rebroadcast the signal to local audiences. The four full-power stations (KBRR, KGFE, KCGE, and KCPM) are located southwest of the project area, the nearest being located approximately 21.1 miles south-southwest of the nearest turbine, and approximately 1.5 miles east of the intersection of County Highway 19 and Highway 75, near Euclid, Minnesota. The remaining full-power station is located approximately 32 miles southwest of the nearest turbine, approximately 1 mile north of East Grand Forks, Minnesota.

According to the Comsearch report, the four full-power digital stations may have disrupted reception in and around the Project, particularly those on the opposite side of the wind turbines from the broadcast stations (i.e. north and northeast). However, based on the low number of local TV channels available, off-air television stations may not be the primary mode of TV service, and direct broadcast satellite may be the dominate delivery mode of TV service in the surrounding communities.

Construction and operation of the proposed wind farm will be designed to avoid adverse impact to telephone, television, internet, or cellular phone service. To the extent Project facilities are installed in proximity to existing telephone lines or communication equipment, the Applicant will closely coordinate with the applicable service providers to avoid interference with such facilities. Should inadvertent impacts to these systems arise after construction, the Applicant will work with affected residents to determine the cause of interference and, where necessary, reestablish acceptable reception in a timely fashion.

8.5.5 Other Local Services

Pipelines

Two pipelines are present in the vicinity of the Project. The closest turbine is over 1,500 ft from the nearest pipeline (see Map 7), which is well in excess of the Ellerth Wind's minimum setback distance of 1.1 times the height of the turbine. As a result, pipelines will be unaffected by the Project.

Electrical Services

There are three electric transmission lines traversing the Project Area (see Map 7). A 115kV conductor operated by Otter Tail Power runs north-south through the eastern portion of the Project Area for approximately 8 miles. A 69kV transmission line operated by Minnkota Power runs east-west through the southern portion of the Project Area for approximately 7 miles. A second 69kV transmission line operated by Otter Tail Power bisects the northeastern corner of the Project Area for approximately 7 miles. Ellerth Wind has applied a protective setback of at least 1.1 times the height of the turbine from all transmission lines.

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

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 Applicant will obtain all relevant permits or authorizations from road authorities relating to any electrical cables and/or feeder lines that may be proposed to be placed in a public road right-of-way and the transport of oversize materials and equipment related to the Project over public roads (see Section 11 for a list of anticipated permits necessary for Project construction). Due to the relatively minor impacts expected to the existing infrastructure during the Project construction and operation, extensive mitigation measures are not anticipated.

8.6 Cultural and Archaeological Resources

In an attempt to provide a cursory review of the cultural resources within the Project Area, a record search and review of existing records was conducted for those records contained at the SHPO in the Minnesota Archaeology Inventory database and the Standing Structures Inventory database. The records search was conducted to determine if significant archeological, architectural, or tribal resources have been documented within the proposed Project Area or the vicinity. Online sources were reviewed to identify known archeological, architectural, or historic properties on or adjacent to the Project Area. These sources investigated included the National Park Service's (NPS) National Archeological Database (NPS 2011) and the National Register of Historic Places (NRHP 2011). Additional library resources were also consulted for historical and archeological sources relevant to northwestern Minnesota. The results of the cultural resource review are summarized in the sections below.

8.6.1 Historic and Archaeological Sites

A total of 10 archaeological sites were identified either in or within 0.5 miles of the Project Area based on review of the records noted in Section 8.6. Of these, three archaeological sites (21MA02 – Andeen Site, 21MA03, 21MA06 – Haarstad Mound) are documented within the proposed Project Area. Site 21MA02 is Native American artifact scatter located near the confluence of the Snake River and an unnamed stream. Site 21MA03 is a Native American Woodland Period earthen mound/burial located near the confluence of the Snake River and an unnamed stream. Site 21MA06 is a Native American Woodland Period earthen mound/burial located on a glacial beach ridge 1.25 miles southeast of the Middle River. Unlike the other archaeological sites documented near the Project Area, Site 21MA06 is not located near a waterway. The seven other archaeological sites located within 0.5 miles of the Project Area are generally located along the Snake and Middle Rivers. These sites are predominantly Native American artifact/lithic scatters and to a lesser extent, earthen mounds/burials (Table 11; Map 8). Two of the ten archaeological sites located in the Project Area vicinity are eligible for listing on the NRHP.

Table 11: Archaeological Sites Documented within 0.5 miles of the Project Area

Site Number	Name	Location	Description	NRHP Status
Within the Project Area				
21MA02	Andeen Site	SW ¼ of S6, T155N, R45W	Native American Artifact Scatter	Not Evaluated
21MA03	N/A	NE ¼ of S6, T155N, R45W	Native American (Woodland) Earthen Mound/Burial	Not Evaluated
21MA06	Haarstad Mound	NW ¼ of S1, T156N, R46W	Native American (Woodland) Earthen Mound/Burial	Not Evaluated
Within 0.5 miles of the Project Area				
21MA01	Snake River Mounds	NW ¼ of S7, T155N, R45W	Native American (Woodland) Earthen Mounds/Burial	Not Evaluated
21MA28	Middle River Site	SE ¼ of S31, T157N, R44W	Native American (Paleoindian, Archaic, Woodland) Artifact Scatter	Eligible
21MA29	N/A	SE ¼ of S31, T157N, R44W	Native American Artifact Scatter	Not Eligible
21MA30	N/A	SE ¼ of S31, T157N, R44W	Native American Artifact Scatter	Not Evaluated
21MA39	Snake River Site	NE ¼ of S12, T155N, R46W	Native American (Woodland) and Euro-American Artifact Scatter	Eligible
21MA40	N/A	NE ¼ of S12, T155N, R46W	Native American Isolated Find	Not Eligible
21MA72	N/A	NE ¼ of S12, T155N, R46W	Euro-American Artifact Scatter and Structural Ruin	Not Evaluated

Architectural History Properties

No architectural history properties were documented within the Project Area. One property, MA-FOL-002 (Gas Station) and one NRHP district (Old Mill State Park WPA) are located within 0.5 miles of the Project Area (Map 8). Property MA-FOL-002 has not been evaluated for the NRHP; however, the Old Mill State Park was listed as a district in 1989. In 1989, the Old Mill State Park WPA Historic District included three buildings (Shelter Building, Latrine, and Beach House), fours structures (Diversion Dam, Swimming Beach, Suspension Beach, and Water Tower), and one object (Drinking Fountain). In November 2010, 11 additional buildings and structures were added to the district as contributing elements. The district defines the original development in the park and contains no intrusive elements.

National Register Listed or Eligible Properties

No NRHP eligible or listed archaeological sites or architectural history properties are documented within the Project Area. Two of the ten archaeological sites documented within 0.5 miles of the Project Area are considered eligible for listing on the NRHP. At this time, these two sites (Table 11) are outside the Project Area and should not be directly impacted by the proposed Project.

One NRHP Historic District (Old Mill State Park WPA) is located within 0.5 miles of the Project Area.

General Land Office Maps

The Original Public Land Surveyor (PLS) Maps from 1872, 1873, 1877, and 1878 indicated that the proposed Project Area was mostly prairie and marshland at the time of initial survey. Several waterways including the Snake and Middle Rivers were labeled on the PLS Maps.

The only cultural resource observed on the PLS Maps was the Pembina Trail. Although labeled as the "Pembina Trail," this trail was officially known as The Woods Trail (see Map 8) or the Crow Wing Trail, and was the eastern most of the Red River Ox-Cart Trails (Gilman et al 1979). This trail which operated from the 1840s to the early 1870s, originated in St. Paul, Minnesota and transected the western side of the Project Area on its way to Pembina, North Dakota.

8.6.2 Impacts

While Ellerth Wind will attempt to avoid archaeological sites, the proposed construction activities for the Project may have the potential to impact such sites or add to the visual impacts in the region of the Project Area. The potential for directly impacting the known archaeological sites (21MA02, 21MA03, and 21MA06) within the Project Area is relatively low; however, there is a potential for impacting undocumented archaeological sites within the area. Due to the presence of Native American earthen mounds/burials, NRHP-eligible archaeological sites, and the Woods Trail within the vicinity of the Project Area, Ellerth Wind will conduct a Phase I Archaeological Survey prior to construction for areas to be directly impacted by the proposed Project. This survey will be completed to inform micrositing decisions and avoid impacts.

The proposed Project also has the potential to visually affect the Old Mill State Park WPA Historic District located within 0.5 miles of the Project Area. Potential impacts to the Old Mill State Park WPA were discussed during an informal meeting with the Applicant and Ms. Kelly Gragg-Johnson, SHPO Review and Compliance Associate, in January 2011. The main discussion points during this informal meeting were summarized in letter dated February 11, 2011 (Appendix A). Ellerth Wind will produce photo simulations using photos taken during leaf-on conditions per the SHPO's request to help model how much of the Project may be visible

from the area of Old Mill State Park that is part of the National Register District. Potential visual impacts to the park for recreation purposes are discussed in Section 8.4.1.

8.6.3 Mitigation

Ellerth Wind will attempt to avoid impacts to identified archaeological and historic resources to the extent possible. If archaeological or historic resources are found during cultural resource investigations or during construction, the integrity and significance of such resources will be determined and an assessment of the Project's potential impacts upon the resource will be made. If avoidance is not possible, appropriate mitigative measures will be developed in consultation with the Minnesota SHPO and Office of the State Archaeologist.

8.7 Recreational Resources

8.7.1 Description of Resources

Park and recreation areas provide opportunities for both active and passive recreation for Marshall County residents and visitors. There are many existing recreational resources in the vicinity of the proposed Project Area, including public hunting grounds, trails, rivers, WMAs and parks. Map 6 depicts the locations of State Parks, DNR WMAs and other recreational resources near the proposed Project Area. Table 12 lists the State Parks, DNR WMAs and other recreational resources and their locations relative to the Project Area.

Minnesota WMAs are managed to provide wildlife habitat, improve wildlife production, and provide public hunting and trapping opportunities. These DNR lands were acquired and developed primarily with hunting license fees. WMAs are closed to all-terrain vehicles and horses because of potential detrimental effects on wildlife habitat. There are 10 WMAs located within ten miles of the Project Area boundary.

One WMA is located within the Project Area. The Adolph Elseth Memorial WMA is located in the north-central portion of the Project Area (Map 6). The terrain on this small 40-acre unit is flat and the habitat is comprised of aspen woodland, emergent wetland, and upland deciduous shrubland. Management of this unit is to preserve the mosaic of habitats associated with the aspen parkland ecosystem. Although it is a small area, this WMA does provide an important island of habitat and cover for a variety of species including deer, ruffed grouse, sharp-tailed grouse, woodcock, furbearers, and other wildlife (DNR 2010).

One additional WMA is located within one mile of the Project Area. The Wright WMA is located adjacent to the northwestern boundary of the Project Area (Map 6). Wright WMA is a 400-acre unit containing restored prairie, aspen woodland, and northern hardwood forest lying along the Middle River. Recreation opportunities at this WMA include hunting and wildlife viewing of deer, small game, forest game birds, and waterfowl (DNR 2010).

Table 12: Recreational Resources within 10 miles of the Project Area.

Resource	Approximate Location	Acres
Snowmobile Trails		
MC Trails	Five miles south of Project Area	N/A
Middle River/Strathcona Driftskippers Trail	One mile east of Project Area	N/A
Pelan Trail/Roseau Trailblazers/BISF #1 Trail	Five miles north of Project Area	N/A
Riverland North Trail	Eight miles east of Project Area	N/A
WMAs		
New Folden WMA	Three miles east of Project Area	200
Adolf Elseth WMA	Within north central portion of Project Area	43.8
Florian WMA	Five miles north of Project Area	1,529.2
West Valley WMA	Three miles north of Project Area	247.3
New Maine WMA	Four miles northeast of Project Area	2,667.2
Alces WMA	Four miles north of Project Area	75.1
Wright WMA	Adjacent to north western Project Area	393.7
Spruce Valley WMA	Five miles east of Project Area	80.9
East Park WMA	Six miles northeast of Project Area	10,427.4
Huntly WMA	Nine miles northeast of Project Area	6,505.6
State Parks		
Old Mill State Park	One mile west of Project Area	406.8

Scientific and Natural Areas (SNAs) are areas designated to protect rare and endangered species habitat, unique plant communities, and significant geologic features that possess exceptional scientific or educational values. There are no SNAs within the Project Area.

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

USFWS administers a program by which the USFWS holds easements on private lands that have wetlands and/or grassland habitat. Development may be restricted on lands held in a USFWS

easement. According to the USFWS, no easements (conservation, wetland or grassland) are known to exist within the Project Area.

No National Wildlife Refuges (NWRs) were identified within the Project Area or a ten-mile radius.

Old Mill State Park is located immediately west of the Project Area (Map 6). The approximately 406.8-acre park contains riverine forest, small areas of oak savanna, and prairie. The river valley that runs through the park acts as an access corridor for many species including beaver, white-tailed jackrabbit, snowshoe hare, and numerous bird species (DNR 2010b).

Two snowmobile trails are located within 5 miles of the Project Area (Map 6). MC Snowmobile Trail 106 runs north-south through Old Mill State Park, approximately 1 mile west of the Project Area boundary. The Middle River/Strathcona Driftskippers Trail runs north-south just east of the Project Area boundary. Two additional snowmobile trails (Pelan Trail and Riverland North Trail) are located within 10 miles of the Project Area boundary.

8.7.2 Impacts

The Project has been designed in such a way that it will avoid direct impacts to recreational resources; no turbines have been sited within public lands. Ellerth Wind has applied a setback of five rotor diameters (505 m; 1,657 ft) from state WMAs and Old Mill State Park. The closest Project facilities are located over one mile from the Old Mill State Park. In general, recreational impacts will be visual in nature affecting individuals using public land near the Project Area for recreation. See Section 8.4 for additional discussion of visual impacts and proposed mitigative measures. Visual impacts will be most evident to visitors using the WMAs, state park, and snowmobile trails within a four-mile radius of the site. No significant impacts to recreational resources are anticipated. No impacts to tourism and community benefits are expected.

8.7.3 Mitigative Measures

The Project does not plan or expect any encroachment into publicly owned lands; therefore, mitigation measures are not proposed at this time.

8.8 Public Health and Safety

8.8.1 EMF

Electromagnetic Fields (EMF) arise from the movement of electrical charge on a conductor such as transmission lines, power collection (feeder) lines, substation transformers, house wiring, and electrical appliances. The intensity of the electric portion of EMF is related to the potential, or voltage, of the charge on a conductor, and the intensity of the magnetic portion of the EMF is related to the flow of charge, or current, through a conductor. EMF is commonly associated with

power lines, but they occur only at close range because the electric field rapidly dissipates as the distance from the line increases (EPA 2010).

Extensive research has been conducted by the National Institute of Environmental Health Sciences (NIEHS 1999). The scientific evidence suggesting that extremely low frequency EMF exposures pose any health risk is weak. In 2002, NIEHS prepared a booklet that summarized worldwide EMF health research studies conducted after 1999 (NIEHS 2002). The NIEHS determined that since 1995, the two major U.S. reports concerning the impact of EMF exposure on human health both concluded that "limited evidence exists for an association between EMF exposure and increased leukemia risk, but when all the scientific evidence is considered, the link between EMF exposure and cancer is weak."

The Minnesota Environmental Quality Board (EQB) addressed the matter of EMF with respect to new transmission lines in a number of separate dockets from 2003 to 2005. See Docket Nos. 03-64-TR-XCEL (161 kV Lakefield Junction to Fox Lake Substation line); 03-73-TR XCEL (345 kV Split Rock Substation to Lakefield Junction Substation line); 04-84-TR-XCEL (115 kV Buffalo Ridge Substation to White Substation line) and 04-81-TR-Air Lake-Empire (115 kV line in Dakota County). In June 2005, in Docket No. 03-73-TR-XCEL for the 345 kV line connecting the Split Rock and Lakefield Junction substations, the EQB made the following finding with regard to EMF: "No significant impacts on human health and safety are expected from the Project. There is at present insufficient evidence to demonstrate a cause and effect relationship between EMF exposure and any adverse health effects. The EQB has not established limits on magnetic field exposure and there are no Federal or Minnesota health-based exposure standards for magnetic fields. There is uncertainty; however, concerning long term health impacts and the Minnesota Department of Health and the EQB all recommend a "prudent avoidance" policy in which exposure is minimized."

While there is no conclusive research evidence that EMFs pose a significant health impact from power lines and wind turbines, the turbines will be installed beyond the minimum allowable distances from occupied residences, where EMF is expected to be at background levels unrelated to wind farm proximity. EMFs from underground electrical collection and feeder lines dissipates very quickly and relatively close to the source because they are installed below ground to a depth of approximately 48 inches, and are heavily insulated and shielded. Consequently, the electrical fields that emanate from buried lines and transformers are generally considered negligible, and magnetic fields often decrease significantly within approximately 3 feet of stronger EMF sources (such as transmission lines and transformers) (NIOSH 2011). Based upon current research regarding EMFs and the separation distances being maintained between transformers, turbines and collector lines from public access and occupied homes, EMFs associated with the Project are not expected to have an impact on public health and safety.

8.8.2 Aviation

There are no airports located within the vicinity of the Project Area. The two nearest airports are the Karlstad Municipal Airport and Warren Municipal Airport, located approximately 16 miles north and southwest of the Project Area, respectively. Both airports are public. Karlstad Municipal Airport has one runway at an elevation of 1,025 ft; and Warren Municipal Airport has two runways, both at an elevation of 886 feet.

Low altitude air traffic may be present near the Project for crop dusting of agricultural fields. Crop dusting is typically carried out during the day by highly maneuverable airplanes or helicopters. The installation of wind turbine towers in active croplands and installation of overhead collection lines, if needed, will create a potential for collisions with crop-dusting aircraft. However, overhead collection lines are expected to be similar to existing transmission and distribution lines (located along the edges of fields and roadways) and the turbines themselves would be visible from a distance and lighted according to FAA guidelines.

Because the proposed turbine structures will exceed 200 ft above ground level, FAA notification is required, and an aeronautical study must be completed. The preliminary turbine locations for the Project have been reviewed by the FAA and all have received a determination of "No Hazard". The FAA review was for turbines with total height of up to 493 feet. The wind and meteorological towers will have lighting to comply with FAA requirements. Project planning, construction and operation will be closely coordinated with air traffic agencies and facilities to ensure public safety is not adversely impacted by the Project.

The Applicant will mark and light the turbines to comply with FAA requirements. The Applicant will paint meteorological towers red at the top to improve visibility and will notify local airports about the Project and new towers in the area to reduce the risk to crop dusters. Permanent meteorological towers will be free-standing with no guy wires.

8.9 Hazardous Materials

8.9.1 Description of Resources

A review of potentially hazardous materials in the Project Area was conducted using the publicly available MPCA "What's in My Neighborhood" database (http://pca-gis02.pca.state.mn.us/wimn2/index.html). The MPCA database revealed the presence of six feedlots, a construction stormwater permit site, and a closed landfill within the Project Area boundaries

The land within the Project Area is primarily rural and used for agriculture. Potential hazardous materials within the Project Area would be primarily associated with agricultural activities, such as feedlots. Other agricultural hazardous waste may include petroleum products (fuel and lubricants), pesticides, and herbicides. Older farmsteads may also have lead-base paint, asbestos

shingles, and polychlorinated biphenyls (PCBs) in transformers. Trash and farm equipment dumps are common in rural settings.

There will be three types of fluids used in the operation of the wind turbines that are petroleum products. These fluids are necessary for the operation of each turbine and include:

- Gear box oil – synthetic or mineral depending on application
- Hydraulic fluid
- Gear grease

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

8.9.2 Impacts

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

8.9.3 Mitigation

Because there are no proposed impacts to hazardous waste sites, no mitigative measures are necessary. If any wastes, fluids, or pollutants are generated during any phase of the operation of the Project, they will be handled, processed, treated, stored, and disposed of in accordance with local, state and federal regulations.

8.10 Land-Based Economics

8.10.1 Description of Resources

Agriculture/Farming

The majority of the Project Area (85%) has been classified in the National Land Cover 2001 Dataset (NLCD) (Homer 2004) as cultivated farmland (Map 9 and Table 13). Cultivated crop areas are defined in these data as those "used for the production of annual crops, such as corn, soybeans, vegetables, tobacco, and cotton, and also perennial woody crops such as orchards and vineyards".

According to the 2007 agricultural census, the top crop items (acres) within Marshall County are wheat, soybeans, sugar beets, barley, and sunflower seed and top livestock inventory include cattle and calves. The number of farms has decreased from 2002 to 2007 yet the number of acres harvested has increased slightly suggesting that a trend is toward fewer and larger farms (USDA 2009).

Converting cropland to the CRP and the RIM program is another source of farm income. CRP land is cropland planted to conservation grasses and legumes to protect and improve the soil and cannot be harvested or pastured. Under the CRP, landowners are compensated for taking agricultural land out of production for a set contract period, and payments are made on a per-acre basis. While wind development is allowed within CRP parcels, coordination with landowners and the NRCS is necessary to withdraw the impacted areas from the CRP contract, and to compensate the NRCS for any payments already distributed for those areas. The RIM program encourages landowners to retire environmentally sensitive land from agricultural production and provides assistance to restore these areas to grass, trees, or wetlands. CRP is enrolled for 10-year periods, whereas RIM easements are permanent conservation easements. According to the NRCS, there are approximately 11,707 acres of land enrolled in CRP located within the Project Area; approximately 2,026 acres with contracts expiring in 2011 and approximately 3,280 acres with contracts expiring in 2012. There is one RIM easement of approximately 79 acres located in the northeaster portion of the Project Area that has been designated a wetland restoration area.

Table 13: Land Cover Classes within the Project Area

Land Cover Class[1]	Acres
Cultivated Crops	28,664.6
Deciduous Forest	1,637.1
Developed, Open Space	1,234.9
Emergent Herbaceous Wetlands	705.9
Pasture / Hay	684.7
Woody Wetlands	507.5
Developed, Low Intensity	133.4
Shrub/Scrub	64.6
Grassland / Herbaceous	59.6

Land Cover Class[1]	Acres
Open Water	15.7
Evergreen Forest	1.0
Total Land Cover	**33,709**

[1] Land Cover Class as presented in National Land Cover 2001 Dataset

Large-scale animal production has been a growing component of the agricultural industry in recent years; however, based on the 2007 Agricultural Census, Marshall County is a very small producer of hogs and cattle (USDA 2009). The MPCA records 109 registered feedlots in Marshall County (MPCA 2010) and only 6 within the Project Area.

The U.S. Department of Agriculture (USDA) NRCS identifies prime farmland as the land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. It could be cultivated land, pasture land, forestland, or other land. Important farmlands consist of prime farmland, unique farmland, and farmland of statewide or local importance. Based on Soil Survey Geographic Database (SSURGO) soils data, 22% of the Project Area is identified as prime farmland, 27 % as farmland of statewide importance, and 38% would be prime farmland if drained (see Map 10).

Forestry

Marshall County is in a region of Minnesota historically known for its prairie grasslands. Economically important forestry resources are not found in this region of Minnesota. Forested areas are primarily associated with homes in the form of woodlots and along creeks within the Project Area.

Mining

Nonfuel raw mineral production in northwestern Minnesota consists mainly of construction sand and gravel, and peat (USGS 2010). Sand and gravel resources occur in glacial till and outwash deposits; 2 active gravel mines are present within the west-central portion of the Project Area (MnDOT 2003). Hawkes Company, Inc. mined on about 87 hectares of private and State-leased land, producing reed-sedge peat northeast of Newfolden and outside of the Project Area (USDA 2010).

8.10.2 Impacts

Specific impacts to agricultural lands will be determined once turbine and road placement and substation/O&M facility locations have been finalized. The loss of agricultural land to the

construction of the wind farm will reduce the amount of land that can be cultivated. Only a very small portion of the Project Area will be converted to non-agricultural land use, and this will not significantly alter crop production in the Project Area or Marshall County. To the extent practicable, temporary staging areas will be placed in previously disturbed locations to minimize the impact to agricultural production.

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

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

Impacts to mining are not anticipated. Sand and gravel operations tend to be small and other occurrences of these materials are likely to be present in nearby areas. Peat is not currently being harvested within the Project Area.

The Applicant will avoid all impacts to RIM land located within the Project Area. The Applicant's first approach will be to avoid impacting CRP land. Should impacts to CRP land become necessary, the Applicant will minimize these impacts and will work to retain surrounding lands in CRP.

8.10.3 Mitigation

Only land used for the turbines, certain electrical equipment, and access roads will be taken out of crop production. Once the wind turbines are constructed, all land surrounding the turbines and access roads may still be farmed.

In the event that 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 the agreement between the Project Owner and the owner of any damaged tile.

If CRP land is impacted, the Applicant will work with the landowner to remove the impacted portion of the parcel from the CRP. There will be no impacts to RIM land; therefore no mitigation will be necessary.

8.11 Tourism

8.11.1 Description of Resources

Tourism in northwestern Minnesota and Marshall County is based predominantly on the area's game and wildlife, lakes, farms, and villages. Also publicized are cultural (museums, art, and antiques) and recreational activities such as parks, hiking trails, camping, canoeing, horseback riding, fishing, wildlife refuges, snowmobiling, golf courses, swimming pools, and cross country skiing. A variety of festivities and cultural events are hosted throughout the year (Northwest Regional Development Commission 2011).

As noted in Section 8.7, Old Mill State Park is located within close proximity to the Project Area. Old Mill State Park hosts about 14,500 visitors each year and includes attractions such as a log cabin and steam-powered flour mill (DNR 2010b).

8.11.2 Impacts

No significant impacts to local tourism are anticipated. The Project will avoid all WMAs, USFWS lands, and public parks. In general, impacts to tourism will be visual in nature affecting individuals using public land near the Project Area for recreation. Visual impacts will be most evident to visitors using the WMAs, state parks, and snowmobile trails within a five-mile radius of the site.

8.11.3 Mitigative Measures

See Section 8.4 for a discussion of visual impacts and proposed mitigative measures.

8.12 Local Economics

8.12.1 Economic Impacts of the Project

Approximately 200 short-term temporary jobs for construction of the Project and approximately 6 to 10 long-term permanent jobs for operation of the Project once it is built will be added to the local economy as a result of Project development. The communities near the Project are also expected to receive positive economic impacts. Short-term impacts to the socioeconomic resources of the area are expected to be minor. It is anticipated that at most roughly 30 acres of land associated with wind turbine foundations and access roads currently being used for agriculture will be removed from production for the length of the easement agreements. As per the private agreement signed between landowners and the Applicant, landowners will be compensated for temporary and permanent damages resulting from the construction of the wind energy facility. Participating landowners with fully executed agreements within the Project Area that receive a wind turbine on their property will receive compensation. Participating landowners who do not receive a turbine will be compensated for wind rights through easements. Construction is anticipated to stimulate some local industries and is not expected to have any

negative impacts to the local industries as a whole. There is no indication that any minority or low-income population is concentrated within the Project Area, or that the wind turbines will be placed in an area occupied by a minority group.

To the extent possible, Ellerth Wind plans to use local contractors and suppliers for portions of the construction. Wages and salaries paid to contractors and workers in Marshall County will contribute to the overall personal income of the region. Equipment, fuel, operating supplies, and other product and service expenses will benefit businesses in the counties and the state. Landowners having a turbine or other Project facilities on their land will receive payment annually for the life of the Project. Such payments should strengthen the local economy. Construction and operation of the Project will provide long-term beneficial impacts to the county's tax bases and contribute to improving the local economy in this part of Minnesota.

8.12.2 Tax Payments to Marshall County

In addition to creating jobs and personal income, the Project will pay an energy production tax to Marshall County and participating townships of $1.20 per MWh of electricity produced, resulting in an annual wind energy production tax projected to be between approximately $378,000 and $421,000.

8.12.3 Impacts and Proposed Mitigation

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

8.13 Topography

Elevations in the Project Area range from 968 ft above mean sea level (AMSL) in the far western portion of the Project Area to 1,099 ft AMSL in the far eastern portion of the Project Area. Elevations within Marshall County range from approximately 770 ft AMSL to 1,225 ft AMSL (USDA 2000). A digital elevation model of the Project Area is provided on Map 11. According to the Soil Survey of Marshall County, topography within the County was defined by the waters of Glacial Lake Agassiz, which left behind a series of beach ridges when it receded

Siting and construction of the turbines, associated facilities, access roads and electrical lines will require grading. The site has very good access from existing public roadways across the Project Area, which will make it possible for Ellerth Wind to minimize the overall length of new access roads. Reduction in access road length will also reduce the amount of grading required to construct the project. Significant impacts to existing topography are not anticipated because the

Project Area is of relatively consistent topography with few steep slopes. Grading within steep slope areas will be avoided to the degree practicable. Minimizing cut and fill requirements will reduce erosion control potential as well as decrease overall construction costs. Layout and siting of access roads will be completed in such a way as to tie into existing public roads, where possible, to reduce unnecessary grading.

Construction Best Management Practices (BMPs) will be implemented surrounding all graded areas in accordance with state standards, the MPCA Stormwater Best Management Practices Manual, and the approved Stormwater Pollution Prevention Plan (SWPPP) for the project. BMPs are mitigation measures applied to the development process to help ensure that construction occurs in an environmentally responsible manner, such as preventing erosion to regional waterways and wetlands. Examples of steep slope and erosion and sediment control BMPs that will be used during the construction process include silt fence, bio-rolls, temporary mulch, and seeding.

8.14 Soils

8.14.1 Description of Resources

According to the NRCS Soil Survey Geographic Database (SSURGO), there are 13 major soil map units within the Project Area. Major soil map units are considered to be those comprising greater than 500 acres of surface area within the Project Area. Table 14 lists the major soil map units within the Project Area, which are also depicted on Map 12.

The Grimstad series consists of very deep, somewhat poorly drained soils that formed in a dominantly sandy mantle of glacial lacustrine or outwash sediments over loamy glacial till or silty glacial lacustrine sediments. These soils are found on glacial lake plains and moraines. Permeability is moderate to rapid in the upper part and moderate in the lower part and slopes range from zero to three percent.

The Vallers series consists of very deep, poorly drained soils that formed in calcareous fine-loamy till on till plains, moraines and lake plains. These soils have moderately slow permeability and slopes ranging from 0 to 3 percent.

The Mavie series consists of very deep, poorly drained soils formed in a loamy over gravelly glaciolacustrine mantle overlying loamy till on nearly level lake plains. These soils have rapid permeability in the upper mantle and moderate or moderately slow permeability in the underlying material. Slopes range from zero to two percent.

The Roliss series consists of very deep, poorly and very poorly drained soils formed in loamy calcareous till on lake plains and moraines. Permeability is moderate or moderately slow and slopes range from zero to two percent.

Table 14: Major Soil Types within the Project Area

Soil Map Unit	Acres
Grimstad fine sandy loam	5,680
Vallers loam	4,932
Mavie fine sandy loam	4,452
Roliss-Vallers complex	4,312
Strathcona fine sandy loam	2,996
Flaming loamy fine sand	1,862
Ulen loamy fine sand	1,519
Foldahl loamy fine sand	1,276
Sandberg loamy sand	979
Foxhome sandy loam	840
Hamerly loam	754
Fluvaquents-Haploborolls complex	579
Kittson loam	528
Total	**33,709**

The Strathcona series consists of very deep, poorly and very poorly drained soils that formed in a mantle of loamy and sandy glaciolacustrine sediments underlain by loamy calcareous till. They are found on lake plains. Permeability is moderately rapid and rapid in the upper part and moderate or moderately slow in the lower part. Slopes range from zero to two percent.

The Flaming series consists of very deep, moderately well drained soils formed in sandy sediments on lake plains, lake plains and till plains. These soils have rapid permeability and slopes ranging from zero to three percent.

The Ulen series consists of very deep, somewhat poorly drained soils that formed in sandy glaciolacustrine deposits on glacial lake plains. Permeability is rapid and slopes range from zero to three percent.

The Foldahl series consists of very deep, moderately well drained soils that formed in a mantle of sandy glacial lacustrine sediments over calcareous loamy till or in lacustrine sediments. The soils are on lake plains. These soils have rapid permeability in the upper part and moderate or moderately slow permeability in the lower part. They have slopes of zero to six percent.

The Sandberg Series consists of very deep, excessively drained soils that formed in coarse or moderately coarse glacial outwash sediments or glacial beach deposits with or without a thin loamy mantle. These soils are on outwash plains, glacial lake beaches, stream terraces valley trains, and glacial moraines. Permeability is moderately rapid or rapid in the upper part and very rapid in the lower part. Slopes range from zero to 45 percent

The Foxhome series consists of very deep, moderately well drained soils that formed in sandy and sandy-skeletal water-sorted sediments over calcareous loamy till or in lacustrine sediments. The soils are on lake plains. Permeability is moderately rapid in the upper part and moderate in the lower part. They have slopes of zero to four percent.

The Hamerly series consists of very deep, somewhat poorly drained soils that formed in calcareous loamy till. Permeability is moderate in the upper horizons and moderate or moderately slow in the lower horizons. These soils are found on flats on lake plains and on convex slopes surrounding shallow depressions and on slight rises on till plains. They have slopes ranging from zero to three percent.

The Fluvaquents-Haploborolls complex consists of very deep, very poorly drained soils that formed in sandy glaciolustrine deposits. These soils are found on flood plains, and have slopes ranging from zero to two percent.

The Kittson series consists of very deep, moderately well drained soils that formed in a mantle of loamy lacustrine sediments and underlying loamy till. These soils are found on lake plains and moraines. They have moderate and moderately slow permeability and slopes of zero to eight percent.

8.14.2 Impacts

Construction of the wind turbines and access roads will increase the potential for soil erosion and compaction during construction and convert prime farmland from agricultural uses to industrial uses. The amount of land that will be converted to wind turbines, transformer pads, and access roads will be determined once the site layout has been finalized. See Section 8.10 for a discussion of impacts to prime farmland.

8.14.3 Mitigation

A National Pollutant Discharge Elimination System (NPDES) permit application to discharge storm water from construction activities will be acquired by the Applicant from the MPCA. Best

Management Practices (BMP) will be used during construction and operation of the Project to protect topsoil and adjacent resources and to minimize soil erosion. Practices will include containing excavated material, protecting exposed soil, and stabilizing restored material. In addition, the placement of wind turbines and access roads will be planned so that the conversion of prime farmland will be minimized.

The only land that will be taken permanently out of crop production will be those areas encumbered by turbines, access roads, and supporting aboveground infrastructure. Additional farmland may be temporarily impacted for use during construction as staging and access areas. Soil compaction will occur, and is considered a temporary impact. However, the construction equipment used in the erection of wind turbines, much like agricultural equipment, is designed with wide tires and tracks to distribute their weight over a larger area and provide stability. This minimizes the degree of soil compaction resulting from construction. Once construction is complete, Ellerth Wind will assess disturbed areas and determine whether excessive soil compaction has occurred in conjunction with the affected landowners and local officials. In areas where excessive soil compaction has occurred from project activities, Ellerth Wind will work with the landowner and establish appropriate corrective action measures (e.g. tilling, chiseling, or other methods). Sites used for temporary storage, material staging, and access areas typically experience significant amounts of traffic which will likely require de-compacting prior to resumption of agricultural use.

8.15 Geologic and Groundwater Resources

8.15.1 Description of Resources

Surficial geology within the Project Area consists of mainly glaciolacustrine deposits and glacial moraine deposits from the late Wisconsin. The glaciolacustrine deposits typically found in the western portion of the Project Area are described as calcareous, very fine to coarse sand, gravelly sand, and gravel ranging from moderately well stratified to well stratified, and moderately sorted to well sorted. These deposits occur as shore and nearshore deposits in beach ridges, spits, tombolos, and offshore bars and as offshore sheet deposits. The moraine deposits typically found in the eastern portion of the Project Area are described as a very calcareous clay, silty clay, clay loam, and silty clay loam clayey till. These deposits are nonstratified and nonsorted, typically with no apparent structure and may be overlain by discontinuous lake clay, silt, sand, and gravel, alluvium, swamp deposits, or peat and muck. Alluvial deposits along existing streams and along abandoned channels may also be present within the Project Area. These alluvial deposits are generally loose, poorly sorted to well-sorted, stratified fine to medium pebbly sand and/or coarse sand and gravel (Fullerton 2000).

Bedrock in the Project Area consists of Archean-aged basement rocks including late Archean granite, granodiorite, granitoid intrusions, which intrude into Late Archean Supracrustal rocks that are typically mafic to intermediate volcanic and volcaniclastic, and volcaniclastic

sedimentary rocks. The intruding rocks are associated with the Florian Batholith, which is located between the Middle River Fault to the north and the Argyle Fault to the south (Jirsa, 1999). Based on well information provided by the Minnesota Health Department's County Well Index, depth to bedrock is approximately 320 feet below ground surface (Minnesota Department of Health 2007).

Two active gravel mines are present within the Project Area (MnDOT 2003) and are depicted on Map 12.

Groundwater in the regions is mainly supplied by surficial sand and gravel deposits. Generally, the Project Area lies over materials that do not yield significant amounts of water. Groundwater may be found in thin bands of beach ridge deposits (Reppe 2005).

8.15.2 Impacts

Impacts to geologic and groundwater resources are not anticipated. Water supply needs will be limited. It is probable that operations and maintenance water requirements will be satisfied with either a well or rural water services.

8.15.3 Mitigation

No impacts to geologic and groundwater resources are expected and no specific mitigation measures are proposed. Ellerth Wind will follow Minnesota Department of Health (MDH) regulations concerning well installation, if needed, for the O&M building associated with the Project. Wind turbine locations will not impact the use of existing water wells because the turbines will be sited according to State and County standards regarding setbacks from occupied structures.

8.16 Surface Water and Floodplain Resources

8.16.1 Description of Resources

The Project Area is located within the Snake River Watershed of the Red River Province in northwestern Minnesota. The Public Waters Inventory (PWI) dataset identifies approximately 70.4 acres of basins within the Project Area; all of which are included within the National Wetlands Inventory (NWI) data. The PWI dataset identifies two watercourses (Snake River and Middle River) within the Project Area totaling approximately 16.4 miles; 13.9 miles of which are identified as perennial streams (Map 13). NWI data indicate that wetlands within the Project Area total approximately 778.9 acres with the mean wetland less than one acre in size. Wetlands are discussed in further detail in Section 8.17.

8.16.2 Designated Wildlife Lakes and Special Waters

There are no DNR Designated Wildlife Lakes within the Project Area or a one-mile buffer. There are also no outstanding resource value waters, known meandered waterbodies, Public Waters or Watercourses, designated shoreland areas or trout streams within the Project Area.

8.16.3 FEMA Floodplains

Non-digital Federal Emergency Management Agency (FEMA) mapping was reviewed to analyze the extent of floodplains within the Project Area (Map 13). FEMA flood panels for the Project Area are provided in Appendix B. A small portion of the northwestern corner and the northeastern corner of the Project Area contains areas identified within the 100-year floodplain and associated with the Middle River.

8.16.4 Impacts

Optimal turbine locations are those which are topographically elevated from their surroundings. Ideally, turbines are to be located on elevated uplands where they are not expected to affect streams or surface water bodies. The Project Area is served by a regular mile by mile grid network of county and township roads, which will provide flexibility in the avoidance of water features during the design process. Based on the current site layout, minimal, if any, impacts to drainage ditches and wetlands are anticipated. Some minor impacts to unavoidable drainage ditches and associated wetlands may occur as a result of access road construction and collector line installation. However, it is the goal of Ellerth Wind to maintain access road and collector line wetland impacts below levels that would require mitigation in the form of replacement. No impacts to wetlands or ditches are expected or proposed for turbine placement. As the design of the Project moves forward, Ellerth Wind will coordinate with the St. Paul District of the U.S. Army Corps of Engineers (USACE), and the Marshall County Soil & Water Conservation District (SWCD) to obtain project concurrence regarding stream and surface water body impacts and avoidance. Marshall County SWCD is the Local Government Unit (LGU) responsible for administering the Minnesota Wetland Conservation Act in this area, and the St. Paul District of the USACE administers Section 404 of the Federal Clean Water Act. If wetlands cannot be avoided, the Applicant will apply for the necessary permits prior to construction.

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

8.16.5 Mitigation

No surface water or floodplain mitigation is anticipated at this time, as Ellerth Wind plans to avoid impacts to surface waters through design. Potential impacts from construction storm water discharges will be mitigated through the application of BMPs that will be implemented as part of the SWPPP for the Project. Primary BMPs will include the use of silt fence and temporary mulching and seeding in areas of soil disturbance.

8.17 Wetlands

8.17.1 Description of Resources

Surface water and floodplain resources for the Project Area were identified by reviewing Major Watershed Index data (DNR 2000), Federal Emergency Management Agency (FEMA) Q3 Flood Data (DNR 2003), Minnesota Public Waters Inventory (PWI) data (DNR 2008), and USFWS National Wetland Inventory (NWI) data (USFWS 2011).

The PWI dataset identifies approximately 70.4 acres of basins within the Project Area; all of which are included within the NWI data. The PWI dataset identifies two watercourses (Snake River and Middle River) within the Project Area totaling approximately 16.4 miles; 13.9 miles of which are identified as perennial streams. NWI data indicate that wetlands within the Project Area total approximately 778.9 acres with the mean wetland less than one acre in size. Some of the wetlands are associated with creeks and unnamed intermittent streams within the Project Area and some of the wetlands are isolated basins. The NWI wetland types and their acreage within the Project Area are presented in Table 15

There are a total of 778.7 acres of NWI wetlands in the Project Area: 579.5 acres of freshwater emergent wetlands, 183.7 acres of freshwater forested shrub wetlands, and 15.5 acres of freshwater pond wetlands. See Map 13 for locations of NWI wetlands, surface waters and floodplain resources within the Project Area.

8.17.2 Impacts

Construction of the wind turbines, transformer pads, O&M building, and access roads will permanently impact land within the Project Area. Turbine locations within the Project have been designed to avoid NWI wetland locations. Access roads will be designed to minimize impacts to surface water resources.

Table 15: NWI Wetland Type and Acreage

NWI Type	Acreage[1]
Freshwater Emergent Wetland	
PEM/SS1B	73.4
PEM/SS1Bd	20.3
PEM/SS1C	6.6
PEMA	19.8
PEMAd	138.8
PEMB	98.3
PEMBd	54.5
PEMBg	47.0
PEMBgd	10.7
PEMC	36.4
PEMCd	50.9
PEMCx	6.8
PEMF	16.0
Subtotal	579.5
Freshwater Forested/Shrub Wetland	
PFO/SS1B	28.2
PFO1A	12.1
PFO1B	21.7
PFO1C	19.5
PFO1Cd	0.7
PSS/FO1B	1.9
PSS/FO1C	3.9
PSS1/EMC	8.3
PSS1A	3.8
PSS1Ad	0.7
PSS1B	54.6
PSS1Bd	9.0
PSS1C	16.1
PSS1Cd	3.2
Subtotal	183.7
Freshwater Pond	
PUBF	1.0
PUBFx	1.5
PUBG	0.9
PUBGh	0.7
PUBGx	11.4
Subtotal	15.5
Total	**778.7**

[1] Wetland acres calculated using National Wetland Inventory data.

8.17.3 Mitigation

If the Project will impact waters of the U.S. or Minnesota PWIs, the Applicant will apply for the necessary permits prior to construction. Access roads constructed adjacent to streams and drainageways will be designed in a manner so runoff from the upper portions of the watershed can flow unrestricted to the lower portion of the watershed. A SWPPP will be prepared and an NPDES permit will be obtained prior to the construction of the Project. Formal wetland delineations of the Project Area will be completed prior to construction, and the layout will be designed to avoid and minimize wetland impacts. Wetlands will be avoided to the extent possible during the construction phase of the Project. If wetland impacts cannot be avoided, the Applicant will submit Section 404 and Minnesota Wetland Conservation Act permit applications to the USACE and the state prior to construction.

8.18 Vegetation

8.18.1 Description of Resources

The Project Area is located in the Aspen Parklands ecological subsection of Minnesota. This subsection is part of a low, level lake plain (Glacial Lake Agassiz) occupied by extensive forested peatlands to the east and tallgrass prairie to the west. Low dunes, beach ridges, and wet swales mark the western edge of the subsection. Pre-settlement vegetation consisted of a combination of aspen savanna, tallgrass prairie, wet prairie, and dry gravel prairie (on gravelly beach ridges). Floodplain forests of silver maple (Acer saccharinum), elm (Ulmus spp.), cottonwood (Populus deltoides var. occidentalis), and ash (Fraxinus spp.) occurred along rivers and streams. Currently, agriculture is the dominant land use in the southern half of the subsection, where the Project Area is located. In the north, extensive areas have been cleared for farming. Remnants of pre-settlement vegetation are more common and in larger blocks than many other Minnesota ecological subsections where agriculture is important. CRP land is discussed in Section 8.2 and is present within the Project Area. CRP land is typically covered by brome grasses, orchard grass, and alfalfa. See Table 13 for a description of land cover classes within the Project Area.

A Tetra Tech biologist visited the Project Area on November 1 through 4, 2010 to assess the current land use in the Project Area. A majority of the Project Area is agricultural and is utilized primarily for cultivated crops such as corn, soybeans, wheat, and forage crops. The remaining land within the Project Area is made up of grasslands, small areas of fragmented forest, and wetlands. Riparian habitat surrounds the Middle River, which flows through the northeastern portion of the Project Area. Identification of native prairie within the Project Area was not feasible due to the timing of the site visit outside the normal growing season; however, a native prairie survey of the Project Area was conducted in July 2011, and a report summarizing the results of this survey will be e-filed upon completion.

8.18.2 Impacts

The amount of vegetation that will be removed as a result of the Project will be determined once a site layout is finalized. Where necessary, vegetation will be permanently removed and replaced by wind turbines, access roads, an O&M building, and substation components. Additional areas may also be temporarily disturbed for the installation of underground power lines during construction. Approximately twenty acres of land will be temporarily impacted for contractor staging, lay down and / or storage areas and these may or may not be located within the Project Area. Ellerth Wind will coordinate with Marshall County officials to obtain all necessary permits before making land alterations. Temporarily disturbed areas will be reseeded to blend in with existing vegetation. Impacts to forests and groves will be minimized by locating turbines in agricultural land. Avoidance and minimization of impacts to wetlands and native prairies will reduce impacts to those vegetated areas.

8.18.3 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 WMAs, recreation areas, wetlands, native prairie, and forests. The pre-construction inventory will have varying levels of detail with the most specific detail in the vicinity of construction;

- Exclude established WMAs and recreation areas from consideration for wind turbine, access road, or electrical line placement;

- Avoid disturbance of 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;

- Initial surveys will identify native prairie remnants in the vicinity of Project facilities. The Project will be designed to avoid impacts to native prairie whenever feasible, and measures to mitigate unavoidable impacts will be agreed to by the Applicant and DNR. If native prairie impacts are anticipated, the Applicant shall, with the advice of the DNR, and any others selected by the Applicant, prepare a prairie protection and management

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

8.19 Wildlife

8.19.1 Description of Resources

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 forage, breeding, and/or shelter. The resident species are representative of Minnesota game and non-game fauna that are associated with upland grass and farmlands with wetland and forested areas. The majority of the migratory wildlife species are birds including waterfowl, raptors, and songbirds.

Bird species found in the cultivated portions of the Project Area include crows (Corvus brachyrynchos), rock doves (Columbia livia), brown-headed cowbirds (Molothrus ater), mourning doves (Zenaida macroura), European starlings (Sturnus vulgaris), American robins (Turdus migratorius), barn swallows (Hirundo rustica), and American goldfinches (Carduelis tristis). The cultivated areas of the site also support red-tailed hawks (Buteo jamaicensis), northern harriers (Circus cyaneus) and American kestrels (Falco sparverius). The Project Area has limited habitat for waterfowl, wading birds (e.g. herons and egrets) or shorebirds on scattered wetlands. Additionally, there is a colonial waterbird nesting site located within the one-mile buffer of the Project Area which is utilized by great blue herons (no conservation status in Minnesota).

Several examples of mammal species which may be present in the Project Area include: the red fox (Vulpes vulpes), badger (Taxidea taxus), coyote (Canis latrans), thirteen-lined ground squirrel (Spermophilus tridecemlineatus), striped skunk (Mephitis mephitis); white-tailed deer (Odocoileus virginianus); raccoon (Procyon lotor); eastern cottontail rabbit (Sylvilagus floridnus) and white-tailed jackrabbit (Lepus townsendi) (Hazard 1982; DNR 2011). These species use the food and cover available from agricultural fields, grasslands, farm woodlots, and wetland areas. 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).

In the Project Area, migratory bat species include hoary bat, eastern red bat, and silver-haired bat. These species all require forested areas for either roosting or feeding, and only small areas of fragmented forest within the Project Area meet these needs. However, the species could

conceivably fly through any portion of the Project Area during migration. Given the potential of these four species to be found within the Project Area, some collision mortality of migratory bat species may occur as a result of Project development. However, given the species' common, widespread status, population-level impacts are not anticipated as a result of Project development (Bat Conservation International [BCI] 2010).

Reptile and amphibian species, which may be present in the Project Area (but are not confirmed in the Project Area), 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), Cope's gray treefrog (Hyla chrysoscelis), wood frog (Rana sylvatica), spring peeper (Pseudacris crucifer), Snapping turtle (Chelydra serpentine), painted turtle (Chyrsemys picta), prairie skink (Plestiodon septentrionalis), tiger salamander (Ambystoma trigrinum), Redbelly snake (Storeria occipitomaculata), plains garter snake (Thamnophis radix), common garter snake (Thamnophis sirtalis), and Western smooth green snake (Opheodrys vernalis) (DNR 2011b).

In accordance with the recommendations of the Wind Turbine Advisory Committee (the Guidelines)(WTGAC 2010), Ellerth Wind has used a tiered approach for assessing potential impacts to wildlife and habitats. Tier 1 of the approach is a preliminary evaluation or screening of sites (landscape-level screening of possible project sites). Tier 2 includes site characterization (broad characterization of one or more potential project sites), and Tier 3 is characterized by field studies to document site wildlife conditions and predict project impacts (site specific assessments at the proposed project site). To date, Ellerth Wind has conducted analysis at all three levels of the process.

Tier 1 was completed by Ellerth Wind as they evaluated available sites for wind development. Along with proximity to transmission interconnection, distance from airports, and willing landowners, Ellerth Wind also looked for a site that was primarily agricultural and had a reasonable buffer from publicly managed lands in an effort to reduce impacts to wildlife.

Tetra Tech conducted a Tier 2 Evaluation of the Project Area in June 2011. Tetra Tech carried out Tier 2 analysis of the Project Area by thoroughly addressing questions recommended for consideration in the Guidelines. These questions were addressed using credible, publicly available information including published studies, technical reports, databases, and information from agencies, local conservation organizations, and/or local experts. In addition, a qualified Tetra Tech biologist conducted a reconnaissance-level site visit to evaluate current vegetation/habitat coverage and land management/use. Tetra Tech conducted multiple surveys of the Project Area in 2009-2010 at the Tier 3 level (pre-construction field studies) to verify desktop analysis and assess avian use of the Project Area.

Primary concerns raised in Tetra Tech's Tier 2 analysis included the presence of state species of concern, federal sensitive species, WMAs, Minnesota County Biological Survey (MCBS) sites of

biological significance, RIM land, and prairie and wetland habitats scattered throughout Ellerth Project Area and vicinity. During preliminary consultation, the DNR also expressed concern about a great blue heron nesting area within the vicinity of the Ellerth Project Area. Such features have been identified by Ellerth Wind and setbacks have been applied in arriving at the current Project layout. Using credible, publicly available information as well as information gathered during a reconnaissance level site visit, Tetra Tech was able to answer the suggested Tier 2 questions. Table 16 highlights items of concern raised by these questions

Tetra Tech has already conducted multiple surveys of the Project Area in 2009-2010 at the Tier 3 level (pre-construction field studies) to verify desktop analysis and assess avian use of the Project Area. Pre-construction field studies conducted to date include fall and spring avian migration surveys, a raptor nest survey, and a prairie grouse lek survey (see Section 8.19.4 for more details on the results of these surveys). The results of these surveys indicated the presence of several listed and sensitive avian species in addition to those recorded by the DNR's Natural Heritage Information System (NHIS) (see Section 8.20.1).

Agency Consultation

Ellerth Wind contacted the USFWS and DNR to obtain information regarding how the proposed development of the Project will affect listed threatened/endangered species, candidate species, species of concern, and critical habitats in the Project Area.

The DNR provided feedback as a result of the preliminary review of the Project on June 14, 2009 (Appendix A). The DNR detailed concerns regarding public lands, natural heritage and wildlife, bird and bat mortality monitoring, native prairie and pasture land, public waters and wetlands, and storm water run-off and invasive species.

The DNR NHIS was queried following the recommendation to do so by the DNR in its preliminary review. A response letter and results of the query were received from Ms. Lisa Joyal, Endangered Species Environmental Review Coordinator, on September 25, 2009 (Appendix A). These results were based on a preliminary Project boundary which has since changed. A revised NHIS query was conducted on May 19, 2011 (DNR 2011c). The results of the revised NHIS query conducted on the current Project boundary are discussed at length below in Section 8.20 (see Appendix D for the index report of revised NHIS query).

There are a total of 778.7 acres of NWI wetlands in the Project Area: 579.5 acres of freshwater emergent wetlands, 183.7 acres of freshwater forested shrub wetlands, and 15.5 acres of freshwater pond wetlands. See Map 13 for locations of NWI wetlands, surface waters and floodplain resources within the Project Area.

Table 16: Items of concern within the Project Area as revealed by Tier 2 analysis.

Item of Concern	Results of Tier 2 Analysis	Details
Are federally protected wildlife species present?	Yes	Two federally protected species, the bald eagle and golden eagle, were detected during fall avian migration surveys. These eagles are protected by the Bald and Golden Eagle Protection Act (BGEPA).
Is federally designated critical habitat present?	No	
Are state listed wildlife species known to be present or does the presence of appropriate habitat make their presence possible?	Yes	State Species of Concern with records of occurrence (or those observed by Tetra Tech) within the Project Area include: greater prairie-chicken, least weasel, marbled godwit, Nelson's sharp-tailed sparrow, short-eared owl, upland sandpiper, and yellow rail. SGCN species observed by Tetra Tech include: American bittern, bald eagle, bobolink, brown thrasher, eastern meadowlark, grasshopper sparrow, marsh wren, northern harrier, rusty blackbird, sharp-tailed grouse, and white-throated sparrow.
Does the Project Area contain areas where development is precluded by law or designated as sensitive?	Yes	The Project Area contains one WMA, a RIM parcel, and six MCBS sites of biological significance.
Are plant communities of concern present of likely to present?	Yes	NHIS and MCBS data show records of native prairie and upland forest/woodlands within the Project Area. In particular, a very small Dry Sand-Gravel Prairie remnant, an NPC with a "good estimated viability" condition ranking, is located in the northwest portion of the Project Area.
Are there known critical areas of congregation of species of concern?	Yes	Tetra Tech recorded the presence of a greater prairie-chicken lek within the Project Area during a prairie grouse lek survey in spring 2010.
Has the relevant federal, state, tribal, and/or local agency independently demonstrated the potential presence of a population of a species of habitat fragmentation concern?	No	
Which species of birds, especially those known to be at risk by wind energy facilities, are likely to use the Project Area?	--	Tetra Tech conducted avian use surveys during 2009 and 2010. Avian mean use of the Project Area was found to be high compared to use at other WMAs, yet the risk to avian species, including raptors, is anticipated to be low based on estimates of exposure risk.
Which species of bats, especially those known to be at risk by wind energy facilities, are likely to use the proposed site?	--	Six species of bats may occur in or near the forested areas within the Project Area.

There are a total of 778.7 acres of NWI wetlands in the Project Area: 579.5 acres of freshwater emergent wetlands, 183.7 acres of freshwater forested shrub wetlands, and 15.5 acres of freshwater pond wetlands. See Map 13 for locations of NWI wetlands, surface waters and floodplain resources within the Project Area.

8.19.2 DNR Waterfowl Feeding and Resting Areas

There are no Waterfowl Feeding and Resting Areas within the Project Area or a one-mile buffer. The Project Area contains one WMA and one RIM parcel. An additional WMA and the Old Mill State Park are within close vicinity to the Project Area (see Section 8.7 for additional details concerning recreational resources).

8.19.3 Important Bird Areas

Important Bird Areas are "sites that provide essential habitat for one or more species of bird, and include sites for breeding, wintering, and/or migrating birds" (National Audubon Society 2011). No Audubon Important Bird Areas have been identified in or near the Project Area.

8.19.4 Impacts

Impacts to wildlife habitat as a result of Project development are expected to be minimal because turbines and access roads will be placed on agricultural lands. Grasslands, forested areas, shrublands, streams/drainages, and wetlands will be avoided.

The overall impact of the proposed Project on wildlife is expected to be minimal. Operation of the wind farm will not change adjacent land uses and a relatively small portion of the Project Area will be affected by construction activities. There is some potential for avian and bat collisions with facility turbines; however, impacts are not expected to have population-level consequences. Specific impacts to avian and bat species are discussed below.

Impacts to Avian Species

Birds have been identified as a group particularly at risk at wind generation facilities because of the potential for collisions with turbines and power lines (Drewitt and Langston 2006, Arnett et al. 2008). Early wind generation facilities had high levels of avian mortality and raptors were found to be particularly at risk (Barclay et al. 2007). Studies conducted at newer wind generation facilities have shown that high levels of collision mortality do not routinely occur, partially due to improved turbine design (Drewitt and Langston 2006; National Wind Coordinating Collaborative [NWCC] 2001). However, several factors such as abundance, composition, presence of migration corridors, landscape features, and prey abundance can still contribute to avian mortality at wind farm facilities.

In addition to collision mortality, birds may also be at risk of displacement due to habitat loss or change associated with the presence of the facility structures. Reduced avian use near turbines has been attributed to avoidance of turbine noise and maintenance activities and reduced habitat attractiveness (Leddy 1999 and Johnson et al. 2000). Previous studies at wind projects have shown that the abundance of shorebirds, waterfowl, upland game birds, woodpeckers, and several groups of passerines were significantly lower at survey plots with turbines than without (Johnson et al. 2000). Little is known, however, about the possible negative effects wind energy development might have on prairie birds; one of the most threatened groups in North America.

The proposed Project Area lies within the Mississippi Flyway, which is heavily utilized by numerous species of birds including many species of waterfowl (i.e., ducks, geese and swans), shorebirds, songbirds, and raptors during the spring and fall migrations. 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.

Ellerth Wind contracted with Tetra Tech to conduct spring and fall avian use surveys, a prairie grouse lek survey, and a raptor nest survey at the Project Area. The avian surveys were conducted to identify potential avian impacts associated with building and operating the equipment and facilities needed for the Project. The results of these studies are summarized below.

Diurnal fixed-point fall and spring avian migration surveys were undertaken with the primary objective of estimating use of the Project Area by raptors and other birds during spring and fall migration. Since the time of the surveys, the DNR has issued the Draft Minnesota Protocols to Monitor Bat & Bird Mortality at Large Wind Energy Conversion Systems (DNR 2011c). Because the surveys were completed before the draft protocol was available, Tetra Tech used other established avian migration survey protocol to conduct the surveys.

Fall surveys took place between September and November of 2009 and spring surveys between April and June of 2010. Overall mean use (# birds/20 min) of the Project Area by birds for the fall and spring surveys was 41.21 birds/20 min and 16.53 birds/20 min, respectively. Compared to mean use for other studies designed to collect avian use data at Wind Resource Areas (WRAs), the avian mean use of the Project Area is moderate to high.

To estimate risk to avian species observed within the Project Area, Tetra Tech calculated an index to exposure risk (R) which represents the number of birds flying at rotor swept area [RSA] height/20 min where exposure risk is defined to be the probability of turbine collision. Despite moderate to high mean use of the Project Area, most species exhibited very low exposure risks. Exceptions to this rule largely included species with stable population trends and widespread ranges and any collision mortality potentially resulting from Project development would be unlikely to have population-level impacts for these species.

Sandhill cranes exhibited both relatively high mean use (2.91 birds/20 min) and exposure risks (1.48 birds flying at RSA height/20 min [GE and Vestas and Siemens]) in the Project Area during fall surveys. The frequency of collisions of large water birds such as cranes with wind turbines has generally been very low, and a recent study found evidence that cranes may actively avoid wind farms (CWS and USFWS 2005; Nagy et. al. 2011). The sandhill crane is one of the world's few crane species that is still common and wide-ranging, and most sandhill crane populations are now stable or increasing in size (Association of Fish and Wildlife Agencies' Migratory Shore and Upland Game Bird Support Task Force 2009). The population size of sandhill cranes in Minnesota is currently unknown; however, breeding bird survey data indicates that the population trend in the state is increasing (DNR 2011d; Sauer et al. 2011). Given their wide-spread and common status and likely stable to increasing populations within the state, population-level impacts are unlikely as a result of potential collision mortality.

Special consideration is given to raptor species at WRAs because diurnal raptors are generally at higher risk for collision with turbines than are many other avian species (National Wind Coordinating Collaborative [NWCC], 2004). A wide range of raptor species were observed within the Project Area during diurnal migration surveys including: American kestrel, bald eagle, broad-winged hawk, Cooper's hawk, golden eagle, northern harrier, prairie falcon, red-tailed hawk, short-eared owl, and turkey vulture. However, mean use of the Project Area by raptors was moderate compared to similar projects and exposure risk was very low, which will likely translate into low risk of raptor mortality at the Project Area.

Several listed and sensitive species were observed within the Project Area during diurnal migration surveys. A single golden eagle and four bald eagles were observed during the fall survey. These eagles are protected by the BGEPA. Two state species of concern, the marbled godwit and the short-eared owl were observed during spring surveys. Twelve SGCN (American bittern, bobolink, brown thrasher, eastern meadowlark grasshopper sparrow, greater prairie-chicken, marbled godwit, marsh wren, northern harrier, sharp-tailed grouse, short-eared owl, and white-throated sparrow) were observed during spring surveys and four SGCN (bald eagle, northern harrier, rusty blackbird, and sharp-tailed grouse) were observed during fall surveys. All listed and sensitive species observed within the Project Area exhibited very low mean use and exposure risk.

In addition to diurnal migration surveys, Tetra Tech also conducted prairie grouse lek surveys at the Project Area. The objective of the prairie grouse lek surveys was to locate active leks, or breeding grounds, within the Project Area. Lek surveys were conducted four times within the Project Area during the period of peak prairie grouse lek attendance. A total of two active prairie grouse leks were observed within the Project: a sharp-tailed grouse lek with 11 individuals; and a greater prairie-chicken lek with six individuals. The sharp-tailed grouse is not federally or state listed; however, as noted above, the greater prairie-chicken is a Minnesota species of special concern. To date, neither sharp-tailed grouse nor greater prairie-chickens have been recorded among avian fatalities at wind energy facilities with publicly available data.

A raptor nest survey of the Project Area was conducted to determine the number, distribution, and density of raptor nests and the species and density of breeding raptors within the Project Area and a 1-mile buffer on all sides of the Project Area. The Project Area and buffer were surveyed on two occasions: once on April 21, 2010; and once on May 18, 2010. No raptor nests were observed within the Project Area or buffer.

Overall, the risk of avian collision mortality within the Project Area is expected to be low. In addition to collision mortality, however, birds at the Project Area may also be at risk of displacement due to habitat loss or change associated with the presence of the facility structures. Reduced avian use near turbines has been attributed to avoidance of turbine noise and maintenance activities and reduced habitat attractiveness. However, agriculture is the dominant land cover within the Project Area, and the impact to high quality avian habitat as a result of Project development is expected to be minimal.

Impacts to Bat Species

Bat collision mortality at wind farms is a widespread phenomenon, often exceeding avian collision mortality (Kunz et al. 2007). Of the 46 species of bats in North America, 11 species have been identified among fatalities at wind farms in the United States (Arnett et al. 2008). Recent bat-specific studies have found that the majority of recorded fatalities occur during the fall migration period (Johnson et al. 2004), and that the primary at-risk bat species are those that are non-residents and have migration routes corresponding to wind energy site locations (Arnett et al. 2008; Kunz et al. 2007). Bat fatality rates in the Upper Midwest have been estimated at 1.7 bats/turbine/year or 2.7 bats/MW/year (NWCC 2004). However, fatalities of birds and bats are highly variable among facilities and regions of the country (NWCC 2010).

In the Project Area, migratory bat species include hoary bat, eastern red bat, and silver-haired bat. No state or federal listed bat species are known to occur within the Project Area or Marshall County. The relatively flat to gently undulating topography of the Project Area and vicinity does not appear to contain topographic features that would funnel bat movements during migration; however, bats may forage over the entire Project Area, although the extent of use is not known. However, as requested by the May 18, 2011 USFWS response, Ellerth Wind intends to deploy anabat detectors at the Project Area in spring 2012 to gather Project specific data concerning the bat species within the Area.

8.19.5 Mitigation

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

- Prepare an Avian and Bat Protection Plan (ABPP) prior to project construction to outline BMPs to minimize and reduce risks for birds, bats and their habitat.
- Conduct a pre-construction inventory of existing biological resources, native prairie, and wetlands in the Project Area;
- Exclude established WMAs and recreation 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.
- A 1-mile buffer will be placed around the known location of the greater prairie-chicken lek, and no turbines or infrastructure will be developed in the buffer.
- Continue to coordinate with the DNR to discuss potential impacts to greater prairie-chickens and include special focus on the greater prairie-chicken in the ABPP.
- Protect existing trees and shrubs that are important to the wildlife present in the area by locating turbines on agricultural land;
- 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;
- Construct wind turbines using tubular monopole towers;
- Minimally light turbines according to FAA requirements;
- Revegetate non-cropland and pasture areas disturbed during construction or operation with an appropriate native seeding mix, in cooperation/coordination with landowners;
- Control noxious weeds in areas disturbed by the construction and operation of the Project and revegetating disturbed ground with native species.

Tetra Tech has already conducted multiple surveys of the Project Area in 2009-2010 at the Tier 3 level (pre-construction field studies) to verify desktop analysis and assess avian use of the Project Area. Tetra Tech believes that data collected at Tier 2 and 3 for the Ellerth Windpark are sufficient to guide siting in a manner that will adequately mitigate significant adverse impacts to

wildlife species and is not recommending additional desktop analysis and/or field studies at this time

8.20 Rare and Unique Natural Resources

8.20.1 Description of Resources

Ellerth Wind reviewed publicly available sources of information regarding federal and state-listed threatened and endangered species known or likely to be found within the Project Area. The USFWS and the Minnesota DNR were contacted to review the Project for threatened and endangered species and unique habitats. Response letters from the DNR and USFWS are included in Appendix A. The DNR provided feedback as a result of the preliminary review of the Project on June 14, 2009 (Appendix A). This review was conducted based on an early Project layout that has since been modified. The results of a revised NHIS query conducted on May 19, 2011, that was based on an updated Project boundary are provided below. The index report of revised NHIS query is included in Appendix D.

In its preliminary review, the DNR detailed concerns regarding public lands, natural heritage and wildlife, bird and bat mortality monitoring, native prairie and pasture land, public waters and wetlands, and storm water run-off and invasive species. In addition, the DNR indicated that several sensitive areas have been documented within a one-mile radius of the Project Area. These include the following:

- The Adolf Elseth, Wright and Florian WMAs and Old Mill State Park are within or adjacent to the Project Area (Map 6). The DNR recommends that no direct impacts occur to these public recreational lands from tower construction, transmission lines, or road networks associated with the project. Additionally, the DNR recommends that a buffer, which is a minimum of five times the rotor blade diameter, be established around all WMAs. This buffer width is subject to reevaluation as the Project progresses and as more information on sensitive resources associated with the WMA is developed.

- Several "Sites of Biodiversity Significance," identified by the MCBS, are located within the Project boundary (Map 14). These sites have varying levels of native biodiversity and are ranked from "Below" to "Outstanding" based on the significance of this biodiversity. Ranking factors include the number of rare species documented within the site, the quality of native plant communities, and the size and context of the site within the landscape. Sites within the Project boundary contain several state-listed plants and animals, and several rare native plant communities. The rare native plant communities within the Project Area include Dry Sand-Gravel Prairie, Aspen Woodland/Forest Complex, Prairie Rich Fen, Mesic to Wet-mesic Prairie, and Brush-Prairie, which are all vulnerable to disappearance from the state. Avoidance of these areas will alleviate most of the Natural Heritage concerns.

In its preliminary review, the DNR recommended a query of the NHIS database. A response letter and results of the query were received from Ms. Lisa Joyal, Endangered Species Environmental Review Coordinator, on September 25, 2009. Ms. Joyal stated her concerns related to the above-listed sensitive areas highlighted in the preliminary review. In addition, Ms. Joyal called special attention to the following rare wildlife species:

The MCBS surveyed for birds in the area in the 1990's and documented the following rare birds in the vicinity of the project: Wilson's phalarope (Phalaropus tricolor), a state-listed threatened species; the short-eared owl (Asio flammeus) and marbled godwit (Limosa fedoa), both state-listed as species of special concern; the upland sandpiper (Bartramia longicauda), a Species in Greatest Conservation Need as identified in Minnesota's Comprehensive Wildlife Conservation Strategy. In addition, a great blue heron nesting area has been documented within one mile of the Project Area.

Table 17 and 18 list the rare species potentially occurring within the Project Area.

Federally-Listed Species

A review of federal endangered and threatened species and critical habitats in Minnesota indicates that the gray wolf (Canus lupus) and the Canada lynx (Lynx canadensis) are both known to occur in Marshall County, though neither species has been recorded within the Project Area. The gray wolf is a federal threatened species in Minnesota. The habitat of the gray wolf is predominantly northern forests in Minnesota, although a growing number have been spotted near prairie lands and semi-wooded areas (DNR 2010c). Due to the prevalence of agriculture and few forested areas, the gray wolf is unlikely to occur within the Project Area. The Canada lynx is also a federal threatened species in Minnesota, where they are found most commonly in dense northern forests (USFWS 2010). Due to the prevalence of agriculture and grasslands, the Canada lynx is unlikely to occur within the Project Area.

Four bald eagles (also listed as a State Species of Special Concern) were detected during fall avian migration surveys conducted within the Project Area. These eagles are protected by the Bald and Golden Eagle Protection Act (BGEPA).

Bald eagles are common throughout Minnesota year-round, and they nest and forage near open water (Buehler 2000; MOU 2009). Some nesting and foraging habitat may be available near the Middle River in the northern portion of the Project Area. However, the four bald eagles observed during the migration surveys were observed at the southern periphery of the Project Area. In addition, no bald eagle nests were observed within the Project Area during the raptor nest survey in 2010, and no records of bald eagle nests were revealed during the NHIS query. The lack of evidence of bald eagle nesting, combined with limited foraging habitat and low observed mean use likely translate into low risk of collision mortality for bald eagles at the Project Area.

Additionally, lack of collision mortality records for bald eagles at other wind farms supports the assessment of low collision risk at the Project Area. Only two bald eagle fatalities have been reported to date at wind farms (Manville 2005, Pearce 2010), and preliminary data from a post-construction eagle use survey at a wind facility in Alaska suggest that bald eagles may actively avoid turbines (Sharp et al. 2010).

One golden eagle was detected during the fall avian migration surveys. The golden eagle is also protected by the BGEPA, and has been among recorded fatalities at wind farms (Associated Press 2010; Kerlinger et al. 2006; Seattle Times 2009; West 2008). However, the presence of golden eagles does not equate to golden eagle fatalities when turbines are placed away from areas of high golden eagle use (Young et al. 2003).

Golden eagles nest and forage in open to semi-open habitats, such as tundra, grassland, woodland-brushlands, coniferous forests, and riparian habitat (Kochert et al. 2002). Golden eagles are not known to breed in Minnesota, but a few golden eagles are seen in Minnesota every fall during migration and occasionally on the Mississippi River in the winter (University of Minnesota, 2010)

The individual observed within the Project Area was likely a migrant, and its flight behavior indicates that it may have been foraging. When their energy resources run low, golden eagles need to find food along their migratory routes. Golden eagles prey primarily on mammals such as rabbits and hares as well as larger rodents. They hunt these prey items by soaring high (30-90 m [98-295 feet]) along open ridges, but they also make low (7-8 m [23-26 feet]), coursing flights (Polite and Pratt 1999). The individual in the Project Area was observed both on the ground and flying at a height of >30 meters.

The presence of the golden eagle and its observed behavior indicate suitable foraging habitat and prey are likely present in or near the Project Area. However, no landscape features that would concentrate migrating eagles, such as ridges or known areas of high prey density (e.g., game farms, prairie dog towns, calving areas), are located in the Project Area, so it is unlikely that the Project Area would attract more than occasional migrants. Given the low mean use of the Project Area and lack of features that would concentrate eagles in the area, the risk of golden eagle collision with turbines at the Project is likely to be low.

State-Listed Species

The DNR NHIS was queried following the recommendation to do so by the DNR. A revised NHIS query conducted May 19, 2011, on the current Project boundary showed 41 recorded occurrences of special status species, plant communities or other unique natural features within a 1–mile radius of the Project Area (Map 14). The 41 recorded occurrences include 12 rare species within a one-mile radius of the Project Area. Each of these species is listed in Table 17 and discussed in more detail below. In addition, there is one recorded occurrence of a colonial

waterbird nesting area (great blue heron) within the search radius. Native plant communities known to occur within the search radius include the Black Ash-Silver Maple Terrace Forest, Dry Sand-Gravel Prairie (Northern), Green Ash-Bur Oak-Elm Forest, Mesic Prairie (Northern), Prairie Rich Fen, and Wet Brush Prairie.

Only one rare mammal species is known to occur within the Project Area. The least weasel is a Minnesota species of special concern that was documented on one occasion in 1967 in the south-central portion of the Project Area. While their habitat selection is generally a function of small rodent distribution, least weasels seem to prefer meadows, grasslands, and marshy and shrubby habitats (Jones and Birney 1988). Despite the great length of time since the last least weasel observation in the Project Area, the presence of suitable habitat makes their presence within the Project Area possible.

Five rare bird species are known to occur within the Project Area: marbled godwit, nelson's sharp-tailed sparrow, short-eared owl, yellow rail, and greater prairie-chicken. The marbled godwit is a Minnesota species of special concern that was documented multiple times within the Project Area in 1992. Marbled godwits prefer native grasslands with sparse to moderate cover, adjacent to a complex of wetlands (DNR 2010c). Three marbled godwit were observed within the Project Area by a Tetra Tech biologist during the spring of 2010.

The Nelson's sharp-tailed sparrow is a Minnesota species of special concern that was documented within the vicinity of the Project Area on one occasion in 2005. The primary habitat of the Nelson's sharp-tailed sparrow is sedge wetlands (DNR 2010c). Tetra Tech did not observe any Nelson's sharp-tailed sparrows within the Project Area during spring and fall avian point count surveys in 2009-2010.

The short-eared owl is a Minnesota species of special concern that was documented within the vicinity of the Project Area on one occasion in 1990. Short-eared owls are found in open habitats such as native prairie, pasture, Conservation Reserve Program grasslands, sedge wetlands, shrub swamps, and open peatlands (DNR 2010c). Short-eared owls were observed on multiple occasions within the Project Area by a Tetra Tech biologist in the spring of 2010.

The yellow rail is a Minnesota species of special concern that was documented within the vicinity of the Project Area on one occasion in 2005. The primary habitat of the yellow rail is sedge wetlands (DNR 2010c). Tetra Tech did not observe any yellow rails within the Project Area during spring and fall avian point count surveys in 2009-2010.

The greater prairie-chicken is a Minnesota species of special concern that was observed within the Project Area by a Tetra Tech biologist during a prairie grouse lek survey of the Project Area during the spring of 2010. The greater prairie-chicken's habitat use varies by season, but in general, the species uses a mixture of native prairie, non-native grasslands, and disturbed habitats (DNR 2010c).

Table 17: State and Federal Listed Species Potentially Occurring within the Project Area

Species Common Name	State Status	Federal Status
Bald eagle	SPC	BGEPA
Blunt sedge	SPC	NL
Canada lynx	NL	THR
Golden eagle	NL	BGEPA
Gray ragwort	END	NL
Gray wolf	SPC	THR
Greater prairie-chicken	SPC	NL
Least weasel	SPC	NL
Louisiana broomrape	SPC	NL
Marbled godwit	SPC	NL
Nelson's sharp-tailed sparrow	SPC	NL
Northern singlespike sedge	SPC	NL
Short-eared owl	SPC	NL
Small white lady's-slipper	SPC	NL
Sterile sedge	THR	NL
Yellow rail	SPC	NL

BGEPA = Protected by the Bald and Golden Eagle Protection Act
END = Endangered
NL = Not listed
SPC = Special concern
THR = Threatened

Given the presence of grassland habitat within the Project Area, it is possible that greater prairie-chickens use the Project Area for breeding or brood rearing. The effect of wind turbines on leks and nesting prairie-chickens is currently being studied and results are not yet available. However, Pitman et al. (2005) found that lesser prairie-chicken nests are located significantly further than expected from anthropogenic features on the landscape in Kansas. Specifically, nests were located a mean of 1,385 m ±60 standard error (0.86 mi) and 1,254 m ±69 (0.78 mi) from transmission lines. Thus, if the avoidance of tall structures is shared by greater prairie-chickens, and greater prairie-chickens show avoidance of wind turbines similar to transmission lines, also a tall structure, then the effects on nesting hens associated with the lek should be reduced by establishing a 1-mile buffer.

Six rare plant species are known to occur within the Project Area: blunt sedge (Carex obtusata), gray ragwort (Senecio canus), Louisiana broomrape (Orobanche ludoviciana), northern singlespike sedge (Carex scirpoidea), small white lady's-slipper (Cypripedium candidum), and sterile sedge (Carex sterilis). These species are associated primarily with prairie or wetland habitats and due to the avoidance of these habitat types during construction, impacts to these species as a result of Project development is unlikely.

Species in Greatest Conservation Need

Species in Greatest Conservation Need (SGCN) are defined by the DNR as animals whose populations are rare, declining, or vulnerable to decline and are below levels desirable to ensure their long-term health and stability. There are 292 species in Minnesota that meet this definition (DNR 2006). While SGCN designation alone does not confer a legally protected status, the DNR recommends that impacts to SGCN species be avoided or mitigated where possible.

Table 18 lists the SCGN species potentially occurring in the Project Area based on NHIS records of occurrence or observations made during Tier 3 studies. Species with endangered, threatened, or special concern status are classified as SGCN species. The remaining SCGN species potentially occurring within the Project Area have the SCGN designation largely based on their Partners in Flight (PIF) priority status. The PIF Species Prioritization Scheme ranks each species of North American breeding bird based upon seven measures of conservation vulnerability. These factors include relative abundance (interspecific), size of breeding and non-breeding ranges, threats to the species in breeding and non-breeding areas, population trend, and the relative density (intraspecific) in a given planning unit compared to the maximum reached within the species' range (American Bird Conservancy 1998).

The overall impact of the proposed Project on rare and unique resources is expected to be minimal. Operation of the wind farm will not change adjacent land uses and a relatively small portion of the Project Area will be affected by construction activities. Mitigation of potential impacts to rare and unique resources will be in the form of avoidance. The siting of turbines, access roads and other infrastructure will be carried out in a manner that avoids impacts to rare plant communities and threatened, endangered or special concern plant and animal species. As previously discussed, turbine, access road and collector line locations are expected to be primarily on agricultural cropland so as to avoid potential rare or unique natural resources.

Table 18: SGCN Species Potentially Occurring within the Project Area

Species	Observed in Project Area by Tetra Tech?	Rationale for SGCN status
American bittern	Yes	High priority in all Bird Conservation Regions Waterbird plans.
Bald eagle	Yes	MN Species of Special Concern
Bobolink	Yes	Highest PIF Priority in several Bird Conservation Regions
Brown thrasher	Yes	Highest PIF Priority in several Bird Conservation Regions
Canada Lynx	No	Federally Threatened
Eastern Meadowlark	Yes	Identified on USFWS region 3 concern list. Precipitous continental population decline, habitat imperiled.
Grasshopper sparrow	Yes	High PIF Priority in several Bird Conservation Regions
Gray Wolf	No	Federally Threatened; MN Special Concern
Greater prairie-chicken	Yes	MN Special Concern
Least Weasel	No	MN Special Concern
Marbled godwit	Yes	MN Special Concern, High PIF priority on all Bird Conservation Regions of Shorebird Plans
Marsh wren	Yes	High PIF Priority in several Bird Conservation Regions
Nelson's sharp-tailed sparrow	No	MN Special Concern
Northern harrier	Yes	High PIF Priority in several Bird Conservation Regions
Rusty blackbird	Yes	PIF Continental Watch List
Sharp-tailed grouse	Yes	Populations well below the range of natural variation in Minnesota. Historically was the dominant prairie Galliform.
Short-eared owl	Yes	MN Special Concern
White-throated sparrow	Yes	Highly significant regional population declines in Natural Resources Research Institute Forest Bird Monitoring

Species	Observed in Project Area by Tetra Tech?	Rationale for SGCN status
Upland sandpiper	No	High PIF Priority in all Bird Conservation Regions of Shorebird Plans
Yellow Rail	No	MN Special Concern, High priority in several Bird Conservation Regions Waterbird Plans

BGEPA = Protected by the Bald and Golden Eagle Protection Act
NL = Not listed
SPC = Special concern
THR = Threatened

8.20.2 Native Prairie

Tetra Tech evaluated the presence of Native Prairie Bank easements in the Project Area and determined that there are no such banks located within the Project Area boundaries. One native prairie bank is located adjacent to the southeastern portion of the Project Area and corresponds with an MCBS Site of Outstanding Biodiversity Significance. This site, Marsh Grove, is approximately 456 acres and is not expected to be impacted by the Project.

Initial surveys will identify native prairie remnants in the vicinity of Project facilities. The Project will be designed to avoid impacts to prairie whenever feasible. If native prairie impacts are anticipated, the Applicant shall, with the advice of the DNR, and any others selected by the Applicant, prepare a prairie protection and management plan, if necessary. The plan will be submitted to the PUC and DNR at the appropriate time. The plan shall address steps to be taken to identify native prairie within the Project Area, measures to avoid impacts to native prairie, and measures to minimize and mitigate for impacts if unavoidable. Wind turbines and all associated facilities, including foundations, access roads, underground cable, and transformers, shall not be placed in native prairie unless addressed in the prairie management plan. Measures to be taken to mitigate unavoidable impacts to native prairie will be agreed to by the Applicant and DNR.

8.20.3 Preconstruction Inventories

Ellerth Wind will conduct the following preconstruction inventories concerning the Project as determined necessary in coordination with regulatory agencies:

- Pre-construction inventory of existing biological resources, a native prairie survey, a wetlands survey, and Phase I Cultural Resource survey to be conducted in 2011.

Ellerth Wind will submit copies of these preconstruction inventories to the PUC as they become available.

9.0 SITE CHARACTERIZATION

9.1 Wind Characteristics in Project Area

Ellerth Wind has two temporary meteorological towers in the Project Area which have been collecting weather data on site since May 2008 and June 2010, respectively, and continue to monitor weather conditions on site. The following sections on wind resources are largely based on analysis of data collected by the first meteorological tower installed in the Project Area of a dataset ranging between May 15, 2008 and August 1, 2010. The aforementioned analysis was carried out by Ellerth Wind's consultants, GL Garrad Hassan. Additionally, publicly available National Oceanic and Atmospheric Administration (NOAA) data has been used.

9.1.1 Interannual Variation

Due to the high variability of the atmosphere, wind speed averages can vary significantly from one year to another. For a given year and a given site, wind speeds can quite frequently differ by 10 percent from the climatic average, and, more rarely, by more than 20 percent. The data observed during the wind monitoring program must be analyzed in the context of the regional climatology in order to best represent the wind potential of the site for the duration of the project. The process is referred to as the long-term wind speed adjustment and is based on long-term data from local meteorological stations.

The long-term wind speed adjustment was done using multiple linear regressions between the site's daily mean wind speeds and wind speeds observed at nearby NOAA meteorological stations. The corresponding regression coefficients obtained from each fit are used to make the long-term adjustment for the monitoring site's wind speeds.

The meteorological stations used to perform the long-term wind speed adjustment were chosen using a number of criteria and conditions. A number of NOAA stations were initially considered because of their proximity to the initial monitoring tower for the Project Area. Statistical tests were then carried out on this meteorological station to verify the continuity of its measurements and to evaluate the correlation between its data and those of the wind monitoring program.

One station, Thief River Falls (94956), having the best correlation with the monitoring tower was then selected. The correlation (R^2) between the project wind monitoring tower and the meteorological station was approximately 0.8. Since this is considered to be a good degree of correlation, the linear regression is judged to be adequate. In addition to the long-term adjustment of wind speeds, the climatological representativeness of the observed wind directions was also validated with respect to NOAA station data.

Based on the above described long-term correlation methodology and the observed wind speed at the Project meteorological tower, the long-term adjusted wind speed at 60 m ranges between 6.6 – 7.1 m/s across the Project Area.

9.1.2 Seasonal Variation

Seasonal variation is represented by the shift in wind speeds from one month to the next. Wind speeds in North America are generally higher in colder months due to synoptic patterns which bring higher pressure gradients to the region during these periods.

Table 19 shows the average monthly wind speeds across the Project Area. Generally, the highest average wind speeds are recorded in winter months and the lowest in the summer months.

Table 19: Approximate Average Observed Wind Speed at 60 m

Month	Average Wind Speed (m/s)
January	6.35 – 6.85
February	5.55 – 6.05
March	6.45 – 6.95
April	6.65 – 7.15
May	6.75 – 7.25
June	5.75 – 6.25
July	5.95 – 6.45
August	5.95 – 6.45
September	6.45 – 6.95
October	6.45 – 6.95
November	6.75 – 7.25
December	5.95 – 6.45
Annual Average	6.25 – 6.75

9.1.3 Diurnal Conditions

The heating of the air over the course of the day increases the temperature gradient in the boundary layer, which increases the mixing of the air. This factor helps explain why wind speeds are generally higher in the afternoon. However, micro or mesoscale phenomena occasionally influence the diurnal wind speed cycle, which may moderate the difference between the maximum and minimum wind speeds or even cause the weakest wind speeds to occur in the afternoon.

Table 20 shows the diurnal wind speed cycle across the Project Area. At 60 m there is less variation during the day. The diurnal evolution of wind speed is more pronounced for the lower

levels, due to the influence of ground heating in the lower layer of the atmosphere, which increases the mixing of the air.

Table 20: Diurnal Wind Speed Pattern at Ellerth Windpark

Hour of the Day	Wind Speed (m/s)
0	6.45 – 6.95
1	6.35 – 6.85
2	6.3 – 6.8
3	6.25 – 6.75
4	6.3 – 6.8
5	6.25 – 6.75
6	6.15 – 6.65
7	5.85 – 6.35
8	5.95 – 6.45
9	6.05 – 6.55
10	6.1 – 6.6
11	6.15 – 6.65
12	6.25 – 6.75
13	6.3 – 6.8
14	6.35 – 6.85
15	6.35 – 6.85
16	6.25 – 6.75
17	6.2 – 6.7
18	6.15 – 6.65
19	6.05 – 6.55
20	6.2 – 6.7
21	6.3 – 6.8
22	6.35 – 6.85
23	6.5 – 7.0

9.1.4 Atmospheric Stability

The stability of the atmosphere can be calculated when the temperatures at two levels are available. For the Ellerth Wind Farm, temperature sensors at multiple heights were not available from the met tower data.

9.1.5 Turbulence

Air turbulence, which is defined as the fluctuation of wind speeds, is generated by a combination of land surface roughness and thermal effects. Because turbulence is influenced by the roughness of the ground surface, turbulence intensity will decrease as the height above ground level increases. The most basic measurement of turbulence intensity (TI), which is defined as the fluctuation of wind speed with respect to the average wind speed, calculated in the report at 10-minute intervals. TI is used to determine an appropriate wind turbine class for a given site and is a parameter considered when modeling the wake effect for a wind farm's energy yield calculation. TI variations are presented in Figure 1. As indicated, TI is low to moderate and, as expected, diminishes with increasing height above ground level.

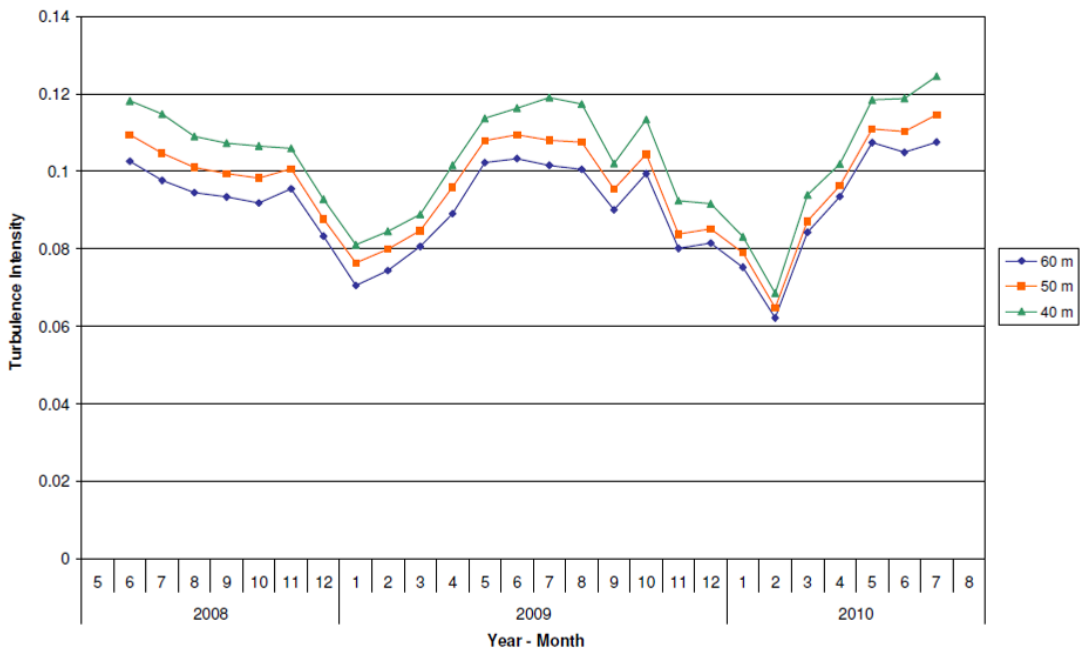


Figure 1: Variation of Turbulence Intensity throughout Observation Period

TI is also influenced by diurnal cycles of heating and thermal mixing of the air. Generally, TI reaches its peak in the beginning of the afternoon. Figure 2 shows the diurnal cycle of the TI, which is moderate during the day and low at night.

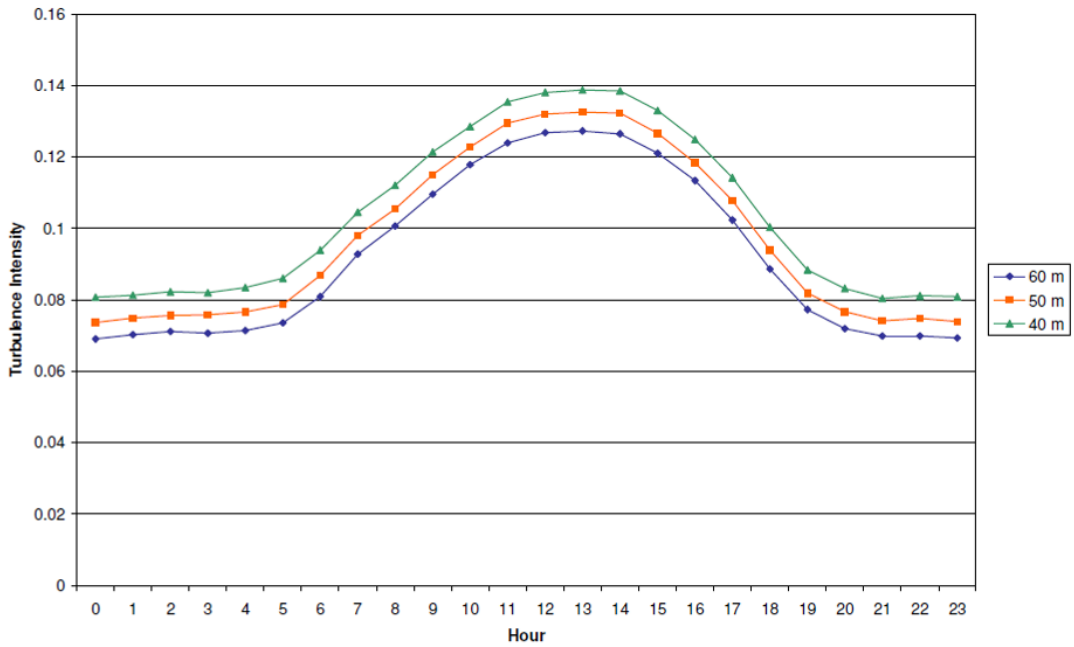


Figure 2: Diurnal Turbulence Intensity Cycle

Finally, in the atmospheric boundary layer, the wind is a flow of turbulent air. Generally speaking, turbulence levels are much more intense when wind speeds are low. Characterizing the variation of turbulence with wind speeds is of interest because it shows the evolution of the TI in the range of operation of wind turbines. Figure 3 presents the variation of turbulence as a function of wind speed. The turbulence values remain roughly constant at moderate wind speeds (11 m/s – 18 m/s) with values between 0.09 and 0.12.

9.1.6 Extreme Conditions

The maximum 10-minute interval average wind speed measured at the Ellerth Windpark meteorological tower site was 21.3 m/s, which was observed on October 27, 2010, at 1:20 pm CT. The maximum gust measured at the Ellerth Windpark meteorological tower site was 36.3 m/s, which was observed on June 17, 2010, at 5:30 pm CT. Extreme weather condition information in the Project Area is further discussed in Section 9.1.11 and presented in Table 22.

9.1.7 Speed Frequency Distribution

Generally, the Weibull statistical distribution is the best representation of the frequency distribution of observed wind speeds, particularly with respect to high wind speeds. Figure 4 shows the distribution of observed wind speeds for the tower over a 28-month period.

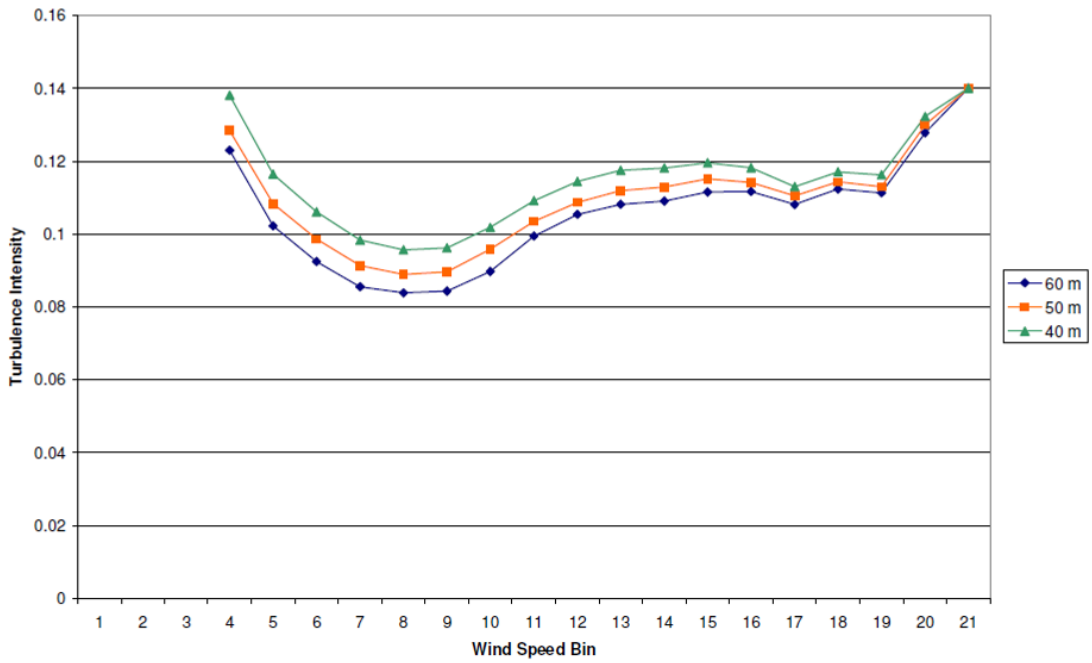


Figure 3: Variation of Turbulence Intensity Sorted into 1 m/s Wind Speed Bins

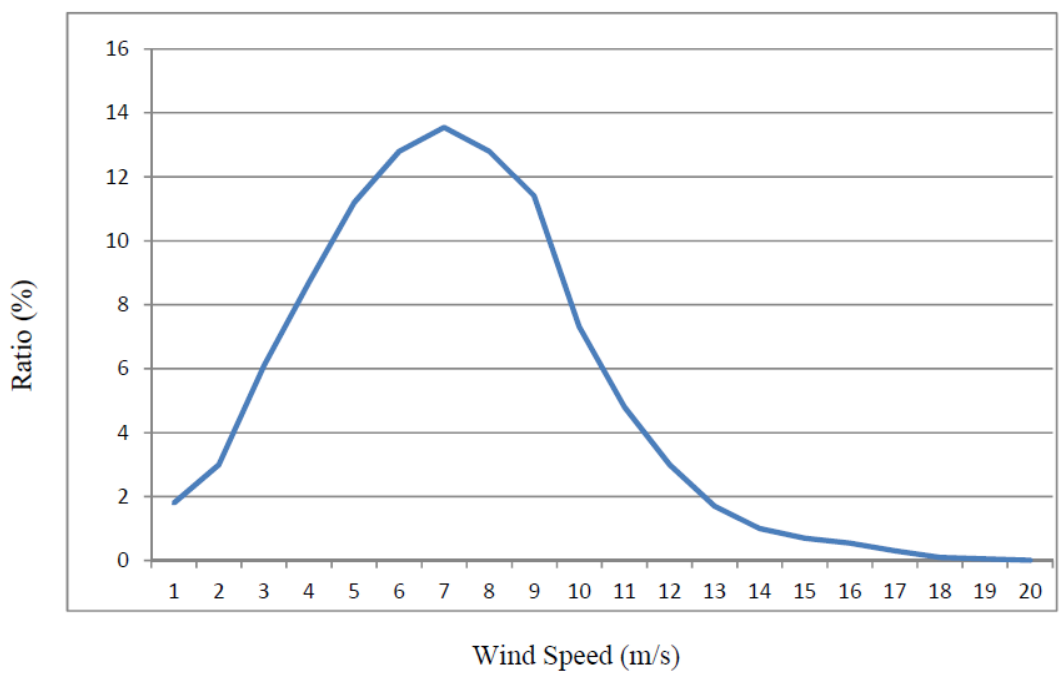


Figure 4: Wind Speed Frequency Distribution at 60 m

9.1.8 Variation with Height

Wind shear is the relative change in wind speed as a function of height. Wind shear is calculated using a power function based upon the relative distance from the ground. The general equation

used for calculating wind shear is S/So = (H/Ho)α where So and Ho are the speed and height of the lower level and α is the power coefficient. The power coefficient can vary greatly due to terrain roughness and atmospheric stability. The power coefficient will also change slightly with variation in height. The average vertical variation with height or shear coefficient, based on the 40 to 60 m level at the Ellerth Windpark meteorological tower site, is 0.26. Figure 5 shows the variation of vertical shear coefficients throughout the monitoring period.

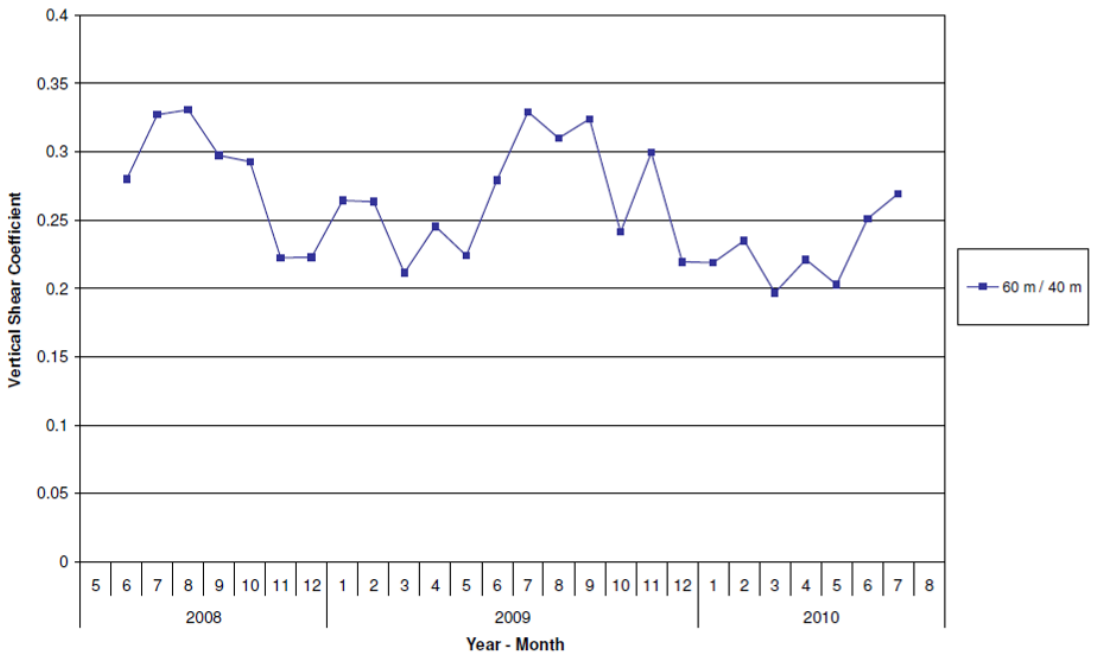


Figure 5: Variation of Vertical Shear Coefficient throughout Observation Period

9.1.9 Spatial Variations

GL Garrad Hassan generated a wind speed map across the Project Area using Wind Atlas Analysis and Application Program (WasP) from the Wind Energy Department at Riso National Laboratory. WasP calculates wind speed values for their directional distributions for a specified height above ground level; its output consists of a grid representing the spatial variation of the wind resource. Additionally, the wind data entered into the model was long-term adjusted and vertically extrapolated to the anticipated hub height, as well the topographic features and roughness area were taken into account. The resulting wind resource analysis program estimates that the spatial variation in wind speed within the Project Area at 80 m is estimated to be between 7.1 m/s and 7.6 m/s. This estimate is supported by the onsite data and the analysis performed for Ellerth Wind.

9.1.10 Wind Rose

A wind rose is a graphical representation of wind speeds based on the direction the wind comes from and the frequency it comes from each direction. Figure 6 shows the observed wind rose at 60 m for the Ellerth Windpark meteorological tower location.

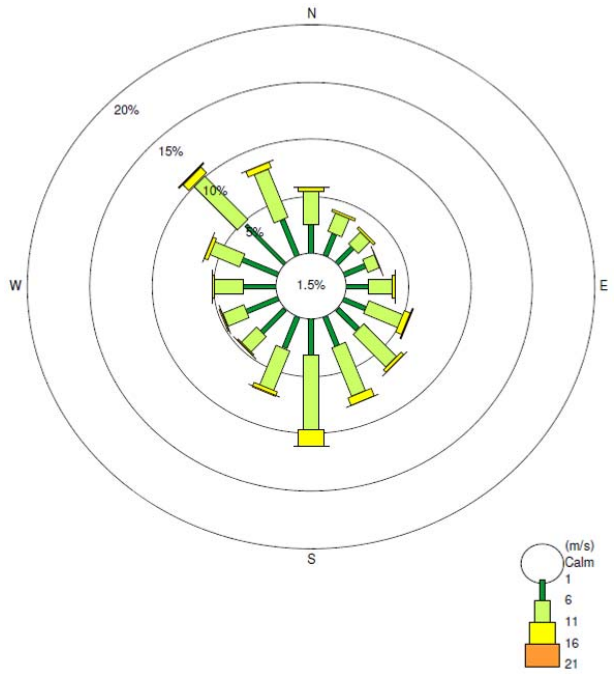


Figure 6: Annual Long-Term Wind Speed and Direction Rose (60m)

9.1.11 Other Meteorological Conditions

Table 21 shows long-term averages from the Thief River Falls monitoring station located approximately 25 miles southeast of the Project Area.

As detailed in Table 22, extreme weather events for Marshall County include thunderstorms, tornadoes, hail, heavy snow and ice, extreme cold, floods, and drought. Tornadoes, thunderstorms, and extreme winds strike occasionally. The state of Minnesota experiences approximately 15 to 20 tornadoes per year. National Climatic Data Center (NCDC) records include 94 thunderstorms and high wind events and 25 tornadoes in Marshall County, for the period January 1, 1950, to November 30, 2010. Such storms are usually of short duration and localized, leading to damage in small geographic areas. Wind turbines are built to withstand hail and lightning, but are not designed to survive tornado-force winds of 89+ m/s (200+ mph). All turbines being considered have lightning protection systems, their turbine blades "feather" into the prevailing wind direction during high wind events to minimize the risk of damage, and all will shut down when the cut-out wind speed is reached.

During the winter, there is potential for ice to accumulate on turbine blades with variable frequency. Although the turbines are not equipped with specific ice-sensing equipment, they will stop turning if significant ice accumulation causes an imbalance. The mechanical safeguards and turbine setbacks mitigate the potential hazard associated with ice throw, and minimize the potential that ice thrown from turbine blades reaches public roads or residences. Ice throw is not expected to be a hazard for this Project.

Table 21: Monthly Average Precipitation and Average Extreme Temperatures for Thief River Falls

	Average Mean Temp (F)	Average Max Temp (F)	Average Min Temp (F)	Average Precipitation (in)
January	3.3	12.1	-5.6	0.22
February	11.2	20.6	1.8	0.28
March	24.4	33.6	15.2	0.44
April	41.5	53.1	29.8	0.96
May	56.1	69.5	42.7	2.59
June	64.4	76.7	52.1	3.39
July	68.6	81.0	56.2	3.43
August	67.2	79.7	54.6	3.14
September	56.4	68.0	44.8	2.44
October	43.7	54.0	33.3	1.68
November	24.4	31.6	17.2	0.86
December	9.3	17.5	1.0	0.26
Annual	**39.2**	**49.8**	**28.6**	**19.69**

Source: National Oceanic and Atmospheric Administration 2002.

Table 22: Extreme Weather Events in Marshall County (Recorded in the Period 1950-2010 in Marshall County, Minnesota)

Event Type	No. of Occurrences in Marshall County
Blizzard	27
Drought	8
Extreme Cold	1
Extreme Cold/Wind Chill	14
Flood	30
Funnel Cloud	5
Hail	134
Heavy Snow	12
High Wind	9
Ice Storm	6
Thunderstorm Wind	85
Tornado	25
Winter Storm	17

Source: National Climatic Data Center Storm Event Database 2010

9.2 Locations of Other Wind Turbines

No other commercial-scale wind turbines are known to exist within the county.

10.0 PROJECT CONSTRUCTION

Temporary disturbances during construction of the Project include crane pads at each turbine site, temporary travel roads for the cranes, temporary laydown areas around each turbine,

trenching in the underground electrical collection system, and storage/stockpile area. Construction of the turbines will include temporary impacts of approximately an additional 12 ft of gravel roadway on either side of the permanent roadway (40 ft total width), a 40-ft-by-120-ft gravel crane pad extending from the roadway to the turbine foundation which will be graded to a minimum of 1 percent, and a component lay down and rotor assembly area centered close to the turbine foundation which will be graded to a minimum of 5 percent. The component lay down area will range from approximately 260 ft by 260 ft to 335 ft by 335 ft, depending on the turbine size selected. In addition to the disturbances associated with the temporary travel roads for the cranes, it is possible that temporary impacts could occur when cranes move cross-country between strings of turbines.

10.1 Roads and Infrastructure

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

- Improving existing access roads to the Project Area;
- Constructing 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;
- Installing 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 the step-up substation and O&M building; and
- Installing 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.

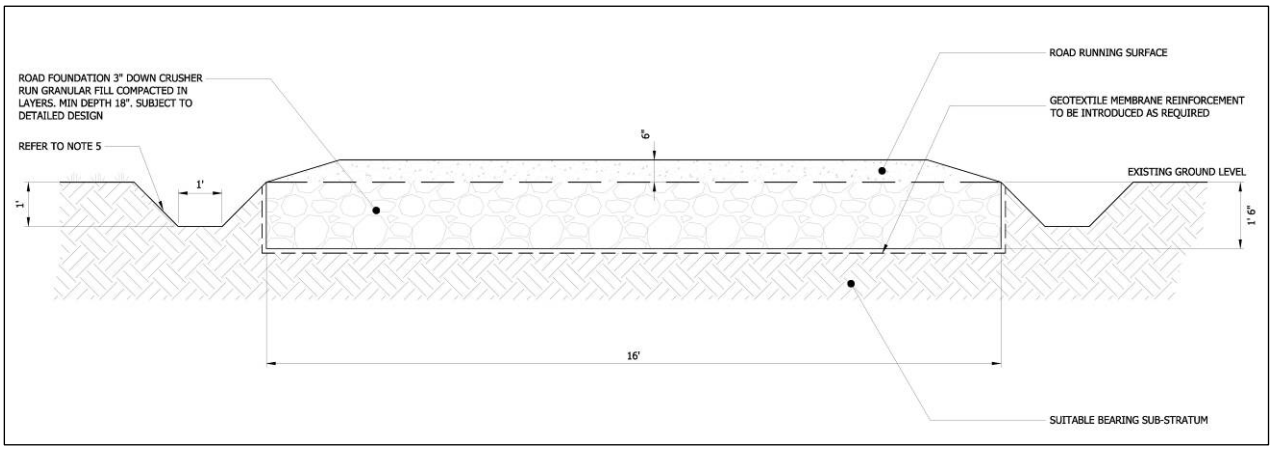
10.2 Access Roads

Access roads will be constructed along turbine strings. 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 roads will be approximately 4.9 m (16 ft) wide and will be covered with road base designed to allow passage under inclement weather conditions. Figure 7 shows a typical cross-section of a permanent access track.

The roads will consist of graded dirt, overlaid with geotechnical fabric (if needed) and covered with gravel. To facilitate crane movement and equipment delivery, an additional 3.5 to 12 ft of gravel roadway will be temporarily installed on either side of the permanent roadway (40 ft total width).

In addition, turbine assembly will require a 40-ft-by-120-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 to 335-ft-by-335-ft area for component lay down and rotor assembly centered close to the turbine foundation which will be graded to a minimum of five percent. Figure 8 shows a typical turbine assembly schematic. 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, repairs to tiling will be done where needed, and the site will be seeded if needed. Once construction is completed, the access roads will be re-graded, filled, and dressed as needed.



Notes:

1. Detail showing permanent access track
2. Temporary access track up to 40'4" will be installed if a crawler crane is required
3. Temporary track to be removed and permanent track reinstated (as per detail above) on completion of works
4. All drawings are preliminary, for reference only, and subject to final detailed design
5. Culverts to be installed as required

Figure 7: Typical Cross-section of a Permanent Access Track

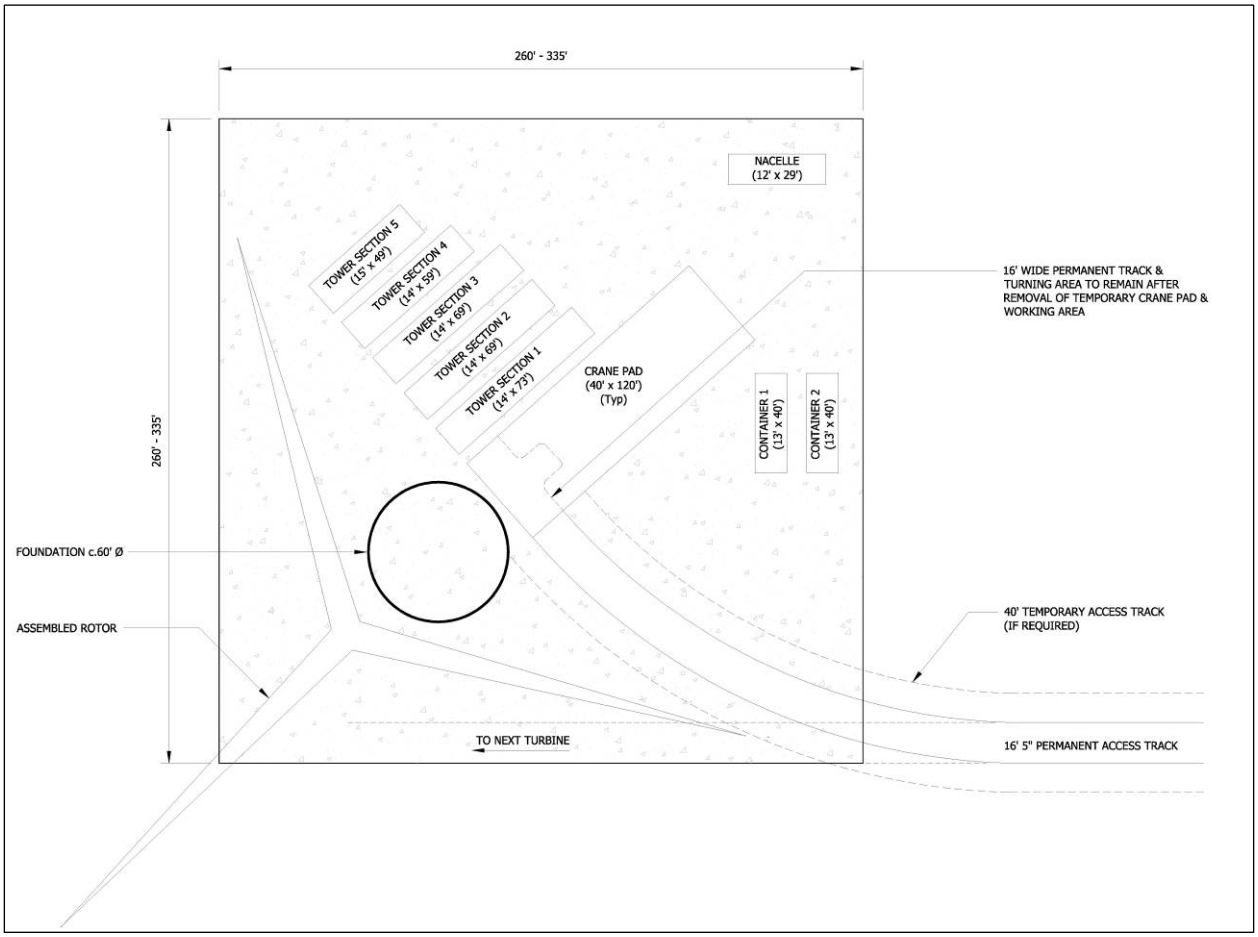


Figure 8: Typical Turbine Assembly Schematic

10.3 Associated Facilities

In addition to the wind turbines, the Project will include access roads, an electrical collection system, a step-up substation, an O&M building, and between one and three permanent meteorological towers. See Map 2 for a depiction of the preliminary turbine locations.

The Project access roads will be approximately 16 ft (4.88 m) wide and low profile to allow cross-travel by farm equipment. Ellerth Wind 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 such as WMAs and state parks.

The electricity generated by each turbine will be stepped-up by a pad-mounted transformer at the base of each turbine or within the nacelle to power collection line voltage of 34.5 kV. The electric energy collected at the turbines will be transmitted via underground lines and then passed

to overhead lines along rights-of-way to the substation location. At the substation, the power will be transformed from 34.5 kV to 115 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 an existing Otter Tail Power Company 115 kV overhead transmission line.

An O&M Building will be constructed on or near the site and will provide access and storage for Project maintenance and operations. The location of the O&M facility at the Project has not been determined at this time, but will be located within the Project Area. The buildings typically used for this purpose are 3,000 to 5,000 square ft and house the equipment to operate and maintain the wind farm. The parking lot adjacent to the building is typically 3,000 square ft.

Ellerth Wind has installed two temporary meteorological towers within the Project Area that were installed in May 2008 and June 2010. It is anticipated that the site will include between one and three permanent meteorological towers to house anemometers and related instruments to monitor Project meteorological conditions. The towers will be painted red on top and will comply with applicable FAA guidelines.

10.4 Turbine Site Location

The wind turbines' freestanding 80 m (262 ft) to 100 m (328.1 ft) tubular towers will be connected by anchor bolts to a concrete foundation. Figure 9 shows a typical turbine 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 turbines under consideration will be approximately 12 to 24 m (40 to 80 ft) in diameter and approximately 2 to 3 m (6 to 10 ft) thick. Pending results of geotechnical investigation, piling may be required for certain turbine foundations.

10.5 Post-Construction Cleanup and Site Restoration

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, repairs to tiling will be done where needed, and the site will be seeded if necessary with a native seed mix. Once construction is completed, the access roads will be graded, filled, and dressed as needed.

10.6 Operation of Project

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 wind farm.

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

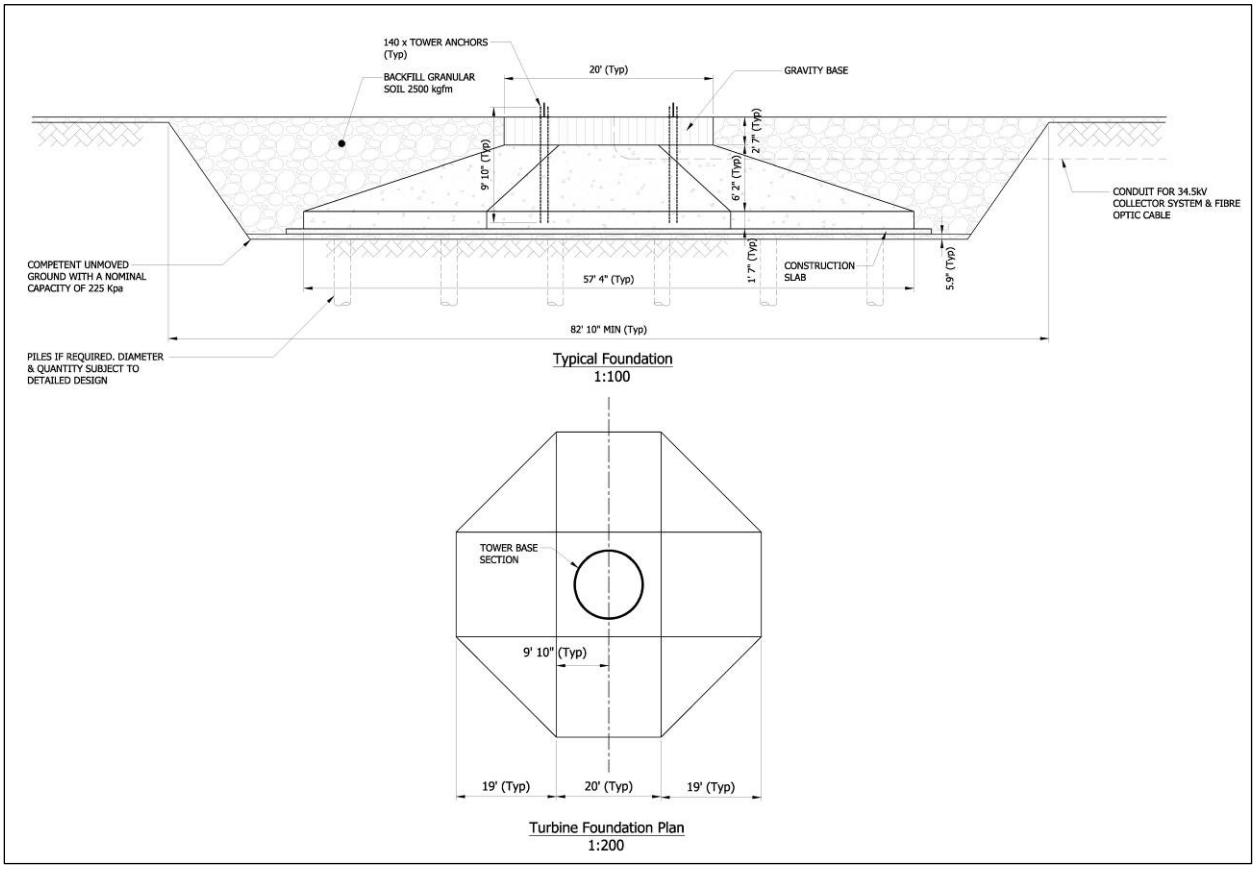


Figure 9: Typical Turbine Foundation

10.6.1 Project Control, Management, and Service

In addition to providing wind farm control, the SCADA system offers access to wind turbine generation or production data, availability, 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 of problems.

The primary functions of the SCADA are to:

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

10.6.2 Maintenance Schedule

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

Project inspection and maintenance is typically 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.

10.6.3 General Maintenance Duties

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

- Maintenance on the wind turbines and on the mechanical, electrical power, and communications system;
- Performance of all routine inspections;
- Maintenance of all oil levels and changing oil filters;
- Maintenance of the control systems, all structures associated with the wind farm, access roads, drainage systems, and other facilities necessary for the operation of the wind farm;
- Maintenance of all O&M field maintenance manuals, service bulletins, revisions, and documentation for the wind farm;
- 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 wind farm, including repairs and replacement of parts and removal of failed parts;
- Assist as needed with avian and other wildlife studies;
- Management of lubricants, solvents, and other hazardous materials as required by local and/or state regulations;
- Maintenance of all appropriate levels of spare parts in order to service equipment;
- 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; and
- Maintenance of site security.

10.6.4 Operations and Maintenance Facility

The location of the O&M facility at the Project has not been determined at this time, but will be located within the Project Area. The buildings typically used for this purpose are 3,000 to 5,000 square ft and house the equipment to operate and maintain the wind farm. The parking lot adjacent to the building is typically 3,000 square ft.

10.7 Costs

Ellerth Wind anticipates financing the cost of all 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. 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. It is anticipated that permanent financing will be secured through a long term power purchase agreement or through a power hedge mechanism.

The total Project-installed capital costs are estimated to be between approximately $195 and $215 million, including wind turbines, associated electrical and communication systems, and roads. Ongoing operations and maintenance costs and administrative costs are estimated to be approximately $4 to 6 million per year, including royalties to landowners for wind easement rights and property taxes.

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

10.8 Schedule

Several activities must be completed prior to the proposed commercial production date of 2012. Pre-construction studies are currently underway and will continue through summer 2011. The majority of the activities relate to equipment ordering lead-time, as well as design and construction of the facility. Below is a preliminary list of activities necessary to develop the Project. Preconstruction, construction, and post-construction activities for the Project include:

- Order 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;
- Construct aboveground or underground feeder lines;
- Design and construct the step-up substation;
- Install tower foundations;
- Install underground cables;
- Tower placement and wind turbine setting;
- Acceptance testing of facility;
- Commencement of commercial production date; and,
- Installation of permanent met tower/towers.

Access roads will be built adjacent to the towers, allowing access both during and after construction. The roads will be approximately 4.9 m (16 ft) wide and have gravel as 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. In addition, there will be a 30-foot diameter gravel work area centered on the base of each turbine.

10.8.1 Land Acquisition

The Applicant will be responsible for all land acquisition and will obtain the necessary easements from landowners.

10.8.2 Permits

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

10.8.3 Equipment Procurement, Manufacture, and Delivery

Ellerth Wind is in the process of procuring turbines for the Project and its other wind farm sites. Turbines will be allocated to the Project after meteorological and economic studies are

completed to achieve the best match of turbines and sites. Turbines could arrive on site in first quarter, 2012.

10.8.4 Construction

Ellerth Wind personnel will oversee the primary contractors performing Project construction, including roads, wind turbine assembly, electrical, and communications work. The construction may take approximately 12 months to complete, however, depending upon seasonal or weather-related constraints (i.e. minimal work would occur during winter months) it may take less time.

10.8.5 Construction Financing

Ellerth Wind anticipates financing the cost of all 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.

10.8.6 Permanent Financing

Permanent financing will be provided with the Applicant's internal funds or a combination of internal funds and third-party sources of debt and equity capital. It is anticipated that permanent financing will be secured through a long-term power purchase agreement or through a power hedge mechanism.

10.8.7 Expected Commercial Operation Date

The Applicant anticipates that the Project would begin commercial operation in November 2012. The commercial operation date is dependent on the completion of the interconnection, permitting, and other development activities. Construction is anticipated to commence in May 2012.

10.9 Energy Projections

Wind turbines will be placed on lands under lease by Ellerth Wind, primarily along the higher elevation features of the site to provide the best exposure to wind. The proposed internal array spacing for Project turbines is a minimum of three RD in the non-prevailing wind directions and a minimum of five RD in the prevailing wind directions. The spacing is dependent upon the selected equipment and the site topography. Ellerth Wind will develop the site to minimize array wake losses and to optimize efficient use of wind and land resources.

10.9.1 Base Energy Projections

The Ellerth Wind Project will have a nameplate capacity of up to 98.9 MW and an estimated net capacity factor of between approximately 37 and 41 percent; Project estimated annual average net-output will be between approximately 315,000 Megawatt hours (MWh) and 351,100 MWh.

Annual energy production output will depend on final design, site specific features, and the equipment selected.

10.10 Decommissioning and Restoration

The Project decommissioning and restoration plan is in accordance with the requirements of Minn. Rules part 7836.0500, subp. 13. At the end of commercial operation, the Project owners will be responsible for removing wind facilities, and removing the turbine foundations to a depth of 4 feet. Project owners may seek to extend land rights instead of decommissioning at the end of the site permit term. This would include applying for an extension of the site permit, if necessary, and continuing operation of the Project. In this case, a decision may be made on whether to continue operation with existing equipment or to retrofit the turbines and power system with upgrades based on newer technologies.

10.10.1 Anticipated Life of the Project

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

10.10.2 Estimated Decommissioning Costs

The estimated decommissioning cost in current dollars is expected to be approximately $58,000 per turbine, including associated facilities. Ellerth Wind's current estimates for the salvage value of the turbines and associated facilities show that the cost to decommission would be fully covered by the sale of salvaged material (steel, copper, etc.) from the Project if decommissioned today. Ellerth Wind 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 wind farm is expected to exceed the costs of decommissioning, but this will depend upon the prevailing rates for salvage value of the equipment and labor costs. This methodology provides a conservative estimate of the Project's residual value because:

Long-term average salvaged metal prices were used, as opposed to more recent prices that exceed long-term averages, and

During the majority of the wind farm's life, the components would be sold as used equipment at significantly higher prices than their underlying salvaged metal value.

The salvage value of the turbines and other components ensures that sufficient funds will be available to cover decommissioning and restoration costs.

10.10.3 Method and Schedule for Updating Costs of Decommissioning and Restoration

Because the uncertainty surrounding future decommissioning cost and salvage value increases with time, Ellerth Wind will review and update the cost estimate of decommissioning and restoration for the Project 10 years after Project commissioning. This revised cost estimate of decommissioning and salvage value will then be submitted to the PUC for review and comment.

10.10.4 Method of Ensuring Availability of Decommissioning Funds

Beginning in year 11 of the Project's operational life, the Applicant will either create a reserve fund or enter into a surety bond agreement and create an escrow account, or provide for a combination of both a reserve and surety bond, that will ultimately fund decommissioning and site restoration costs after Project operations cease, to the extent that the salvage value does not cover decommissioning costs. The exact amount to be allocated for decommissioning will be determined by a third party study in year 10 that will assess the difference between estimated decommissioning costs and the salvage value.

10.10.5 Anticipated Manner in which the Project will be Decommissioned

The owner will be responsible for costs to decommission the Project and associated facilities. As a condition to termination of the landowner agreement, the owner will remove all of the remaining improvements on the property and reasonably restore the property to its approximate original condition prior to the installation of the improvements, all at the project owner's sole cost and expense. Easement agreements include a license to enter the property to perform such removal and restoration. There are provisions within the landowner agreement that enable the agreements to be transferred and reassigned, and requirements which identify the obligations and assignment of assets in the event of bankruptcy or default

Such removal and restoration obligations shall be completed within twelve (12) months of commercial operation of the project ceasing, and in general accordance with the requirements of Minnesota Rules 7854.0500, subp. 13. Decommissioning will involve removal of all above-ground wind facilities including wind turbine nacelles, blades, towers, foundations, roads, and other ancillary facilities. The Project owner shall remove footings, foundations and other structures down to a level of forty-eight (48) inches below grade and return the grade to a condition reasonably comparable to conditions prior to Ellerth Wind's installation of improvements on the property. All access roads will be removed unless the affected landowner provides written notice that the road or portions of the road can remain. Additionally, disturbed surfaces shall be graded, reseeded, and restored to a condition reasonably similar to original.

11.0 IDENTIFICATION OF OTHER 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 23.

Table 23: Potential Required Permits and Approvals

Regulatory Authority	Statute	Permit/ Approval	Description	Trigger	Fee	Application Timeline	Website
Federal Approvals							
FAA	49 USC 44718	Notice of Proposed Construction (Form 7461-1) Hazard Determination	Notifies FAA of proposed structures that might affect navigable airspace. Form requires proposed markings and lighting. FAA must review possible impacts to air safety and navigation, as well as the potential for adverse effects on radar systems.	All turbines/ structures over 200 feet tall; and/or turbines/ structures less than 200 feet tall near an airport.	No fee.	Submit notice at least 30 days prior to anticipated start of construction or before the application for construction permit is filed.	http://www.faa.gov/
USACE	Clean Water Act	Section 404 Permit	Required for the discharge of dredged or fill material into waters of U.S. Minimal levels of fill may be covered under existing General Permits/Letters of Permission	Presence of waters of the U.S.	No fee.	Dependent on level of fill and type of permit required (individual vs. Letter of Permission)	http://www.usace.army.mil/
State Approvals							
Minnesota Public Utilities Commission	Pursuant to Minnesota Statute §216F.08	LWECS Site Permit	Application required for facilities with nameplate capacity greater than 5 MW	Generation of greater than 5 MW of power.	To be determined by the PUC.	180 days prior to construction (minimum).	https://www.revisor.mn.gov/statutes/?id=216F

Regulatory Authority	Statute	Permit/ Approval	Description	Trigger	Fee	Application Timeline	Website
Minnesota Public Utilities Commission	Minnesota Statutes §§216B.2421 and 216B.243 subd. 2, and Minnesota Rules Chapter 7849	Certificate of Need	Needed for a large energy project and HVTL in Minnesota. Commission determines basic types of facility to be constructed, size of facility, and the time of the facility	Project nameplate is greater than 50 MW.	To be determined by the PUC.	Notice of intent must be filed 3 months prior to application. Following the filing, application process generally takes one year.	https://www.revisor.mn.gov/statutes/?id=7849
Minnesota Pollution Control Agency	Clean Water Act	Section 401 Certification	Verify that project construction would comply with state water quality standards.	Wetland impacts proposed that do not qualify for Section 404 GP/LOP.	No fee.	Prior to construction activities.	http://www.pca.state.mn.us/water/401.html
Minnesota Pollution Control Agency	National Pollutant Discharge Elimination System Act	General Permit (Construction)	For stormwater discharges from construction activities.	Grading of more than 1 acre.	$400	Permit to be filed prior to construction with a SWPPP.	http://www.pca.state.mn.us/publications/wq-strm2-05.pdf
Minnesota Pollution Control Agency	Minnesota Hazardous Waste Rules Chapter 7045	Very Small Quantity Generator of Hazardous Waste License	For discharge of hazardous waste.	Generate 220 pounds or less per month hazardous waste	$477 (2009 base fee)	Apply annually.	http://www.pca.state.mn.us/publications/w-hw7-09.pdf
Minnesota Department of Health	Minnesota Statutes, Chapter 103I	Well Construction Notification Fee	For construction of new water-supply wells	Construction of well for O&M building	$215	Prior to construction	http://www.health.state.mn.us/divs/eh/wells/rulershandbook/permits.pdf
Minnesota Department of Natural Resources	Minnesota Statute Chapter 84.415.	License to Cross Public Land and Water	For siting facilities on, or crossing over, any State administered Public Lands or Waters	Siting facilities on, or crossing over, any State administered Public Lands or Waters	$2,000 for public waters; $5,000 for public lands	Prior to impact. Process takes 60 to 90 days.	http://www.dnr.state.mn.us/waters/watermgmt_section/pwpermits/applications.html

Regulatory Authority	Statute	Permit/ Approval	Description	Trigger	Fee	Application Timeline	Website
Minnesota Department of Natural Resources	Minnesota Statute Chapter 84.415.	Permit to Work in Public Waters	For work affecting the course, current, or cross-section of a lake, wetland, river or stream	Course, current, or cross-section of a lake, wetland, river or stream affected	$150 minimum fee, $1000 maximum fee	Prior to impact.	http://www.dnr.state.mn.us/waters/watermgmt_section/pwpermits/applications.html
Minnesota Board of Water and Soil Resources	Wetland Conservation Act (WCA)	WCA Approval	For wetland impacts. Ranges from an exemption for small or temporary impacts to a permit and mitigation for greater impacts	Impacts to any wetland in the state.	To be determined by LGU	Permit application process takes up to 60 days.	http://www.bwsr.state.mn.us/wetlands/forms/form03_B.pdf
Minnesota Department of Transportation	Minnesota Statute 505, Minnesota Rules 8810.0050	Access Driveway Permit	Required to provide driveway access to state-owned right of way.	Project requires change in access to or from state right of way or change in use of property.	To be determined by MnDOT	Prior to construction; process takes 30 days.	http://www.dot.state.mn.us/utility/
Minnesota Department of Transportation	Minnesota Statute 161.45, Minnesota Rules 8810.3100-8810.3600	Utility Permit on Trunk Highway Right of Way	Required to install utilities within state owned right of way.	Project requires use of state right of way for utility route or crossing.	To be determined by MNDOT	Prior to construction. Process takes 4 to 6 weeks	http://www.dot.state.mn.us/utility/
Minnesota Department of Transportation	Minnesota Statute 169.862	Wind Energy Transportation Oversize and/or Overweight Permit	Required to transport oversize loads on state maintained roads.	Project construction requires oversize/ overweight truck loads.	60-day $36	Permit required prior to construction.	http://www.dot.state.mn.us/cvo/oversize/oversize.html

Regulatory Authority	Statute	Permit/ Approval	Description	Trigger	Fee	Application Timeline	Website
Minnesota Department of Transportation	Minnesota Statute 360.83	Tall Structure Permit	Required for wind turbines and other tall structures	Structure more than 200 feet above ground level within 3 miles of an airport and increasing by 100 feet for each additional mile out to 6 miles and 500 feet	No fee	Review takes approximately 2 weeks; submittal must include FAA Aeronautical Study Determination	http://www.dot.state.mn.us/aero/avoffice/talltowers.html
Local Approvals							
Marshall County	County Regulations	Land Alteration Permit	Permits in floodplain and shoreland areas are required for specific grading, filling and other land alteration activities.	Project construction requires permitted activities in floodplain and shoreland areas.	$50	Prior to construction.	http://www.co.marshall.mn.us/marshallcounty/departments/waterandland.htm#permitreq
Marshall County	County Regulations	Building Permit	Required for placement of roads, driveways, and parking areas and specific grading, filling, and other land alteration activities.	Project construction requires permitted activities in floodplain and shoreland areas.	$50	Prior to construction	http://www.co.marshall.mn.us/marshallcounty/departments/waterandland.htm#permitreq
Marshall County	County Regulations	Conditional Use Permit	Required for development that would not be appropriate generally but may be allowed with appropriate restrictions	Project requires land use outside of normal zoning ordinance specifications	$250	Prior to construction	http://www.co.marshall.mn.us/marshallcounty/departments/waterandland.htm#permitreq
Marsh Grove Township	Township Regulations		N/A	N/A	N/A	N/A	N/A
Foldahl Township	Township Regulations		N/A	N/A	N/A	N/A	N/A
West Valley Township	Township Regulations		N/A	N/A	N/A	N/A	N/A

Regulatory Authority	Statute	Permit/ Approval	Description	Trigger	Fee	Application Timeline	Website
Wright Township	Township Regulations		N/A	N/A	N/A	N/A	N/A
Viking Township	Township Regulations		N/A	N/A	N/A	N/A	N/A
Comstock Township	Township Regulations		N/A	N/A	N/A	N/A	N/A

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