DRAFT Application to the North Dakota Public Service Commission for a Certificate of Site Compatibility

Sunflower Wind Energy Project

Stark and Morton Counties, North Dakota

Case #: PU-13-847



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Exhibit 1

Sunflower Wind Project, LLC

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Acronyms and Abbreviations

AADT	Average Annual Daily Traffic
APE	Area of Potential Effects
Basin	Basin Electric Power Cooperative
BMPs	Best Management Practices
Certificate	Certificate of Site Compatibility
CRP	Conservation Reserve Program
dBA	A-weighted decibel
DOD	Department of Defense
EMF	Electromagnetic Field
EPC	Engineering, procurement, and construction
ESA	Endangered Species Act
FAA	Federal Aviation Administration
IS (WAUE)	Integrated System (Western's East-side Balancing Authority Area)
kV	kilovolt
kWh	kilowatt-hour
MW	megawatt
MAPP	Mid-Continent Area Power Pool
MBTA	Migratory Bird Treaty Act
MCZR	Morton County Zoning Regulation
NDDOT	North Dakota Department of Transportation
NDAC	North Dakota Administrative Code
NDCC	North Dakota Century Code
NDGFD	North Dakota Game and Fish Department
NPDES	National Pollutant Discharge Elimination System
NRCS	National Resource Conservation Service
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
O&M	Operations and Maintenance

PLOTS	Private Land Open to Sportsmen
Project	Sunflower Wind Energy Project
PSC or Commission	North Dakota Public Service Commission
SCADA	Supervisory Control and Data Acquisition
SCZO	Stark County Zoning Ordinance
SHPO	State Historic Preservation Office
Sunflower	Sunflower Wind Project, LLC
SWPPP	Storm Water Pollution Prevention Plan
USEPA	US Environmental Protection Agency
USDA	United States Department of Agriculture
USFWS	US Fish and Wildlife Service
Western	Western Area Power Administration
WMA	Wildlife Management Area

1.0 INTRODUCTION

Sunflower Wind Project, LLC (Sunflower) is submitting this application for a Certificate of Site Compatibility (Certificate) to construct the Sunflower Wind Energy Project (Project). The Project is located in Stark and Morton counties, North Dakota, (Figures 1-3) and will have a nameplate capacity of up to 110 megawatts (MW). The Project will use up to 59 wind turbine generators depending on the turbine type used. Additional Project facilities include access roads, electrical collection systems and cabling, an operation and maintenance (O&M) building, a substation, and an interconnection yard where the Project will interconnect to the U.S. Department of Energy (DOE) Western Area Power Administration (Western)'s Dickinson-Mandan 230 kilovolt (kV) transmission line, which crosses the Project Area. The interconnection will require additional upgrades to Western's existing Ward-Mandan and Ward-Bismarck transmission lines, which do not cross the Project Area, to support the new electrical generation that would be created by the Project.

1.1 Compliance with the Energy Conversion and Transmission Facility Siting Act Chapter 49-22

The siting of an energy conversion facility in North Dakota requires filing of an application for a Certificate to meet the criteria set forth in the North Dakota Energy Conversion and Transmission Facility Siting Act (North Dakota Century Code [NDCC] 49-22 and Article 69-06 of the North Dakota Administrative Code [NDAC]). Table 1 outlines the information required to fulfill the requirements for a Certificate with the North Dakota Public Service Commission (PSC) and where these requirements are addressed in this document.

NDAC Section 69-06-08-01 establishes exclusion and avoidance areas and selection and policy criteria for the siting or energy facilities. Sunflower considered these areas and policy criteria in the design of the Project, as describe in Section 3.

Table 1. Certificate Completion Checklist

State Authority	Description	Section
49-22-08	Application for a certificate	
a.	A description of the size and type of facility.	1.2, 4.0
b.	A summary of any studies which have been made of the environmental impact of the facility.	Appendix A
c.	A statement explaining the need for the facility.	2.0
d.	An identification of the location of the preferred site for any energy conversion facility	3.0
e.	An identification of the location of the preferred corridor for any transmission facility	NA
f.	A description of the merits and detriments of any location identified and a comprehensive analysis with supporting data showing the reason why the preferred location is best suited for the facility	3.0
g.	A description of mitigative measures that will be taken to minimize all foreseen adverse impacts resulting from the location, construction, and operation of the proposed facility.	1.5, 5.1.3, 5.2.3, 5.3.3, 5.4.3, 5.5.3, 5.6.3, 5.7.3, 5.8.3, 5.9.3, 5.10.3, 5.11.3, 5.13.3
h.	An evaluation of the proposed site or corridor with regards to the applicable considerations set out in section 49-22-09 and the criteria established pursuant to section 49-22-05.1	7.0, 3.4.1, 6.4.2, 3.4.3 and 3.4.4
i	An 8.5 x 11 inch black and white map suitable for newspaper publication depicting site area.	Figure 11A and 11B
49-22-09	Factors to be considered in evaluating applications and designation of sites, corridors, and routes.	Section 7
1.	Available research and investigations relating to the effects of the location, construction, and operation of the proposed facility on public health and welfare, natural resources, and the environment.	Section 7.1
2.	The effects of new energy conversion and transmission technologies and systems designed to minimize adverse environmental effects.	Section 7.2
3.	The potential for beneficial uses of waste energy from a proposed energy conversion facility.	Section 7.3
4.	Adverse direct and indirect environmental effects which cannot be avoided should the proposed site or route be designated.	Section 7.4
5.	Alternatives to the proposed site, corridor or route which are developed during the hearing process and which minimize adverse effects.	Section 7.5
6.	Irreversible and irretrievable commitments of natural resources should the proposed site, corridor, or route be designated.	Section 7.6
7.	The direct and indirect economic impacts of the proposed facility.	Section 7.7
8.	Existing plans of the state, local government, and private entities for other developments at or in the vicinity of the proposed site, corridor, or route.	Section 7.8
9.	The effect of the proposed site or route on existing scenic areas, historic sites and structures, and paleontological or archaeological sites.	Section 7.9
10.	The effect of the proposed site or route on areas which are unique because of biological wealth or because they are habitats for rare and endangered species.	Section 7.10
11.	Problems raised by federal agencies, other state agencies, and local entities.	Section 7.11
49-22-05.1	Energy conversion facility siting criteria	Section 3.4.1, 3.4.2, 3.4.3 and 3.4.4

1.2 Project Summary

1.2.1 Proposed Project Area

The Project is located in Morton and Stark counties, south of Hebron, west of Glen Ullin and east of Richardton in west-central North Dakota (Figure 1). The Project Area will encompass approximately 12,700 acres, all of which is private land. Table 2 lists the township, range and section locations where to Project will be located.

Table 2. Project Area Location

Township	Range	Section
138N	90W	5, North ½ Section 6
138N	91W	North ½ Section 1
139N	90W	19, 20, 21, 26 through 34; South ½ Sections 18, 22, 23; West ½ Section 35
139N	91W	25, 26, 35, 36

1.2.2 Proposed Turbine Types

Depending on the turbine model selected, the Project would install up to 59 turbines to meet the full generation capacity of 110 MW. Although the exact turbine manufacturer and model has not been selected, two models are currently being considered; these two turbine models are described in Table 3.

The Project would utilize up to 55 Vestas V-110 turbines; however, 64 potential Vestas turbine locations are included to account for alternate locations that may be used (Figure 4A).

The Project would utilize up to 59 GE 1.85-87 turbines; however, 76 potential GE turbine locations are to account for alternate locations that may be used (Figure 4B).

Table 3. Specifications for Potential Project Turbines

Specification	Turbine Option #1	Turbine Option #2
Manufacturer	Vestas 2.0 V-110	GE 1.85-87
Rated Output (MW)	2.0	1.85
Tower Height (meters)	80 meters (262 feet)	80 meters (262 feet)
Rotor Diameter	110 meters (361 feet)	87 meters (285 feet)
Total Height/	135 meters (443 feet)	123.5 meters (405 feet)
Height, Ground to Rotor	25 meters (82 feet)	36.5 meters (120 feet)

Rotor Swept Area	9,503 meters^2 (102,289 feet^2)	5,945 meters^2 (63,991 feet^2)
Minimum (cut-in) Wind Speed [a/]	3 m/s (6.7 mph)	3 m/s (6.7 mph)
Maximum (cut-out) Wind Speed	20 m/s (44 mph)	25 m/s (56 mph)
Total Number of Turbines (maximum)	55	59
a/ m/s = meters per second; mph = miles per hour		

1.2.3 Projected Output

The Project will have a nameplate generating capacity of 110 MW. The projected average annual output is estimated between 450,000 to 525,000 megawatt hours (MWh) depending on the turbine model that is selected. As with all wind projects, actual output would be dependent upon wind resource, final design, site-specific features, and equipment performance.

1.3 Project Schedule

Sunflower is targeting the start of construction for early 2015 provided all pre-construction permits and approvals have been obtained. The target date for operation is the end of 2015, dependent upon permitting, equipment deliveries, and other development activities. The Project schedule includes the following components:

a. Certificate: Sunflower anticipates the Certificate will be approved in by June of 2014.

b. Permits: Sunflower will obtain all permits and licenses that are required following issuance of the Certificate. (See Section 6.0 for the list of anticipated permits.)

c. Equipment Procurement, Manufacture and Delivery: Sunflower will order the wind turbine components and other items with long lead times as soon as practical following issuance of the Certificate.

d. Construction: Construction will begin as early in 2015 as weather conditions allow.

e. Test and Operations: Testing and operation will begin in late 2015 following completion of construction.

f. Commercial Operation: Sunflower anticipates commercial operation to begin in December 2015.

1.4 Potential Project Impacts

The Project will create both direct and indirect impacts. Direct impacts are those caused by the Project which would occur at the same time and place as the Project. Examples of direct impacts would include the physical loss of habitat to new access roads and potential direct mortality to birds from collision with turbine blades. Indirect impacts are those caused by the Project but which would occur later in time or farther removed in distance, but are still reasonably foreseeable. Examples of indirect impacts include effects to predator species

resulting from the direct loss of habitat for prey species, or impacts to bird species from the energy used to avoid the wind turbines.

Impacts may also be permanent or temporary. Permanent impacts are those which will last for the life of the Project, such as habitat loss resulting from the establishment of permanent access roads, turbine foundations, the substation and O&M building. Temporary impacts are those which will last only for the period of construction and then would either cease or be restored. Examples include temporary increases in traffic or housing demand during construction, or temporary impacts to habitat at construction laydown areas. Table 4 summarizes the estimated permanent and temporary impact for each potential turbine type based on Project components.

All potential impacts presented are "worst-case" estimates, and actual impacts are anticipated to be smaller than presented. Access road impacts assume that all access roads will be new construction, and does not include the use of existing farm roads.

Table 4. Estimated Project Ground Disturbing Impacts

Project Component	Assumptions	Layout A - Vestas 2.0 V -110			Layout B - GE 1.85-87		
		Number/ miles/ac	Permanent Impact (acres)	Temporary Impact (acres)	Number/ miles/ac	Permanent Impact (acres)	Temporary Impact (acres)
Turbine foundations	Permanent: 65-foot radius turbine pad; Temporary: Up to 200-foot radius around towers for construction work area.	55	16.8	159.3	59	169*.8	170.2
Access roads	Permanent: 16-foot finished width; Temporary: 36-foot initial construction width	13.4 mile	26.1	58.8	13.7 miles	26.6	59.9
Substations	Permanent: Area within substation/ interconnection yard fenceline; Temporary: None	5.7 acre fenced substation and 5.5 acre fenced interconnection yard	11.2	0 ac	5.7 acre fenced substation and 5.5 acre fenced interconnection yard	11.2	0
O&M facility	Permanent: Area within building and yard fenceline; Temporary: None	5 acre site	5	0 ac	5 acre site	5	0
Construction laydown area	Permanent: None; Temporary: Area within temporary fenceline	Up to 15 acre temporary site	0	15	Up to 15 acre temporary site	0	15
Collection Lines	Permanent: None;	19.3 miles	0	18.7	19 miles	0	18.4

b/	Temporary: 8 feet wide along each collection line						
Totals (acres) /c			**182.9**	**53.8**		**191.8**	**55.2**

a/ Collection lines will be co-located with access roads and county roads where possible. Estimates listed in table are worst case scenarios.
/b Impact calculations are summed accounting for where disturbances overlap. Therefore final assumed impact numbers are lower than the sum of each column independently.

1.5 Reference to the Draft Upper Great Plains Programmatic Environmental Impact Statement

Throughout this document Sunflower has referenced, where appropriate, the Upper Great Plains Wind Energy Programmatic Environmental Impact Statement (UGP Wind Energy PEIS) which has been drafted by Western and the US Fish and Wildlife Service (USFWS) (Western and USFWS 2013). This document can be accessed on line at the Upper Great Plains Wind Energy website (UGPWE 2014). The UGP Wind Energy PEIS addresses the majority of the environmental impacts that occur when wind energy projects are constructed, operated, maintained, and decommissioned in Western's Upper Great Plains Customer Service Region (UGP Region), including the location the Project is located. Based on Western's experience with existing projects, the PEIS identifies a range of potential environmental impacts expected for wind energy projects. In response to impacts, the PEIS lists Best Management Practices (BMPs) and mitigation measures that have been found to be effective in avoiding or reducing impacts on specific environmental resources that could be applied to satisfactorily eliminate, minimize, or reduce the environmental impacts for many wind energy projects. Sunflower has adopted these avoidance and mitigation measures and BMPs where appropriate as discussed in Section 5.

1.6 Public and Agency Coordination

Sunflower has been in contact with the public, landowners, and agencies throughout the planning stages of the Project. State and federal laws require public involvement as part of the decision making process. The different approaches for this involvement include scoping meetings, letters, newspaper advertisements, and radio announcements.

1.6.1 Outreach

There were three meetings conducted on behalf of the Project. On August 22, 2013, a public scoping meeting was held at the Hampton Inn in Dickinson to address the NEPA process that Western is undertaking. On December 3, 2013, Sunflower held an open house meeting for at the Hebron Community Center in Hebron. The third meeting was on February 26, 2014, and was a public scoping meeting at the Hampton Inn in Dickinson. This meeting was held in relation to the Tiered Environmental Assessment approach Western is using for the NEPA process.

1.6.2 Contacting Affected Landowners.

Sunflower has been working with the participating landowners within the Project area since 2009. Initial easements were signed at that time to allow the preliminary wind evaluation and other due diligence. Over time, additional landowners have joined and are participating in the Project. Sunflower has kept in close communication with landowners through Project updates, landowner meetings, and mailings to keep them aware of the progress.

Sunflower notified all landowners within the Project boundary and up to 1.5 miles outside of the Project boundary, inviting them to attend the three meetings discussed in Section 1.6.1. In addition, Sunflower advertised the two NEPA process scoping meeting invitations in the newspapers, and broadcast notices on the radio, including Dickinson Press, Bismarck Tribune, Hebron Herald, Bismarck KBMR-AM, RBMR-AM, KFYR-AM, RFYR-AM, KXMR-AM, and RXMR-AM.

1.6.3 Contacts with Local Government and Public Officials.

Below is a list of agencies contacted throughout the planning process. In addition, see Section 7.12 of this document for a list of agencies that were contacted via a letter on February 10, 2014 and asked to comment on the Project in accordance with Section 69-06-01-05 of the PSC's administrative rules.

- *USFWS and North Dakota Game and Fish.* Both agencies were contacted in early 2011 with regard to early evaluation of potential biological constraints. Both agencies were again contacted in early 2013 prior to starting intensive field surveys, pursuant to the USFWS Wind Energy Guidelines. Both agencies attended a kickoff meeting with Western in July of 2013 to discuss the NEPA process for the Project. An in-person meeting was held with the USWFS in August 2013 to provide preliminary findings from the field surveys completed within the Project Area. A meeting is scheduled to occur on Wednesday, February 26, 2014 with the USFWS, Western, and representatives from Sunflower to discuss the results from the year of field surveys completed within the Project Area.
- *County Commissioners.* Representatives from Sunflower provided an introduction to the Project in an open meeting for Morton County on September 17, 2013, and Stark County on December 3, 2013.
- *County Departments.* Introductory letters with information about the Project were sent to the Morton County Emergency Services, Morton County Sheriff, Stark County Emergency Services and Stark County Sheriff in December 2013. No responses have been received to date.
- *ND Aeronautics Commission.* Project Information was submitted to the ND Aeronautics Commission in October 2013. Staff from the ND Aeronautics Commission recommended contacting airport contacts within 10 miles of the Project Area, and

consequently, introductory letters were sent to these contacts. No responses have been received to date.

- *County Conditional Use Permit/Special Use Permits*. Applications have been filed with both Stark and Morton counties. Planning and Zoning meetings are scheduled to be held on Thursday, February 27, 2014 for both counties. The Stark County Commissioners are scheduled to review the applications and provide a final determination on Tuesday, March 4, 2014. The Morton County Commissioners are scheduled to review the applications and provide a final determination on Monday, March 10, 2014. Both counties have sent out meeting notifications for all hearings.

2.0 NEED FOR THE FACILITY

2.1 Need Analysis

Due partly to high heating demand in winter, North Dakota's per capita energy consumption is among the highest in the nation. Nearly three-tenths of North Dakota households use electricity as their primary energy source for home heating.

Most of the coal used for power generation is supplied by several large surface mines in the central part of the state.

In March 2007, North Dakota enacted legislation (H.B. 1506) adopting a voluntary renewable portfolio objective that aims to have ten percent of electricity used in the state generated from renewable sources by 2015. According to the U.S. Energy Information Administration (USEIA 2012), in 2010, 82 percent of North Dakota's net electricity generation came from coal, 12 percent came from wind energy, and 6 percent from conventional hydroelectric power sources. Consequently, the ten percent renewable portfolio objective is being met. However, other goals for renewable energy have been established. According to a 2010 report prepared by the EmPower ND Commission, one of the state energy goals is to increase installed wind energy capacity to 5,000 MW by 2020 (EmPower ND 2010). North Dakota's goals include the following:

- general economic development and help the nation achieve greater energy independence,
- derive 25 percent of all energy produced in America from renewable sources by 2025, and
- provide a fair and responsible regulatory environment that promotes energy development.

In recent years, the Mid-Continent Area Power Pool (MAPP) has consistently reinforced the regional need for increased generating capacity in the coming decade. The most recent MAPP report available (2009) indicates that deficits are now expected by 2017 (Table 5).

Table 5. MAPP (US) Summer Season Surplus/Deficit

Year	MW
2008	2,377.3
2009	1,522.2
2010	1,044.8
2011	939.5
2012	785.7
2013	502.8
2014	657.8
2015	524.4
2016	227.5
2017	-19.3
2018	-367.3

Source: Page III-5 of the MAPP 2009 Load and Capability Report (MAPP, 2009).

A regional need exists for renewable energy produced in North Dakota. Eleven of the MISO states currently have renewable portfolio standards. According to the MISO Transmission Expansion Plan for 2012, the MISO region needs to add between 4,484 and 11,290 MW of new capacity or 3,865 and 9,733 MW of demand reduction to meet the minimum Planning Reserve Margins in 2022. 9,912 MW of retirements are assumed to occur from 2015 onward due to EPA regulations. Depending on the projection scenario, MISO assumes anywhere from 13 to 60 GW of incremental wind penetration. Seventeen Multi-Value Projects have been integrated into MISO planning models, which will relieve a major part of MISO's internal future congestion and deliver wind energy more efficiency.

Within North Dakota, the expansion of oil and gas operations within the Bakken Formation is anticipated to significantly increase future load growth. In 2012, the North Dakota Transmission Authority commissioned a study to forecast future load growth demands due to the increased development in the Bakken Formation over a 20 year period. Based on modeled load growth projections, North Dakota alone is expected to need an additional 1,830 MW by 2017, 2400 MW by 2022, 2,769 MW by 2027, and 3,030 MW by 2032.

In 2013, Basin Electric Power Cooperative (Basin) issued an RFP for short- and long-term baseload of 25 MW of capacity or higher for intermediate and peaking capacity starting in 2016. Basin Electric determined that capacity and energy is needed in the Intergraded System (IS) area located in Western's east-side Balancing Authority Area (WAUE), which covers a large geographic area including North Dakota. Sunflower submitted a proposal to supply power from the Sunflower Wind Project, which was selected by Basin. Sunflower now has a fully executed power purchase agreement with Basin for the power produced by the Project.

The Project will allow North Dakota to continue to provide capacity to meet those forecasted deficits with clean, efficient, renewable energy for at least the projected 30-year life of the Project.

2.2 Alternatives

Feasible technology alternatives to wind include electricity generation using coal, natural gas, or biomass. None of these alternatives were considered because these technologies do not meet the state's goal of adding new renewable energy.

2.3 Ten Year Plan

In accordance with NDCC Section 49-22-04, Sunflower filed its first Ten-Year Plan with the PSC and with the Auditor for Stark and Morton counties on October 30, 2013.

3.0 SITE SELECTION CRITERIA

NDAC Chapter 69-06-08 established criteria for siting energy facilities, including exclusion areas, avoidance areas, selection criteria and policy criteria. Sunflower's compliance with these criteria is discussed in the following sections.

3.1 Introduction

As a preliminary matter, a viable wind power project must have the following characteristics:

3.1.1 Wind resources.

A viable wind power project must be based on a reliable wind regime, capable of producing the required amount of electric power. Sunflower utilized wind data from three onsite meteorological towers installed in 2009 to determine the wind characteristics of the Project Area.

3.1.2 Landowner Agreements

A viable wind power project must have a sufficient number of landowners who are willing to participate through lease agreements. Sunflower has entered into agreements with landowners within the Project Area in order to secure rights to access their property for surveys, testing, construction, operation, and maintenance of the Project. Landowner agreements, and appropriate easement agreements and waivers, are now secured for the Project.

3.1.3 Environmental Conditions

A viable wind power project must be based on environmental conditions which allow the Project to meet environmental standards at an economically-supportable cost. Sunflower has chosen a Project site with favorable environmental conditions as discussed in Section 5.

3.1.4 Interconnection Infrastructure.

A viable wind power project requires interconnection infrastructure sufficiently close to the Project to keep the cost of additional transmission reasonable. Western's Dickenson-Mandan 230 kV transmission line crosses the Project Area, eliminating the need for a Project-specific transmission line. Power generated from the Project will be delivered from the Project substation and interconnection yard located adjacent to the transmission line.

3.1.5 Power Purchase Agreement

A viable wind power project must secure a purchase agreement for the power produced. Sunflower and Basin Electric entered into a 20-year power purchase agreement on November 6, 2013.

3.2 PSC Siting Criteria

3.2.1 Exclusion Areas

In accordance with NDAC Section 69-06-08-01-1, the geographical areas listed in Table 6 have been excluded in the consideration of a site for the Project. Most categories of exclusion area are not present in the Project Area. Exclusion and avoidance areas are shown for the Project Area on Figure 5A for the Vestas turbine layout and Figure 5B for the GE turbine layout.

Table 6. Exclusion Areas

Exclusion Area	Present within Project Area?	Description	Section Addressed
Designated or registered national areas: parks; memorial parks; historic sites and landmarks; natural landmarks; historic districts; monuments; wilderness areas; wildlife areas; wild, scenic, or recreational rivers; wildlife refuges; and grasslands.	No	NA	5.2, 5.4, 5.6, 5.11, Figures 5A, 5B, 7A, 7B, 10A and 10B.
Designated or registered state areas: parks; forests; forest management lands; historic sites; monuments; historical markers; archaeological sites; grasslands; wild, scenic, or recreational rivers; game refuges; game management areas; management areas; and nature preserves.	Potentially Present	Of these exclusion areas, only previously unknown historic sites are potentially present. No NRHP-listed or eligible sites are known to exist in the Project Area. Historic or cultural sites that were discovered during Class III Pedestrian surveys or during construction will be avoided as necessary.	5.2, 5.4, 5.6, 5.11, Figures 5A, 5B, 7A, 7B, 10A and 10B.
County parks and recreational areas; municipal parks; parks owned or administered by other governmental subdivisions; hardwood draws; and enrolled woodlands.	No	NA	5.4, 5.6, 5.11, Figure 5A and 5B
Prime farmland and unique farmland, as defined by the land inventory and monitoring division of the soil conservation service, United States department of agriculture, in 7 C.F.R. part 657; provided, however, that if the Commission finds that the prime farmland and unique farmland that will be removed from use for the life of the facility is of such small acreage as to be of negligible impact on agricultural productions, such exclusion shall not apply.	Yes	Prime farmland is present, but makes up approximately 1% of the Project Area. Prime farmland will be avoided during final design, to the extent practical.	5.1, Figure 7A, 7B, Table 13, Figure 5A, 5B 8A and 8B.
Irrigated land	No	NA	5.6
Areas critical to threatened or endangered animal or plant species	No	NA	5.3, 5.4, 5.5 and Appendix A
Areas where animal or plant species that are unique or rare to this state would be irreversibly damaged.	No	NA	5.3, 5.4, 5.5 and Appendix A
Areas within 1,200 feet of the geographic center of an intercontinental ballistic missile (ICBM) launch or launch control facility	No	NA	5.6

Exclusion Area	Present within Project Area?	Description	Section Addressed
Setbacks from Interstate or state roadways ROW, railroads, transmission lines, non-participating landowners, and county or township roadways.	Yes	Required setbacks as required by Stark and Morton County as well as recommend setbacks from the ND PSC have been incorporated into the proposed layouts. Where both state and county setbacks apply, the more restrictive setback was used.	3.3, 5.6, Table 10, Table 11, Figures 5A and 5B

3.2.2 Avoidance Areas

In accordance with NDAC Section 69-06-08-01-3, the geographical areas listed in Table 7 have been avoided unless, under the circumstances, there is no reasonable alternative. As with exclusion areas, most categories of avoidance area are not present in the Project Area. Avoidance areas are mapped for the Project Area on Figure 5A for the Vestas turbine layout and Figure 5B for the GE turbine layout.

Table 7. Avoidance Areas

Avoidance Areas	Present within Project Area?	Description and Proposed Buffer	Section Addressed
Historical resources which are not designated as exclusion areas	Present	A Class III cultural resources inventory has been completed for the Project. Sites with potential cultural significance will be avoided to the extent practicable.	5.11
Areas within the city limits of a city or the boundaries of a military installation	No	NA	5.6 and Figure 1-3
Areas within known floodplains as defined by the geographical boundaries of the 100-year flood	No	NA	5.2, Figure 5A and 5B
Areas that are geologically unstable	No	NA	5.1
Wetlands	Yes	Permanent impacts to wetlands will be avoided.	5.3, Figures Table 15, 9A and 9B
Woodlands	No	The Project Area will not impact deciduous trees.	Section 5.4, Table 15, and Figures 6A and 6B
Native Prairie	Potentially Present	Approximately 24 acres of grasslands will be permanently impacted and 81 acres of grasslands will be temporarily impacted and that may include isolated areas of native prairie. These areas will be avoided to the extent practical.	5.4, Table 15, and Figures 6A and 6B
Areas of recreational significance which are not designated as exclusion areas	No	NA	5.12

Avoidance Areas	Present within Project Area?	Description and Proposed Buffer	Section Addressed
Areas critical to threatened or endangered animal or plant species which are not designated as exclusion areas	No	NA	5.3, 5.4, 5.5 and Appendix A
Sound levels within 100' of an inhabited residence or a community building cannot exceed 50 dBA	No	NA	5.10, Figure 10A and 10B

3.2.3 Selection Criteria

NDAC Section 69-06-08-01-5 establishes selection criteria based on avoidance of significant adverse effects to specific resources resulting from the location, construction, and operation of the facility in that area. Table 8 describes the potential adverse effects to these resources. All such impacts will be at an acceptable minimum, or will be managed and maintained at an acceptable minimum.

Table 8. Selection Criteria

Selection Criteria	Potential Adverse Effects	Section Addressed
The impact upon:		
Agricultural production	Approximately 55 acres of land will be permanently impacted and 190 acres of land will be temporarily impacted. These impacts represent a minor portion of the land area within the 27,000-acre Project Area, most of which is available for agricultural production. These impacts are adverse but minimal.	5.1 and 5.6
Family farms and ranches	Although some farmland will be permanently converted to wind turbine foundations and pads, access roads, and a substation, wind lease payments to farmers will provide a compensatory source of income and no adverse impacts will result. The Project will comply with local setbacks for non-participating landowners. Easement agreements and waivers with participating landowners contain language that stipulates landowners acquiescence to setback requirements.	3.5, 5.1, 5.6 and Figure 10A and 10B
Land which the owner demonstrates has soil, topography, drainage, and an available water supply that cause the land to be economically suitable for irrigation	No agricultural irrigation is currently present within the Project Area. No adverse effects are expected.	5.6
Surface drainage patterns and ground water flow patterns	No adverse effects are expected. A SWPPP and NDPES will be adhered to in order to avoid impacts to surface drainages and ground water flow patterns.	5.2, 5.3 and Figure 9A and 9B
The agricultural quality of the cropland	No impacts to the agricultural quality of cropland are anticipated other than for the area directly converted to wind energy facility use. Sunflower will work with the landowners to alleviate the compaction of any soils which occurs during construction.	5.1 and 5.6

Selection Criteria	Potential Adverse Effects	Section Addressed
The impact upon the availability and adequacy of:		
Law enforcement	No adverse impacts are expected	5.6
School systems and education programs	No adverse impacts are expected	5.6
Governmental services and facilities	No adverse impacts are expected	5.6
General and mental health care facilities	No adverse impacts are expected	5.6
Recreational programs and facilities	No adverse impacts are expected	5.12
Transportation facilities and networks	During construction, a small increase in vehicle trips per day is anticipated for the duration of the Project construction. No impacts to existing levels of service are anticipated. During facility operation, no discernable impacts are anticipated.	5.7
Retail service facilities	Local services such as motels, restaurants, and convenience stores are likely to experience an increase in business during Project construction. During facility operation, no discernable impacts are anticipated.	5.13
Utility services	No significant impacts are anticipated. Sunflower will purchase station service from Basin Electric. Utilities will suggest appropriate configurations for the electrical system, and Sunflower will abide by the recommendations to prevent impacts to the transmission system.	5.8
The impact upon:		
Local institutions	No impacts are anticipated.	5.6
Noise sensitive land uses	The only noise sensitive land uses within the Project Area are residences. Based on the acoustic analysis presented in Section 5.10 Project-related noise levels will not violate any local, state or federal threshold levels.	5.10, Table 24, Figure 10A and 10B, and Appendix A
Rural residences and businesses	The Project will comply with local setbacks. No significant impacts are anticipated.	3.5, 5.6, 5.13 and Tables 10 and 11
Aquifers	No adverse effects are expected.	5.1 and 5.2
The impact upon:		
Human health and safety	No impacts to human health and safety are anticipated.	5.8
Animal health and safety	No impacts to livestock are anticipated from construction or operation of the facility. Sunflower will implement measures to avoid and minimize impacts to wildlife by siting facilities away from active raptor nests and wetlands to the extent practicable.	5.5, 5.10.2, and Appendix A
Plant life	The Project will result in approximately 55 acres of permanent ground disturbance, including loss of the existing plant populations. As discussed above, this impact would be minimal in the context of the entire Project Area.	5.4 and 5.6, Table 15, and Figures 6A and 6B
Temporary and permanent housing	No adverse impacts to housing are anticipated.	5.13
Temporary and permanent skilled and unskilled labor	No adverse impacts are anticipated. Project impacts to skilled and unskilled labor are expected to be positive.	5.13

Selection Criteria	Potential Adverse Effects	Section Addressed
The cumulative effect of the location of the facility in relation to existing and planned facilities and other industrial development	The Project is not anticipated to contribute to cumulative effects in relation to existing and planned facilities or other industrial development.	7.11 Table 26

3.2.4 Policy Criteria

In accordance with NDAC Section 69-06-08-01-6, the PSC may give preference to an applicant that will maximize benefits that result from the adoption of the policies and practices listed. Table 9 lists those policy criteria and its applicability to the Project.

Table 9. Policy Criteria

Policy Criteria	Applicability and Applicant Response	Section Addressed
Recycling of the conversion byproducts and effluents	Not applicable. The Project will not create byproducts or effluent.	NA
Energy conservation through location, process, and design	Sunflower is developing the site to maximize energy output and will develop a site layout that optimizes wind resources while minimizing the impact on land resources and any potentially sensitive areas.	3.1 and 4.0
Training and utilization of available labor in this state for the general and specialized skills required	Sunflower's EPC contractor will use local labor to the extent practicable.	5.14
Use of a primary energy source or raw material located within the state	The energy generated at the site will utilize the wind resources of the State of North Dakota.	2.1
Non-relocation of residents	No residents will be relocated as a result of the Project.	5.6 and 5.14
The dedication of an area adjacent to the facility to land uses such as recreation, agriculture, or wildlife management	The Project will not interfere with adjacent land uses. As such, it is not anticipated that areas adjacent will be dedicated to recreation, agriculture, or wildlife management issues.	5.6 and 5.12
Economies of construction and operation	Sunflower will utilize local contractors to the extent practicable.	5.14
Secondary uses of appropriate associated facilities for recreation and enhancement of wildlife	None.	NA
Use of citizen coordinating committees	Sunflower will continue to work with landowners of properties for the Project.	5.6 and 5.8
A commitment of a portion of the energy produced for	Energy produced will be injected into the Western's Dickinson-Mandan 230 kV line at the new Project substation and will be	3.3 and 4.2

Policy Criteria	Applicability and Applicant Response	Section Addressed
use in this state	transferred to customers of Basin Electric. Basin Electric's service area includes North Dakota, and a portion of the energy produced will be used in-state.	
Labor relations	No labor relations will be affected.	5.14
The coordination of facilities	Existing facilities and facility corridors were considered in the location of the wind farm and associated facilities.	4.0
Monitoring of impacts	Sunflower and the EPC contractor will employ BMPs during construction to monitor environmental impacts. Environmental monitors will be onsite during construction to ensure there will be no impacts to wetlands and documented archeological sites that require avoidance.	5.2, 5.3, 5.4, 5.5 and 5.8

3.3 County Criteria

In addition to the North Dakota siting criteria discussed above, Sunflower will comply with the setbacks for wind turbines established by Stark and Morton Counties (Figure 5A and Figure 5B), as follows:

Table 10. Stark County Zoning Ordinance Setback Distances for Wind Turbines

Ordinance Section	Setback Type	Setback Distance
6.19	Occupied dwellings, commercial buildings or publicly-used structures or facilities	2,000 feet
6.19	Centerline of public roads and above-ground communication and electrical lines	200 feet
6.19	Perimeter of the facility	2.5 times the rotor diameter or greater
3.7	New Project related building	Minimum of 125 feet from centerline of county roads or from section lines

Table 11. Morton County Zoning Regulation (MCZR) Setback Distances for Wind Turbines

Regulation	Setback Type	Setback Distance
Article 5, Section 4.27	Occupied residences, commercial buildings or publicly used structures or facilities, or state and county parks	1.25 times the total height or 1,320 feet, whichever is greater
Article 5, Section 4.27	Public roads and above-ground communication or electrical lines	250 feet or greater from the centerline of the roadway
Article 5, Section 4.27	Perimeter of the facility	1 to 1.5 times the rotor diameter or greater
Article 18	New Project related building	Minimum of 60 feet from the right-of-way line of county roads and state or federal highways

4.0 DESCRIPTION OF THE PROPOSED FACILITY

4.1 Project Layout and Associated Facilities

The Project will consist of up to 59 wind turbine generators, supported by required access roads, power collection lines, a Project substation, interconnections yard, and an Operations and Maintenance (O&M) building.

At the substation and interconnection yard, power will be injected to Western's Dickinson-Mandan transmission line, under the terms of a large generator interconnection agreement (LGIA) that will be executed shortly with Western. Western's review of Sunflower's interconnection request has determined that a network upgrade is required to support the new electrical generation that would be created. Specifically, reconductoring will take place on approximately 12 miles of the existing Ward - Mandan 230 kV transmission line and 8 miles of the Ward-Dickinson 230 kV transmission line. Reconductoring would take place entirely in existing transmission line right of way and the only activity would be the replacement of the conductors with 1272 ACSR wire. As discussed in Section 5, reconductoring is not anticipated to result in environmental impacts.

4.1.1 Turbines

Electricity will be generated by a network of wind turbine generators. The final layout of the turbines will be determined based on the turbine model chosen. Turbines will be arranged in lines or "strings" generally oriented southwest to northeast with variations from this overall pattern being mainly attributable to topography, land control, and/or avoidance of sensitive areas. After construction, turbines will be accessible via all-weather, aggregate-surfaced roads which will connect with public roads.

Sunflower is currently considering two turbine models for the Project, and plans to select the most appropriate turbine technology for the Project during final design. The Project will include between 55 and 59 turbines, depending on the turbine model chosen. Turbine towers will consist of three to four tubular steel sections, with a hub height of 80 meters. Access to the turbine is through a lockable steel door at the base of the tower. The rotor assembly will have three blades mounted to a rotor hub. The hub is attached to the nacelle, which houses the gearbox, generator, brake, cooling system and other electrical and mechanical systems.

Each turbine will be equipped with a lightning protection system. The lightning protection system will be installed during foundation work, and will be designed for local soil conditions. The resistance to neutral earth will be in accordance with local utility or code requirements.

4.1.2 Access Roads

Access roads will be built to each turbine and the met tower and will be used during both construction and operation. Access roads will initially be constructed at 36 feet wide and will

have an aggregate surface adequate to support the size and weight of construction and maintenance vehicles. Following construction, the permanent roads will be narrowed to 16 feet wide and the wider area restored. Approximately 14 miles of access roads will be needed for the Project for both turbine layout designs; with the final length of access roads to be determined by the specific turbine locations in the final Project design. Access roads will be on private land and will not be open to public use.

Large construction cranes may spend as little as one day at each turbine site before moving on to the next. Cranes are sometimes moved cross-country rather than by using the developed access roads, especially where these roads are crossed by overhead utility lines. This type of cross-country walking enables the crane to be moved without complete de-rigging and disassembly, which is time-consuming and costly. Where cranes would travel cross-country, workers would lay down some form of cribbing, bedding or mats to support the weight of the crane without impacting the ground below. The cribbing or mats would be removed immediately following passage of the crane, to be re-used elsewhere.

4.1.3 Electrical Collection Systems

A step-up transformer will be used at each turbine to raise the voltage to the power collection line voltage of 34.5 kV. The power from these transformers will be run through an underground collection system consisting of direct-buried cables, generally located alongside the Project access roads (Figure 4A and Figure 4B).

The collection line cables will be laid in trenches approximately two feet wide and four feet deep; the cables will be buried a minimum of 42 inches deep. All trenches will be filled with compacted material and associated temporary impacts will be restored following burial of the electrical cables. Sunflower does not anticipate the need to use any overhead collection lines. Should collection lines cross wetlands or other sensitive features, horizontal directional drilling (HDD) below the features will be used to avoid impacts if rerouting is not possible.

4.1.4 Control System

The Project will have Supervisory Control and Data Acquisition (SCADA) communication technology to allow control and monitoring of the wind farm. The SCADA communications system permits automatic, independent operation and remote supervision of the wind turbines and system provides detailed operating and performance information and history. The SCADA system will be located at the O&M building.

Each turbine will be equipped with a wind speed and direction sensor that communicates with the turbine's control system; this allows for both startup when wind is sufficient and for automatic shutdown when winds exceed operational speeds. Turbines will have variable-speed control and independent blade pitch to assure aerodynamic efficiency.

4.1.5 Meteorological Tower

The permanent met tower will be approximately 80 meters (262 feet) high when installed. The tower will be un-guyed and secured to a concrete foundation. The tower will be located along a Project access road outside of statutory exclusion areas.

4.1.6 Substation and Interconnection Yard

At the Project substation, power from the turbines will be aggregated and stepped up to transmission line voltage. Connection to the Dickinson-Mandan line will take place at an interconnection yard, both the substation and the interconnection yard will be located adjacent to the Dickinson-Mandan line. The substation will be approximately 5.7 acres in size and the interconnection yard will be approximately 5.5 acres in size. Both will be located adjacent to the Dickinson-Mandan transmission line in order to minimize costs and environmental impacts.

A microwave communications tower may be constructed within the interconnection yard, in order to provide Western with remote data acquisition and facility control. The microwave tower will be approximately 30 meters (100 feet) in height, and will utilize a non-guyed steel lattice design.

4.1.7 Operations and Maintenance Buildings

The Project will include an O&M facility, which will consist of an approximately 5 acre metal building within a fenced gravel parking area. The size of the entire facility will be approximately five acres. The final location will be selected during final design using the results of final resource surveys so as to minimize impact to sensitive resources.

4.1.8 Construction Laydown Area

Construction of the Project will require the establishment of one construction laydown area, which will be used for the temporary storage of construction materials and equipment, concrete batch plants (if needed) and the construction office. The laydown area will cover approximately 15 acres. The final location will be selected during final design using the results of final resource surveys so as to minimize impact to sensitive resources.

4.2 Construction

The general sequence of pre-construction, construction, and post-construction activities for the Project is as follows:

- Grant of Certificate
- Ordering of Project components with long lead times including towers, nacelles, blades, and transformers;
- Final biological and archaeological surveys;

- Soil borings, testing and analysis for proper foundation design and materials;
- Final siting of turbines, access roads and other Project facilities;
- Construction of access roads;
- Construction of underground power collection and communication lines;
- Design and construction of the Project substation and interconnection yard;
- Installation of tower foundations;
- Tower placement and wind turbine setting;
- Acceptance testing of facility; and
- Commencement of commercial production.

4.2.1 Construction Management

Sunflower will hire an engineering, procurement, and construction (EPC) contractor which will have primary responsibility for construction management. The EPC contractor will use the services of local contractors where possible and appropriate and will undertake the following activities:

- Securing building, electrical, grading, road, and utility permits;
- Performing detailed civil, structural and electrical engineering;
- Scheduling execution of construction activities;
- Completing surveying and geotechnical investigations;
- Forecasting Project labor requirements and budgeting;
- Coordinating and managing the work of all Project subcontractors;
- Providing direct supervision for the installation of all Project components including roads, foundations, towers and turbines, communication and power collection lines, the O&M facility, Project substation and all related equipment.

Construction activities under the supervision of the EPC will consist of the following general tasks:

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

Throughout the construction phase, ongoing coordination will occur between Sunflower and the EPC. The EPC's on-site Project construction manager will help to coordinate ongoing communication with local officials, citizens groups and landowners. Sunflower, the EPC construction manager and the O&M staff manager will work together to ensure a smooth transition from construction through wind farm commissioning and operation.

4.2.2 Commissioning

The Project will be commissioned after completion of the construction phase and detailed inspection and testing. Inspection and testing will occur for each component of the wind facility.

4.3 Operation and Maintenance

Project operation and maintenance will consist of continuous remote monitoring through the SCADA system and regular on-site maintenance approximately every six months. On-site maintenance includes operational checks and tests and regular preventive maintenance.

4.4 Decommissioning and Restoration

The Project will have an anticipated life of 30 years, based primarily on the projected life of the turbines. At the end of that period or at Sunflower's option, Project components may be upgraded and the Project continued in use or the Project may be decommissioned. Prior to commencement of decommissioning, Sunflower will file a decommissioning plan with the North Dakota Public Utilities Commission which meets the requirements of NDAC 69-09-09-06.

In the event that the Project is decommissioned, all towers and turbine generators, transformers and overhead cables will be dismantled and removed. Underground cables will be removed to a depth of 24 inches below ground. Foundations, buildings and ancillary equipment will be removed to a depth of 36 inches below ground. Unless a landowner requests the retention of access roads or other disturbed areas, access road surface materials will be removed and all disturbed areas will be restored and reclaimed to approximate pre-Project contours. Areas disturbed by construction and decommissioning activities will be graded, topsoiled, and reseeded according to agency recommendations and landowner specifications.

In addition to Sunflower's contractual obligations for infrastructure removal related to decommissioning, Sunflower's easements require the creation of a restoration fund to provide financial assurance of decommissioning. At the 11th year of operation, Sunflower is required to create a restoration fund through a federally chartered bank for each turbine associated with the Project and is also required to continue to make annual contributions through the life of the Project. The restoration fund is intended to secure Sunflower's obligations under its easements related to the decommissioning and removal of the project components. If Sunflower were to go bankrupt, the landowner would then have access to the restoration fund in order to pay for the removal costs associated with Project infrastructure.

5.0 ENVIRONMENTAL ANALYSIS

This section provides a description of the environmental conditions that exist within the Project Area, along with the potential Project impacts and mitigative measures.

5.1 Geology and Soils

5.1.1 Existing Conditions

Elevation and Topography

Topography within the Project Area is slightly rolling to rolling, with the steepest topography occurring to the southwest. Elevation ranges from approximately 2,230 feet to 2,360 feet above sea level.

Geology and Mineral Resources

Surficial geology within the Project Area consists of glacial sediments deposited during the Holocene to Pre-Wisconsinan Period (Bleumle 1988, Clayton 1980). The primary deposits that define the Project Area are collapse/draped transition sediments. The glacial sediment is characterized by hummocky topography that has draped over and partially obliterated the topography existing before the glacial advance. An area of ring-shaped hummocks is located along the west end of the Project Area. The sediments are described as an unbedded, unsorted mixture of clay, silt, sand, and pebbles with a few cobbles and boulders. The glacial deposits can be as thick as 100 feet.

The bedrock geology of the Project Area consists of Sentinel Butte Formation from the Tertiary System. The Sentinel Butte Formation consists of gray-brown bentonitic claystone, siltstone, sandstone, and lignite. The sandstone is thin bedded and is generally fine-grained and silty. This formation can be up to 510 feet thick.

No economic coal deposits were identified within the Project Area. There is one economic coal deposit identified approximately 1 mile southwest of the Project Area. This deposit has not been mined and does not represent an active mining area. No active or previously active gravel pits are located within the Project Area. Ten gravel pits were identified within 3 miles of the Project Area, located primarily to the south. One mine shaft was identified approximately 0.75 miles west of the Project. Investigations of public maps and local geology did not identify any fossil collection sites in the immediate vicinity of the Project Area.

Seismic Risk

No recorded areas of seismic activity or subsidence were identified in the Project Area. According to the North Dakota Geographic Survey, North Dakota is located in an area of very low earthquake probability. There are no known active tectonic features in south-central North

Dakota and the deep basement formations underlying North Dakota are expected to be geologically stable (Bluemle 1991). This information is supported by US Geographic Survey seismic hazard maps, which show that the Project Area is located in an area with very low seismic risk (USGS 2008). Related geologic hazards, such as soil liquefaction, are therefore also unlikely.

Soil Resources

The U.S. Department of Agriculture (USDA) has mapped soils in the Project Area (Figure 8A and Figure 8B; USDA 2009). Table 12 provides a summary of the hydric soils and non-hydric soil acres within the Project Area for both turbine layouts. These soils are primarily well-drained loams and silt loams derived from the underlying glacial deposits and, to a lesser extent, the underlying sandstones and siltstones.

Table 12. Mapped Soil Units

Soil Unit Name	Layout A - Vestas 2.0 V - 110		Layout B - GE 1.85-87	
	Temporary (ac)	Permanent (ac)	Temporary (ac)	Permanent (ac)
Mostly Hydric	0.3	0.1	0.0	0.0
Not Hydric	182.6	53.6	191.8	55.2
TOTAL	**182.9**	**53.8**	**191.8**	**55.2**

According to the Soil Survey of Morton County (USDA 2002), wind erosion may be a hazard on most of the soils in Morton County. Of the soils in the Project Area, erosion hazard is most severe on the coarse textured and moderately coarse textured soils, such as Beisigl, Ekalaka, Flasher, Manning, Parshall, Tally, and Vebar, along with Cabba and Chama soils. These soils have a relatively high content of lime and are susceptible to wind erosion in the spring if they have been bare throughout the winter. Water erosion is a severe hazard on gently rolling and steeper soils, such as Amor, Cabba, Chama, Flasher, Moreau, and Vebar. Water erosion hazard is also greatest when the surface is bare. The soil survey report notes that loss of organic matter through erosion is also of concern, and indicates that proper management of soils to maintain good tilth is especially needed on the Daglum and Rhoades soils that have a sodic subsoil and on the Lawther and Moreau soils that have a silty clay surface layer.

Farmland

The Project Area consists mostly of farmland areas not classified as Prime Farmland or Farmland of Statewide Importance. Figure 7A and Figure 7B shows the Prime Farmland and Farmland of Statewide Importance soil classifications for the Vestas turbine layout and the GE turbine layout, respectively.

Table 13 gives the breakdown of non-prime farmland, Prime Farmland and Farmland of Statewide Importance for the Project.

Table 13. Potential Impacts to Farmland Soils

Farmland Status	Layout A - Vestas 2.0 V - 110		Layout B - GE 1.85-87	
	Temporary (ac)	Permanent (ac)	Temporary (ac)	Permanent (ac)
Prime Farmland	1.0	0.6	0.6	0.4
Farmland of Statewide Importance	17.7	13.1	28.3	15.1
Other farmland	164.1	40.1	163.0	39.7
Total	**182.9**	**53.8**	**191.9**	**55.2**

Prime Farmland soils are defined in the NRCS Title 430 National Soil Survey Handbook, issued November 1996, as follows: "Prime Farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is also available for these uses. It has the soil quality, growing season, and moisture supply needed to produce economically sustained high yields of crops when treated and managed according to acceptable farming methods, including water management" (USDA 1996).

5.1.2 Potential Impacts

The Project will result in direct, permanent impacts to soils through the establishment of turbine foundations, access roads, and the substation and the O&M facility. These impacts will remove soils from agricultural production for the life of the Project. The Project will result in temporary impacts at the construction laydown area, the portions of Project access roads used for construction and then reclaimed, and temporary construction areas surrounding each turbine.

The Project will create up to approximately 55 acres of permanent impact and 190 acres of temporary impact as shown in Table 13. Because of the relatively gentle relief in the Project Area, the deliberate avoidance of steep slopes, and the use of appropriate BMPs during and following construction, the potential for soil loss due to erosion will be low. Impacts to hydric soils such as compaction are expected to be minimal due to the micrositing of Project facilities to avoid wetlands and other areas with hydric soils.

Soil erosion, compaction, and other related soil disturbance will be short-term, and will be minimized by implementing environmental protection measures including appropriate access road design and stormwater management BMPs, robust hazardous materials handling and spill response procedures, regular maintenance of access roads, decompaction of temporary disturbance areas as needed, and implementing dust control measures to limit wind erosion and revegetation of disturbed areas. The loss of organic matter will be limited through implementation of stormwater management BMPs, and by stripping and stockpiling topsoil in disturbance areas and using stockpiled topsoil to finish restoration of temporary disturbance

areas. With the proper implementation of these environmental protection measures, no unmitigated loss of highly productive soil will result from implementation of the Project.

There will be no direct impacts to mineral resources or other regional geology. Sand and gravel are plentiful locally and the presence of the Project will not necessarily prevent either from being mined in the Project Area. Direct impacts to geology and soils are therefore not anticipated to be significant.

Geologic hazards such as seismicity, landslide, or subsidence will not be concerns for the Project. The region is considered to be seismically stable, and no areas of subsidence, liquefaction, mass movement or other geologic hazards have been identified in the Project Area. Project facilities will be microsited to avoid such areas if any are identified during final design, and appropriate engineering design, primarily for turbine foundations, will be used to further reduce the impacts of geologic hazards to a non-significant level.

5.1.3 Mitigative Measures

Sunflower will avoid all impacts to Prime Farmland, which is an exclusion area listed in NDAC Section 69-06-08-01-1, see Section 3.2.1. Prime Farmland will be avoided by siting wind turbines, access roads, and other Project infrastructure off of these farmlands to the extent practical. The Project will make use of existing farm access roads as much as possible, and will place wind turbines at the edges of farm fields to minimize additional disruptions to cropland. Collector lines will generally be placed within or adjacent to the access roads to minimize impacts.

Sunflower will implement avoidance and minimization measures as identified in the Draft UGP Wind Energy PEIS (Western and USFWS 2013), including the following:

- Avoid placement of wind energy facilities in areas with unsuitable seismic, liquefaction, slope, subsidence, settling, and flooding conditions.
- Minimize the extent of the project footprint, including improved roads and construction staging areas.
- Minimize ground-disturbing activities, especially during the rainy season.
- Use existing roads and disturbed areas to the extent possible.
- Site new roads to follow natural land contours; excessive slopes should be avoided.
- Site new roads to avoid stream crossings and wetlands and minimize the need to cross drainage bottoms.
- Surface new roads with aggregate materials, wherever appropriate.
- Restrict heavy vehicles and equipment to improved roads to the extent practicable.
- Control vehicle and equipment speed on unpaved surfaces.
- Conduct construction and maintenance activities when the ground is frozen or when soils are dry and native vegetation is dormant.
- Stabilize disturbed areas that are not actively under construction using methods such as erosion matting or soil aggregation, as site conditions warrant.

- Salvage topsoil from all excavation and construction activities to reapply to disturbed areas once construction is completed.
- Dispose of excess excavation materials in approved areas to control erosion.
- Isolate excavation areas (and soil piles) from surface water bodies using silt fencing, bales, or other accepted appropriate methods to prevent sediment transport by surface runoff.
- Use earth dikes, swales, and lined ditches to divert local runoff around the work site.
- Reestablish the original grade and drainage pattern to the extent practicable.

Reseed disturbed areas with a native seed mix and revegetate disturbed areas immediately following construction. Potentially applicable mitigation measures for hazardous materials and wastes at wind energy facilities may include the following:

- Developers of wind energy facilities should prepare several plans addressing various aspects of hazardous materials and waste, including a hazardous materials and waste management plan, a construction and operation waste management plan, a fire management and protection plan, an integrated pest and vegetation management plan (if the facility will use pesticides/herbicides), and a spill prevention and emergency response plan. Such plans should include the following items:
    - Prepare a hazardous materials and waste management plan that addresses the selection, transport, storage, and use of all hazardous materials needed for construction, operation, and decommissioning of the facility for local emergency response and public safety authorities and for the regulating agency, and that addresses the characterization, on-site storage, recycling, and disposal of all resulting wastes. The plan should include a comprehensive hazardous materials inventory; Material Safety Data Sheets (MSDSs) for each type of hazardous material; emergency contacts and mutual aid agreements, if any; site map showing all hazardous materials and waste storage and use locations; copies of spill and emergency response plans (see below), and hazardous materials-related elements of a decommissioning/closure plan. The waste management plan should identify the waste streams that are expected to be generated at the site during construction and operation and address hazardous waste determination procedures, waste storage locations, waste-specific management and disposal requirements (e.g., selecting appropriate waste storage containers, appropriate off-site treatment, storage, and disposal facilities), inspection procedures, and waste minimization procedures. The plan should address solid and liquid wastes that may be generated at the site in compliance with CWA requirements if a National Pollutant Discharge Elimination System (NPDES) permit is needed.
    - Develop a fire management and protection plan to implement measures to minimize the potential for fires associated with substances used and stored at the site. The flammability of the specific chemicals used at the facility should be considered.

  - If pesticides/herbicides are to be used on the site, develop an integrated pest and vegetation management plan to ensure that applications will be conducted within the framework of managing agencies and will entail the use of only EPA-registered pesticides/herbicides that are (1) nonpersistent and immobile and (2) applied by licensed applicators in accordance with label and application permit directions, following stipulations regarding suitability for terrestrial and aquatic applications.

- All site characterization, construction, operation, and decommissioning activities should be conducted in compliance with applicable Federal and State laws and regulations, including the Toxic Substances Control Act of 1976, as amended (15 USC 2601, et seq.). In addition, any release of toxic substances (leaks, spills, and the like) in excess of the reportable quantity established by 40 CFR Part 117 should be reported as required by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, Section 102b. A copy of any report required or requested by any Federal agency or State government as a result of a reportable release or spill of any toxic substances should be furnished to the authorized officer concurrent with the filing of the reports to the involved Federal agency or State government.
- Pollution prevention opportunities should be identified and implemented, including material substitution of less hazardous alternatives, recycling, and waste minimization.
- Systems containing hazardous materials should be designed and operated in a manner that limits the potential for their release, and constructed of compatible materials in good condition (as verified by periodic inspections), including provision of secondary containment features (to the extent practical); installation of sensors or other devices to monitor system integrity; installation of strategically placed valves to isolate damaged portions and limit the amount of hazardous materials in jeopardy of release; and robust inspection and use of repair procedures.
- Dedicated areas with secondary containment should be established for off-loading hazardous materials transport vehicles.
- To the greatest extent practicable, “just-in-time” ordering procedures should be employed that would limit the amounts of hazardous materials present on the site to quantities minimally necessary to support continued operations. Excess hazardous materials should receive prompt disposition.
- Written procedures for the storage, use, and transportation of each type of hazardous material present should be provided, including all vehicle and equipment fuels.
- Authorized users for each type of hazardous material should be identified.
- Procedures should be established for fuel storage and dispensing, including shutting off vehicle (equipment) engines; using only authorized hoses, pumps, and other equipment in good working order; maintaining appropriate fire and spill response materials at equipment-fueling stations; providing emergency shutoffs for fuel pumps; ensuring that fueling stations are paved; ensuring that both aboveground fuel tanks and fueling areas have adequate secondary containment; prohibiting smoking, welding, or open flames in fuel storage and dispensing areas; equipping the area with fire suppression devices, as appropriate; conducting routine inspections of fuel storage and dispensing areas;

requiring prompt recovery and remediation of all spills, and providing for the prompt removal of all fuel and fuel tanks used to support construction vehicles and equipment at the completion of facility construction and decommissioning phases.

- Refueling areas should be located away from surface water locations and drainages and on paved surfaces; features should be added to direct spilled materials to sumps or safe storage areas where they can be subsequently recovered.
- Drip pans should be used under the fuel pump and valve mechanisms of any bulk fueling vehicles and during on-site refueling to contain accidental releases.
- Spills should be immediately addressed per the appropriate spill management plan, and cleanup and removal initiated, if needed. Operations and maintenance personnel should be trained in spill prevention and containment, and spill containment supplies should be located on site and be readily available.
- All vehicles and equipment should be in proper working condition to ensure that there is no potential for leaks of motor oil, antifreeze, hydraulic fluid, grease, or other hazardous materials.
- Hazardous materials and waste storage areas or facilities should be formally designated and access to them restricted to authorized personnel. Construction debris, especially treated wood, should not be disposed of or stored in areas where it could come in contact with aquatic habitats.
- Design requirements should be established for hazardous materials and waste storage areas that are consistent with accepted industry practices as well as applicable Federal, State, and local regulations and that include, at a minimum, containers constructed of compatible materials, properly labeled, and in good condition; secondary containment features for liquid hazardous materials and wastes; physical separation of incompatible chemicals; and fire-fighting capabilities when warranted.
- Written procedures should be established for inspecting hazardous materials and waste storage areas and for plant systems containing hazardous materials; identified deficiencies and their resolution should be documented.
- Schedules should be established for the regular removal of wastes (including sanitary wastewater generated in temporary, portable sanitary facilities) for delivery by licensed haulers to appropriate off-site treatment or disposal facilities.
- During facility decommissioning, the following should occur: emergency response capabilities should be maintained throughout the decommissioning period as long as hazardous materials and wastes remain on-site, and emergency response planning should be extended to any temporary material and equipment storage areas that may have been established; temporary waste storage areas should be properly designated, designed, and equipped; hazardous materials removed from systems should be properly containerized and characterized, and recycling options should be identified and pursued; off-site transportation of recovered hazardous materials and wastes resulting from decommissioning activities should be conducted by authorized carriers; hazardous materials and waste should be removed from on-site storage and management areas, and the areas should be surveyed for contamination and remediated as necessary.

BMPs to prevent soil erosion would be implemented during construction of the Project as required by the NPDES Construction Stormwater Permit and the accompanying Project Erosion and Sedimentation Control Plan (ESCP). Sunflower expects that BMPs implemented through the NPDES permit would adequately capture those measures identified in the Draft PEIS.

Additional site-specific measures to further reduce impacts to soils may be identified and implemented as appropriate; however, impacts to soil resources are not expected to be significant.

5.2 Water Resources

5.2.1 Existing Conditions

Surface Water

Surface water in most of the Project Area flows southward to the Heart River, via Spring Creek, Beaver Creek, Heart Butte Creek, Big Muddy Creek and their many unnamed tributaries. Surface water in the northern edge of the Project Area flows northward via several unnamed tributaries to the East Branch Knife River.

Figure 9A and Figure 9B show the streams and wetlands present throughout the Project Area for the Vestas turbine layout and the GE turbine layout, respectively. Table 14 displays impact numbers for both turbine layouts based on surface water features mapped by the USGS in the National Hydrography Dataset (NHD; USGS 2013). Most streams are intermittent and in many cases function as drainage ways within tilled agricultural fields. There are no known surface water withdrawals for irrigation or other uses within the Project Area. There are no major rivers or traditional navigable waters found within the Project Area.

The Project is located in an area of North Dakota for which flood hazard areas have been mapped by Federal Emergency Management Agency (FEMA 2009); however, no mapped floodplain occurs in the Project Area.

Table 14. Potential Impacts to Surface Water

Surface Water	Layout A - Vestas 2.0 V - 110		Layout B - GE 1.85-87	
	Temporary (ac)	Permanent (ac)	Temporary (ac)	Permanent (ac)
Perennial	0.00	0.00	0.00	0.00
Intermittent	0.07	0.03	0.06	0.03
Ephemeral	0.00	0.00	0.00	0.00
Other	0.00	0.00	0.00	0.00
Total	**0.07**	**0.03**	**0.06**	**0.03**

Groundwater

Groundwater in the region supplies both public and private wells. Shallow groundwater typically follows local topography, while regional groundwater flow in the deeper bedrock aquifers is

generally directed north and east toward Lake Sakakawea and the Missouri River (Trapp and Croft 1975, Ackerman 1980).

Groundwater in Morton and Stark Counties is found in both surficial and bedrock aquifers and is generally plentiful (Trapp and Croft 1975, Ackerman 1980). Most of the usable ground water is found in the numerous bedrock aquifer systems comprising the semiconsolidated rocks of the Late Cretaceous and Tertiary ages. Small quantities of water are available from the unconsolidated deposits of Quaternary age. Quaternary sands and gravels of alluvial and glacial outwash deposits provide the highest yields and best quality water; however, these glacial drift aquifers are primarily concentrated in narrow bands along existing and ancient buried rivers, none of which are located within the Project. Bedrock aquifers are widely distributed throughout the counties and provide the primary source for most domestic and stock wells. The sedimentary bedrock of the Sentinel Butte and Tongue River Formations provides the primary source of groundwater in the Project Area; wells in the area also tap the Upper Ludlow and Fox Hills formation aquifer systems. Water from these rocks is typically hard, but is adequate for use in domestic and stock wells. The nearby cities of Hebron and Glen Ullin both utilize the Tongue River formation for their municipal water systems. Yields from the deeper sandstone aquifers are generally less than 100 gallons per minute, while yields from the sandstone-lignite Sentinel Formation can be more than 100 gallons per minute (Trapp and Croft 1975, Ackerman 1980).

Review of driller logs available from the North Dakota State Water Commission database indicates one well has been drilled within the Project Area, a 438 foot-deep well in Morton County (SE1/4SE1/4-NW1/4, Sec. 20, T139N, R90W), tapping the Tongue River aquifer for stock watering purposes.

5.2.2 Potential Impacts

The Project will not use surface water, and there will consequently be no direct or indirect impacts either to water quantity or water quality. The Project will not impact mapped 100-year floodplain areas.

The only permanent use of groundwater will be through a well supplying water to the O&M facility for restroom and cleanup facilities. This well will require a water right permit for Industrial use pursuant to NDCC 61-04, which will be obtained through an application to the ND State Water Commission. The small amount of groundwater withdrawn will not create a measureable impact to groundwater.

Project construction activities such as excavation and construction of foundations are unlikely to affect groundwater quality or flow patterns. If impacts were to occur, they will likely be minor and highly localized, and unlikely to adversely affect local water supply wells. As the design of the Project is finalized, facilities will be adjusted to avoid impacts to the few existing wells in the area.

Although it appears to be unlikely based on existing conditions, subsurface blasting may be required to excavate for turbine foundations. This could potentially fracture bedrock and affect

groundwater flow in the immediate vicinity of the disturbance; however, potential blasting activities would not be deep enough to impact typically used aquifers in the region. In the event that subsurface blasting is required, a blasting plan would be developed and implemented to keep the impacts localized and fracture the least amount of bedrock necessary for construction. Potential disturbances due to blasting would be localized and temporary, with groundwater likely to resume its natural course of flow down-gradient of the foundation.

Operation of the Project would involve periodic changing of lubricating fluids for the turbines, and may involve small quantities of hazardous materials to be kept and used onsite (e.g., herbicides used for noxious weed management). These materials will be managed according to the mitigation measures described in Section 5.2.3, which would prevent their release into surface or groundwater in the Project Area.

Reconductoring activities would have no impacts on ground or surface waters. This work would utilize existing access roads and other previously-disturbed areas, so no new impacts to surface waters or wetlands would occur. This work would not require water, either for construction or operation, beyond a minimal amount used for dust control at active work sites. Dust control water would be obtained from an authorized source, such as a municipal supplier with adequate water rights, so this work would not adversely impact existing water rights or supplies.

5.2.3 Mitigative Measures

Sunflower will implement measures to avoid or minimize impacts to water resources, as identified in the Draft UGP Wind Energy PEIS (Western and USFWS 2013). Mitigation measures related to Hazardous Materials are listed above in Section 5.1. Mitigation measures related to Water Resources are as follows:

- Minimize the extent of land disturbance to the extent possible.
- Use existing roads and disturbed areas to the extent possible.
- Site new roads to avoid crossing streams and wetlands and minimize the number of drainage bottom crossings.
- Apply standard erosion control BMPs to all construction activities and disturbed areas (e.g., sediment traps, water barriers, erosion control matting) as applicable to minimize erosion and protect water quality.
- Apply erosion controls relative to possible soil erosion from vehicular traffic.
- Identify and avoid unstable slopes and local factors that can cause slope instability (groundwater conditions, precipitation, seismic activity, high slope angles, and certain geologic landforms).
- Identify areas of groundwater recharge and discharge and evaluate their potential relationship with surface water bodies and groundwater quality.
- Avoid creating hydrologic conduits between two aquifers (e.g., upper and lower).
- Construct drainage ditches only where necessary; use appropriate structures at culvert outlets to prevent erosion.

- Avoid altering existing drainage systems, especially in sensitive areas such as erodible soils or steep slopes.
- Clean and maintain catch basins, drainage ditches, and culverts regularly.
- Limit herbicide and pesticide use to nonpersistent, immobile compounds and apply them using a properly licensed applicator in accordance with label requirements.
- Dispose of excess excavation materials in approved areas to control erosion and minimize leaching of hazardous materials.
- Reestablish the original grade and drainage pattern to the extent practicable.
- Reseed (non-cropland) disturbed areas with a native seed mix and revegetate disturbed areas immediately following construction.
- When decommissioning sites, ensure that any wells are properly filled and capped.

Additional site-specific measures to further reduce impacts to water resources may be identified and implemented as appropriate; however, impacts to water resources are not expected to be significant.

5.3 Wetlands

5.3.1 Existing Conditions

A preliminary assessment of the presence of wetlands was performed for Project using available desktop data including the National Wetlands Inventory (NWI) data set (USFWS 2013a). This data was evaluated using current high-resolution aerial photography. The use of aerial photography is appropriate for the Project Area since the area contains little tree cover and the boundary of these waters is generally evident. Figure 9A and Figure 9B show the locations of wetlands and streams within the Project Area for the Vestas turbine layout and the GE turbine layout, respectively; these waters are scattered and relatively sparse. Table 15 displays the temporary and permanent impact calculations for both turbine layouts.

The preliminary assessment was used as a guide to avoidance and minimization, and to determine potential impacts for the Project. NWI data is not definitive as to classifications and existence of features, and any potentially jurisdictional wetland that would actually be impacted by the Project will be delineated prior to construction.

5.3.2 Potential Impacts

Based on the current design, impacts to wetlands yield low numbers. As shown in Table 15 (below), for the Vestas layout temporary impacts would be 0.2 acres and for the GE turbine layout temporary impacts would be 0.1 acres. Permanent impacts would be 0.04 acres for either layout, however Sunflower is committed to making further design changes to avoid permanent impacts completely.

5.3.3 Mitigative Measures

Sunflower will implement the following measures to avoid or minimize impacts to wetlands identified in the Draft UGP Wind Energy PEIS (Western and USFWS 2013), as well as measures listed in Sections 5.1 and 5.2.

- Site new roads to avoid wetlands and minimize the need to cross drainage bottoms.
- A Project Storm Water Pollution Prevention Plan (SWPPP) will be obtained and complied with to ensure surface water, including wetlands, is not adversely affected by run off from construction activities.

5.4 Vegetation

5.4.1 Existing Conditions

Vegetation Communities

Vegetation within the Project Area includes crops interspersed with rangeland made up of fallow parcels or grassland. Typical crops include wheat, hay, barley, oats, and corn. In steeper terrain the primary land cover is grassland. Scattered areas may be classified as native prairie (areas of naturally occurring grasses and forbs) (USGS 2013). Riparian areas are likely to contain shrubs and small trees. Wetland basins are common, most are less than five acres and support seasonal surface water.

The vegetation communities within the Project Area were described by WEST using available desktop information and current aerial photography in spring 2013 (See Habitat Mapping Report in Appendix A). These communities are shown in Figure 6A and Figure 6B for the Vestas turbine layout and the GE turbine layout, respectively, and impacts to the mapped vegetation communities are provided in Table 15.

Table 15. Potential Impacts to Mapped Vegetation Communities

Veg Community	Layout A – Vestas 2.0 V - 110		Layout B – GE 1.85-87	
	Temporary (ac)	Permanent (ac)	Temporary (ac)	Permanent (ac)
Cropland	112.3	32.5	109.5	31.1
Grassland	69.6	20.9	81.4	23.6
Deciduous Trees	0.0	0.0	0.0	0.0
Shrubs	0.01	0.0	0.1	0.0
NWI Wetland	0.2	0.04	0.1	0.04
Developed	0.7	0.4	0.8	0.4
Total	**182.8**	**53.8**	**191.8**	**55.2**

Native Prairie Habitats

Remnant native prairie may be present at scattered locations throughout the Project Area. Native prairie serves as a vital ecological resource by improving water quality, providing erosion

control, and supporting a diverse population of plants and animals. However, due to the native prairie's fertile soils and predominantly flat topography, large portions of the native prairie have been converted to agricultural lands. Native prairie is important habitat used by prairie grouse (e.g., sharp-tailed grouse, greater prairie chicken) for lekking, nesting, brood rearing, and wintering. Grouse leks are discussed in further detail in Section 5.5.1.3.

Noxious and Invasive Weeds

North Dakota has listed twelve species as noxious weeds (NDCC 63-01.1). The Stark County Weed Board has added two additional weed species (black henbane and hoary cress); Morton County does not list additional noxious weed species (NDDA 2013a).

The North Dakota Weed Mapper (NDDA 2013b) indicates that Canada thistle is present along many of the roads within and surrounding the Project Area. None of the other state or county listed weeds are known to be present.

Rare Plant Populations

There are no federal listed, proposed, or candidate plant species known to occur in Stark or Morton counties. North Dakota's list of Species of Conservation Priority includes only one plant, the western prairie fringed orchid, which is not known to occur in Stark or Morton counties.

5.4.2 Potential Impacts

The Project will result in direct, permanent impacts to vegetation communities through the establishment of turbine foundations, access roads, and the substation, interconnection yard and O&M facility. The Project will result in temporary impacts at the construction laydown area, the portions of Project access roads used for construction and then reclaimed, and temporary construction areas surrounding each turbine.

The Project will have approximately 55 acres of permanent impact and 190 acres of temporary impact as shown in Table 15. These impacts will be distributed between cropland and grassland, with extremely small impact to developed area (existing roads), and no impacts to wetlands, trees, shrubs or water.

5.4.3 Mitigative Measures

Remnant native prairie may be present at scattered locations throughout the Project Area. During final design Sunflower will use aerial photography and the results of further on-site investigations to locate turbines, access roads and collection lines on previously disturbed land to the maximum extent practical.

Sunflower will implement measures to avoid or minimize impacts to sensitive habitats and measures to control the spread of invasive species as identified in the Draft UGP Wind Energy PEIS (Western and USFWS 2013), as follows:

- Minimize the size of areas in which soil would be disturbed or vegetation would be removed.
- Reduce habitat disturbance by keeping vehicles on access roads and minimizing foot and vehicle traffic through undisturbed areas.
- Initiate habitat restoration of disturbed soils and vegetation as soon as possible after construction activities are completed. Restore areas of disturbed soil using weed-free native grasses, forbs, and shrubs, in consultation with land managers and appropriate agencies such as State or County extension offices or weed boards.
- Develop a plan for control of noxious weeds and invasive plants that could occur as a result of new surface disturbance activities at the site. The plan should address monitoring, weed identification, the manner in which weeds spread, and methods for treating infestations. Require the use of certified weed-free mulching.
- Establish a controlled inspection and cleaning area for trucks and construction equipment are arriving from locations with known invasive vegetation problems. Visually inspect construction equipment arriving at the project area and remove and contain seeds that may be adhering to tires and other equipment surfaces.
- Regularly monitor access roads and newly established utility and transmission line corridors for the establishment of invasive species. Initiate weed control measures immediately upon evidence of the introduction or establishment of invasive species.
- Do not use fill materials that originate from areas with known invasive vegetation problems.
- Access roads, utility and transmission line corridors, and tower site areas should be monitored regularly for the establishment of invasive species, and weed control measures should be initiated immediately upon evidence of the introduction of invasive species.
- Regularly inspect access roads, utility and transmission line corridors, and tower site areas for damage from erosion, washouts, and rutting. Initiate corrective measures immediately upon evidence of damage.
- Salvage and reapply topsoil excavated during decommissioning activities to disturbed areas during final restoration activities.
- Reclaim areas of disturbed soil using weed-free native shrubs, grasses, and forbs. Restore the vegetation cover, composition, and diversity to values commensurate with the ecological setting.

Introduction of noxious weeds will be mitigated through prompt revegetation with native species or restoration of prior land use, and through ongoing monitoring and control programs. Additional site-specific measures to further reduce impacts to wildlife may be identified and implemented as appropriate; however, impacts to wildlife are not expected to be significant.

5.5 Wildlife

Based on issues identified at wind generation sites throughout the U.S., wildlife species of greatest concern are federally and/or state-protected species, avian species, and bats that may occur in the Project Area. Protection for wildlife species is provided under the following statutes:

- The Endangered Species Act (ESA) mandates protection of species federally listed as threatened or endangered and their associated habitats. The ESA makes it unlawful to "take" a listed species. Take is defined as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect or attempt to engage in any such conduct." Significant modification or degradation of listed species' habitats is considered "harm" under ESA regulations. Projects that have such potential will require consultation with USFWS and may require special permitting or mitigation measures to avoid or reduce impacts to these species. Candidate species receive no statutory protection from the USFWS; however, they do receive full protection once listed.
- The Bald and Golden Eagle Protection Act prohibits the take of any bald eagle or golden eagle, alive or dead, including any part, nest, or egg. "Take" is defined as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb". "Disturb" means to agitate or bother an eagle to a degree that causes, or is likely to cause 1) injury to an eagle; 2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior; or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior. The USFWS promulgated regulations in 2009 that provide for a permitting framework for incidental take associated with otherwise lawful activities, including wind energy (50 Code of Federal Regulations § 22.26). The Final Eagle Conservation Plan Guidance – Version 2, that outlines the recommended steps for permit applicants, was released by USFWS in April 2013 (USFWS 2013b).
- Under the Migratory Bird Treaty Act (MBTA) it is unlawful to pursue, hunt, take, capture or kill; attempt to take, capture, or kill; possess, offer to or sell, barter, purchase, deliver or cause to be shipped, exported, imported, transported, carried or received any native migratory bird, part, nest, egg or product. On March 23, 2012, the USFWS released the Land- Based Wind Energy Guidelines (USFWS 2012a). These voluntary guidelines provide recommended approaches for assessing and avoiding impacts to wildlife and their habitats, including migratory birds, associated with wind energy project development. While the MBTA provides no process for authorizing incidental take of MBTA-protected birds, USFWS has indicated that compliance with these guidelines would be considered in assessing any potential liability under the MBTA.

5.5.1 Existing Conditions

Federally Listed and Candidate Species

The USFWS provides data regarding federally threatened, and endangered, and candidate species at the county level for public use. According to the USFWS, Stark County has three endangered wildlife species and one candidate species, and Morton County has five endangered wildlife species, one threatened species, and one candidate species (see Table 16). These species are discussed in the following sections.

Table 16. Federally Listed and Candidate Species in Stark and Morton Counties

Common Name	Latin Name	County	Habitat	Status
Black-footed Ferret	*Mustela nigripes*	Morton, Stark	Prairie dog complexes	Endangered
Gray Wolf	*Canis lupus*	Morton, Stark	Frequently observed in Turtle Mountains	Endangered
Interior Least Tern	*Sternula antillarum*	Morton	Missouri River and Yellowstone sandbars; beaches;	Endangered
Piping Plover[a]	*Charadrius melodus*	Morton	Missouri River sandbars, alkali beaches	Threatened
Pallid Sturgeon	*Scaphirhynchus albus*	Morton	Bottom dwelling, Missouri and Yellowstone Rivers	Endangered
Whooping Crane	*Grus Americana*	Morton, Stark	Palustrine wetlands and cropland ponds	Endangered
Spragues pipit	*Anthus spragueii*	Morton, Stark	Native prairie	Candidate

Source: USFWS 2010
a/ Designated Critical Habitat for piping plover is located on the following water bodies: Lake Audubon, Lake Sakakawea, and the Missouri River. All of these water bodies are located north and east of the Project Area.

Black-footed Ferret

Historically, black-footed ferrets occupied much of the Great Plains region of North America, co-locating with prairie dog (Cynomys sp.) colonies and complexes. Black-footed ferrets depend on prairie dog complexes for food and habitat. Prairie dogs and black footed ferrets prefer level topography in grasslands, steppe, and shrub steppe. Plowed lands, forests, wetlands, and water are avoided (USFWS 2013c). There are no records of recent black-footed ferret occurrences in North Dakota though there is potential for reintroduction (USFWS 2008b, as cited in HDR Critical Issues Analysis; see Appendix A).

No black-footed ferrets were observed during WEST's wildlife surveys of the Project Area (see Appendix A).

Gray Wolf

The gray wolf was listed as an endangered species in 1978 (USFWS 1978). In 2003, the USFWS downlisted the two northern subpopulations (western and eastern distinct population segments) to threatened (USFWS 2003). The eastern population remains listed as threatened.

Once common throughout North Dakota, the last confirmed sighting in the state was 1991, although there have been more recent but unconfirmed reports of sightings in the Turtle Mountains in the north-central portion of the state. The presence of wolves in most of North Dakota would likely remain sporadic and consist of occasional dispersing animals from Minnesota and Manitoba (USFWS 2008a).

There were no incidental observations of gray wolves during spring and summer avian use surveys (see WEST report in Appendix A).

Interior Least Tern

The interior population of the least tern was listed as endangered in 1985 (USFWS 1985a). In North Dakota, the interior least tern is primarily found on sandbars on the Missouri River between the Garrison Dam and Lake Oahe, in the reservoirs, and on the Missouri and Yellowstone Rivers upstream of Lake Sakakawea (USFWS North Dakota Ecological Field Services Office 2008). This tern nests on barren sandbars on the Missouri River and feeds on small fish in the river (USFWS 1990a). As of 2008, approximately 100 pairs were known to breed in North Dakota (USFWS 2008b). Critical habitat for the interior least tern has not been designated.

No interior least terns were observed during spring and summer avian use surveys (see WEST report in Appendix A).

Piping Plover

The Great Plains population of the piping plover was listed as threatened in 1985 (USFWS 1985b). The piping plover breeding range stretches from south central Canada into the Midwest United States. The majority of piping plover breeding pairs found in the United States are concentrated in Montana, the Dakotas, and Nebraska. This population of piping plover winters in the Gulf of Mexico. The plover nests in 23 counties in North Dakota, primarily in alkali wetlands in the Missouri Coteau and on barren sandbars in the Missouri River and system reservoirs. Reasons for decline of the piping plover include habitat loss and nest depredation in the wetlands, however the main reason for decline of the species along the Missouri River is habitat loss due to water development projects (e.g. Fort Peck Dam, Garrison Dam, and Oahe Dam) and loss of wetlands due to agriculture and other developments (NDSWC 2008).

Critical habitat for the piping plover was designated on September 11, 2002 (USFWS 2002). There is no USFWS-designated critical habitat for the piping plover in the Project Area (50 CFR Part 17). The closest critical habitat is located along Lake Sakakawea approximately 45 miles north of the Project Area.

No piping plovers were observed during spring and summer avian use surveys (see WEST report in Appendix A).

Pallid Sturgeon

The pallid sturgeon historically occupied the Mississippi and Missouri rivers and their major tributaries (USFWS 1990b). The reason for decline of the sturgeon has been water control and development projects on the Mississippi and Missouri rivers. The sturgeon still occupies portions of the main stem of the Missouri River.

There is no pallid sturgeon habitat in the Project Area.

Whooping Crane

The whooping crane is protected by federal laws in the United States. It was listed as endangered in the United States in 1970 under the Endangered Species Preservation Act of 1966 (16 USC Section 668aa(c)) and then under the ESA in 1973. Critical habitat was designated in 1978. Under the North Dakota Comprehensive Wildlife Conservation Strategy Guide (NDGFD, 2005), the whooping crane is a Level III Species of Conservation Priority, defined as "North Dakota's species having a moderate level of conservation priority but are believed to be peripheral or non-breeding in North Dakota" (NDGFD, 2005)

One self-sustaining wild population of whooping cranes currently exists in the world. Members of this population breed primarily within the boundaries of Wood Buffalo National Park in Canada and migrate through the central United States en route to the wintering grounds at Aransas National Wildlife Refuge along the Gulf Coast of Texas. This flock is referred to as the Aransas-Wood Buffalo National Park Population. Due to intensive management, this population has increased from 15 birds in 1941 to 263 as of the start of spring migration in 2010 (WCCA 2010). The migration route is well defined and 95 percent of all observations occur within a 200-mile wide corridor during spring and fall migration (CWS and USFWS 2007). The USFWS subdivides this corridor into 5 percent increments starting at 75 percent. The Project Area is within the area encompassing 85 to 90 percent of confirmed whooping crane sightings, and is approximately 71 mi (114.2 km) west of the migration corridor centerline.

Sunflower contracted WEST to complete an analysis of potential whooping crane habitat in the Project Area (see Whooping Crane Habitat Review report in Appendix A). The habitat review and analysis evaluated whether the proposed Project Area represented high, average or low potential whooping crane habitat as compared to nearby alternate locations. The potential whooping crane habitat analysis included a comparison of land cover within the proposed Project Area and four alternate areas of the same dimensions located a few miles to the north, south, east and west. A recently developed potentially suitable habitat assessment (Watershed Institute 2012) was also used to quantify and compare whooping crane habitat within the study areas. This assessment first screens all wetlands within the study areas for minimum size, visual obstructions, and disturbances. Those wetlands left are then quantified by their size, density of wetlands around them, distance to food, whether they are natural or manmade, and their water regime as a means to quantify suitability.

The mean suitability score for wetlands in the Project Area was 8.5; mean suitability scores and ranges for the other four reference areas were similar. The overall ranking is generally below what was determined to be suitable potential habitat in Kansas (a mean score of 12 or more).

No whooping cranes were observed during spring and summer avian use surveys (See Appendix A). While whooping cranes likely migrate over the Project Area and there is potential for roosting or foraging use, the Project Area does not provide significant potential habitat nor does it provide unique habitat compared to adjacent areas. Although the Project Area is within the defined migration corridor, no whooping cranes have been documented within the Project Area (see Appendix A). The closest confirmed sighting is approximately 15 miles northwest of the Project Area.

In 2007 the USFWS and the Canadian Wildlife Service released the International Recovery Plan (Third Revision) for the whooping crane. That plan includes recovery strategies and actions to be implemented to improve the likelihood of whooping crane population recovery.

In a letter dated September 19, 2013, the North Dakota Game and Fish Department (NDGFD) provided comments to Sunflower regarding the Project (see Appendix B); whooping cranes were not specifically addressed in that letter. The primary concerns expressed included limiting impacts within native prairie to the extent possible; avoiding wetlands and alternations to surface drainage patterns; and placing electrical collection lines underground where possible, and applying appropriate APLIC design standards for any necessary above-ground segments.

The USFWS provided comments on the Project in a letter dated December 1, 2010, in response to a request for comment made for the Critical Issues Analysis (see Appendix B). The letter notes the presence of potentially suitable roosting and feeding habitat for whooping cranes in the Project Area, and recommends mapping wetlands and analyzing the potential effects to migrating whooping cranes from loss of use of habitat in the Project Area for migration stopovers. The only specific recommendations made are that any new transmission line (if included as part of the Project) be placed underground to avoid collision mortality, and the installation of visual marking devices on existing transmission lines within one mile of potentially suitable whooping crane habitat. The USFWS letter includes a general recommendation that high value habitat types, including native prairies, woodlands, wooded draws and riparian forests, be avoided whenever possible. It also recommends minimizing impacts to wildlife and habitat by reseeding disturbed native prairie; minimizing grassland disturbance by using fewer, larger turbines and fewer access roads; using self-standing towers (no guy wires); avoiding wetland fill; replacing unavoidable wetland impacts with functionally equivalent wetlands; and utilizing appropriate erosion control measures to prevent water quality degradation.

Sprague's Pipit

The Sprague's pipit is closely tied with native prairie habitat and breeds in the north-central United States in Minnesota, Montana, North Dakota and South Dakota as well as south-central Canada (Jones 2010). The USFWS reviewed the conservation status of Sprague's pipit to determine whether the species warrants protection under the ESA. The status review found that

listing Sprague's pipit as threatened or endangered is warranted, but that listing the species at this time is precluded by the need to complete other listing actions of a higher priority (Jones 2010). Currently the Sprague's pipit remains a candidate species for listing under the ESA and is also protected under the MBTA. Conversion of native prairie to agriculture and overgrazing in much of this species' range continue to cause declines on breeding and wintering grounds (Jones 2010).

No Sprague's pipits were observed during spring and summer avian use surveys (See Appendix A).

State Species of Conservation Priority

The NDGFD has identified 100 species of conservation priority, or those in greatest need of conservation in the state (NDGFD 2008). These species are categorized into three levels as follows:

- Level I - Species in greatest need of conservation
- Level II - Species in need of conservation, but have had support from other wildlife programs
- Level III - Species in moderate need of conservation, but are believed to be on the edge of their range in North Dakota

Table 17 shows Level I species that have been documented in the Missouri Slope Region including Stark and Morton Counties.

Table 17. Species of Conservation Priority Level I in the Missouri Slope Region

Common Name	Scientific Name	Habitat Type	Habitat Details
Swainson's Hawk	*Buteo swainsoni*	Native Prairie/ Grassland/Forests	Require native prairie or cropland that includes thickets of natural tree growth, brush margins of native forested tracts, or shelterbelts.
Ferruginous Hawk	Buteo regalis	Native Prairie	Confined to very limited areas of native prairie, usually those with hilly terrain or with low-grade topsoil that has not been altered by plowing or overgrazing.
Upland Sandpiper	Bartramia longicauda	Native Prairie/ Grassland	Inhabit mixed-grass prairie, extensive tracts of wet meadow, grazed tall-grass prairie, tame haylands, CRP fields, and mowed or burned railroad or highway rights-of-way.
Long-billed Curlew	Numerius americanus	Native Prairie/ Grassland	Inhabit dry native grasslands.
Wilson's Phalarope	Phalaropus tricolor	Wetland	Inhabit swales along ephemeral streams and various types of ponds and lakes that contain expanses of shallow water that are interspersed with, or adjacent to, wet-meadow vegetation.

Common Name	Scientific Name	Habitat Type	Habitat Details
Sprague's Pipit	Anthus spragueii	Native Prairie	Inhabit native medium to intermediate height prairie. In short grass prairie landscape, can often be found in areas with taller grasses. More abundant in native prairie than in exotic vegetation. Requires relatively large areas of appropriate habitat.
Grasshopper Sparrow	Ammodramus savannarum	Native Prairie	Inhabit open prairie with intermittent brush, avoids heavy brush cover.
Baird's Sparrow	Ammodramus bairdii	Native Prairie /Grassland	Prefer native prairie; structure may be more important than plant species composition. Nesting may take place in tame grasses (found in Crested Wheat, while avoids Smooth Brome). Areas with little to no grazing activity are required.
Lark Bunting	Calamospiza melanocorys	Native Prairie/ Grassland	Inhabit short-grass & mixed-grass communities as well as fallow fields, roadsides, and hayfields.
Chestnut-collared Longspur	Calcarius ornatus	Native Prairie/ Grassland	Located in tracts of heavily grazed or hayed mixed-grass prairie or mixed-grass/short-grass prairie.
Plains Spadefoot	Spea bombifrons	Native Prairie/ Grassland/Cropland	Found in the dry prairies, sagebrush communities, and farm fields.
Western Hognose Snake	Heterodon nasicus	Native Prairie	Prefers sandy or gravelly habitats like sand prairies, very open portions of prairies, or sand dunes with very little cover.
Black-tailed Prairie Dog	Cynomys ludovicianus	Native Prairie/ Grassland	Require short-grass prairie habitats. Avoids heavy brush and tall grass areas due to the reduced visibility these habitats impose.

Source: Hagen et al. 2005

North Dakota's list of Species of Conservation Priority includes five species that are also listed as federally threatened or endangered: the interior least crane, piping plover, pallid sturgeon, whooping crane and gray wolf. These species are discussed above.

Sixteen North Dakota Species of Conservation Priority were observed in or near the Project Area during surveys (See Appendix A). These included 6 Level I species and 10 Level II species (Table 18).

Table 18. Species of Conservation Priority Observed During 2013 Wildlife Surveys

Common Name	Scientific Name	Conservation Priority Level
sharp-tailed grouse	*Tympanuchus phasianellus*	2
northern harrier	*Circus cyaneus*	2
Swainson's hawk	*Buteo swainsoni*	1
Bobolink	*Dolichonyx oryzivorus*	2
upland sandpiper	*Bartramia longicauda*	1
Willet	*Catoptrophorus semipalmatus*	1
burrowing owl	*Athene cunicularia*	2
lark bunting	*Calamospiza melanocorys*	1
northern pintail	*Anas acuta*	2
grasshopper sparrow	*Ammodramus savannarum*	1
marbled godwit	*Limosa fedoa*	1
loggerhead shrike	*Lanius ludovicianus*	2
bald eagle	*Haliaeetus leucocephalus*	2
Redhead	*Aythya americana*	2
prairie falcon	*Falco mexicanus*	2
red-headed woodpecker	*Melanerpes erythrocephalus*	2

WEST identified three Swainson's hawk nests during surveys in spring 2013. One nest is located within the Project Area, and the other two are 0.5 and 1 mile from the Project Area, respectively (see Appendix A).

Avian Species

Avian Point Count Surveys

Sunflower contracted WEST to conduct fixed-point avian surveys in 2013 to estimate seasonal and spatial use of the study area by birds. The surveyors also recorded incidental observations of all diurnal raptors, unusual or unique birds, sensitive species, mammals, reptiles and amphibians detected outside of the standardized survey periods. Birds observed incidentally were excluded from avian use calculations.

Sixty-eight unique bird species were identified during spring and summer 2013 point count surveys and incidentally. No federally endangered, threatened or candidate species were recorded. Sixteen North Dakota Species of Conservation Priority were recorded, including two bald eagles.

Passerines were the most abundant bird type observed, accounting for 84.2% of all observations. Waterbirds, represented almost entirely by sandhill cranes (*Grus canadensis;* 350 observations), were the second most abundant bird type observed in the study area, representing 6.1% of all observations. A total of 79 diurnal raptors were observed, accounting for 1.4% of all individuals recorded. Northern harrier (*Circus cyaneus*) and Swainson's hawk (*Buteo swainsoni*) were the most commonly observed raptor species (20 and 19 individuals,

respectively). Two individual bald eagles (*Haliaeetus leucocephalus*) were observed in the spring. No listed or candidate avian species were observed.

Species diversity of birds observed reflected the grassland and agricultural habitat within the Study Area. Species which use open grassland habitats were dominant, but species that utilize woodlands and wetlands were also observed interspersed throughout the Study Area. A far greater number of bird observations occurred in the spring season (5,338) compared to summer (454). Although the spring season had almost twice as many surveys conducted, it is unlikely that doubling the number of surveys in summer would have resulted in the total number of birds observed to approach those recorded in spring, especially as birds observed during the spring included migrating individuals.

In total, 26 bird species were recorded in spring that were not recorded in the summer, while only four species were observed in the summer that were not recorded in the spring. Lapland longspur and common redpoll had the highest number of individuals recorded and were only observed in the spring. Diurnal raptors were also more common in the spring.

Sharp-tailed Grouse Lek Surveys

Sunflower contracted WEST to conduct sharp-tailed grouse lek aerial surveys in April and May 2013, in order to determine the approximate location of sharp-tailed grouse leks and provide general information on sharp-tailed grouse use within and immediately adjacent to the Project Area. Surveys were conducted during peak lekking activity (early April through mid-May). Eight confirmed leks (birds observed in courtship behavior at the same location during more than one survey) and five possible leks (birds observed in courtship behavior during only one survey) were recorded.

Five of the confirmed leks and two of the possible leks were identified within the Project Area. The three additional confirmed leks that are outside of the Project Area are approximately 0.25 miles to the north, and 1.5 miles and 2.5 miles to the south. Three additional potential lek sites were identified outside the Project Area. The maximum number of sharp-tailed grouse recorded on leks ranged from 7 to 30 (Table 19).

Table 19. Sharp-tailed Grouse Lek Status and Distance to Project Area

Lek ID	Lek Status	Maximum number of individuals	Distance to Project Area (mi)
1	confirmed	21	Within
2	possible	12	0.5
3	possible	14	Within
4	possible	8	1
5	confirmed	8	0.25
6	confirmed	9	Within
7	confirmed	18	2.5
8	confirmed	16	Within
9	possible	7	Within
10	confirmed	25	Within
11	confirmed	29	1.5
12	confirmed	30	Within
13	possible	18	0.8

Raptor Nest Surveys

For the purposes of the Project, raptors are defined as kites, accipiters, buteos, harriers, eagles, falcons, and owls. Surveys for nests of all raptor species included the Study Area plus a 1-mile buffer. Aerial surveys, including for eagle nests, were carried out in accordance with guidance provided in the USFWS Inventory and Monitoring Protocols (Pagel et al. 2010). Eagle surveys included the Study Area plus a 10-mile buffer because the USFWS defines the area nesting population for golden eagle to be the "number of pairs of golden eagles known to have a nesting attempt during the preceding 12 months within a 10-mile radius of a golden eagle nest" (USFWS 2013b). The raptor nest survey used the same approach for bald eagles.

Eighteen raptor nests representing five species were documented within the Study Area and associated buffers during the 2013 aerial survey spring and summer ground-based avian point count surveys (Table 20). No eagle nests were recorded within the Study Area or the 1-mile buffer. Five bald eagle nests (1 active and 4 inactive/unoccupied) were recorded within the 10-mile buffer.

The closest bald eagle nest to the Project was located along Haymarsh Creek, approximately 8 miles northeast of the Project Area; this nest was unoccupied at the time of surveys. The one active bald eagle nest observed was located along the Heart River, approximately 11 miles south of the Project Area. Based on these distances there is potential that important use areas for bald eagles may exist within 10 miles of the Project.

Of the 13 other raptor nests identified, 4 were within the Project Area. All four nests within the Project Area were occupied at the time of the survey (Table 20). Nests belonging to three Species of Conservation Priority were documented: bald eagle, Swainson's hawk, and burrowing owl. Of these species, bald eagle and burrowing owl are also Birds of Conservation Concern.

Table 20. Raptor Nest Status and Distance to Project Area

Nest ID[/a]	Species	Nest Status	Distance to Project Area (mi) [/b]
BAEA_Nest4	Bald eagle	Occupied, active	11
BAEA_Nest1	Potential bald eagle	Unoccupied, inactive	8
BAEA_Nest2	Potential bald eagle	Unoccupied, inactive	9
BAEA_Nest3	Potential bald eagle	Unoccupied, inactive	10
BAEA_Nest5	Potential bald eagle	Unoccupied, inactive	12
SF-9	Burrowing owl	Occupied, active	Within
SF-5	Great horned owl	Occupied, active	Within
SF-1	Great horned owl	Occupied, active	0.5
SF-2	Great horned owl	Occupied, active	0.5
SF-8	Red-tailed hawk	Occupied, active	Within
SF-6	Red-tailed hawk	Occupied, active	0.5
SF-11	Red-tailed hawk	Occupied, active	0.1
SF-3	Swainson's hawk	Occupied, active	Within
SF-7	Swainson's hawk	Occupied, active	1
SF-13	Swainson's hawk	Occupied, active	0.5
SF-12	Unknown raptor	Occupied, active	0.5
SF-4	Unknown raptor	Unoccupied, inactive	0.5
SF-10	Unknown raptor	Unoccupied, inactive	0.4

/a Nest IDs as assigned by WEST in Raptor Nest Survey Report and Figure 1 and 2 (Appendix A)
/b distances are approximate.

Bat Study

Of the 47 bat species in the United States, 10 occur in North Dakota and may potentially occur within the Project Area based on current known distribution ranges including the little brown bat (Myotis lucifugus), silver-haired bat (Lasionycteris noctivagans), big brown bat (Eptesicus fuscus), eastern red bat (Lasiurus borealis), hoary bat (Lasiurus cinereus), western long-eared myotis (M. evotis), western small-footed myotis (M. ciliolabrum), Keen's myotis (M. keenii), northern long-eared myotis (M. septentrionalis) and long-legged myotis (M. volans) (ASM 2007, NatureServe 2008, BCI 2009). None of the species that potentially occur within the Project Area are federally listed as threatened or endangered. The northern long-eared bat is a sensitive species and was recently proposed for listing as endangered by the USFWS (2013d). Three of the species that could potentially occur within the Project Area – hoary bat, silver-haired bat, and eastern red bat – are highly migratory and are found in the greatest abundance in North Dakota during late May through early September (Cryan 2003).

Sunflower contracted WEST to complete a study of bat activity in the Project Area during summer and fall 2013 (see report in Appendix A). Acoustic monitoring surveys were conducted at three meteorological tower stations within the Project Area between June 12 and October 23, 2013. Three ground-based AnaBat detectors were used to record bat activity; one of these was paired with another elevated AnaBat detector placed at approximately 148 feet (45 meters) above ground level to record bats flying near rotor heights. The detectors were programmed to

start recording approximately 30 minutes before sunset and turn off approximately 30 minutes after sunset each night.

The standard metric used for measuring bat activity was the number of bat passes per detector-night, and this metric was used as an index of bat activity in the Project Area. To assess potential for bat fatalities, bat activity in the Project Area was compared to existing data at other wind energy facilities in the Midwest.

Bat activity was consistently higher – nearly twice as high on average – at the ground-based detectors than at the elevated detector. Research suggests that bat activity in the rotor-swept heights may be more representative of bat exposure to turbines and potential fatalities. Because bat activity was generally lower at the raised met tower station than ground level stations, there may be a lower potential risk of collision with turbines than if the call rates were similar at both the ground and at the raised station. Bat activity was relatively low in the summer and higher in the fall, peaking from August 4 to August 10, and steadily decreasing thereafter. Most bat fatality studies at wind energy facilities in the US have shown a peak in fatality in August and September (the fall migration period) and generally lower mortality earlier in the summer and very low mortality during the spring.

Bat activity recorded by ground detectors at met towers during the fall migration period (1.70 ± 0.20 bat passes per detector-night) was the lowest activity when compared to all publicly-available reports from facilities in Midwest, and the third lowest when compared to all facilities in North America with similarly-collected activity data, potentially indicating low direct impacts to bats.

5.5.2 Potential Impacts

Impacts to wildlife can be short-term (one or two reproductive seasons, generally during the construction period), or long-term (affecting several generations during the life of the Project). Impacts can also be direct (an immediate effect to an individual, population, or its habitat), or indirect (an effect that may occur over time or result from other actions).

Federally Listed and Candidate Species

Black-footed Ferret

The Project is unlikely to affect black-footed ferret as there have not been any prairie dog colonies found in the Project Area and it is unlikely that black-footed ferrets are present.

Gray Wolf

The Project is unlikely to affect current gray wolf habitat, and there has not been a confirmed wolf sighting in North Dakota since 1991.

Interior Least Tern

The Project is unlikely to impact interior least tern, as there have been no documented occurrences of the species in or near the Project Area.

Piping Plover

The Project is unlikely to impact piping plover, as there have been no documented occurrences of the species in or near the Project Area.

Pallid Sturgeon

The Project will have no impact on pallid sturgeon, as there is no habitat for this fish within the Project Area, and the Project will not impact water quality in the Missouri River or its major tributaries where the pallid sturgeon is known to occur.

Whooping Crane

The Project is unlikely to impact whooping cranes. No whooping cranes were observed during the spring and summer avian surveys, the Project Area is located outside of the known migratory corridor, and the Project Area was assessed as not containing suitable wetland habitat. There are no historical records of whooping cranes occurring within the Project Area. In addition, a study was presented at the 2012 National Wind Coordinating Collaborative meeting describing avoidance behavior of whooping and sandhill cranes at a wind farm in South Dakota (Nagy et al. 2012). Sandhill cranes altered flight trajectory away from turbines when flying within the height of the rotor-swept area more often than when flying above the rotor-swept area. It is likely that whooping cranes will respond similarly and move around wind turbines.

Sprague's Pipit

The Project may impact individual Sprague's pipits during the spring and fall migration through collision with the turbines. However, any impacts are expected to be minimal as the species was not detected during surveys.

State Species of Conservation Priority

Sixteen North Dakota Species of Conservation Priority were observed during wildlife surveys, and an additional seven are known to occur in Stark and Morton counties (see Table 18 and 17, respectively). None of the five Species of Conservation Priority that are also ESA-listed have been documented to occur in the Project Area. Impacts discussion below related to passerines, grouse, and raptors cover impacts to State Species of Conservation Priority.

Avian Species

Passerines

Passerines (songbirds) were the most abundant bird type observed during surveys. Migrant passerines are found more often in post-construction mortality monitoring compared to other

groups of birds (Arnett et al. 2007, Strickland and Morrison 2008, Strickland et al. 2011). Although nocturnal migrants comprise the majority of songbird fatalities, the proportion of migrating songbirds killed at any given wind project during migration is reported to be low (Strickland et al. 2011). Locally breeding songbirds may experience lower mortality rates than migrants because many of these species tend not to fly at turbine heights during the breeding season, except some species with aerial flight displays in the rotor swept area (Pickwell 1931, Johnson and Erickson 2011).

During the avian surveys, 4875 small birds were observed. The Lapland longspur was observed 1,530 times, and the horned lark and red-winged blackbird were both observed over 600 times. Although these species have been documented at other wind energy facilities, if fatalities occur at the Project, they are unlikely to have population-level impacts.

Grouse

Prairie grouse have been identified as a group that exhibits avoidance behavior. Particular concern over avoidance issues has been raised by agencies and non-governmental groups with respect to grouse species (USFWS 2012b). The only published research on operational wind facilities and grouse show that sage-grouse continue to use habitats near wind energy facilities; however, the researchers state that in long-lived species, long-term data sets are needed to adequately assess impacts (Johnson et al. 2012). Given the lack of wind-specific studies, wildlife agencies have relied on research from other types of development to evaluate potential impacts to grouse. To date, this research is limited to observational studies, with results varying by grouse species and source of disturbance (i.e., roads, oil and gas wells, vertical structures, transmission lines).

Studies of grouse and anthropogenic features have documented that some species of grouse avoid transmission lines, improved roads, buildings, oil and gas wells, and communication towers (Pitman et al. 2005, Pruett et al. 2009, Johnson et al. 2012). However, other studies have found no evidence of avoidance of transmission lines or of wind facilities (Johnson et al. 2012). Although some studies have concluded that avoidance of other development is based on height, which could drive avoidance of wind turbines, Walters et al. (2014) found that, in most published studies, the effect of the height of a structure could not be conclusively isolated from the other effects of energy development.

Raptors

Eighteen raptor nests representing five species were documented during 2013 surveys, of which 5 were bald eagle nests. Eleven raptor nests were located in the Project Area, although none were eagle nests. Two observations of bald eagles flying through the area confirm the potential utilization of the area by eagles, however, the probability of mortality with Project facilities is low. Mean raptor use in the Project area in spring and summer is 0.53 and 0.35 raptors/plot/20-min survey, respectively (see WEST Wildlife Baseline Study Report in Appendix A). When compared to other wind energy facilities, the mean annual raptor use ranged from

0.06 raptors/20-min survey to 2.34 raptor s/20-min survey. Based on the results from these facilities, a ranking of mean annual raptor use was developed as: low (0 – 0.5 raptors/plot/20-min survey); low to moderate (0.5 – 1.0); moderate (1.0 – 2.0); high (2.0 – 3.0); and very high (over 3.0; Strickland et al. 2011). Using this ranking, mean raptor use in the Project area is considered to be low to moderate with the most abundant raptors at the project being northern harrier, Swainson's hawk, and red-tailed hawk.

Bats

Overall, there is a low likelihood of occurrence for bat species for the entire Project Area. Should bats occur in the Project Area, the potential for direct impacts (e.g., mortality resulting from turbine collisions or barotraumas) will be minimized by turbine siting away from areas of potential bat activity such as wetlands. Based on the available data, it is expected that bat fatalities at the Project, while likely low overall, will be highest during late summer and early fall at potential turbine locations.

5.5.3 Mitigative Measures

Federally Listed and Candidate Species

Sunflower will implement the avoidance and minimization measures and BMPs listed in the Draft UGP Wind Energy PEIS (Western and USFWS 2013), as follows:

Black-Footed Ferret

Survey Requirements and Avoidance Measures:

- Coordinate with the Service on any sitings of turbines, transmission lines, access roads, or other project facilities on black-footed ferret reintroduction sites.
- Conduct preconstruction surveys within 100 miles of reintroduction sites and in areas of suitable habitat, (as per the 1989 survey protocols) within project boundaries.

Whooping Crane

Survey Requirements and Avoidance Measures:

For projects that that occur within the portion of the whooping crane migration corridor that encompasses 95 percent of historic sightings:

- Conduct preconstruction evaluations and/or surveys to identify wetlands that provide potentially suitable stopover habitat.
- Do not site turbines, transmission lines, access roads, or other project facilities within or adjacent to wetlands that provide suitable stopover habitat or within 5 mi (8 km) of the Platte or Niobrara Rivers.
- Do not site turbines, transmission lines, access roads, or other project facilities within 5 mi (8 km) of designated critical habitat.

Conservation Measures:

For projects that that occur within the portion of the whooping crane migration corridor that encompasses 95 percent of historic sightings:

- Place state-of-the-art bird flight diverters on any new or upgraded overhead collector, distribution, and transmission lines located within 1 mi (1.6 km) of suitable stopover habitat.
- Establish a procedure for preventing whooping crane collisions with turbines during operations by establishing and implementing formal plans for monitoring the project site and surrounding area for whooping cranes during spring and fall migration periods throughout the operational life of the project and shutting down turbines and/or construction activities within 2 mi (3.2 km) of whooping crane sightings. Specific requirements of the monitoring and shutdown plan will be determined during site-specific ESA consultations, but will include adequate coverage (appropriate dates, times, numbers, and qualifications of observers) based on size of the wind farm.
- Instruct workers to avoid disturbance of cranes present near project areas.
- Within the portion of the whooping crane migration corridor that encompasses 95% of historic sightings, the acreage of wetlands that are suitable migratory stopover habitat located within a 1 mi (1.6 km) radius of turbines may be mitigated based upon site-specific evaluations.

Pallid Sturgeon

Survey Requirements and Avoidance Measures:

- Conduct preconstruction evaluations and/or surveys in areas of potential occurrence to identify suitable habitat and areas of occurrence within project boundaries.
- Do not site turbines, access roads, transmission line towers, or other project facilities in or adjacent to aquatic habitat where pallid sturgeon occurs.

Conservation Measures:

For projects that encompass areas within drainages occupied by pallid sturgeon:

- Employ BMPs during and after construction to control erosion and runoff to aquatic habitats.
- Avoid using herbicides or pesticides in the vicinity of aquatic habitats.
- Employ measures to minimize the amount of stream habitat disturbance when transmission lines and access roads must be constructed across streams.
- Ensure that upstream and downstream fish passage is maintained in any areas where stream habitat disturbance occurs.
- Avoid actions that would alter surface water flow in occupied habitat.

Interior Least Tern

Survey Requirements and Avoidance Measures:

- Do not site turbines, access roads, transmission lines, or other project facilities within 0.50 mi (0.8 km) of suitable sandbar habitat, reservoir shorelines, or other known shoreline nesting, resting, and foraging areas.

Conservation Measures:

- Conduct construction activities during the non-breeding season in areas near known occupied habitat.
- Mark new overhead power lines within 1 mi (1.6 km) of known least tern habitat with bird flight diverters.
- If least terns nest in the project area during construction, avoid construction activities within 0.5 mi (0.8 km) of nesting areas during late April to August.

Piping Plover

Survey Requirements and Avoidance Measures:

- Do not site turbines, access roads, transmission lines, or other project facilities within 2 mi (3.2 km) of suitable sandbar habitat, reservoir shorelines, alkali wetlands, or other known shoreline nesting, resting, and foraging areas.
- Do not site turbines, transmission lines, access roads, or other project facilities in or within 2 mi (3.2 km) of designated critical habitat.

Conservation Measures:

- Mark new overhead power lines within 1 mi (1.6 km) of known piping plover habitat with bird flight diverters.
- If piping plovers nest in the project area during construction, avoid construction activities within 0.5 mi (0.8 km) of nesting areas during late April to August.

Sprague's Pipit

Survey Requirements and Avoidance Measures:

- Avoid placement of turbines, access roads, and transmission lines on or within 1,000 ft (304.8 m) of suitable native prairie tracts larger than 70 ac (0.28 km2).

Conservation Measures:

- Design layouts to minimize further fragmentation of native prairie habitats that are suitable for Sprague's pipit.
- Conserve or restore native prairie habitats to offset impacts on native prairie caused by fragmentation, as determined in tiered site specific consultation.

Gray Wolf

Survey Requirements and Avoidance Measures:

- Conduct preconstruction evaluations and/or surveys in areas of potential occurrence to identify suitable habitat and areas of occurrence within project boundaries.
- Do not site turbines, transmission lines, access roads, or other project facilities in habitats occupied by gray wolf.

State Species of Conservation Priority and Avian Species

Sunflower will avoid the resources identified to the extent practicable. Avoidance/minimization practices are discussed below.

Sunflower will implement measures during construction, operations and decommissioning to avoid or minimize impacts to wildlife as identified in the Draft UGP Wind Energy PEIS (Western and USFWS 2013), as follows:

Measures applicable during construction:

- Consult with the appropriate natural resource agencies to avoid scheduling construction activities during important periods for wildlife courtship, breeding, nesting, lambing, or calving that are applicable to sensitive species within the project area.
- Instruct employees, contractors, and site visitors to avoid harassment and disturbance of wildlife, especially during reproductive (e.g., courtship and nesting) seasons. Pets should not be allowed on the project area.
- Establish buffer zones around known raptor nests, bat roosts, and biota and habitats of concern if site evaluations show that proposed construction activities would pose a significant risk to avian or bat species of concern.
- If needed during construction, only use explosives within specified times and at specified distances from sensitive wildlife or surface waters as established by the appropriate Federal and State agencies.
- Minimize the use of guy wires on permanent meteorological towers. If guy wires are necessary, they should be equipped with line marking devices.
- Place marking devices on any newly constructed or upgraded transmission lines, where appropriate, within suitable habitats for sensitive bird species.

Measures applicable during operations phase:

- Turn off unnecessary lighting at night to limit attraction of migratory birds. Follow lighting guidelines, where applicable, from the Wind Energy Guidelines Handbook (USFWS 2012a). This includes using lights with timed shutoff, downward-directed lighting to minimize horizontal or skyward illumination, and avoidance of steady-burning, high-intensity lights.
- Instruct employees, contractors, and site visitors to avoid harassment and disturbance of wildlife, especially during reproductive (e.g., courtship and nesting) seasons. Pets should not be allowed on the project area.

- In the absence of long-term mortality studies, monitor regularly for potential wildlife problems including wildlife mortality. Report observations of potential wildlife problems, including wildlife mortality, to the appropriate State or Federal agency in a timely manner, and work with the agencies to utilize this information to avoid/minimize/offset impacts. The Ecological Services Division of the Service shall be contacted. Development of additional mitigation measures may be necessary.

Measures applicable during decommissioning:

- All turbines and ancillary structures should be removed from the site.

Additional site-specific measures Sunflower may employ to further reduce impacts to wildlife are listed below.

General

- Sunflower will bury all collection lines;
- Siting access roads and turbines away from wetlands, waterbodies, and native prairies to the greatest extent practicable;
- No overhead power lines will be constructed as part of the Project;
- Minimizing the use of lights on turbines when practicable in accordance with state, federal, and local requirements;

Grouse

- Sunflower will work to incorporate a setback from known grouse leks in consultation with the USFWS and North Dakota Game and Fish.

Raptor Nests

- Restricting construction and/or operation activities due to active raptor nests; mapping and flagging raptor nests found during construction; placing turbines as far away from raptor nests as project and engineering constraints permit and avoid removal of trees;

Habitat Restoration

- Reseeding or planting disturbed areas with native material;
- Enhancing existing degraded habitat, where practicable, through the removal and replacement of invasive species with plants native to the site;
- Developing a management plan to prevent the spread of noxious weeds throughout the Project Area or adjacent areas during construction and ongoing operations;

Post construction mortality monitoring

- Implementing a wildlife reporting protocol once turbine construction is completed. The protocol will include measures for field technicians to report and document avian mortalities during routine maintenance operations.

5.6 Land Use/Farmland

5.6.1 Existing Conditions

The land within the Project Area is entirely in private ownership, and is in agricultural use including crops and livestock grazing, with scattered farmstead residences. The Project Area is not located within any city limits or any military installation. There are no industrial developments in or near the Project Area, with the exception of Western's Dickinson-Mandan 230 kV transmission line and several communication towers. U.S. Interstate Highway 94 runs east-west just north of the northern boundary of the Project Area. The roads within the Project Area include gravel surfaced county roads and two-track farm access roads and trails.

County Land Use Regulation

The Project is subject to land use regulation by Morton and Stark Counties. Zoning has been adopted in both counties; the entire Project Area is zoned for Agricultural use under both the Morton County and the Stark County zoning regulations.

Morton County

Under the MCZR (March 2013), the construction of a wind energy facility in the Agricultural District requires a Special Use Permit (MCZR Article 5, Section 4.27). The entire Project Area is zoned for Agricultural use. The MCZR include specific provisions for wind turbines, including defined setbacks as follows:

- Each wind turbine is to be set back a distance of at least 1.25 times its total height or 1,320 feet, whichever is greater, from occupied residences, commercial buildings or publicly used structures or facilities, or state and county parks.
- Each wind turbine is to be set back from public roads and above-ground communication or electrical lines a distance of not less than 250 feet from the centerline of the roadway.
- Each wind turbine is to be set back from the perimeter of the facility by a distance not less than one to one and one half (1 to 1 ½) times the rotor diameter; a variance may be granted if the owners/residents of adjoining properties sign a formal and binding agreement with the applicant, expressing support for a variance that may reduce the perimeter setback requirement.

In addition, buildings are to be set back a minimum of 60 feet from the right-of-way line of county roads and state or federal highways (MCZR Article 18).

MCZR Appendix I also includes provisions and requirements for siting of turbines to avoid or minimize impacts to environmental resources, requirements for restoration of temporary disturbance areas, and requirements for removal of facility infrastructure at the time of decommissioning. These requirements will be satisfied through the implementation of impact avoidance and mitigation measures and BMPs as identified in Section 5.6.3.

Additional administrative permits would be needed for construction of the Project in Morton County. Building permits would be needed, and structures must comply with the North Dakota State Building Code and any future amendments or revisions to that code (MCZR Article 20). Construction within a mapped 100-year floodplain would require a floodplain development permit to be issued by the County Building Inspector (MCZR Article 12). A Stormwater Management Plan must also be approved by the County Engineer for any building permit or land disturbing activity (MCZR Article 21).

Stark County

In Stark County, a wind energy facility may be approved through the issuance of a Wind Energy Facility Siting Permit (Stark County Zoning Ordinance [SCZO] Section 6.19.2). The permit would be issued by the Planning and Zoning Commission, following public hearings by both the Planning and Zoning Commission and the County Commissioners. The SCZO, Section 6.19 includes specific provisions for wind energy facilities, including defined setbacks as follows:

- Each wind turbine is to be set back not less than 2,000 feet from occupied dwellings, commercial buildings or publicly-used structures or facilities;
- Each wind turbine is to be set back not less than 200 feet from the centerline of public roads and above-ground communication and electrical lines;
- Each turbine is to be set back a distance of not less than 2.5 times the rotor diameter from the facility perimeter. A variance may be granted if the owners/residents of adjoining properties sign a formal and binding agreement with the applicant, expressing support for a variance that waives or reduces the perimeter setback requirement.

In addition, buildings must be set back a minimum of 125 feet from the centerline of county roads or from section lines (SCZO Sec 3.7).

Additional administrative permits would be needed for construction of the Project in Stark County. Building permits would be needed, and structures must comply with the North Dakota State Building Code, the International Building Code, the International Mechanical Code, and the State Uniform Plumbing Code, and any future amendments or revisions to those codes. Construction within a mapped 100-year floodplain would require a permit to be issued by the Code Administrator.

The SCZO, Section 6.19 also includes provisions and requirements for siting of turbines to avoid or minimize impacts to environmental resources, requirements for restoration of temporary disturbance areas, and requirements for removal of facility infrastructure at the time of decommissioning. These requirements will be satisfied through the implementation of impact avoidance and mitigative measures and BMPs, as identified in Section 5.6.3.

USFWS Wetland and Grassland Easements

The USFWS has been purchasing wetland easements in the Prairie Pothole Region since 1989. Easement wetlands are part of the National Wildlife Refuge System. There are no USFWS wetland easements in the Project Area or in Morton or Stark counties (NCED 2013).

Conservation Reserve Program (CRP) Easements

The Natural Resource Conservation Service (NRCS) and Farm Services Agency administer a number of conservation-based programs for private landowners. The CRP conserves soil and water resources and provides wildlife habitat by removing enrolled tracts from agricultural production, generally for a period of 10 years. The NRCS administers a number of conservation-based programs for private landowners. These tracts cannot be hayed, tilled, seeded, or otherwise disturbed without the authorization of the NRCS. The 2002 Farm Bill amended Section 3832 of the Farm Security and Rural Investment Act to allow the use of CRP land for wind energy generation.

According to the Farm Services Agency, there are a total of 6,436.2 acres of land in Morton County and 30,946.8 acres of land in Stark County currently enrolled in CRP; the Project Area may include some lands that are enrolled in CRP. Sunflower will work with landowners within the Project Area to determine if any lands are enrolled in CRP. Should any CRP lands be identified, Sunflower will avoid those areas to the extent practicable during micrositing; if avoidance is not practical, Sunflower will work with the landowner and USDA to determine an appropriate course of action.

USDA Loan Coordination

The USDA offers a variety of loans through its Rural Development program. Land under loans from the USDA requires special coordination with the USDA if non-agricultural project activities are proposed within those parcels. The Project Area may include some lands that have used USDA loads and are therefore subject to USDA review. Sunflower will work with landowners within the Project Area to determine if any lands are under USDA jurisdiction due to loans. Should any loan coordination lands be identified, Sunflower will work with the landowner and USDA to determine appropriate avoidance or mitigation measures, if necessary.

Private Land Open to Sportsman (PLOTS)

NDGFD runs the PLOTS program, under which private lands may be opened to public hunting use. These lands are enrolled in one of three NDGFD programs to enhance fish and wildlife populations for sustained public use, and may also be jointly enrolled in other federal programs such as the CRP described below. No PLOTS are located within the Project Area (Figure 5A and Figure 5B).

Wildlife Management Areas

Wildlife Management Areas (WMAs) are state-owned lands managed by the NDGFD for wildlife habitat. There are no WMAs in or near the Project Area. The closest is the Storm Creek WMA in Morton County located approximately 18 miles east of the Project Area.

The Heart Butte Reservoir State Game Management Area is not a WMA, but is managed by the NDGFD for fishing and hunting. This game management area is located approximately 16 miles southeast of the Project Area.

State Trust Lands

One state trust land parcels exists within the southern edge of the Project Area (Figure 5A and Figure 5B). Trust lands are administered by the North Dakota State Land Department. No Project components will be located on this parcel.

Federal Lands

There are no federally-owned or –managed lands within the Project Area.

Tribal Lands

There are no tribally-owned or managed lands within the Project Area.

5.6.2 Potential Impacts

The development of the Project will not displace any residents or existing or planned industrial facilities. Wind turbines will be sited a minimum of 1,320 feet from occupied residences in Morton County and 2,000 feet from occupied residences in Stark County, in accordance with the requirements of the respective county zoning regulations. Setbacks to roads and nonparticipating lands as established by county and state regulations would also be observed.

The Project would not impact any wetland easements, wetlands management districts, PLOTS lands, or wildlife management areas. If Project facilities are proposed for parcel enrolled in CRP and it is not practical to move such facilities, Sunflower will work with landowners to determine whether the parcel should be removed from the program and if reimbursement is necessary.

Reconductoring activities would have no impacts to land use. This work would occur entirely within the existing transmission right-of-way and would utilize existing access roads and other previously-disturbed areas.

5.6.3 Mitigative Measures

Operation of the wind farm will not change the land use in the majority of the Project Area. The proposed land use will not involve any ongoing industrial use of non-renewable resources or emissions into the environment. Consequently, no further mitigative measures have been proposed.

5.7 Transportation

5.7.1 Existing Conditions

Ground Transportation

The analysis area for transportation impacts is the area delineated by roadways adjacent to the Project Area. The Project Area is generally bounded by I-94 on the north side, 45th Street on the south, 80th Avenue on the west, and 71th Avenue on the east. Local county roads are spaced throughout the Project Area; these are generally section line roads. However, while section lines in North Dakota are all designated as public right-of-way, not all such right-of-way is owned or maintained by the local counties. Within the Project Area, Morton and Stark County roads are shown on Figure 5A for the Vestas turbine layout and on Figure 5B for the GE turbine layout.

State Highway 10 (ND 10) is the only other major road in the vicinity; it runs through Hebron en route between Glen Ullin and Richardton. A Burlington Northern Santa Fe rail line runs roughly adjacent to ND 10.

Most construction equipment and materials would arrive at the Project Area via truck, along I-94. An existing interchange is located south of Hebron at 76th Avenue, approximately at the center of the north side of the Project Area; this interchange and 76th Avenue would serve as the primary route from the highway into the Project Area. Additional I-94 interchanges are located one mile northeast (at ND 10) and three miles west (at 83rd Avenue) of the Project Area, allowing options for specific routing of Project materials if necessary.

According to the North Dakota Department of Transportation (NDDOT)'s 2007 Functional Classification Maps, all roads within the Project Area are considered local roads. 76th Avenue north of I-94 is a County Major Collector, as are ND 10 and 44th Street SW, which runs east-west one mile south of the Project Area between Glen Ullin and 83rd Avenue (this route is also named as County Road 138, and on the NDDOT maps as CMC 3018 in Morton County and CMC 4520 in Stark County). The Morton County Road Map identifies 76th Avenue south of Hebron and County Road 89 as County Highways. In the Morton County Comprehensive Plan, ND 10 and 76th Avenue north of I-94 are identified as Major Collectors, while other roads in the vicinity are minor county roads. Some are shown on the Morton County Road Map as minimum maintenance roads. The Stark County Comprehensive Plan does not provide road classifications; all roads in the Project Area appear to be minor county or private roads. Roads within the Project Area are generally gravel surfaced.

Traffic volume data in the vicinity of the Project is limited. No vehicle count data are available for the county and township roadways in the Project Area. Traffic counts are available for some roads in the vicinity. Available existing traffic volumes on the area's roadways are documented in Table 21.

Additional county and township roads run through the Project Area in addition to those listed in Table 21, but no vehicle count data are available for them. In general, the NDDOT indicated that roads with vehicle counts under 100 vehicles per day, or Average Annual Daily Traffic (AADT), are rarely counted. According to NDDOT, vehicle counts on routes with no count data are likely lower than those with count data. For purposes of comparison, the functional capacity of a two-lane paved rural road is approximately 5,000 AADT. Paved four-lane highways such as I-94 have a functional capacity of approximately 80,000 vehicles per day. Based on these data, traffic volumes on the roads in and near the Project Area are low and levels of service are high.

Table 21. Existing Daily Traffic Levels

Roadway Segment	Existing AADT/Commercial Truck Traffic
I-94 at Richardton	7320/ 2110
I-94 at Hebron	7595/ 2145
I-94 westbound exit at Hebron	70/ n/a
I-94 westbound on-ramp at Hebron	250/ n/a
I-94 eastbound exit at Hebron	85/ 20
I-94 eastbound on-ramp at Hebron	75/ 25
76th Ave north of I-94	500/ n/a
76th Ave south of I-94	140/ n/a
ND10 at Glen Ullin	575/ 55
ND 10 west of Hebron	190/ 15
83rd Avenue south of I-94	225/ n/a
ND 8 south of Richardton	555/ n/a
50th Street SW at ND 8	25/ n/a
Source: North Dakota DOT Transportation Information Map (NDDOT, 2013).	

Air Transportation

There are two public airports and four private airports within 25 miles of the Project Area (Table 22). Setbacks from public and private airports follow North Dakota Aeronautics Commission and Federal Aviation Administration (FAA) requirements. The North Dakota Aeronautics Commission has provided guidance on other wind projects related to safety for crop dusting aircraft to decrease their risk of colliding with met towers and turbines.

Table 22. Public/Private Airports within 25 Miles of the Project Area

Airport Name	Type	Distance from the Project Area (miles)
Chase Airstrip	Private	4.4
Glen Ullin Regional	Public	5.75
Richardton	Public	10.7
Brands	Private	15.0
Fitterer's Strip	Private	16.5
Jurgens Airstrip	Private	17.4

Notice to the FAA allows the agency to evaluate the effect of the proposed construction on air safety and navigable airspace, which begins with a determination of whether the proposed structure represents an obstruction. Obstructions are defined in 14 CFR 77, Subpart C (Sections 77.13 through 77.23), which defines obstructions based on both absolute height of the proposed object and height in relation to protected airspace, in effect establishing five distinct thresholds. The first threshold is defined in Section 77.17(a)(1) as an object that is greater than a height of 499 feet above ground level at the site of the object. The second threshold is defined in Section 77.17(a)(2) as an object with "a height that is 200 feet AGL, or above the established airport elevation, whichever is higher, within 3 nautical miles [3.45 statute miles] of the established reference point of an airport, excluding heliports, with its longest runway more than 3,200 feet in actual length." As with the notification requirement, "airport" is defined as a public use airport, a military airport, an airport operated by a federal agency or the Department of Defense (DOD), or an airport with an FAA-approved Instrument Approach Procedure (IAP).

The FAA has issued Determinations of No Hazard based on a filing of the preliminary array.

5.7.2 Potential Impacts

Ground Transportation

Construction will increase traffic on local roads to the Project Area, possibly causing temporary impacts to local traffic flow while equipment is hauled to the site. There are several roads adjacent to the Project Area in which construction-related traffic will be concentrated. Construction-related vehicles will primarily use I-94, and access the Project Area via the interchange with 76th Avenue just south of Hebron. The EPC contractor will obtain any necessary permits for transporting equipment.

While the number of vehicle trips for workers and equipment has not been modeled, construction traffic is highly unlikely to materially impact local traffic patterns or lower the existing levels of service, given the low volume of existing traffic.

Operation of the Project is not expected to result in any significant traffic issues on the area highways or state roads because there will be only a minor increase in traffic (only a few vehicles per day). In addition, the necessary permits will be obtained and safety protocols will be implemented.

Impacts to existing road infrastructure will mostly be positive. Construction activities will use the existing section line roads whenever possible. Where needed, existing local roads will be improved to allow heavy construction cranes and extra-long trucks used to transport turbine blades. These on-site and offsite improvements will remain in place following the completion of construction to assist with access and maintenance of the proposed facilities. Roads damaged during construction will be returned to pre-construction condition or better.

Air Traffic

The installation of wind turbines creates a potential for impacts to air traffic. However, The wind turbines and meteorological towers will have lighting and markings that comply with FAA requirements. Due to minimal air traffic, generally good visibility, and lighting, no impact to air traffic is anticipated.

The Project has received Determinations of No Hazard to Air Navigation based on the preliminary Project layout. The Project would not affect protected airspace for any airport as defined in the FAA rules.

Reconductoring activities would have no impact to air traffic. This work would utilize the existing transmission support towers and all work would occur within the existing transmission right-of-way. The reconductored transmission line would be essentially identical to its current configuration.

5.7.3 Mitigative Measures

Sunflower will observe the setbacks to roadways as established by the State in NDAC 69-06-08 during final micrositing of Project infrastructure. The observance of these setbacks would prevent damage to area roadways or disruptions to local travel in the unlikely event of a catastrophic failure of a wind turbine.

Sunflower will also comply with avoidance and mitigation measures and BMPs related to transportation impacts as identified in the Draft UGP Wind Energy PEIS (Western and USFWS 2013), as follows:

- Existing roads should be used to the extent possible, but only in safe and environmentally sound locations. If new access roads are necessary, they should be designed and constructed to the appropriate standard necessary to accommodate their intended function (e.g., traffic volume and weight of vehicles) and minimize erosion. Access roads that are no longer needed should be recontoured and revegetated.
- A transportation plan should be prepared that identifies measures the developer will implement to comply with State or Federal requirements and to obtain the necessary permits. This will typically address the transport of turbine components, main assembly crane, and other large pieces of equipment. The plan should consider specific object size, weight, origin, destination, and unique handling requirements and should evaluate alternative means of transportation (e.g., rail or barge).
- A traffic management plan should be prepared for the site access roads to ensure that no hazards would result from increased truck traffic and that traffic flow would not be adversely impacted. This plan should identify measures that will be implemented to comply with any State or Federal DOT requirements, such as informational signs, flaggers when equipment may result in blocked throughways, and traffic cones to identify any necessary changes in temporary lane configurations. Signs should be placed along roads to identify speed limits, travel restrictions, and other standard traffic control

information. To minimize impacts on local communities, consideration should be given to limiting construction vehicles on public roadways during the morning and late afternoon commute times.

- Project personnel and contractors should be instructed and required to adhere to speed limits commensurate with road types, traffic volumes, vehicle types, and site-specific conditions to ensure safe and efficient traffic flow.
- During construction, operations and maintenance, and decommissioning phases, traffic should be restricted to designated project roads. Use of other unimproved roads should be restricted to emergency situations.

5.8 Human Health and Safety

This section considers potential Project impacts to human health and safety.

5.8.1 Existing Conditions

Telecommunication and Radar

Wind turbines can cause loss of detection, false alarms, and corrupt data for primary and weather surveillance radar. This is a concern for air traffic control, DOD, Department of Homeland Security, FAA, and for weather radar. The potential impacts to NEXRAD (next generation weather radar) area are greatest within 10 nautical miles of a radar unit. Non-federal beam paths (such as for commercial radio stations) can also be impacted.

Two private land-mobile communication towers and one microwave transmission tower are located within the Project Area (HDR Critical Issues Analysis; see Appendix A). Seventeen registered microwave towers are located on a large hill (Custer Lookout) about 1.5 miles west of the Project Area.

A microwave beam path study was conducted to identify all non-federal microwave telecommunication systems, as well as AM, FM, cellular, and television tower locations (see report in Appendix A). The study identified 15 specific microwave pathways that cross the Project Area; the worst-case Fresnel zones (WCFZ) for each beam path were calculated. Turbines placed within these beam pathways would potentially cause disruptions to microwave communications.

The FAA's online DOD Preliminary Screening Tool allows developers to gain preliminary insights regarding potential impacts that structures may have on long range radars, military training routes, and special use airspace prior to official filing of an Obstruction Evaluation/Airport Airspace Analysis request with the FAA. This tool does not replace any official processes or procedures that may be required by the FAA.

Electromagnetic Fields

The term electromagnetic fields (EMF) refers to electric and magnetic fields that are present around any electrical device. Electric fields arise from voltage, or electrical charges, and

magnetic fields arise from current, or the flow of electricity that travels along transmission lines, power collection lines, substation transformers, house wiring, and electrical appliances. The intensity of the electric field is related to the voltage of the line, and the intensity of the magnetic field is related to the current flow through the conductors.

Shadow flicker

A wind turbine's moving blades can cast a moving shadow on locations within a certain distance of a turbine. These moving shadows are called shadow flicker, and can be a temporary phenomenon experienced by people at nearby residences or public gathering places. The impact area depends on the time of year and day (which determines the sun's azimuth and altitude angles) and the wind turbine's physical characteristics (height, rotor diameter, blade width, and orientation of the rotor blades). Shadow flicker generally occurs during low angle sunlight conditions, typical during sunrise and sunset.

Hazardous Materials / Hazardous Waste

The Project Area is located in a relatively rural area of North Dakota. Potential hazards may exist in rural areas from old gasoline facilities, landfill sites, and private activities. Hazardous wastes from large industrial or commercial activities are not likely.

The U.S. Environmental Protection Agency (USEPA) Superfund National Priorities List database was reviewed to determine the potential for major hazardous material issues within the Project Area. No National Priorities List sites are present within Stark and Morton counties (USEPA CERCLIS 2013). NDDOT maps were also consulted as they often identify known dumps in the area; there are no known dumps in the Project Area. There are no hazardous waste handlers or toxic release inventory sites located within the Project Area or within 5 miles of the Project Area (National Atlas 2003).

Potentially hazardous materials associated with the Project include gear box oil, hydraulic fluid, and gear grease for the turbines, and mineral oil used for the transformers.

Vandalism, Sabotage and Terrorism

The Project may be subject to intentional destructive acts, including unauthorized or illegal access to site facilities, theft or destruction of Project-related material, and the potential injury to members of the public who attempt to climb towers or open electrical panels.

5.8.2 Potential Impacts

Telecommunication Interference

A beam path study was conducted to identify all non-federal microwave telecommunication systems, as well as AM, FM, cellular, and television tower locations. The worst-case Fresnel zones for each beam path were calculated. The study identified several beam paths crossing the Project Area. These areas will be avoided during micrositing of the Project.

With the switch to digital television in 2009 throughout the United States, the concern of ghost images and flickering that may be caused by wind turbine interference with analogue signals are no longer an issue.

The Long Range Radar Screening Tool indicates that there would be no impacts to Air Defense and Homeland Security radars, minimal to no impact to Weather Surveillance Radar or Doppler Radar, and no impacts to military airspace. When the notice of proposed construction to the FAA is filed (see Section 4.16), the FAA will conduct an aeronautical study that will include an assessment of potential impacts to radar systems.

Electromagnetic Fields

While the general consensus is that electric fields pose no risk to humans, the question of whether exposure to magnetic fields can cause biological responses or health effects continues to be the subject of research and debate. As discussed above, EMF levels will not be above background levels at any residences. The only exposure will be to maintenance workers, primarily at the substation, and no impacts to health and safety will be created.

The Project would generate EMF at the substation and the underground collection system. All Project facilities would be set back from residences as required by state and county regulation. At these distances EMF levels would not be above background levels. The only exposure would be to maintenance workers, primarily at the substation.

Shadow Flicker

Shadow flicker impacts are not regulated in applicable state or federal law, and there is no permitting trigger or established threshold of significance with regard to hours per year of anticipated shadow flicker impacts to a receptor from a wind energy project.

The British Epilepsy Foundation states that there is no evidence that wind turbines can cause seizures (Epilepsy Action 2008). However, they recommend that wind turbine flicker frequency be limited to 3 Hz. Since the Project's wind turbine blade pass frequency is approximately 0.9 Hz (less than 1 alternation per second), no negative health effects to individuals with photosensitive epilepsy are anticipated.

A shadow flicker study was conducted for the two wind turbine models being considered for the Project using WindPro (Appendix A). The analysis included both the primary and alternative turbine locations for both preliminary turbine layouts. The maximum predicted shadow flicker duration at any occupied residence receptor is 36 hours 24 minutes per year (Receptor 1, Figure 10), which is approximately 0.8 percent of the potential available daylight hours. This is a participating landowner and the structure is not occupied full time.

Morton County has a required turbine setback of 1,320 feet from occupied residences, and Stark County requires a setback of 2,000 feet from occupied residences. The observance of these setback requirements will minimize potential impacts from shadow flicker.

The analysis of potential shadow flicker impacts from the Project on nearby receptors shows that shadow flicker impacts within the area of study are expected to be minor and well within acceptable ranges for avoiding nuisance and/or health hazards. Effective mitigative measures for shadow flicker include vegetation planting and curtains; if any landowners in or near the Project area have an issue with shadow flicker, Sunflower will work with them to the extent practical.

Hazardous Materials / Hazardous Waste

All hazardous materials will be handled in accordance with state and federal regulation. The potential for spills of hazardous materials will be mitigated by the implementation of a Spill Prevention, Control and Countermeasures (SPCC) Plan during construction of the Project. An SPCC Plan would not be necessary during the operational phase of the Project, because the only significant quantities of hazardous materials would be contained within the substation transformers, switches and circuit breakers. These are considered qualified oil-filled operational equipment, and require the establishment of an inspection and monitoring program, as well as a spill contingency plan and the commitment of resources to expeditiously control and remove any discharged oil. These measures will reduce the level of risk for human health impacts to a level of non-significance.

Reconductoring activities would not result in an increased hazard due to hazardous materials. The only hazardous materials that would be involved would be fuels and hydraulic oils for construction equipment. These would be managed according to the Project SPCC and in accordance with applicable state and federal regulations.

Vandalism, Sabotage and Terrorism

Security measures will be taken during construction and operation, including temporary and permanent fencing at the substation, and warning signs and locks on equipment and wind power facilities. Access will be strictly controlled to all facilities, including turbines and the substation. Turbines will sit on solid-steel-enclosed tubular towers in which all electrical equipment will be located except for the pad-mounted transformer. Access to the turbines will only be through a solid steel door that will be locked when not in use. The substation will be controlled by key entry.

These measures will act to reduce the potential for vandalism, sabotage and terrorism-related impacts. Sunflower believes that the Project presents an unlikely target for an act of terrorism, with an extremely low probability of attack.

5.8.3 Mitigative Measures

All facilities will be constructed in accordance with the National Electrical Safety Code, U.S. Department of Labor Occupational Safety and Health Standards, and other applicable State safety standards.

Telecommunication Interference

Since no significant findings are anticipated, no mitigative measures are proposed at this time.

Electromagnetic Fields

Since no significant findings are anticipated, no mitigative measures are proposed at this time.

Shadow Flicker

Since no significant findings are anticipated, no mitigative measures are proposed at this time.

Hazardous Materials / Hazardous Waste

Since no significant findings are anticipated, no mitigative measures are proposed at this time. All petroleum fluids will be contained within the wind turbines and electrical equipment. Any petroleum wastes generated will be handled and disposed of in accordance with local, state and federal regulations.

Vandalism Sabotage and Terrorism

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

- The towers will be placed at least 200 feet from road right-of-way and a minimum of 1,320 feet from non-participating occupied homes. These distances are considered to be safe based on developer experience, and are consistent with the required local setbacks.
- Security measures will be taken during the construction and operation of the Project, including temporary and permanent safety fencing, warning signs, and locks on equipment and wind power facilities.
- Turbines will sit on solid steel-enclosed tubular towers in which all electrical equipment will be located, except for the pad-mounted transformer. Access to the tower is only through a solid steel door that will be locked when not in use.
- Where necessary or requested by landowners, Sunflower will construct gates or fences to control access to private property, such as those around the collection substation.
- Sunflower will provide educational materials to landowners within the site boundaries and upon, request, to interested persons about the Project.

5.9 Air Resources

5.9.1 Existing Conditions

USEPA and the North Dakota Department of Health (NDDoH) regulate air quality in North Dakota through implementation of the Federal Clean Air Act (CAA) (42 U.S.C. §§ 7401-7671q). The CAA requires the adoption of National Ambient Air Quality Standards (NAAQS) to protect the public health and welfare from the effects of air pollution. The CAA defines NAAQS as levels

of pollutant above which detrimental effects on human health and welfare could occur. A state or region is given the status of "attainment" if the NAAQS thresholds have not been exceeded for any criteria pollutant, or "nonattainment" for a specific pollutant if the NAAQS thresholds have been exceeded for that pollutant. Standards are provided for sulfur dioxide (SO_2), carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3) particulate matter less than 10 microns (PM10), particulate matter less than 2.5 microns (PM2.5), and lead (Pb), which are known as the criteria pollutants.

The entire state of North Dakota is in attainment of all state and federal air quality standards, and no exceedences have been reported for at least the past ten years[1]. Relatively high concentrations of total suspended particulates (dust) may occur in springtime from farming operations and strong winds; however these have not and are not likely to exceed NAAQS.

5.9.2 Potential Impacts

Direct impacts to air quality would include temporary increases in vehicle emissions and dust during construction. All such impacts would be limited to the period of construction, and are not expected to cause an exceedence of any NAAQS or federal guidance related to greenhouse gas (GHG) emissions.

GHG emissions from construction equipment and construction vehicle use are expected to be well below the 25,000 metric tons CO_2e per year threshold of potential significance. GHG emissions from decommissioning would be similar. The Project itself will not generate GHG emissions, so GHG emissions during the operational phase would be limited to emissions from occasional maintenance operations. These are expected to be negligible. The Project would therefore not have a meaningful impact in terms of a contribution to climate change.

GHG emissions from a wind farm can be estimated using several techniques. The first technique requires a detailed analysis of the types and usage of construction equipment, the number of trips made to deliver materials and equipment to the site, the number of construction worker trips, the amount of concrete made, the construction processes used for wind farm construction, and other factors. The West Butte Wind Power Project[2] provides an example of such an analysis. West Butte Wind proposed a 104 MW project with up to 52 turbines; their analysis arrived at a total of 4,066.7 metric tons CO_2e over the entire lifespan of the facility. Of that, 1,321.7 metric tons CO_2e emissions (32 percent) would occur during construction (see West Butte Wind Final EIS section 3.11.2; BLM 2009). Most of those emissions would occur during construction and decommissioning of the project, and the total amount of GHG emissions is highly dependent on the number of turbines constructed. Assuming that this analysis can be

[1] Annual reports of the North Dakota Department of Health Air Quality Monitoring program were reviewed for the years 2000 to 2011; these and additional annual reports are available online at: http://www.ndhealth.gov/AQ/AmbientMonitoring.htm

[2] http://www.blm.gov/or/districts/prineville/plans/wbw_power_row/

scaled up in direct proportion to the total number of turbines, this would indicate that the Sunflower project, with up to 59 turbines, would result in approximately 4,500.0 metric tons CO_2e over its entire lifespan. Less than half of that would occur during the year of construction and again in the year of decommissioning, and a small portion would occur during the projected 30 years of project operation. Even allowing for a generous margin of error, the estimated emissions attributable to the Project would be far below the 25,000 metric tons per year CO_2e threshold of potential significance established in the 2010 CEQ guidance on climate change.

A second method to determine GHG emissions from a wind farm is to utilize readily-available life cycle analysis (LCA) figures. A number of independent studies have been published, and several manufacturers including Vestas have completed their own LCAs for specific turbine models. An LCA is a cradle-to-grave assessment of the inputs and outputs of resources attributable to wind turbine manufacturing, transport of components and construction equipment, construction of the wind energy facility, operation of the facility, and decommissioning of the facility. Some LCAs factor in the use of recycled metals in manufacturing, recycling of components and materials at the end of the lifespan, and include reasonable expectations for replacement of major components such as blades, gearboxes or generators. Fripp (2009) compared life cycle and life stage GHG emissions from coal, natural gas and wind power generators. This study provided a summary of 32 primary wind turbine LCAs, and used the ten most recent cases to arrive at a "conservative" average GHG emission rate of 10.7 grams CO_2e per kilowatt-hour (kWh) of energy produced (g CO_2e/kWh) by wind turbines over the entire lifespan of the wind energy facility. Of that, 10 g CO_2e/kWh (92 percent) is due to construction and decommissioning, and 0.63 g CO_2e/kWh (8 percent) comes during operation of the facilities. Approximately 46 percent of the total lifespan emissions would occur during construction only. Fripp notes that the total emissions rate has decreased as wind turbine technology has improved, allowing fewer turbines – and fewer construction emissions - to produce larger amounts of power. The emissions rate is also influenced by the load factor, or the ratio of the operating hours at nominal power divided by the total hours in a year; greater operating time at nominal wind speeds reduced the lifespan GHG emissions rate.

Based on the "conservative" GHG emissions rates used by Fripp, and using a conservative 30% load factor and an expected 30 year lifespan, the Project would result in a total of approximately 8,700.0 metric tons CO_2e produced over the lifespan of the 110 MW facility. Again, less than half of that would occur during the year of construction and again in the year of decommissioning, and a small portion would occur during operation of the Project. Using this method both the projected total lifespan emissions and the resulting annual emissions of the Project would be well below the 25,000 metric tons per year CO_2e threshold of potential significance established in the 2010 CEQ guidance.

The only emissions related to operation of the Project would be extremely minor exhaust emissions from maintenance vehicles. These emissions would not cause any detectable impacts to regional air quality.

The only indirect impact of the Project would be positive, since the Project has the potential to lower the need for additional thermal power plants, and thus to improve overall air quality in the region.

5.9.3 Mitigative Measures

Sunflower will implement measures applicable to reducing air quality impacts, as identified in the Draft UGP Wind Energy PEIS (Western and USFWS 2013), including the following:

- General mitigation measures applicable to multiple phases of project development include the following:
  - Use surface access roads, on-site roads, and parking lots with aggregates or that maintain compacted soil conditions to reduce dust generation.
  - Post and enforce lower speed limits on dirt and gravel access roads to minimize airborne fugitive dust.
  - Minimize potential environmental impacts from the use of dust palliatives by taking the necessary measures to keep the chemicals out of sensitive terrestrial habitats and streams. The application of dust palliatives must comply with Federal, State, and local laws and regulations.
  - Ensure that all pieces of heavy equipment meet emission standards specified in the State Code of Regulations, and conduct routine preventive maintenance, including tune-ups to manufacturer specification to ensure efficient combustion and minimum emissions. If possible, equipment with more stringent emission controls should be leased or purchased.
  - Employ fuel diesel engines in facility construction and maintenance that use ultra-low sulfur diesel, with a maximum 15 ppm sulfur content.
  - Limit idling of diesel equipment to no more than 10 minutes unless necessary for proper operation.

Mitigation measures applicable during construction activities include the following:

- Stage construction activities to limit the area of disturbed soils exposed at any particular time.
- Water unpaved roads, disturbed areas (e.g., scraping, excavation, backfilling, grading, and compacting), and loose materials generated during project activities as necessary to minimize fugitive dust generation.
- Install wind fences around disturbed areas if windborne dust is likely to impact sensitive areas beyond the site boundaries (e.g., nearby residences).
- Spray stockpiles of soils with water, cover with tarpaulins, and/or treat with appropriate dust suppressants, especially when high wind or storm conditions are likely. Vegetative plantings may also be used to limit dust generation for stockpiles that will be inactive for relatively long periods.
- Train workers to comply with speed limits, use good engineering practices, minimize the drop height of excavated materials, and minimize disturbed areas.

- Cover vehicles transporting loose materials when traveling on public roads, and keep loads sufficiently wet and below the freeboard of the truck in order to minimize wind dispersal.
- Inspect and clean tires of construction-related vehicles, as necessary, so they are free of dirt prior to entering paved public roadways.
- Clean (e.g., through street vacuum sweeping) visible trackout or runoff dirt from the construction site off public roadways.

No additional mitigation measures are considered necessary during normal operations of the Project, but some dust control measures discussed above may be applicable to minimize fugitive dust emissions from bare surfaces and unpaved access roads.

Decommissioning activities generally mirror construction activities; thus, the same mitigation measures should be applied during decommissioning as would be applied during construction.

5.10 Noise

5.10.1 Existing Conditions

Noise is generally defined as unwanted or excessive sound. Noise from wind energy facilities includes primarily mechanical and aerodynamic noise from the wind turbines, and noise emanating from substation equipment. Mechanical noise is primarily generated by the gearbox, generator, cooling fans and other moving parts within the wind turbine. Mechanical noise tends to be tonal but also has a broadband component. Aerodynamic noise originates primarily from the flow of air over and past the blades, so it generally relates to the ratio of blade tip speed to wind speed. Aerodynamic noise is characterized by a broadband “swish” sound, and is the dominant noise component for modern wind turbines. Some noise would also be generated from substation and interconnection equipment. The primary noise from substations is a tonal noise emanating from the transformers; this occurs at harmonic frequencies of the transmission frequency (e.g., 120, 240 and 360 Hz tones on a 60-Hz transmission system).

Stark and Morton counties would generally be characterized as a rural agricultural land use area, and existing ambient sound levels are expected to be relatively low, although sound levels may be sporadically elevated in localized areas due to roadway noise or periods of human activity. Background sound levels will vary both spatially and temporally depending on proximity to area sound sources, roadways and natural sounds. Principal contributors to the existing acoustic environment likely include motor vehicle traffic, farming equipment, farming activities such as plowing and irrigation, all-terrain vehicles, local roadways, rail movements, periodic aircraft flyovers, and natural sounds such as birds, insects, and leaf or vegetation rustle during elevated wind conditions in areas with established trees or crops. Diurnal effects result in sound levels that are typically quieter during the night than during the daytime, except during periods when evening and nighttime insect noise dominates in warmer seasons.

In areas with elevated background sound levels, sound may be obscured through a mechanism referred to as acoustic masking. Seasonal effects such as cricket chirping, certain farming activities, as well as wind-generated ambient noise as airflow interacts with foliage and cropland, contribute to this masking effect. The latter is most prevalent in rural and suburban areas with established tree stands. Wintertime defoliate conditions typically have lower background sound levels due to lower wind masking effects and reduced outdoor activities in colder climates. During colder seasons, people typically exhibit lower sensitivities to outdoor sound levels, particularly in this geographical region of the United States, as windows and doors are typically closed, and limited time is spent outdoors as compared to more temperate climates.

Some land uses are considered more sensitive to intrusive noise than others due to the type of activities typically involved at the receptor location. Sensitive noise receptors normally include residences, schools, libraries, religious institutions, hospitals and nursing homes, daycare centers, and some types of businesses; North Dakota also specifies community buildings as noise sensitive receptors. Noise sensitive receptors in the Project Area are identified on Figure 10A for the Vestas turbine layout and on Figure 10B for the GE turbine layout.

At the state level, NDAC requires that the potential for adverse impacts at noise sensitive receptors be assessed during the site selection process. NDAC 69-06-08-01 Section 4 establishes avoidance areas for wind energy facilities, stating:

> A wind energy conversion facility site must not include a geographic area where, due to operation of the facility, the sound levels within one hundred feet of an inhabited residence or a community building will exceed fifty dBA [A-weighted decibels]. The sound level avoidance area criteria may be waived in writing by the owner of the occupied structure or the community building.

The North Dakota standard is the strictest noise limitation applicable to Project operation.

Morton County does not currently have noise standards or ordinances that are applicable to the Project. The SCZO, section 6.7 mandates that, “Sustained noise over eighty (80) decibels (dB) during the day and seventy (70) decibels (dB) at night is prohibited.” It does not specify where these noise limits apply (e.g., at noise-sensitive receptors).

The recommended USEPA (1978) noise guideline is an Ldn of 55 dBA (Ldn(24-hours), applicable to outdoor locations at noise sensitive receptors where extended periods of time are spent, (e.g., yards). This noise level corresponds to a maximum instantaneous equivalent sound level (Leq) of 48.6 dBA. The USEPA guideline is essentially echoed by the North Dakota standard.

The National Safety Council (NSC) recommends no more than 85 dBA for 8 hours of exposure as the safe limit for farm operations. Industrial standards of the Occupational Safety and Health Administration (OSHA) regulations would apply to those involved in the construction, operation, and maintenance of the facilities. OSHA permissible noise exposures are shown in Table 23.

Table 23. OSHA Permissible Noise Standards

Duration (number of hours per day)	Sound Level (dBA)
8.0	90
6.0	92
4.0	95
3.0	97
2.0	100
1.5	102
1.0	105
0.75	110
0.5	115

Potential noise receptors in the vicinity of the Project Area are limited to scattered rural residences; there are no schools, libraries, places of worship, community buildings, places of business or other types of noise sensitive receptors within or within one mile of the Project Area (Figure 10A and Figure 10B). Twelve residences have been identified within or within one mile of the Project Area. Of those 12, 7 are occupied, 1 in not occupied, and 3 are undetermined. Figure 10A and Figure 10B show the locations of all known occupied residences and residences of unknown occupancy for the Vestas turbine layout and the GE turbine layout, respectively; the one unoccupied residence is not shown on the maps, and is not considered a potential noise-sensitive receptor.

5.10.2 Potential Impacts

Project construction may cause short-term but unavoidable noise impacts due types of construction and equipment. Construction activity would also generate traffic that would have potential noise effects, such as trucks travelling to and from the site on public roads. Sound generated by construction activities is generally exempt from state and local noise regulation. Once the Project has been built, no significant noise impacts are anticipated from regular maintenance.

A screening level acoustic assessment was conducted to determine the feasibility of the Project to operate within applicable noise criteria (Appendix A). The assessment is representative of worse-case scenario because the Project layout includes more than the target number of turbine locations needed to meet the Project's nameplate capacity to account for alternate locations. Noise was modeled at a distance of 100 feet from each residential structure in consideration of the North Dakota noise standard. The acoustic modeling results were compared to the State's numerical limits of 50 dBA. Table 24 summarizes the number of noise sensitive receptors within selected sound pressure level ranges (in dBA) under each of the modeled operational conditions.

Table 24. Number of Noise Sensitive Receptors by Sound Level Range and Exceedance Condition for each Wind Turbine Layout

Sound Level Range (dBA)	GE 1.85-87		Vestas V110-2.0	
	Typical Downwind	Anomalous Meteorological	Typical Downwind	Anomalous Meteorological
Less than 35	6	3	4	2
35 – 40	2	4	2	5
40 - 45	4	5	5	5
45-50	4	4	3	4
50-55+	0	0	0	0
>50 (North Dakota Limit)	0	0	0	0

The results of the acoustic assessment demonstrate that the Project would comply with regulatory limits and/or guidelines at all noise sensitive receptors.

Potential Noise Impacts to Wildlife

Although it is likely that construction of the Project will result in short-term disturbance of wildlife, it will be difficult to assess whether the disturbance comes from the noise of construction activities or the activities themselves (e.g., construction vehicles moving along roads). All such activities will be short-term and limited to the period of construction. Available research regarding the noise impacts of wind farm operations suggests that animals in the area would either habituate to consistent low-frequency noise from the turbines or would alter their behaviors to adapt to the new acoustic environment (e.g., Rabin et al. 2003, Brumm and Slabbekoorn 2005, Wood and Yezerinac 2006)

Reconductoring activities would not create additional noise impacts. Noise disturbance would be limited to the use of equipment to remove the existing conductors and install new wires. This would be short-term and temporary. Once the new conductors are in place, the Ward-Mandan line is likely to operate with a lower noise level than currently exists as the new conductors would likely exhibit less corona activity than the older wires that are likely to be dirtier and more pitted.

5.10.3Mitigative Measures

Sunflower will work to site turbines in the final design stage such that potential noise exceedances would be avoided if possible, and would work with landowners and/or residents to obtain waivers where avoidance is not practical.

Sunflower will implement BMPs and mitigation measures applicable to noise, as identified in the Draft UGP Wind Energy PEIS (Western and USFWS 2013), as follows:

BMPs and mitigation measures applicable throughout multiple phases of a wind energy development project include the following:

- Take advantage of topography and the distance to nearby sensitive receptors when positioning potential sources of noise.
- Establish sufficient setback distances from sensitive receptors wherever feasible. Based on previous experience, noise complaints seldom exist for people living more than 1–1.5 mi (1.6–2.4 km) from a wind farm.
- Select equipment with the lowest noise levels available and no prominent discrete tones, when possible.
- Maintain all equipment in good working order in accordance with manufacturer specifications. Suitable mufflers and/or air-inlet silencers should be installed on all internal combustion engines and certain compressor components.
- All vehicles traveling within and around the project area should operate in accordance with posted speed limits.
- Establish a process for documenting, investigating, evaluating, and resolving project-related noise complaints.

BMPs and mitigation measures applicable during construction of a wind energy project include the following:

- Limit noisy construction activities to the least noise-sensitive times of day (daytime only, between 7 a.m. and 7 p.m.) and weekdays.
- Schedule noisy activities to occur at the same time whenever feasible, since additional sources of noise generally do not greatly increase noise levels at the site boundary. Less-frequent but noisy activities would generally be less annoying than lower-level noises occurring more frequently.
- Locate stationary construction equipment (e.g., compressors or generators) as far as practical from nearby sensitive receptors.
- In the unlikely event that blasting or pile driving would be needed during the construction period, notify nearby residents in advance.

BMPs and Mitigation measures applicable during operation of a wind energy project include:

- If a transformer becomes a noise issue, a new transformer with reduced flux density generating noise levels as much as 10–20 dB lower than National Electrical Manufacturers Association (NEMA) standard values could be installed. Alternatively, barrier walls, partial enclosures, or full enclosures could be adopted to shield or contain the transformer noise, depending on the degree of noise control needed.

The same BMPs and mitigation measures applicable to construction activities are applicable to decommissioning activities.

5.11 Cultural, Historical, and Architectural Resources

Cultural resources include archeological sites, historic standing structures, objects, districts, traditional cultural properties and other properties that illustrate important aspects of prehistory or history or have important and long-standing cultural associations with established

communities or social groups. Significant archeological and architectural properties are usually defined by eligibility criteria for listing in the National Register of Historic Places (NRHP), and in consultation with the State Historic Preservation Office (SHPO).

5.11.1 Existing Conditions

A search of the State Historical Society of North Dakota's web site and manuscript files was conducted for the Area of Potential Effect (APE), defined as the area in and within 1 mile of the Project Area. The file search revealed one site, no site leads, and no isolated finds within a one mile radius of the APE; and four manuscripts on file within sections of the APE (Appendix A, Cultural Report, Tables 2 and 3). A portion of previously recorded site 32MO1379 was located within the APE.

A Class III pedestrian survey was conducted in September 2013 by Beaver Creek Archaeology, Inc. During the field inventory, BCA archaeologists identified four previously unrecorded cultural resources and one previously recorded site. Resources included one Native American cultural material scatter (32MO1379), two Native American Isolated Finds (32MOx553 and 32MOx554), and two Historic/Architectural Sites (32MO1415 and 32MO1416). The Native American cultural material scatter site has been recommended unevaluated to the NRHP by BCA, and is recommended to be avoided during construction. The two Isolated Finds and Historic/Architectural sites were recommended as not eligible to the NRHP and will not need to be avoided. Further evaluation of the Native American cultural material scatter site in consultation with SHPO may find that this site is not eligible for NRHP listing and does not need to be avoided; however, avoidance will be assumed until such time as SHPO makes such a determination.

BCA also conducted an architectural inventory of structures and buildings around the Project Area to determine the potential for visual impacts to potentially NRHP-eligible architectural sites caused by the Project. During the visual impact inventory, seven architectural locations, with 16 structures, were examined. None of the structures in the APE were recorded as potentially eligible for NRHP listing. The BCA report notes that the survey did not cover all potential impacts of the Project, since the location of some facilities was not known at the time of the surveys. Sunflower will conduct additional surveys prior to construction to characterize any potential new impact areas.

The online NRHP database was searched for registered properties in the APE. No NRHP registered archaeological or historic facility resources are located within in the APE.

The absence of listed archaeological and/or historic facility resources does not mean the Project Area is clear of significant resources. It is possible there are both recorded and unrecorded resources in the Project Area that may be significant, but which have been neither evaluated nor had their status determined. Additionally, previously unknown cultural or archaeological resources may be identified during Project construction.

5.11.2 Potential Impacts

A significant impact to cultural resources would occur if a site or archaeological, tribal, or historical value that is listed, or is eligible for listing, in the NRHP could not be avoided or mitigated during siting or construction.

Possible concerns that should be considered for this project include:

- Unrecorded cultural resources located within the study area
- Any ground disturbing activity within the study area that has potential to impact known or unknown cultural resources
- Visual impacts to recorded or unrecorded cultural resource properties

No significant impacts to cultural resources are anticipated from the Project. As the layout of the Project is finalized, the location of Project facilities will be adjusted as needed to avoid impacts to cultural resource.

If historic or prehistoric materials are discovered during monitoring of earth-disturbance construction activities, construction would be halted and Western would be notified in order to initiate procedures outlined in 36 CFR Part 800. These procedures would include evaluating the find for eligibility and determining appropriate treatment with the SHPO and the North Dakota Intertribal Reinterment Committee (NDIRC).

An impact to significant architectural resources would occur if a site that is listed, or is eligible for listing, in the NRHP would be affected by the Project. Effects can be either direct, which involves physical harm to a listed or eligible resource, or indirect, which involves a change in the setting, feeling or associations related to a listed or eligible resource. Since no NRHP listed or eligible architectural resources are known to exist in the Project Area, impacts are not expected. The one Native American scatter site documented by BCA will be avoided.

Reconductoring activities would not impact cultural, historical or archaeological resources. That work would utilize existing access roads and other disturbed areas, and would not require the disturbance of additional lands. Reconductoring would not substantially alter the appearance of the existing transmission line, so would not impact the viewshed of listed properties or sites.

5.11.3 Mitigative Measures

Sunflower will implement avoidance and mitigation measures and BMPs applicable to historic and cultural resources identified in the Draft UGP Wind Energy PEIS (Western and USFWS 2013), as follows:

To mitigate or minimize potential paleontological resource impacts, the following mitigation measures could be adopted:

- Whether paleontological resources exist in a project area should be determined on the basis of the sedimentary context and soil surveys of the area, a records search of

Federal, State, and local inventories for past paleontological finds in the area, review of past paleontological surveys, and/or a paleontological survey.

- Placement of wind energy structures in fossil-rich areas, such as outcrops, should be avoided.
- A paleontological resources management plan should be developed for areas where there is a high potential for paleontological material to be present. Management options may include avoidance, removal of the fossils, or monitoring. If the fossils are to be removed, a mitigation plan should be drafted identifying the strategy for collection of the fossils in the project area. Often it is unrealistic to remove all of the fossils, in which case a sampling strategy can be developed. If an area exhibits a high potential, but no fossils were observed during surveying, monitoring could be required. A qualified paleontologist should monitor all excavation and earthmoving in the sensitive area. Whether the strategy chosen is excavation or monitoring, a report detailing the results of the efforts should be produced.
- If an area has a strong potential for containing fossil remains and those remains are exposed on the surface for potential collection, steps should be taken to educate workers and the public on the consequences of unauthorized collection.

The following mitigation measures could be implemented to address potential impacts on cultural resources:

- The appropriate Federal agency should consult with federally recognized Native American governments early in the planning process for a wind energy development to identify issues and areas of concern. Consultation is required under the NHPA. Consultation is necessary to establish whether the project is likely to disturb traditional cultural properties, affect access rights to particular locations, disrupt traditional cultural practices, and/or visually impact areas important to the tribe(s).
- The presence of archaeological sites and historic properties in the APE should be determined on the basis of a records search of recorded sites and properties in the area and/or an archaeological survey. The SHPO is the primary repository for cultural resource information. The NRHP could also be consulted at http://www.nps.gov/nr/research/index.htm.
- Archaeological sites and historic properties present in locations that would be affected by project activities should be reviewed to determine whether they meet the criteria of eligibility for listing on the NRHP. Cultural resources listed on or eligible for listing on the NRHP are considered “significant” resources.
- If a development is within the viewshed of a national historic trail eligible for listing on the NRHP, the developer should evaluate the potential visual impacts on the trail associated with the proposed project. If impacts were to occur, mitigation measures such as vegetation or landscape screening could be employed.
- If cultural resources are known to be present at the site, or if areas with a high potential to contain cultural material have been identified, consultation with the SHPO should be undertaken by the appropriate Federal agency (e.g., Western, the Service, USFS, or

BLM). In instances where Federal oversight is not appropriate, developers can interact directly with the SHPO. Avoidance of these resources is always the preferred mitigation option. Other mitigation options include archaeological survey, excavation, data recovery, and monitoring (as warranted). If an area exhibits a high potential but no artifacts are observed during an archaeological survey, monitoring by a qualified archaeologist could be required during all excavation and earthmoving in the high-potential area. A report should be prepared documenting these activities. Other steps include the identification and implementation of measures to prevent potential looting/vandalism or erosion impacts, as well as educating workers and the public to make them aware of the consequences of unauthorized collection of artifacts.

- Periodic monitoring of significant cultural resources in the vicinity of development projects may help curtail potential looting/vandalism and erosion impacts. If impacts are recognized early, additional actions can be taken before the resource is destroyed. Monitoring activities do not require Federal involvement.
- Cultural resources discovered during construction should immediately be brought to the attention of the responsible Federal agency. Work should be immediately halted in the vicinity of the find to avoid further disturbance to the resources while they are being evaluated and appropriate mitigation plans are being developed.
- If human remains are found on a development site, work should cease immediately in the vicinity of the find. The appropriate law enforcement officials and the appropriate Federal agency should be contacted. No material should be removed from the find location. Once it is determined that the remains belong to an archaeological site, the appropriate SHPO should be contacted to determine how the remains should be addressed.

5.12 Recreational Resources

5.12.1 Existing Conditions

There are no designated recreation areas, public or private parks and no designated trails in or near the Project Area. The nearest known public recreational resource is the Bureau of Land Management (BLM) Schnell Recreation Area, located approximately 9 miles northwest of the Project Area.

A major recreational activity in North Dakota is hunting. The NDFGD runs the PLOTS program, under which private lands enrolled in the program may be opened to the public for hunting. No PLOTS are located within the Project Area. Several PLOTS parcels are located near the southwestern corner of the Project Area; these PLOTS lands would not be impacted by the Project.

5.12.2 Mitigative Measures

Because there are no designated recreation resources in and near the Project Area, the Project will have no impact to recreation. No mitigative measures are proposed.

5.13 Socioeconomics

5.13.1 Existing Conditions

The Project is located in Stark and Morton counties, North Dakota, a primarily rural agricultural area located south of U.S. Highway 94 and approximately 55 miles west of Bismarck, ND and 30 miles east of Dickinson, ND.

There are several small cities and near the Project Area. The city of Hebron (2010 population 747) is located a few miles north of the Project Area; Richardton (2010 population 529) is located approximately 10 miles to the northwest of the Project; and Taylor (population 148, is located approximately 15 miles to the northwest. The city of Glen Ullin (2010 population 807) is located approximately 9 miles to the southeast. The largest city in the area is Dickinson (2010 population 17,787), located approximately 30 miles to the west of the Project (U.S. Census Bureau 2010). There is no indication of any new residential construction within the Project Area.

Stark County

In the 2010 US Census the population of Stark County was reported at 24,199, an increase of 6.90 percent from the 2000 Census count of 22,636. In the 2010 US Census the population of Morton County was reported at 27,471, an increase of 8.57 percent from the 2000 Census count of 25,303. The population of North Dakota according to the 2000 Census was 642,200, and grew by 4.73 percent to 672,591 in 2010 (U.S. Census Bureau 2010).

Stark County contains 1,338 square miles of land, with a density of just over 18 persons per square mile; the population density of the census block group in which the Project Area is located (Stark County Tract 9633, Block Group 2) is approximately 1.6 persons per square mile. Approximately 94 percent of the population is composed of white persons who are not of Hispanic or Latino origin. The median age of Stark County residents is 38.3 years. Approximately 16 percent of the county population is 65 years or older and 6 percent of the population is under five years of age (US Census Bureau 2010). The 2010 census reported a total of 10,638 housing units in Stark County, of which approximately 7.9 percent were vacant.

According to the 2010 Census, almost a quarter (22.1%) of the workforce in Stark County worked in education, health, and social services. Retail trade accounted for over 13 percent of the jobs in the county. Per capita income in 1999 was $27,347; median household income was $55,196. Approximately 7.4 percent of the population lived below the poverty level, compared to 14.3 percent nationwide.

Agriculture plays a significant role in the County's land use and economy. In 2007, there were 865 farms in Stark County, comprising approximately 98 percent (837,143 acres) of the land area. According to the 2007 Census of Agriculture (USDA 2007), total market value of agricultural products produced in Stark County was $96,812,000, 65 percent of which was from crops and 34 percent from livestock sales. The primary livestock is cattle and the principal crops include wheat and forage. Sunflowers, corn, and barley are also grown.

Tax revenues in Stark County fund a number of vital community services, including fire protection and law enforcement, emergency management, health and welfare services, and public schools. Tax revenues also fund agricultural extension services, weed management programs, and a roads maintenance department, along with other typical county government services.

Morton County

Morton County contains 1,936 square miles of land, with a density of just over 14 persons per square mile; the population density of the census block group in which the Project Area is located (Morton County Tract 205, Block Group 2) is approximately 2.6 persons per square mile. Approximately 95 percent of the population is composed of white persons who are not of Hispanic or Latino origin. The median age of Stark County residents is 39.3 years. Approximately 15 percent of the county population is 65 years or older and 7 percent of the population is under five years of age (US Census Bureau 2010). The 2010 census reported a total of 11,972 housing units in Morton County, of which approximately 8.8 percent were vacant.

According to the 2010 Census, a fifth (20.6%) of the workforce in Morton County worked in education, health, and social services, and another 12.7 percent in agriculture, forestry, fishing and hunting, and mining. Retail trade accounts for 10.2 percent of the jobs in the county. Per capita income in 1999 was $26,678; median household income was $54,269. Approximately 9.3 percent of the population lived below the poverty level, compared to 14.3 percent nationwide.

According to the 2010 Census, almost a quarter (22.1%) of the workforce in Stark County worked in education, health, and social services. Retail trade accounts for over 13 percent of the jobs in the county. Per capita income in 1999 was $27,347; median household income was $55,196. Approximately 7.4 percent of the population lived below the poverty level, compared to 14.3 percent nationwide.

Agriculture plays a significant role in the counties' land use and economy. In 2007, there were 836 farms in Morton County, comprising approximately 94 percent (1,165,098 acres) of the land area. According to the 2007 Census of Agriculture (USDA 2007), total market value of agricultural products produced in Morton County was $117,251,000, 52 percent of which was from crops and 48 percent from livestock sales.

Tax revenues in Morton County fund a number of vital community services, including fire protection and law enforcement, emergency management, health and welfare services, and public schools. Tax revenues also fund agricultural extension services, weed management programs, and a roads maintenance department, along with other typical county government services.

5.13.2 Potential Impacts

Economic Impacts

The Project would have positive economic impacts for the local population, including lease and royalty payments for participating landowners, employment, and property and sales tax revenue. Landowner compensation will be established by individual lease agreements, but are anticipated to total over $800,000 annually. Annual property tax payments to local entities are estimated at $500,000. In general, agricultural areas surrounding each turbine can still be farmed. In addition, in an environment of uncertain and often declining agricultural prices and yields, the supplemental income provided to farmers from wind energy leases will provide stability to farm incomes and thus will help assure the continued viability of farming in the Project Area.

The Project would create 8 to 12 full-time permanent jobs and up to 300 peak construction jobs. To the extent that local contractors are used for portions of the construction, total wages and salaries paid to contractors and workers in Morton and Stark counties will contribute to the total personal income of the region. Additional personal income will be generated for residents in the county as well as the state by circulation and recirculation of dollars paid out by Sunflower Wind as business expenditures and state and local taxes. Expenditures made for equipment, energy, fuel, operating supplies and other products and services will benefit businesses in the county.

These anticipated impacts are consistent with the limited amount of published information on other projects. A 2009 case study evaluated the socioeconomic impacts of a wind energy facility constructed in 2007 and 2008 in Cavalier County, northeastern North Dakota (Leistritz and Coon 2009). The study authors felt that the Project Area was typical of Great Plains communities where many similar wind energy projects are being constructed. This study found that the 159-MW project resulted in a peak workforce of 269 workers during construction, 10 permanent jobs, and $1.4 million in ongoing annual expenditures to local businesses and households. This includes payments to landowners totaling $413,000 the first year, annual local property taxes to the County and school district, and direct payments for wages and materials in Cavalier County and adjacent counties. On a per-megawatt basis, the project's economic impacts were $8,900 in local expenditures per year; $2,600 per year in landowner payments; and $2,900 per year in property taxes.

Direct spending by Sunflower will have a multiplier effect as directly spent funds get distributed and re-distributed throughout the economy. The Leistritz and Coon study indicated that for every dollar of direct expenditures, nearly 3 dollars of indirect spending would occur.

At other wind farms, the public has expressed concerns over potential devaluation of property in and adjacent to proposed wind projects. A study published in October 2002, "Economic Impacts of Wind Power in Kittitas County, Final Report," conducted by Dr. Stephen Grover of ECONorthwest of Portland, OR, summarized survey results as follows:

> Views of wind turbines will not negatively impact property values. Based on a nationwide survey conducted of tax assessors in other areas with wind power projects, we found no evidence supporting the claim that views of wind farms decrease property values (Grover 2002, p.2).

More recently, the Lawrence Berkeley National Laboratory conducted two multi-year studies on the impact of wind power projects on residential property values in the U.S. (Hoen et al 2009, 2013). Both studies included literature review, data collection for residential sales transactions at multiple study areas, visit to each home to measure turbine visibility and quality of scenic vista, use of multiple statistical models. The studies concluded that:

- There was no statistical evidence that homes sold after announcement or construction of wind facilities have reduced property values;
- There was no statistical difference in sales price between homes with a view of wind turbines and homes without such views; and
- There was no statistical difference in sales price between homes within one mile of wind turbines and homes outside of 5 miles or that had been sold prior to facility announcement.

Other Potential Impacts

It is likely that sufficient skilled labor is available in Morton and Stark counties to serve the basic infrastructure and site development needs of the Project. Specialized labor from outside the local area will be required for certain components of wind farm construction.

No effects on permanent housing are anticipated. During construction, out-of-town laborers will likely use lodging facilities in Bismarck or Dickinson. Operation and maintenance of the facility will employ from 8-12 maintenance staff; these are expected to largely be existing residents of the area

Local businesses such as motels, restaurants, bars, gas stations, and grocery stores would likely experience some increase in revenue resulting from new employment of the non-resident portion of Project construction crews. In particular, the consumption of goods, services, and temporary lodging in and near Bismarck, Hebron, Glen Ullin, Dickinson, Richardton, and surrounding cities could be expected to minimally increase due to the presence of these non-native workers. Other local area businesses that may benefit through increased sales would likely include ready-mix concrete and gravel suppliers, hardware and general merchandise stores, welding and machine shops, packaging and postal services, and heavy equipment repair and maintenance services.

This relatively small increase in demand for local goods and services would be minimal due to the small size of the non-local workforce and the short-term nature of the construction phase of the Project. For the same reasons, the effects to infrastructure such as schools, hospitals, housing, and utilities would also be minimal.

5.13.3 Mitigative Measures

Socioeconomic impacts associated with the Project will be primarily positive, with an influx of wages and expenditures made at local businesses during the Project construction and an increase in the county's tax base due to construction and operation of the wind turbines and associated infrastructure. In addition, the lease payments paid to landowners will offset potential financial losses associated with removing land from agricultural production.

6.0 POTENTIAL PERMITS AND APPROVALS

The federal and state permits or approvals that have been identified as potentially required for the construction and operation of the Project are shown in Table 25. Permits dependent on the final site layout will be applied for after receiving PSC approval and prior to construction.

Table 25. Potential Permits and Approvals Required for Construction and Operation of the Proposed Facility

Regulatory Authority	Statute	Permit/Approval	Description	Trigger	Application Time	Website
Federal						
NEPA	40 C.F.R. § 1508	Categorical Exclusion (CE) determination, or preparation of an Environmental Assessment (EA) and Finding of No Significant Impact (FONSI); or preparation and drafting of an Environmental Impact Statement (EIS) and Record of Decision (ROD).	Federal agencies evaluate the potential environmental impacts of their actions and to identify and evaluate reasonable alternatives to proposed actions and those alternatives' environmental impacts.	The project involves federal funding, federal permit or approval, use of federal land, or a federal program.	CA – 6-8 weeks, depending on other approvals EA – 4 months, including 30 comment period and final edits approval EIS – Up to 2 Years including 21-day advanced public hearing notice, edits and approvals, and a 30-day comment period	http://www.nepa.gov/
FERC	18 CFR 366.7	Exempt Wholesale Generator Status	Request for a determination that the utility is a wholesale generator of electric power and thus exempt from most FERC regulations that pertain to a public utility	Request by entity generating electric power for wholesale customers		

Regulatory Authority	Statute	Permit/Approval	Description	Trigger	Application Time	Website
FERC	18 CFR Part 35	Market Based Rate Authorization	An entity seeking to make market-based rate sales of energy, capacity and ancillary services in the wholesale markets must first seek authorization from FERC	Request by entity generating wholesale electricity		
FAA	14 CFR Part 77	Notice of Proposed Construction or Alteration (Form 7460-1)	Notifies FAA of proposed structures that might affect navigable airspace. FAA reviews possible impacts to air safety and navigation, as well as the potential for adverse effects on radar systems.	• Construction or alteration of structures standing higher than 200 feet above ground level • Construction or alteration of structures near airports; 14 CFR 77.13 provides details • Siting within radar line-of-sight of an air defense facility	45 days	
FAA	14 CFR Part 77	Supplemental Notice (Form 7460-2)	Supplemental Notice provided to FAA in advance of beginning construction	Planned start of construction on project for which a Notice of Proposed Construction was required	5 days	
U.S. Army Corps of Engineers	Clean Water Act (33 USC 1251 et seq) Section 404 (33 USC 1344)	CWA Section 404 Permit; individual, general or nationwide permit	Regulates discharge of dredged or fill materials into waters of the United States	Activities that may impact federal waters, including wetlands	45 days	

Regulatory Authority	Statute	Permit/Approval	Description	Trigger	Application Time	Website
USFWS Region 6	ESA Section 7 16 USC 1536(a)(2)	Consultation pursuant to ESA Section 7.	Federal activities and non-Federal activities that receive Federal funding or require a Federal permit typically obtain incidental take authority through the consultation process under Section 7 of the ESA.	Federal action and the presence of listed species in or near the project area.	Prior to ground disturbing activities. Depending on project size and potential impacts to listed species – 1 to 6 months.	http://www.fws.gov/endangered/hcp/hcpbook.htm http://www.fws.gov/mountain-prairie/endspp/
U.S. Environmental Protection Agency	Clean Water Act Section 311, 40 CFR 112	Spill Prevention Control and Countermeasures (SPCC) Plan.	Would be required if any facility associated with the project (O&M or substation) has a tank holding more than 1,320 gallons.	Oil storage of more than 1,320 gallons of oil.	A copy of the plan will need to be maintained on file with the owner/operator and reviewed by the certifying engineer every five years.	
North Dakota Public Service Commission	Pursuant to North Dakota Century Code 49-22	Certificate of Site Compatibility.	For facilities with greater than 0.5 MW nameplate capacity.	Generation of power described in previous column.	180 days prior to construction (minimum).	http://www.psc.state.nd.us/ jurisdiction/electricity-laws.html
North Dakota Department of Health	Clean Water Act 33 USC 1342 NDAC 33-16-01	NPDES General Permit (Construction).	For stormwater discharges from construction activities.	Grading of more than 1 acre.	Permit to be filed prior to construction with a Stormwater Pollution Prevention Plan (SWPPP).	http://www.ndhealth.gov/WQ/Storm/Construction/C onstructionHome.htm
	NDAC 33-16-01	Septic Tank and Drainfield Permit.	Required for installation of septic system at O&M facility.	Installation of a septic system.	Prior to construction.	

Regulatory Authority	Statute	Permit/Approval	Description	Trigger	Application Time	Website
North Dakota Highway Patrol		Overheight/ Overweight Permit.	Required to transport oversize loads on state maintained roads.	Project construction requires oversize/ overweight truck loads.	Prior to construction.	http://www.nd.gov/ndhp/permits/permits.html
State Historic Preservation Office (SHPO) and the Office of the State Archaeologist (OSA)	North Dakota Century Code 55-10; 49-22 And NHPA Section 106, 16 USC 470	Review and Coordination.	Section 106 Compliance is required if there is a federal permit or approval.	Interconnection request to Western.	Prior to construction.	
North Dakota Department of Game and Fish		Wildlife conservation recommendations.	Consultation will be required as part of by North Dakota PSC review of the Certificate of Site Compatibility.	Certificate of Site Compatibility Review by ND PSC.		
North Dakota State Water Commission	NDAC 889-03-01-10	Temporary Water Permit.	Required for temporary use of surface or groundwater.	Construction water used onsite.	Prior to construction; permit is valid for up to one year	http://www.swc.state.nd.us/4dlink9/4dcgi/GetSubCategoryRecord/Permits/Water%20Permits
Stark and Morton Counties	County Regulations (Morton and Stark)	Conditional Use Permit.	All proposed wind energy facilities in an agricultural zone must apply for a conditional use permit with County Planning Commission.	Wind energy facility in agricultural zone.	Prior to construction. Process takes about 3 months.	

Regulatory Authority	Statute	Permit/Approval	Description	Trigger	Application Time	Website
Stark and Morton Counties	County Regulations-Morton Only	Wind Energy Facilities Permit.	Construction requirements (materials used, proximity to buildings, etc).	Wind development.	Prior to construction.	http://www.co.morton.nd.us/vertical/Sites/%7B90CBB59C-38EA-4D41-861A-81C9DEBD6022%7D/uploads/%7B5A74CC6D-8D37-4C41-B676-1AE4A6040CDB%7D.PDF
	County Regulations (Morton and Stark)	Road Crossing/ Encroachment Permit.	Required for installation of service connections or extensions of existing underground utilities including crossing of county highways or for placing temporary obstructions on the right-of-way.	Working in or utility crossing of county road right-of-way.	Prior to construction.	
	County Regulations (Morton and Stark)	Building Permit.	Required if O&M building is constructed.	O&M Building.	Prior to construction.	

7.0 FACTORS CONSIDERED BY PSC

The North Dakota Energy Conversion and Transmission Facility Siting Act lists 11 factors to guide the Commission in the evaluation and designation of the site of the facility (49-22-09).

7.1 Public Health and Welfare, Natural Resources, and the Environment

The preceding sections discuss the research and investigations relating to the effects of the proposed facility on public health and welfare, natural resources, and the environment. These effects and the proposed mitigative to minimize these effects are summarized in Section 5.0.

7.2 Technologies to Minimize Adverse Environmental Effects

Sunflower will utilize the most current technologies that minimize impacts to the environment. As discussed in Section 4, these will include use of the most current and efficient wind turbine models to minimize noise impacts, and the use of horizontal directional drilling to avoid impacts to wetlands and streams.

7.3 Potential for Beneficial Uses of Waste Energy

This factor is not applicable to this Project since wind energy does not produce waste energy

7.4 Unavoidable Adverse Environmental Effects

Unavoidable adverse environmental effects are described for each resource area in Section 5. Unavoidable permanent ground disturbance will including the permanent loss of approximately 55 acres of habitat through the construction of access roads, turbine foundations, and the Project substation, interconnection yard and O&M facility. Unavoidable permanent effects will also include noise effects from the turbines. Unavoidable temporary effects will include ground disturbance, noise and air emissions related to construction. Temporary ground disturbing impacts will total approximately 190 acres.

7.5 Alternatives to the Proposed Site

During its siting process Sunflower investigated a variety of sites in the central North Dakota area, and alternative designs for the Project within the Project Area. The proposed Project site was selected based on the following initial factors which will both meet the requirements for a viable wind project and minimize environmental impacts:

- The Project Area has a reliable wind regime, capable of producing the required amount of electric power. Within the Project Area, the turbine corridors have been placed to maximize the available wind, and during final micro-siting turbine locations will be further adjusted.

- The Project Area has sufficient number of landowners who are willing to participate in the Project through lease agreements.
- Environmental conditions in the Project Area will allow the Project to meet applicable environmental standards at an economically-supportable cost.
- Western's Dickinson-Mandan transmission line crosses the Project Area, eliminating the need for a Project transmission line.
- Sunflower has secured a power purchase agreement with a utility which can be served through Western's transmission system.

Sunflower then used the data from site-specific resource investigations to avoid sensitive resource as represented by the exclusion areas, avoidance areas, selection criteria and policy criteria discussed in Section 3.

Sunflower believes that the proposed Project layout represents the alternative which is both the most economically viable and has the least environmental impacts.

7.6 Irreversible and Irretrievable Commitment of Natural Resources

Irreversible and irretrievable resource commitments are related to the use of nonrenewable resources and the effects that the use of these resources have on future generations. Irreversible effects primarily result from use or destruction of a specific resource that cannot be replaced within a reasonable timeframe. Irretrievable resource commitments involve the loss in value of an affected resource that cannot be restored as a result of the action. There are few commitments of resources associated with this Project that are irreversible and irretrievable, but these include those resources primarily related to construction. Construction of the Project will necessitate a one-time expenditure of funds, which is not retrievable.

Labor and natural resources will be used in the fabrication and preparation of construction materials. These materials are usually not retrievable. Construction resources that will be used include aggregate, concrete, steel, and hydrocarbon fuel. Access roads will require aggregate for their construction and maintenance. During construction, vehicles will travel to and from the site utilizing hydrocarbon fuels. These resources are not in short supply, and their use will not have an adverse effect on the availability of these resources. In addition, the anticipated economic benefits of the Project will balance the irretrievable commitment of resources resulting from the construction of the Project.

7.7 Direct and Indirect Economic Impacts

Direct and indirect economic impacts are primarily positive, as discussed in Section 5.14. Sunflower's annual payments to local landowners are anticipated to be in the range of $800,000. This will be new revenue which will help to diversify and strengthen the local farming economy. Sunflower's annual property tax payments to Morton and Stark Counties are anticipated to total around $500,000, this new revenue will support important local government functions. The majority of both revenue sources will be spent in the local and state economies,

thus supporting local employment. The Project will support 8 -12 permanent jobs for maintenance and operation of the facility.

A one-time economic benefit will be realized during construction of the Project, which will support a maximum of approximately 300 direct construction jobs. Continuing to establish the central region of North Dakota as an important producer of alternative energy sources may spur the development of wind-related businesses in the area, in turn contributing to economic growth in the region.

7.8 Existing Development Plans of the State, Local, Government and Private Entities at or in the Vicinity of the Site

No conflicts are anticipated with existing state and local government and private entities' development plans.

7.9 Effect of Site on Cultural Resources

A Class III pedestrian survey was conducted in September 2013 by BCA. BCA archaeologists identified four previously unrecorded cultural resources and one previously recorded site. Sunflower is committed to minimize impacts to cultural resources and will avoid known resources and any additional resources identified throughout the life of the Project. If avoidance is not possible, Sunflower will work with the North Dakota SHPO to mitigate potential impacts.

7.10 Effect of Site on Biological Resources

Sunflower will implement measures to avoid and minimize effects to biological resources at the proposed site. The impact of the Project on wildlife is expected to be minimal. There is potential for avian and bat collisions with facility turbines or meteorological towers. The site will be designed to minimize those impacts. Detailed discussion of potential impacts and proposed mitigative measures on biological resources is provided in Section 5.4 (Vegetation) and Section 5.5 (Wildlife).

7.11 Cumulative Effects

A list of reasonably foreseeable actions in the region of the Project was developed based on a search of projects listed on the PSC online case information, and other publicly available information (Table 26). Reasonably foreseeable actions include three proposed wind energy developments. In this area of North Dakota there are no transmission lines or other energy projects currently proposed, and there is little residential, commercial, or industrial development existing or expected in the area.

Table 26. Reasonably Foreseeable Future Actions in the Vicinity of the Project

Project Name	Operator	Proposed Generation Capacity	County	STATE	Approximate Distance from Sunflower Project Area
Clean Energy 1	ALLETE Clean Energy	100 MW	Mercer	ND	6 miles
Bison IV	Minnesota Power	210 MW	Oliver and Mercer	ND	14 Miles
Oliver III	Next Era Energy Resources, LLC	48MW	Morton	ND	37 Miles
Thunder Spirit Wind Project	Wind Works Power Corp	150 MW	Adams	ND	49 miles
Wilton IV	Next Era Energy Resources, LLC	96 MW	Burleigh	ND	60 miles
New Frontier Wind Energy Project	Meadowlark Wind I LLC	102 MW	McHenry	ND	83 miles

7.11.1 Potential Cumulative Effects

For cumulative impacts to occur, impacts from the Project would need to overlap in time and space with impacts from one or more of the reasonably foreseeable future actions that were identified. No cumulative impact would occur for resources where the Project would not have an impact, this would include the following resource areas:

- Environmental Justice
- Recreation

There would also be no cumulative impact where the Project would have an impact to a resource but this impact would not occur in the same time and space as the impact of a reasonably foreseeable action. This would include the following:

- Geology and Soils
- Air Quality
- Climate Change
- Water Resources
- Surface Waters and Wetlands
- Vegetation
- Land Use
- Noise
- Transportation
- Health and Safety
- Cultural, Historical and Archaeological Resources

Wind energy development is anticipated to have a positive cumulative impact on several resources, including air quality and socioeconomics.

The principal resource of concern for cumulative impacts is anticipated to be wildlife (particularly whooping cranes, avian and bat species). Each of these is discussed below.

Bats, Raptors and Other Avian Species

As discussed in Section 5.5 construction and operation of the Project will result in direct and indirect impacts to bats, raptors and other birds. Direct impacts include collision mortality and indirect impacts are associated with habitat fragmentation and displacement. For the Project Area, bird and bat fatalities that occur are unlikely to have population-level impacts. Species that were documented in the Project Area are common and widely distributed. Raptor mean use in the Project Area is predominately low, therefore impacts to raptors would be low. Raptors species documented area also common and wide spread.

Based on documents of wind generation facilities listed Table 26, birds, bats and raptors in those project area were common and widely distributed. Construction and operation related effects to birds, bats and raptors caused by one project are not expected to amplify the effects caused by other projects, or to result in significant cumulative effects. The different construction timing of the projects listed in Table 26 will also lessen cumulative effects to birds bats and raptors

Wildlife and Wetlands

With regard to the cumulative impacts to wildlife, there is a concern that even if no wetlands and other sensitive habitat are directly affected by wind energy projects, the wetlands surrounding the projects will no longer be used by whooping cranes and other bird species. Sunflower believes that the Project can be designed to avoid all direct impacts to wetlands, and that an individual permit will not be needed. In addition, Sunflower will implement buffers around identified wetlands within which no turbines would be placed, in accordance with USFWS Guidelines and as may be required by the UGP Wind Energy PEIS.

Reconductoring would utilize existing access roads and would not require additional wetland impacts. Consequently, Sunflower expects to have no impacts to whooping cranes or other wetland-dependent bird species, and would thus not contribute to cumulative impacts.

Further, with the adoption of the UGP Wind Energy PEIS, it is expected that similar measures for wildlife protection would be implemented for most or all future wind energy development in the Upper Great Plains region, including requirements for buffers and/or curtailment during migration season and provision of mitigation if necessary to offset unavoidable or incidental impacts. Consequently, it is anticipated that the total cumulative impacts to whooping cranes avian and bat species as well as other wildlife from the Project and other reasonably foreseeable actions will be minimal.

7.12 Agency Comments

Section 69-06-01-05 of the PSC's administrative rules lists agencies to contact about the Project. Agencies listed below were sent a letter on February 10, 2014 requesting comment on the Project (Appendix B). Comments from agencies that respond to Sunflower's request will be considered and incorporated into the design of the Project.

- Central Stark & Western Soil Conservation District
- Federal Aviation Administration
- Morton County Highway Department
- Morton County Planning Commission
- Morton County Soil Conservation District
- Natural Resources Conservation Service
- North Dakota Aeronautics Commission
- North Dakota Attorney General
- North Dakota Department of Agriculture
- North Dakota Department of Career and Technical Education
- North Dakota Department of Commerce
- North Dakota Department of Health
- North Dakota Department of Human Services
- North Dakota Department of Labor
- North Dakota Department of Transportation
- North Dakota Department of Transportation
- North Dakota Energy Infrastructure and Impact Office
- North Dakota Game and Fish Department
- North Dakota Geologic Survey
- North Dakota Indian Affairs Commission
- North Dakota Industrial Commission, Renewable Energy Program
- North Dakota Office of Management & Budget
- North Dakota Parks and Recreation Department
- North Dakota Soil Conservation Committee
- North Dakota State Historic Preservation Office
- North Dakota State Land Department
- North Dakota State Water Commission
- Office of the Governor
- Stark County Planning Commission
- Stark County Road Department
- State Historic Society of North Dakota
- U.S. Army Corps of Engineers, Omaha District
- U.S. Environmental Protection Agency, Region 8
- U.S. Fish & Wildlife Service

- USDA Farm Service Agency, North Dakota
- USDA North Dakota State Office
- Chase Airstrip
- Glen Ullin Regional Airport

8.0 QUALIFICATIONS OF CONTRIBUTORS

Name Project Role	Education and Professional Experience
Tracey Dubuque Principal in Charge, Senior Peer Review	Ms Dubuque is a senior project manager and professional civil engineer. She serves as the Director of Onshore Wind Energy Development for Tetra Tech. Ms. Dubuque has experience preparing environmental documentation for energy facilities throughout the United States, including applications under North Dakota energy siting regulations. Ms. Dubuque has a BS in Civil Engineering.
Dale Bennett Project Manager, Lead Author	Mr. Bennett is a senior project manager with over 20 years of experience managing large and small planning, land use and regulatory projects. For the last four years his practice has focused on renewable energy development including wind and transmission projects. Mr. Bennett has a BA in biology and a JD.
Thomas Kruger Land Use Planner, Contributing Author	Mr. Kruger is a land use planner and regulatory specialist with over 12 years of experience. He regularly performs detailed regulatory research, authors environmental and permitting documents, and performs peer review of complex data sets. Mr. Kruger has a BA in Biology and a Master's degree in Urban and Regional Planning.
Jennifer D'Avanzo Senior Biologist, Contributing Author	Ms D'Avanzo is a biologist with over 11 years of experience, including coordination of field surveys, environmental monitoring and authoring reports and sections of environmental documents. She has worked a senior biologist on large-scale power transmission and pipeline projects throughout the western United States. Ms D'Avanzo has a BS in Forest Biology and a Master's Degree in Landscape Architecture.
Laura Nagy Biology Peer Review	Ms. Nagy is Tetra Tech's Natural Resources Discipline Lead, and is that role is responsible for training and quality control standards, and works to ensure that appropriate resources company-wide are available to meet our clients' needs. Ms. Nagy has a BA in Biology, Master's Degree in Zoology and PhD in Evolution and Ecology

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Figures

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Sunflower Wind Project
Application for North Dakota Certificate of Site Compatibility

Figure 1
Project Location

Morton and Stark Counties, ND
February 2014

- Project Area
- County Boundary
- Existing Transmission Line (Over 230 kV)
- Railroad
- Interstate Highway
- Federal Highway
- State Highway
- Stream or River
- City/Town

Canada

MN, ND, MT, SD, WY, NE

1:480,000 WGS84 UTM Zone 13N

0 10 20 Miles

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Sunflower Wind Project
Application for North Dakota Certificate of Site Compatibility

Figure 2
Project Area
Aerial Image

Morton and Stark Counties, ND
February 2014

Stark County

Morton County

Big Muddy Creek

Heart Butte Creek

Beaver Creek

- Project Area
- Existing Transmission Line
- County Boundary
- Interstate Highway
- Stream or River

Canada

MN
ND
MT
SD
WY
NE

1:35,000 WGS84 UTM Zone 13N

0 2 4 Miles

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Sunflower Wind Project
Application for North Dakota Certificate of Site Compatibility

Figure 3
Project Area
Topographic Image

Morton and Stark Counties, ND
February 2014

- Project Area
- Existing Transmission Line
- County Boundary
- Interstate Highway
- Stream or River

Canada

MN
ND
MT
SD
WY
NE

Stark County

Morton County

Big Muddy Creek

Heart Butte Creek

Beaver Creek

Heart Butte Creek

1:35,000 WGS84 UTM Zone 13N

0 2 4 Miles

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Sunflower Wind Project

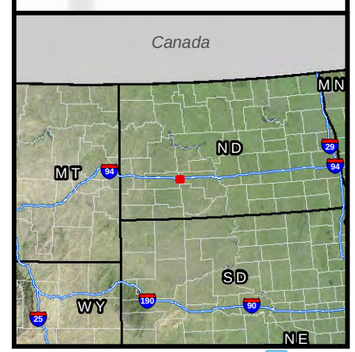
Application for North Dakota Certificate of Site Compatibility

Figure 4A
Project Layout A
Vestas 2.0 V-110

Morton and Stark Counties, ND
February 2014

- Project Area
- Turbine Location*
- Alternate Turbine Location*
- Approximate Underground Collection System Routing
- Approximate Access Road Routing
- Proposed Interconnection
- Proposed Substation
- County Boundary
- Interstate Highway
- Minor Road
- Stream or River

*The Project would utilize up to 55 Vestas V-110 turbines; however, 64 potential Vestas turbine locations are included on this figure to account for alternate locations that may be used.



1:35,000 WGS84 UTM Zone 13N

0 2 4 Miles

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Sunflower Wind Project

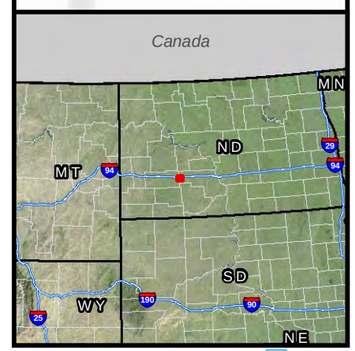
Application for North Dakota Certificate of Site Compatibility

Figure 4B
Project Layout B
GE 1.85-87

Morton and Stark Counties, ND
February 2014

- Project Area
- Turbine Location*
- Alternate Turbine Location*
- Approximate Underground Collection System Routing
- Approximate Access Road Routing
- Proposed Interconnection
- Proposed Substation
- County Boundary
- Interstate Highway
- Minor Road
- Stream or River

*The Project would utilize up to 59 GE 1.85-87 turbines; however, 76 potential GE turbine locations are included on this figure to account for alternate locations that may be used.



1:35,000 WGS84 UTM Zone 13N

0 2 4 Miles

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Sunflower Wind Project
Application for North Dakota Certificate of Site Compatibility

Figure 5A
Exclusion and Avoidance Areas
Vestas 2.0 V-110

Morton and Stark Counties, ND
February 2014

Stark County

Morton County

- Project Area
- Turbine Location*
- Alternate Turbine Location*
- Approximate Underground Collection System Routing
- Approximate Access Road Routing
- Proposed Interconnection
- Proposed Substation

Exclusion Areas

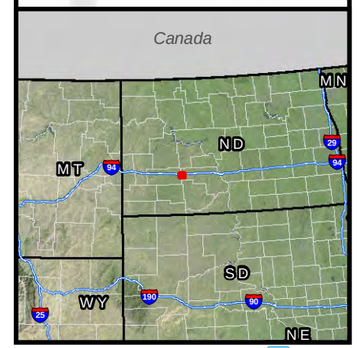
- Consolidated State and County Setbacks
- Prime Farmland

Avoidance Areas

- NWI wetland
- 100 Year Flood Zones
- Interstate Highway
- County Road
- County Boundary

Setbacks based on:
Tower Height = 80m
Rotor Diameter = 110m
Max Turbine Height = 135m

*The Project would utilize up to 55 Vestas V-110 turbines; however, 64 potential Vestas turbine locations are included on this figure to account for alternate locations that may be used.



1:35,000 WGS84 UTM Zone 13N

0 2 4 Miles

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Sunflower Wind Project

Application for North Dakota Certificate of Site Compatibility

Figure 5B
Exclusion and Avoidance Areas
GE 1.85-87

Morton and Stark Counties, ND
February 2014

Stark County

Morton County

- Project Area
- Turbine Location*
- Alternate Turbine Location*
- Approximate Underground Collection System Routing
- Approximate Access Road Routing
- Proposed Interconnection
- Proposed Substation

Exclusion Areas

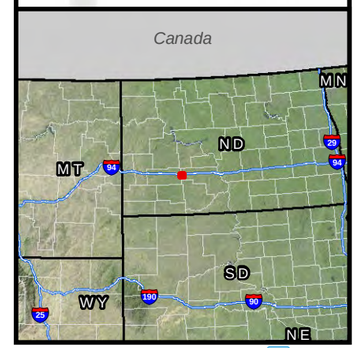
- Consolidated State and County Setbacks
- Prime Farmland

Avoidance Areas

- NWI wetland
- 100 Year Flood Zones
- Interstate Highway
- County Road
- County Boundary

Setbacks based on:
Tower Height = 80m
Rotor Diameter = 87m
Max Turbine Height = 127m

*The Project would utilize up to 59 GE 1.85-87 turbines; however, 76 potential GE turbine locations are included on this figure to account for alternate locations that may be used.



1:35,000 WGS84 UTM Zone 13N

0 2 4 Miles

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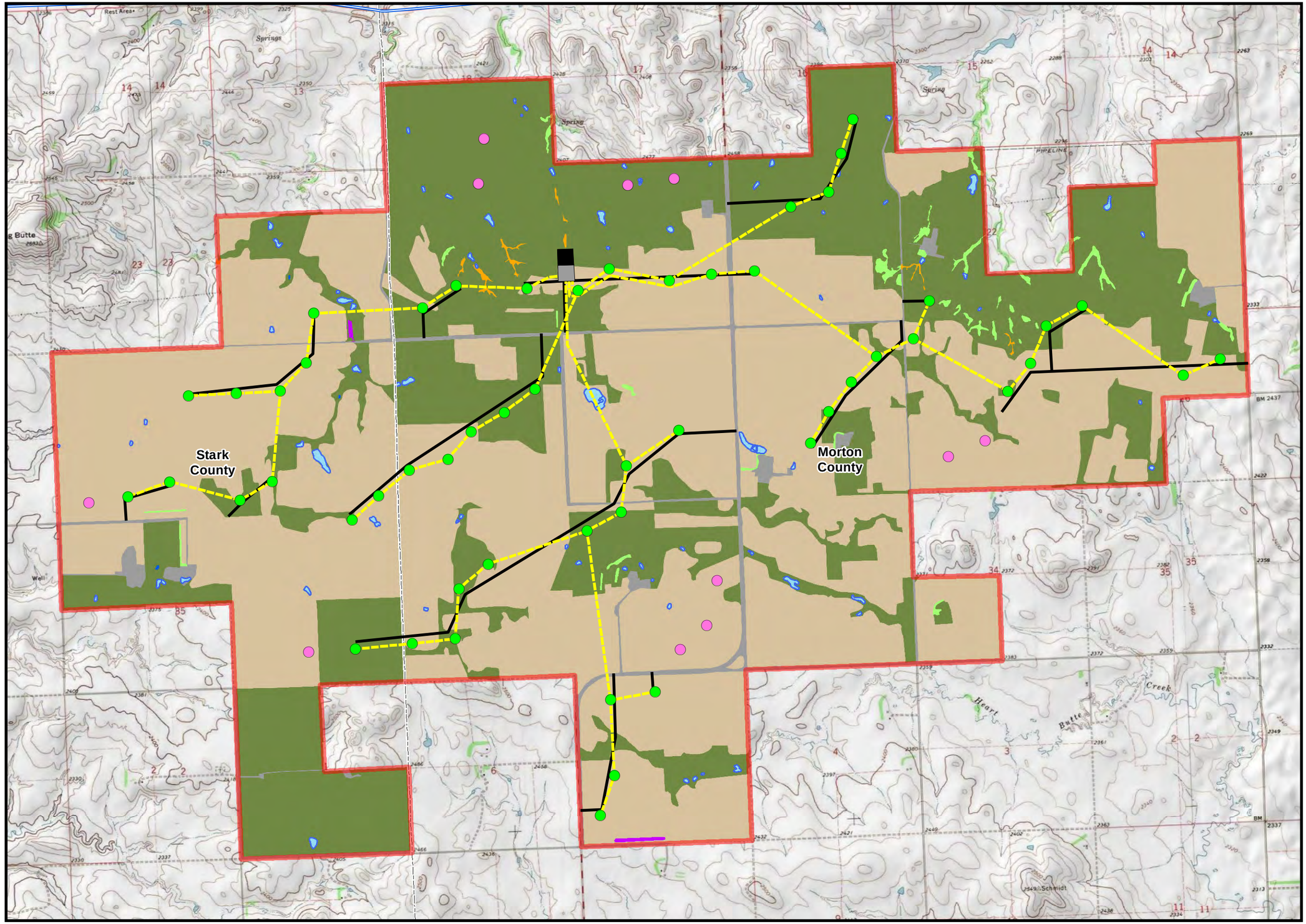
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Sunflower Wind Project
Application for North Dakota Certificate of Site Compatibility

Figure 6A
Land Cover
Layout A Vestas 2.0 V-110

Morton and Stark Counties, ND
February 2014

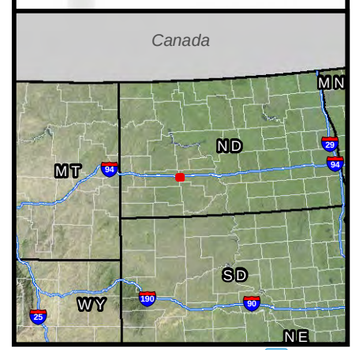


- Project Area
- Turbine Location*
- Alternate Turbine Location*
- Approximate Underground Collection System Routing
- Approximate Access Road Routing
- Proposed Interconnection
- Proposed Substation
- County Boundary
- Interstate Highway

WEST Land Cover

- NWI wetland
- Crop
- Deciduous Trees
- Developed
- Grass
- Shrubs
- Trees
- Water

*The Project would utilize up to 55 Vestas V-110 turbines; however, 64 potential Vestas turbine locations are included on this figure to account for alternate locations that may be used.



1:35,000 WGS84 UTM Zone 13N

0 2 4 Miles

TETRA TECH

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Sunflower Wind Project
Application for North Dakota Certificate of Site Compatibility

Figure 6B
Land Cover
Layout B GE 1.85-87

Morton and Stark Counties, ND
February 2014

Project Area
Turbine Location*
Alternate Turbine Location*
Approximate Underground Collection System Routing
Approximate Access Road Routing
Proposed Interconnection
Proposed Substation
County Boundary
Interstate Highway

WEST Land Cover

NWI wetland
Crop
Deciduous Trees
Developed
Grass
Shrubs
Trees
Water

*The Project would utilize up to 59 GE 1.85-87 turbines; however, 76 potential GE turbine locations are included on this figure to account for alternate locations that may be used.

Stark County

Morton County

Canada

MN
ND
MT
SD
WY
NE

1:35,000 WGS84 UTM Zone 13N

0 2 4 Miles

TETRA TECH

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Sunflower Wind Project

Application for North Dakota Certificate of Site Compatibility

Figure 7A
Farmland Soils
Vestas 2.0 V-110

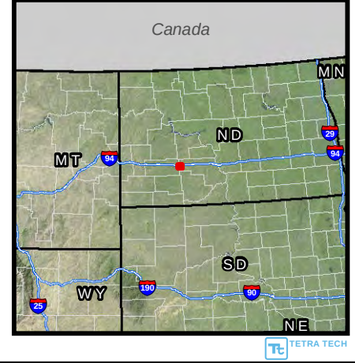
Morton and Stark Counties, ND
January 2014

Stark County

Morton County

- Project Area
- Turbine Location*
- Alternate Turbine Location*
- Approximate Underground Collection System Routing
- Approximate Access Road Routing
- Proposed Interconnection
- Proposed Substation
- Prime Farmland
- Farmland of Statewide Importance
- County Boundary

*The Project would utilize up to 55 Vestas V-110 turbines; however, 64 potential Vestas turbine locations are included on this figure to account for alternate locations that may be used.



1:35,000 WGS84 UTM Zone 13N

0 2 4 Miles

TETRA TECH

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Sunflower Wind Project

Application for North Dakota Certificate of Site Compatibility

Figure 7B
Farmland Soils
GE 1.85-87

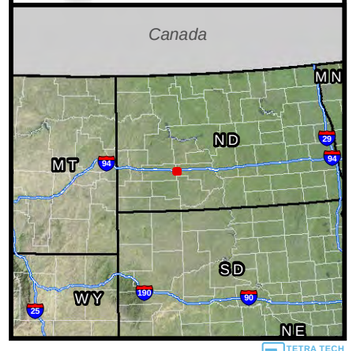
Morton and Stark Counties, ND
February 2014

Stark County

Morton County

- Project Area
- Turbine Location*
- Alternate Turbine Location*
- Approximate Underground Collection System Routing
- Approximate Access Road Routing
- Proposed Interconnection
- Proposed Substation
- Prime Farmland
- Farmland of Statewide Importance
- County Boundary

*The Project would utilize up to 59 GE 1.85-87 turbines; however, 76 potential GE turbine locations are included on this figure to account for alternate locations that may be used.



1:35,000 WGS84 UTM Zone 13N

0 2 4 Miles

TETRA TECH

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Sunflower Wind Project
Application for North Dakota Certificate of Site Compatibility

Figure 8A
Soils Distribution
Vestas 2.0 V-110

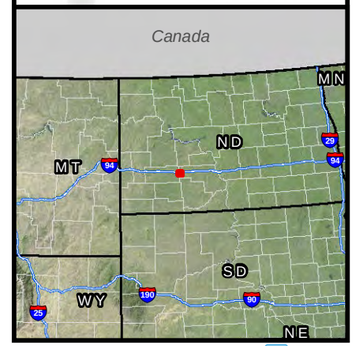
Morton and Stark Counties, ND
February 2014

Stark County

Morton County

- Project Area
- Turbine Location*
- Alternate Turbine Location*
- Approximate Underground Collection System Routing
- Approximate Access Road Routing
- Proposed Interconnection
- Proposed Substation
- SSURGO Soil Unit
- County Boundary

*The Project would utilize up to 55 Vestas V-110 turbines; however, 64 potential Vestas turbine locations are included on this figure to account for alternate locations that may be used.



N

1:35,000 WGS84 UTM Zone 13N

0 2 4 Miles

TETRA TECH

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Sunflower Wind Project
Application for North Dakota Certificate of Site Compatibility

Figure 8B
Soils Distribution
GE 1.85-87

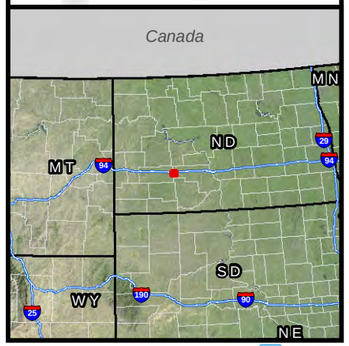
Morton and Stark Counties, ND
February 2014

Stark County

Morton County

- Project Area
- Turbine Location*
- Alternate Turbine Location*
- Approximate Underground Collection System Routing
- Approximate Access Road Routing
- Proposed Interconnection
- Proposed Substation
- SSURGO Soil Unit
- County Boundary

*The Project would utilize up to 59 GE 1.85-87 turbines; however, 76 potential GE turbine locations are included on this figure to account for alternate locations that may be used.



1:35,000 WGS84 UTM Zone 13N

0 2 4 Miles

TETRA TECH

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Sunflower Wind Project

Application for North Dakota Certificate of Site Compatibility

Figure 9A
Wetlands and Surface Waters
Vestas 2.0 V-110

Morton and Stark Counties, ND
February 2014

Stark County

Morton County

Big Muddy Creek

Heart Butte Creek

Beaver Creek

Heart Butte Creek

- Project Area
- Turbine Location*
- Alternate Turbine Location*
- Approximate Underground Collection System Routing
- Approximate Access Road Routing
- Proposed Interconnection
- Proposed Substation
- County Boundary
- Interstate Highway

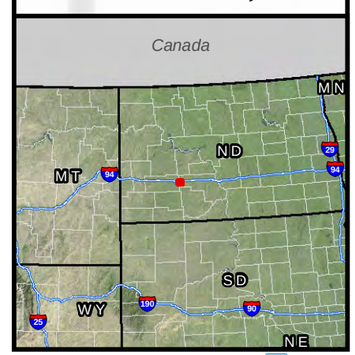
NHD Stream Type

- Perennial Stream
- Intermittent Stream

NWI Wetland Type

- Freshwater Emergent Wetland
- Freshwater Forested/ Shrub Wetland
- Freshwater Pond
- Other Freshwater Wetland

*The Project would utilize up to 55 Vestas V-110 turbines; however, 64 potential Vestas turbine locations are included on this figure to account for alternate locations that may be used.



1:35,000 WGS84 UTM Zone 13N

0 2 4 Miles

TETRA TECH

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Sunflower Wind Project
Application for North Dakota Certificate of Site Compatibility

Figure 9B
Wetlands and
Surface Waters
GE 1.85-87

Morton and Stark Counties, ND
February 2014

- Project Area
- Turbine Location*
- Alternate Turbine Location*
- Approximate Underground Collection System Routing
- Approximate Access Road Routing
- Proposed Interconnection
- Proposed Substation
- County Boundary
- Interstate Highway

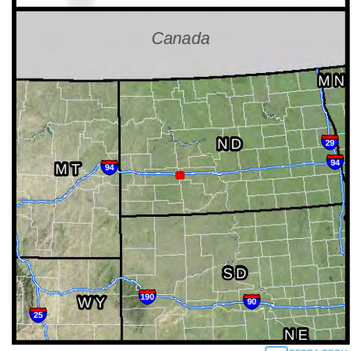
NHD Stream Type

- Perennial Stream
- Intermittent Stream

NWI Wetland Type

- Freshwater Emergent Wetland
- Freshwater Forested/ Shrub Wetland
- Freshwater Pond
- Other Freshwater Wetland

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1:35,000 WGS84 UTM Zone 13N

0 2 4 Miles

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Sunflower Wind Project

Application for North Dakota Certificate of Site Compatibility

Figure 10A
Turbine Sound Levels Greater than 50dbA
Vestas 2.0 V-110

Morton and Stark Counties, ND
February 2014

Stark County

Morton County

Big Muddy Creek

Heart Butte Creek

Beaver Creek

Project Area

Turbine Location*

Alternate Turbine Location*

Approximate Maximum 50dbA or Greater Noise Extent

Occupied Residence

Structure (Occupation Unknown)

Unoccupied Structure

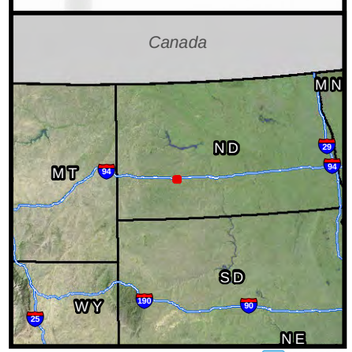
County Boundary

Interstate Highway

Stream or River

Tt_ID	Type	Tt_ID	Type
1	Home	23	Outbuilding
2	Home	24	Outbuilding
3	Home	25	Outbuilding
4	Home	26	Outbuilding
5	Home	27	Outbuilding
6	Home	28	Outbuilding
7	Home	29	Outbuilding
8	Home	30	Outbuilding
9	Home	30	Outbuilding
10	Home	32	Outbuilding
11	Home	33	Outbuilding
12	Home	34	Outbuilding
13	Home	35	Outbuilding
14	Home	36	Outbuilding
15	Home	37	Outbuilding
16	Home	38	Outbuilding
17	Barn	39	Outbuilding
18	Barn	40	Outbuilding
19	Microwave Tower	41	Outbuilding
20	Outbuilding	42	Outbuilding
21	Outbuilding	43	Tanks
22	Outbuilding		

*The Project would utilize up to 55 Vestas V-110 turbines; however, 64 potential Vestas turbine locations are included on this figure to account for alternate locations that may be used.



1:35,000 WGS84 UTM Zone 13N

0 2 4 Miles

TETRA TECH

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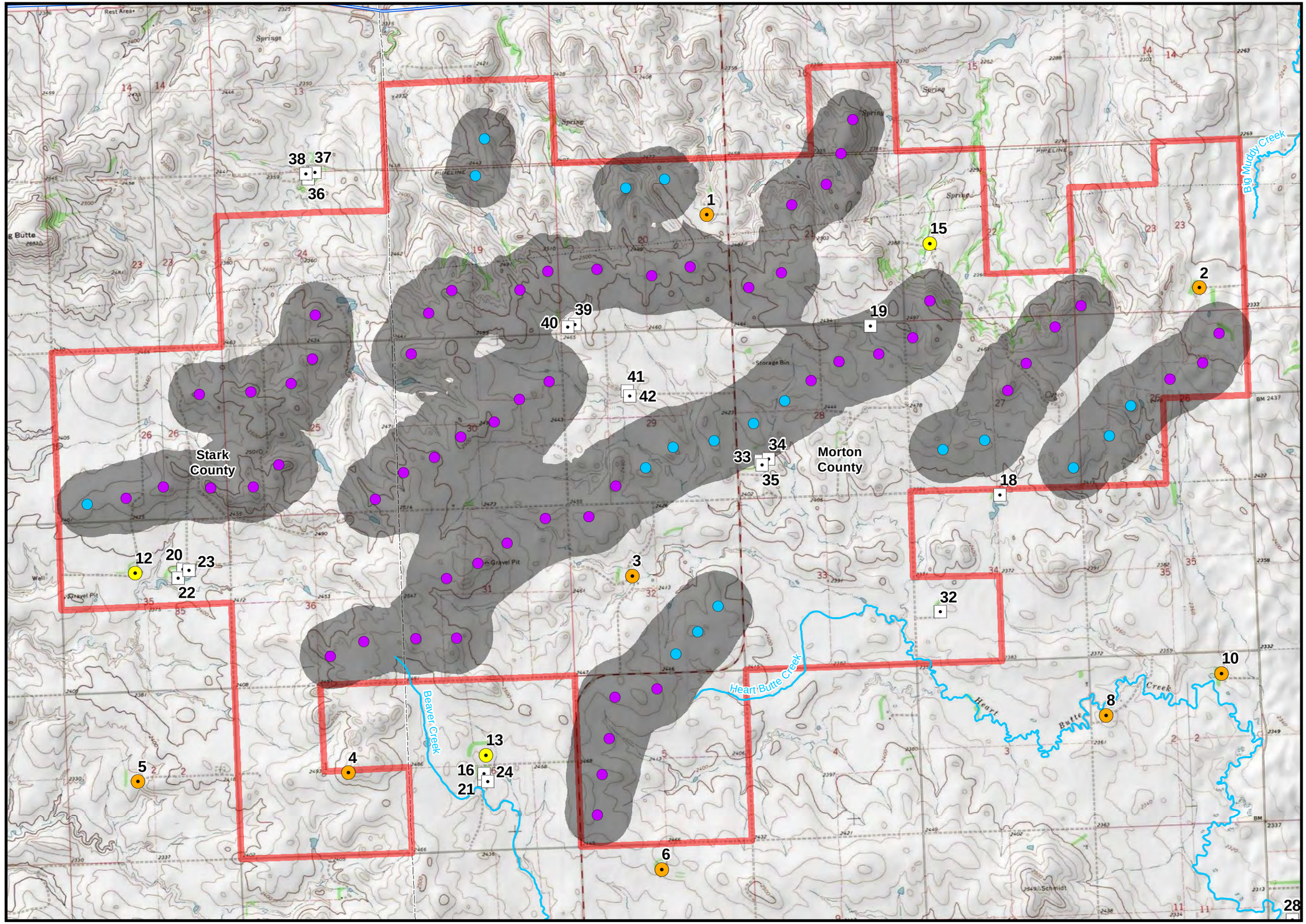
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Sunflower Wind Project

Application for North Dakota Certificate of Site Compatibility

Figure 10B
Turbine Sound Levels Greater than 50dbA
GE 1.85-87

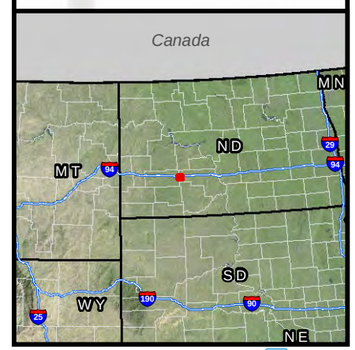
Morton and Stark Counties, ND
February 2014



- Project Area
- Turbine Location*
- Alternate Turbine Location*
- Approximate Maximum 50dbA or Greater Noise Extent
- Occupied Residence
- Structure (Occupation Unknown)
- Unoccupied Structure
- County Boundary
- Interstate Highway
- Stream or River

Tt_ID	Type	Tt_ID	Type
1	Home	23	Outbuilding
2	Home	24	Outbuilding
3	Home	25	Outbuilding
4	Home	26	Outbuilding
5	Home	27	Outbuilding
6	Home	28	Outbuilding
7	Home	29	Outbuilding
8	Home	30	Outbuilding
9	Home	30	Outbuilding
10	Home	32	Outbuilding
11	Home	33	Outbuilding
12	Home	34	Outbuilding
13	Home	35	Outbuilding
14	Home	36	Outbuilding
15	Home	37	Outbuilding
16	Home	38	Outbuilding
17	Barn	39	Outbuilding
18	Barn	40	Outbuilding
19	Microwave Tower	41	Outbuilding
20	Outbuilding	42	Outbuilding
21	Outbuilding	43	Tanks
22	Outbuilding		

*The Project would utilize up to 59 GE 1.85-87 turbines; however, 76 potential GE turbine locations are included on this figure to account for alternate locations that may be used.



1:35,000 WGS84 UTM Zone 13N

0 2 4 Miles

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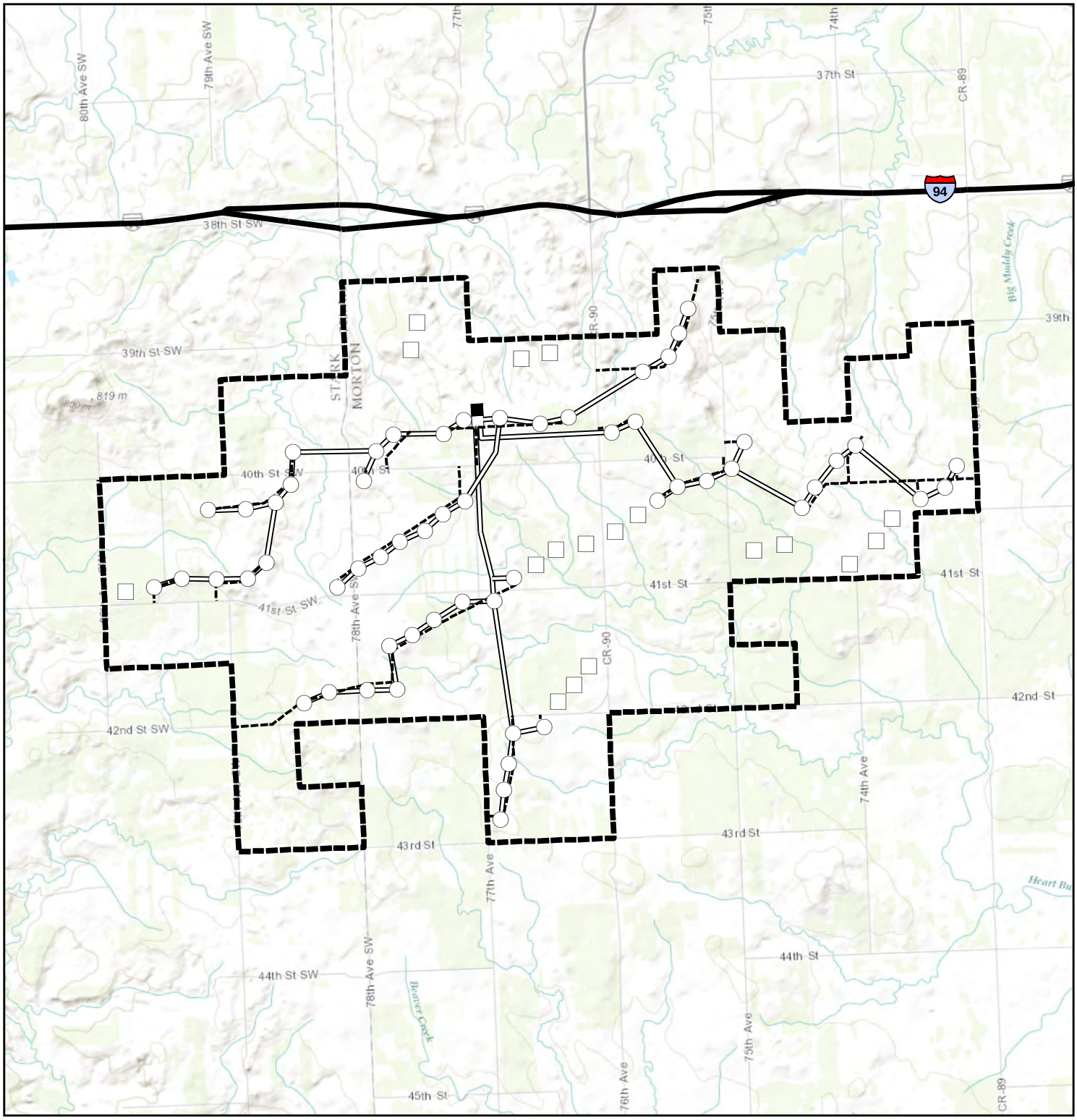


Figure 11B

1:70,000 WGS84 UTM Zone 13N

0 0.5 1 1.5 Miles

Sunflower Wind Project

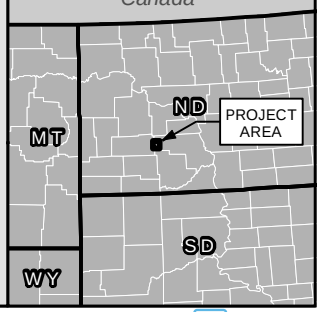
Application for North Dakota Certificate of Site Compatibility

Project Layout B
GE 1.85-87

Morton and Stark Counties, ND
February 2014

- Turbine Location*
- Alternate Turbine Location*
- Project Area
- Approximate Access Road Routing
- Approximate Underground Collection System Routing
- Proposed Interconnection
- Proposed Substation
- Interstate Highway
- Existing Transmission Line

*The Project would utilize up to 59 GE 1.85-87 turbines; however, 76 potential GE turbine locations are included on this figure to account for alternate locations that may be used.



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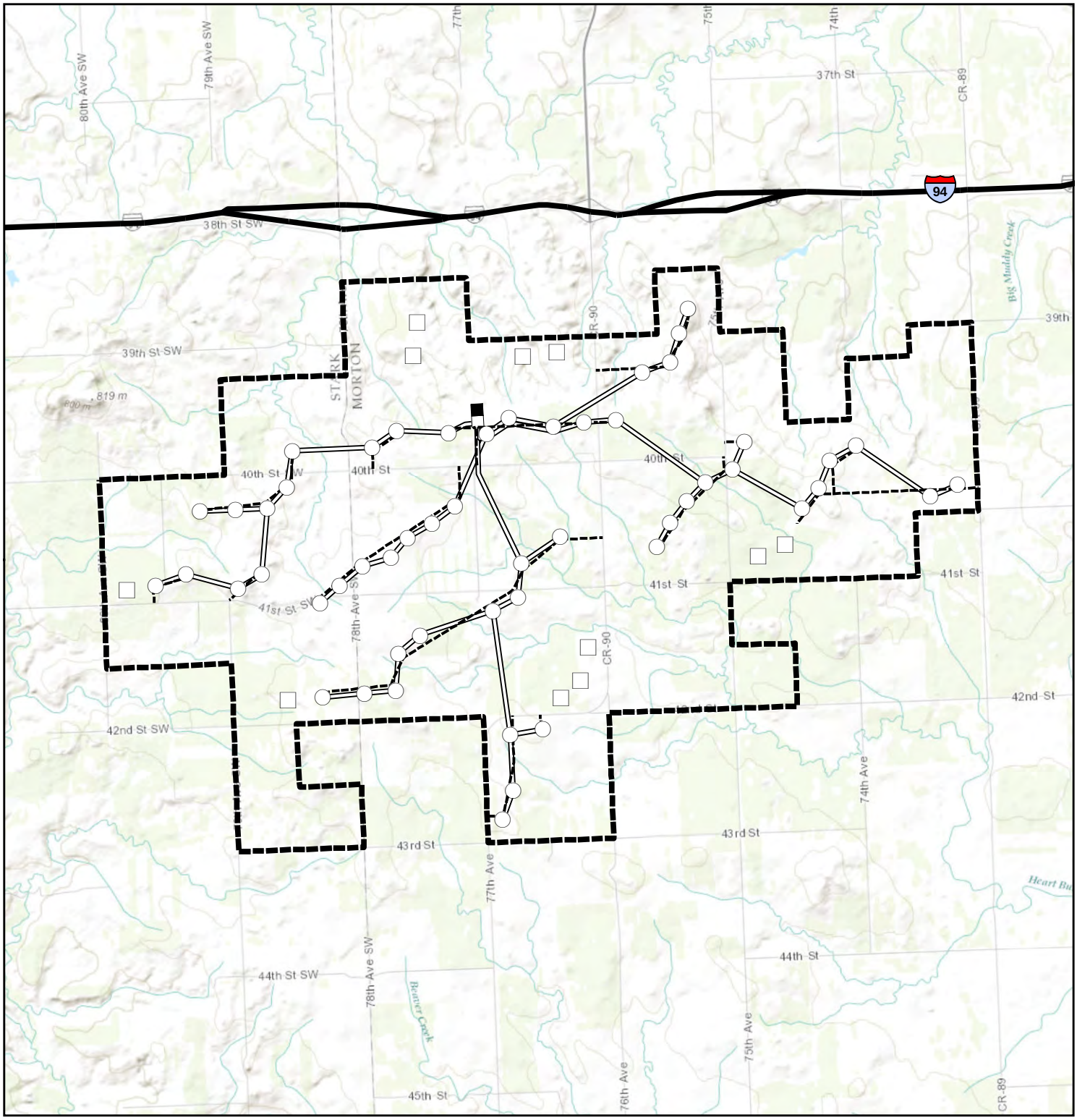


Figure 11A	1:70,000 WGS84 UTM Zone 13N	0 0.5 1 1.5 Miles

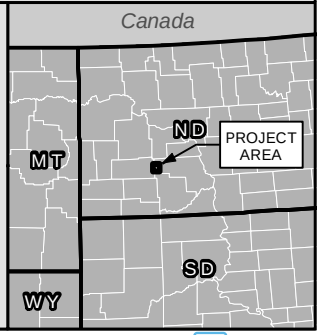
Sunflower Wind Project
Application for North Dakota Certificate of Site Compatibility

Project Layout A
Vestas 2.0 V-110

Morton and Stark Counties, ND
February 2014

- Turbine Location*
- Alternate Turbine Location*
- Project Area
- Approximate Access Road Routing
- Approximate Underground Collection System Routing
- Proposed Interconnection
- Proposed Substation
- Interstate Highway
- Existing Transmission Line

*The Project would utilize up to 55 Vestas V-110 turbines; however, 64 potential Vestas turbine locations are included on this figure to account for alternate locations that may be used.



TETRA TECH

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Appendix A
Studies and Assessments

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APPENDIX A STUDIES AND ASSESSMENTS

CONTENTS:

- Critical Issues Analysis (CIA)
- Raptor Nest Survey Report
- Sharp-Tailed Grouse Lek Survey Report
- Wildlife Baseline Studies Report and Update
- Habitat Mapping Report
- Bat Acoustic Monitoring Report
- Whooping Crane Habitat Review
- Screening Level Acoustic Assessment
- Shadow Flicker Impact Analysis

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Sunflower Wind Project
Critical Issues Analysis

Infinity Wind Power

January 2011

Prepared for

Sunflower Wind Project, LLC
3760 State Street, Suite 102
Santa Barbara, CA 93105



Prepared by

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ONE COMPANY | *Many Solutions*℠



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1.0 INTRODUCTION

1.1 BACKGROUND

Sunflower Wind Project, LLC, a wholly owned subsidiary of Infinity Wind Power (Infinity) contracted HDR Engineering, Inc. (HDR) to prepare a critical issues analysis (CIA) for a proposed utility-scale wind energy project – the Sunflower Wind Project – located in west central North Dakota. This CIA identifies potential development constraints on the proposed project related to publicly available data on biological, archaeological, cultural, historical, surface hydrological resources, and land use within a study area defined by Infinity. The CIA is based on a desk-top evaluation of the environmental characteristics of the study area. The information presented in the analysis was obtained from the following:

- ESRI ArcGIS online aerial imagery, streets, and basemap information
- United States Geological Survey (USGS) streams and rivers data
- Public lands data: federal lands, state lands, and county lands
- Municipalities and counties
- USGS GAP analysis land cover data
- U.S. Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) maps
- USFWS county-level species information
- Federal Aviation Administration (FAA) registered airports data
- Department of Defense (DOD) Preliminary Screening Tool
- Federal Communications Commission tower data
- USGS topographic maps and digital elevation data
- U.S. Department of Agriculture (USDA) Soil Survey Geographic (SSURGO) data
- North Dakota Department of Transportation data
- North Dakota Geological Survey data
- North Dakota State Water Commission data
- North Dakota GIS Hub data

The final section of this CIA discusses permits and approvals that may be necessary for construction of the project. Figures are presented after the permits and approvals matrix. Appendix A contains the Department of Defense Preliminary Screening Tool results for the study area. Economic coal deposit maps are found in Appendix B. Appendix C contains the North American Breeding Bird Survey results for the study area vicinity.

1.2 PROJECT LOCATION

The 15,600-acre study area lies within Morton and Stark counties, North Dakota. The nearest communities to the study area include Hebron to the north, Glen Ullin to the east, and Richardton to the west (see Figure 1). Table 1 lists the townships and sections within the study area. Townships are not organized into civil townships; civil townships are common in several parts of North Dakota, and often require additional permitting.

Table 1. Counties, Townships and Sections within Project Study Area

Township	Range	Section
138N	90W	4-6
138N	91W	1,2
139N	90W	16-23, 26-33
139N	91W	23-25, 35, 36

1.3 POPULATION INFORMATION

Table 2 presents population information obtained from the U.S. Census Bureau 2000 Census and 2009 Census Estimates for the municipalities and small towns near the study area. Hebron is the nearest community, located 2 miles north. Glen Ullin and Richardton are located 7 miles and 8 miles from the study area, respectively.

Table 2. Population Estimates for Counties, Cities, and Townships near the Study Area

County/Township/Town	2000 U.S. Census Population	2009 U.S. Census Estimate
Morton County	25,303	26,464
Stark County	22,636	22,247
Hebron	803	725
Glen Ullin	865	796
Richardton	619	577

2.0 ENVIRONMENTAL CHARACTERISTICS

2.1 LAND USE

Stark and Morton counties' primary land use is agricultural. Typical crops include wheat, hay, barely, oats, and corn. Raising livestock (cattle, hogs, sheep, and horses) is another important land use. More information on agriculture is included in the Land Cover section below.

Land Cover

According to GAP land cover data (Figure 3) the study area is a mixture of cropland with interspersed rangeland made up of fallow parcels (classified in the GAP data as planted herbaceous perennials) or grassland/prairie. Grassland/prairie is mostly associated with steeper terrain. Rangeland in these areas is not likely to have ever been tilled. Riparian areas are likely to contain shrubs and small trees. Wetland basins are common but most are less than five acres and support only seasonal surface water. Most streams within the study area are intermittent and, in many cases, function as drainageways within tilled agricultural fields. Table 3 shows the acreages of each land cover type based on GAP data.

Table 3. Gap Analysis

Cover Type	Total (Acres)*	Percentage of Study Area
Cropland	5,645	36.3
Grassland/Prairie	4,474	28.8
Planted Herbaceous Perennials	4,195	26.9
Shrubland	489	3.2
Barren	274	1.8
Wetlands	216	1.4
Woodland	213	1.3
Developed	49	0.3
Total	**15,555**	**100.0**

** Rounded to nearest acre.*

Public Lands

- Public and private parks and trails (Figure 2):
    - There are no public or private parks within the study area. A cemetery is located in the southwestern corner of the study area in Section 2 of Township 138N, Range 91W.
    - There are no designated multi-use or snowmobile trails in Stark or Morton counties (State of North Dakota 2009).
- **USFWS Easements**—USFWS administers a program by which it holds easements on private lands that have wetlands and/or grassland habitat. Development may be restricted on lands held in a USFWS easement. As the USFWS does not provide specific easement data to the public; consultation regarding possible easements on private lands that have documented wetlands or grassland is recommended.
- **Programmatic Environmental Impact Statement**—Western Area Power Administration (WAPA) and the USFWS are in the process of preparing a Programmatic Environmental Impact Statement (PEIS). This document is intended to identify potential environmental impacts associated with wind energy development and associated transmission systems; to identify mitigation strategies, standard construction practices, and best management practices to reduce potential impacts; and to establish a comprehensive environmental program for evaluating future wind-energy proposals. The draft PEIS is scheduled to be published in fall 2010 and a Record of Decision is to be published in 2011. Once finalized, developers can expect that avoidance, minimization, and mitigation measures identified in the PEIS will be required for all wind projects that occur on USFWS easement lands. Currently, there is a process (through providing a reversionary clause) for allowing wind development on USFWS grassland easements. However, this process requires extensive coordination and a project-specific review under the National Environmental Policy Act.
- **Wetland Management Districts (WMDs)** – No WMDs are located in or within 5 miles of the study area. WMDs are lands purchased by the U.S. Bureau of Reclamation (Reclamation) as part of North Dakota's Garrison Diversion Unit. Reclamation developed these areas for wildlife by restoring drained wetlands and planting cropland acres to grassland. The WMDs were transferred to the USFWS to be managed primarily for the production of migratory birds and for

public use. The closest WMD is located 21 miles southwest of the study area in Hettinger County.

- **Wildlife Management Areas (WMAs)**—WMAs are state-owned lands managed by the North Dakota Game and Fish Department (NDGFD) for wildlife habitat. There are no WMAs in or within 5 miles of the study area. The closest is the Storm Creek WMA in Morton County located 18 miles east of the study area. The Heart Butte Reservoir State Game Management Area is not a WMA, but is managed by the NDGFD and is located 16 miles southeast of the study area. This area is a reservoir used for fishing and hunting.
- **Bureau of Land Management (BLM) Recreational Areas** – The Schnell Recreation Area is located 9 miles west of the study area. The recreation area is a converted ranch that provides rustic camping, wildlife viewing, and environmental education opportunities.
- **State Trust Lands**—No state trust land parcels exist within the study area. One state trust land parcel is within 2 miles of the study area (Figure 2). Trust lands are administered by the North Dakota State Land Department.
- **Private Land Open to Sportsman (PLOTS)** — No PLOTS are located in or within 0.5 miles of the study area. These are private lands that are open to public hunting. These lands are enrolled in one of three NDGFD programs to enhance fish and wildlife populations for sustained public use. These lands may be jointly enrolled in other federal programs such as the Conservation Reserve Program described below.
- **Natural Resources Conservation Service (NRCS) Conservation Reserve Program (CRP)**—Under CRP, landowners are compensated for taking agricultural land out of production for a set contract period for which 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. HDR recommends contacting the NRCS Beulah Field Office to identify which lands are enrolled in CRP; permission from the individual landowner of each parcel is required to gain access to CRP data.
- **U.S. Department of Agriculture (USDA) Loan Coordination**—The study area is located with in a rural agricultural area. Land under loans from the USDA requires special coordination with the USDA if project activities are proposed within those parcels; this coordination can include a modified National Environmental Policy Act (NEPA) review. HDR recommends contacting the USDA to identify which lands have loans from the USDA; permission from the individual landowner of each parcel is required to gain access to USDA loan data.

2.2 PUBLIC SERVICES AND INFRASTRUCTURE

Figure 1 shows roads and railroads in the study area. Airports within a 25-mile radius are shown in Figure 4. Figure 5 shows the locations of Federal Communication Commission (FCC)-licensed towers and existing transmission lines.

- **State, county, and local roads**—Figure 1 shows state and county roads within the study area. Roads in the study area follow section lines. A transportation assessment should be completed to evaluate potential access routes and identify improvements necessary to facilitate project construction and operation. Stark and Morton counties and the North Dakota Department of Transportation (NDDOT) may require highway crossing permits for any utility crossings of county roads. The North Dakota Public Service Commission (PSC) has voluntary turbine fall-down setbacks from public roads. Stark and Morton counties have not established any setbacks specific to wind development.

- **Airports and Heliports**—There are two public airports and four private airports within 25 miles of the study area (Table 4). Setbacks from public and private airports follow North Dakota Aeronautics Commission and FAA requirements. The North Dakota Aeronautics Commission has provided guidance on other wind projects related to safety for crop dusting aircraft to decrease their risk of colliding with anemometers and turbines.

Table 4. Public/Private Airports within 25 Miles of the Study Area

Airport Name	Type	Distance from the Study Area (miles)
Chase Airstrip	Private	4
Glen Ullin Regional	Public	6
Richardton	Public	11
Brands	Private	15
Fitterer's Strip	Private	16
Jurgens Airstrip	Private	17

- **Railroads**— An east/west rail line, operated by Burlington Northern Santa Fe Railway, runs to the north and east of the study area crossing Highway 94 (Figure 2).
- **Pipelines**—No interstate pipelines have been identified within the study area.
- **Transmissions lines** —A 230 kV transmission line parallels Highway 94 through the northern portion of the study area (Figure 5).
- **FCC Towers –** Two private land-mobile communication towers are located within the study area (Township 139N, Range 90W, Sections 20 and 32). One microwave transmission tower is located within the study area (Township 139N, Range 90W, Section 21). Seventeen registered microwave towers are located on a large hill 1.5 miles west of the study area (Township 139N, Range 91W, Section 16). The presence of a microwave tower within the study area and the proximity of a large array of microwave towers increase the likelihood that the study area will contain microwave beam paths. HDR recommends completing a microwave beam path analysis to determine their presence in the study area.

Military Facilities, Aviation and Weather Radar

The FAA's online *Department of Defense (DoD) Preliminary Screening Tool* (DoD Tool)[1] allows developers to gain preliminary insights regarding potential impacts that structures may have on long range radars, military training routes, and special use airspace prior to official filing of an Obstruction Evaluation/Airport Airspace Analysis request with the FAA. This tool does not replace any official processes or procedures that may be required by the FAA.

The Long Range Radar Screening type produced the following results:

- **Green**: No anticipated impact to Air Defense and Homeland Security radars. Aeronautical study required.

The NEXRAD screening type produced the following results:

[1] FAA Disclaimer: The DoD Preliminary Screening Tool enables developers to obtain a preliminary review of potential impacts to Long Range Radar(s), Military Training Route(s), and Special Use Airspace prior to official OC/AAA filing. This tool will produce a map of the structure and nearby military airspace or Long Range Radars. The use of this tool is **100% optional** and will provide a first level of feedback and a single point of contact within DoD to discuss impacts/mitigation efforts on the military training mission. **The use of this tool does not in any way replace the official FAA process/procedures.**

- **Green**: Minimal to no impact to Weather Surveillance Radar-1988 Doppler (WSR-88D) weather radar operations. National Telecommunications & Information Administration (NTIA) notification advised.

The Military Operations screening type produced the following results:

- The preliminary review of your proposal does not return any likely impacts to military airspace. Please contact Dr. Thomas (Thom) H. Rennie at the USAF Regional Environmental Coordinator at (214) 767-4678 for confirmation and documentation.

2.3 CULTURAL RESOURCES

Archaeological and Historic Facility Resources

Archaeological and historic facility resources represent the visible or otherwise tangible record of human activity on the landscape. These resources vary in size, shape, condition, and importance, among other considerations; some are clearly evident on the landscape, while others are buried or only visible to knowledgeable people.

Records were reviewed through the National Register of Historic Places (NRHP) online database which can be accessed at http://www.nps.gov/history/nR/research/. This database was used as an initial search to see if any NRHP listed resources were in or near the study area.

It is anticipated that this project falls under multiple state statutes encompassed in the North Dakota Century Code, including:

- 55-03-01, which requires permits to investigate, evaluate, or mitigate adverse effects on cultural resources, historic buildings, structures, or objects under section 106 of the National Historic Preservation Act of 1966.
- 55-03-01.1, which requires permits to investigate, excavate, or otherwise record cultural resources on land owned by instrumentality of the state of North Dakota and to excavate cultural resources on private land.
- 23-06-27, which outlines the protection of unmarked burials and the penalties for their disturbance.
- 55-02-07.1, which protects site locations of prehistoric or historic sites. This statute limits access to, and release of information from, files of the State Historical Society of North Dakota until the director is satisfied that the applicant has a reasonable need for the information and is assured that the release of the information will not result in unnecessary destruction of the resource.
- 55-1008(2), which offers protection to sites listed on the State Historic Sites Registry.

Resources are typically categorized by type and significance. The status of a resource is completed for compliance with federal regulations, typically Section 106 of the National Historic Preservation Act of 1966 (as amended) (NHPA), by applying the National Register Criteria for Evaluation developed by the National Park Service (Bulletin 15 completed by the staff of the National Register of Historic Places, finalized by Patrick W. Andrus, edited by Rebecca H. Shrimpton, 1990, Revised 1991, 1995, 1997, Revised for Internet 1995, 2001, 2002).

The status of a resource can fall into three possible categories: not eligible, not evaluated, and eligible. A cultural resource is determined "not eligible" when a federal agency has determined that it is not eligible for the NRHP. Such resources do not require further investigation. A cultural resource is considered "not evaluated" when a federal agency has not made any determination as to its eligibility. Further work is

needed to understand the significance of the cultural resource. A cultural resource is considered "eligible" when a federal agency has determined it to be of value and significant enough to be listed on the NRHP. Coordination with the "appropriate parties" is needed to discuss project impacts as they relate to the resources.

Resource status is useful for project planning purposes. In addition, when resources have not been evaluated for significance and will be physically impacted by the project, coordination with State Historic Preservation Office (SHPO) to address the impacts will be needed.

Recorded Archaeological and Historic Facility Resources

The online NRHP database was searched for registered properties in Morton and Stark counties located in and within 1 mile of the study area. No NRHP registered archaeological or historic facility resources were found.

The absence of listed archaeological and/or historic facility resources does not mean the project area is clear of significant resources. It is possible there are both recorded and unrecorded resources in the project area that may be significant, but which have been neither evaluated nor had their status determined.

Possible Concerns or Effects

Possible concerns that should be considered for this project include:

- Unrecorded cultural resources located within the study area
- Any ground disturbing activity within the study area that has potential to impact known or unknown cultural resources
- Visual impacts to recorded or unrecorded cultural resource properties

Recommendations

No NRHP properties were identified in or near the study area. However, it is likely that unevaluated or unknown resources may be present within or near the project area that may be significant. To assist in initial development of a project layout, HDR recommends that a literature search be completed for the study area to identify previously recorded cultural resources. Additionally, HDR recommends that a field survey be completed in the study area prior to construction to identify unrecorded cultural resources that should be avoided. Typically, this includes a field survey for undiscovered cultural resources located (buried or on the surface) within the area that could potentially be directly disturbed by construction activities. Additionally, an evaluation of historic structures within the general project area is sometimes appropriate to inform project development.

If federal permits (e.g. USACE Section 404), federal funds, or federal review under NEPA is required or used in any part of this project, then Section 106 of the NHPA would be applicable. If Section 106 is applicable, a field survey (Phase I Field Inventory) and a formal determination of a resource's eligibility under the NRHP (Phase II Evaluation) will likely be required to consider both recorded and unrecorded above-ground resources.

Taking into consideration the types of climate, agricultural practice, and land use present in the study area, the most probable periods for completing field surveys for archaeological resources would be after spring thaw and before fall freeze, preferably before agricultural land becomes fully grown, or after agricultural land has been harvested. However, in area where the primary land use is range or pasture land, survey work could take place from spring thaw to fall freeze. An evaluation of historic structures can be completed at any time of the year, but seasons with minimal vegetation cover are more ideal.

2.4 GEOLOGIC AND GROUNDWATER RESOURCES

Elevation and Topography

Topography within the study area is slightly rolling to rolling, with the steepest topography occurring to the southwest (Figure 6). The elevation ranges from 2,231 feet (680 meters) to 2,362 feet (720 meters).

Geology and Groundwater

Surficial geology within the study area consists of glacial sediments deposited during the Holocene to Pre-Wisconsinan Period (Bleumle 1988, Clayton 1980). The primary deposits that define the study area are collapse/draped transition sediments. The glacial sediment is characterized by hummocky topography that has draped over and partially obliterated the topography existing before the glacial advance. An area of ring-shaped hummocks is located along the west end of the study area. The sediments are described as an unbedded, unsorted mixture of clay, silt, sand, and pebbles with a few cobbles and boulders. The glacial deposits can be as thick as 100 feet.

The bedrock geology of the study area consists of Sentinel Butte Formation from the Tertiary System. The Sentinel Butte Formation consists of gray-brown bentonitic claystone, siltstone, sandstone, and lignite. The sandstone is thin bedded and is generally fine-grained and silty. This formation can be up to 510 feet thick.

No economic coal deposits were identified within the study area as shown in Appendix B. These deposits meet the minimum criteria established by coal companies operating surface mines in North Dakota (Murphy 2007). One economic coal deposits was identified in several areas adjacent to the southwestern corner of the study area. This deposit has not been mined and does not represent an active mining area. HDR recommends that Infinity consult with landowners regarding the presence of economic coal deposits. Conflicts with future coal mining operations could be avoided by placing turbines and other project facilities outside of areas thought to include economic coal deposits.

No recorded areas of seismic activity or subsidence were identified in the study area. However, there are several active or previously mined areas that were identified south of the study area. One gravel pit is located within the study area. Approximately eight gravel pits were identified within 3 miles of the study area and are located primarily to the south (Figure 2).

Groundwater in the region supplies both public and private wells (Croft 1973). Shallow groundwater typically follows local topography and regional groundwater flow is likely directed north and east toward Lake Sakakawea and the Missouri River.

Soil Resources

The study area consists mostly of farmland areas classified as not prime farmland (77 percent). The remaining area is mostly farmland of statewide importance (19 percent). Figure 7 shows the prime farmland and farmland of statewide importance soil classifications. Table 5 shows the acreage of the various soil classifications in the study area.

Table 5. Prime Farmland Soils Project Study Area

Farmland Status	Acres of Study Area	Percentage of Study Area (%)
Prime Farmland	235	1.5
Unclassified	327	2.1
Farmland of Statewide Importance	2,972	19.1
Not Prime Farmland	12,019	77.3
Total	**15,555**	**100.0**

Source: NRCS SSURGO Soils Data

2.5 HAZARDOUS MATERIALS

The Environmental Protection Agency (EPA) Superfund National Priorities List (NPL) database was reviewed to determine the potential for major hazardous material issues within the study area. An Environmental Data Resources search was not purchased. However, NDDOT maps were consulted as they often identify known dumps in the area. No NPL sites are present within Stark and Morton counties (U.S. EPA CERCLIS 2009).

There are no hazardous waste handlers or toxic release inventory sites located within the study area or within 5 miles of the study area (National Atlas 2009).

HDR recommends that a Phase I Environmental Site Assessment (ESA) be conducted on all leased properties within the study area in order to properly locate and avoid hazardous and/or potentially hazardous sites. A current Phase I ESA is often requested by an insurance provider or financer of a project in order to identify potential or existing environmental contamination liabilities.

2.6 SURFACE WATER AND FLOODPLAIN RESOURCES

Wetlands and Watercourses

As shown in Figure 8, there are intermittent streams and wetlands throughout the study area. Most are intermittent in nature, and in many cases, function as drainageways within tilled agricultural fields. More information on wetlands is found in Section 2.7.

Floodplains

The study area is located in an area of Stark and Morton counties that has not been mapped by the Federal Emergency Management Agency (FEMA). Flood Insurance Rate Maps (FIRM) are not available.

2.7 BIOLOGICAL RESOURCES

Wetlands

Wetlands within the study area are scattered and relatively sparse as evidenced by NWI data. Table 6 provides the acres of NWI wetlands present in the study area. Seasonal wetlands are usually surrounded by tilled fields; open water wetlands are occasional, and in many cases associated with streams. Open water wetlands are often surrounded by pasture.

Wetlands in the state of North Dakota are regulated by USACE, whose jurisdiction only includes wetlands connected to a "Water of the U.S." (i.e. non-isolated). Based on a preliminary review of the project site using aerial photos and USGS maps, many of the freshwater emergent wetlands and freshwater ponds are isolated and will not be jurisdictional under USACE regulations. Impacts to

wetlands that are jurisdictional will fall under Nationwide Permit 12 conditions, provided that the following conditions are met:

- None of the crossings are longer than 500 linear ft and do not run parallel to the stream channel.
- None of the impacts exceed 1/10th of an acre.

HDR recommends completing a wetland delineation to identify wetlands in the project area and their jurisdictional status. A delineation will also provide information to project developers to help avoid wetlands where possible and meet Nationwide Permit conditions if impacts occur. Previous wind projects in this part of North Dakota have been able to avoid jurisdictional wetlands completely, with turbine foundations, access roads and other facility components that require permanent impacts. Temporary impacts from buried underground cabling have often been required, but the 500 foot crossing distance allows sufficient distance to cross the types of wetlands that are present in the study area. As a result, permitting through USACE has not typically posed a challenge.

Table 6. NWI Wetlands in the Study Area

Type of Wetland	Acres of Wetland	Percentage of Study Area (%)
Freshwater Emergent Wetland	21.6	<1.0
Freshwater Pond	37.6	<1.0
Freshwater Forested/Shrub Wetland	0.8	<1.0
Other	2.0	<1.0
Total	**62.0**	**<0.4**

Vegetation

Agriculture is the predominant land use in the study area; crops are generally small grains and corn. North Dakota has listed twelve species which are considered noxious weeds (North Dakota Century Code chapter 63-01.1). Stark and Morton counties have no additional listed noxious weed species (NDDA 2009). None of these species have been inventoried in either county in the North Weed Mapper (State of North Dakota 2009).

Wildlife

The wildlife species likely present within the study area are typical for agricultural landscapes, pasture grasslands, and wetland habitat in the region. They include mammals such as badgers, beavers, ground squirrels, chipmunks, mice, voles, rats, moles, shrews, raccoons, skunks, and bats. Snakes, lizards, frogs, and toads are also found in the area.

Birds in the area include local predatory and grassland birds; however, a wide variety of birds may use the area seasonally during migration. Migrating birds use local ponds and wetlands for stopovers and local birds use the marshland and shrubland habitat for nesting.

Terrestrial wildlife is most common in farm fields, pasture, fencerows, intermittent creeks, and wetland areas. These areas provide corridors for migration and foraging as well as ample cover for small mammals, raptors, waterfowl, upland game birds, and other common wildlife in the area.

A review of the North Dakota Natural Heritage conservation database was not completed for this analysis, but is recommended to identify species of concern or ecosystems considered significant by the state of North Dakota.

Breeding Bird Surveys

There are no documented North American Breeding Bird Surveys Routes (BBS) occurring within the study area. There is one (Glen Ullin, 39,454.1 meters long) BBS documented which ends about 6 miles southeast of the study area. This survey route is shown on Figure 9. Surveys along the route are conducted annually during the peak of the nesting season, usually in May or June. The results of these surveys are used to estimate the number of birds that a very good birder would encounter in about 2.5 hours of birding along the BBS route. Observations along the Glen Ullin Route have identified 116 species of birds (Sauer and others 2008).

The 10 most frequently recorded BBS species along each route are listed in Table 7.

Table 7. Ten Most Frequently Recorded Species in BBS (Glen Ullin)

Bird Estimate*	Common Name	Scientific Name
195.13	Lark Bunting	*Chondestes melanocorys*
193.73	Western Meadowlark	*Sturnella neglecta*
134.13	Horned Lark	*Eremophila alpestris*
113.47	Brown-headed Cowbird	*Molothrus ater*
110.87	Red-winged Blackbird	*Agelaius phoeniceus*
102.73	Ring-necked Pheasant	*Phasianus colchious*
84.87	Mourning Dove	*Zenaida macroura*
65.53	Chestnut-col. Longspur	*Calcarius ornatus*
47.53	Common Grackle	*Quiscalus quiscula*
40.07	Bank Swallow	*Riparia riparia*

** The number of birds that a very good birder would encounter in about 2.5 hours of birding along the BBS route.*

The lark bunting is considered a North Dakota Species of Conservation Priority (SoCP). See Appendix C for a full list of species recorded in the Glen Ullin BBS.

Migratory birds, including many of the species documented in the BBS, are protected under the Migratory Bird Treaty Act (MBTA) of 1918 (16 U.S.C. 703-712). The MBTA is distinct from the Endangered Species Act (ESA) (16 U.S.C. 1531-1544) because it protects migratory bird species that are not necessarily threatened or endangered. See the discussion above about potential migrating bird habitat in and near the study area.

More detailed habitat assessments and/or targeted surveys of the study area might need to be conducted prior to construction to evaluate potential impacts to bird and bat species from the proposed project. HDR recommends that Infinity contact the USFWS, NDGFD, and the North Dakota Parks and Recreation Department (which oversees the North Dakota Natural Heritage conservation database) to discuss the need for siting surveys and preconstruction plans.

Federal and State Listed Species

Section 7 of the ESA requires that all federal agencies consider and avoid, if possible, adverse impacts to federally listed threatened or endangered species or their critical habitats, which may result from their direct, regulatory, or funding actions. The USFWS is responsible for compiling and maintaining the federal list of threatened and endangered species. Section 9 of the ESA also prohibits the taking of any federally listed species by any person without prior authorization. The term "taking" is broadly defined at the federal level and explicitly extends to any habitat modifications that may significantly impair the

ability of that species to feed, reproduce, or otherwise survive. While the prohibition of "taking" federal species applies to anyone, the prohibition of the destruction or adverse modification of designated critical habitat only applies to federal agencies.

The USFWS provides federally threatened and endangered species data at the county level for public use. According to the USFWS, Stark County has two endangered species and one threatened species and Morton County has four endangered species and one threatened species (Table 8, USFWS 2010).

Designated Critical Habitat for piping plover is located in Lake Audubon, Lake Sakakawea, and the Missouri River. These bodies of water are outside of the study area.

Table 8. Federally Listed Threatened and Endangered Species in Stark and Morton Counties

Common Name	Latin Name	County	Habitat	Status
Black-footed Ferret	*Mustela nigripes*	Stark, Morton	Prairie dog complexes	Endangered
Gray Wolf	*Canis lupus*	Stark, Morton	Frequently observed in Turtle Mountains	Endangered
Interior Least Tern	*Sternula antillarum*	Morton	Missouri River and Yellowstone sandbars; beaches;	Endangered
Piping Plover**	*Charadrius melodus*	Stark, Morton	Missouri River sandbars, alkali beaches	Threatened
Pallid Sturgeon	*Scaphirhynchus albus*	Morton	Bottom dwelling, Missouri and Yellowstone Rivers	Endangered

*** Designated Critical Habitat for piping plover is located on the following water bodies: Lake Audubon, Lake Sakakawea, and the Missouri River. All of these water bodies are located north and east of the study area.*

Black-footed ferret—Historically, black-footed ferrets occupied much of the Great Plains region of North America, colocating with prairie dog (*Cynomys* sp.) colonies and complexes. Black-footed ferrets depend on prairie dog complexes for food and habitat. Prairie dogs and black footed ferrets prefer level topography in grasslands, steppe, and shrub steppe. Plowed lands, forests, wetlands, and water are avoided (USFWS 1988). There are no records of recent black-footed ferret occurrences in North Dakota but there is potential for reintroduction (USFWS 2008b).

Gray wolf—The gray wolf was historically found throughout North America, with the exception of parts of the southwest and southeast United States. There have been documented occurrences of gray wolves in North Dakota during the 1990s. The presence of wolves in most of North Dakota would likely remain sporadic and consist of occasional dispersing animals from Minnesota and Manitoba (USFWS 2008a). Wolves have most frequently been observed in the Turtle Mountains of North Dakota, approximately 200 miles from the study area (USFWS 2008b).

Interior least tern—The interior least tern is a migratory species that breeds along the Pacific, Atlantic, and Gulf coasts as well as the major interior rivers of North America. Historically the interior population bred along the Mississippi, Missouri, Arkansas, Red, Rio Grande, and Ohio River systems (USFWS 1994). In North Dakota, the least tern is found mainly on the Missouri River from Garrison Dam south to Lake Oahe, and on the Missouri and Yellowstone Rivers upstream of Lake Sakakawea. Approximately 100 pairs breed in North Dakota (USFWS 2008c).

Piping plover—The piping plover breeding range stretches from south central Canada into the Midwest United States. The majority of piping plover breeding pairs found in the United States are concentrated in Montana, the Dakotas, and Nebraska. This population of piping plover winters in the Gulf of Mexico. In

North Dakota, the piping plover nests on midstream sandbars along the Missouri and Yellowstone Rivers and along shorelines of saline wetlands. More piping plovers nest in North Dakota than any other state (USFWS 2008b). There is no USFWS-designated critical habitat for the piping plover in the study area (50 CFR Part 17). The closest critical habitat is located along Lake Sakakawea approximately 45 miles north of the study area.

USFWS has been taking a very cautious approach to energy projects within the migratory corridor and they should be consulted to discuss potential impacts and probable avoidance or mitigation strategies.

Pallid Sturgeon—The pallid sturgeon's native habitat in the Mississippi and Missouri Rivers and their tributaries includes large river ecosystems with high turbidity, free flow, and warm water, according to the Pallid Sturgeon Recovery Plan (USFWS 1993). There is no habitat in the study area.

Whooping Crane—Historic nesting ranges for the whooping crane are thought to have extended throughout the northern Great Plains (USFWS 2007a). The Aransas-Wood Buffalo population of whooping cranes winters in the Aransas National Wildlife Refuge on the Texas Gulf Coast, and then migrates across the Great Plains to breed in the summer in the Wood Buffalo National Park in Northwest Territories, Canada. This population contained 236 individuals in October 2007 (Stehn and Wassenich 2008), and is the only self-sustaining, wild population (USFWS 2007b). The study area is within the 200-mile wide migratory corridor (Figure 9). The migration corridor was identified based on sightings since 1975 (USFWS 2007).

No sightings have been documented in the study area, and the nearest confirmed sighting is 14 miles east-northeast of the project area. Wetland maps and aerial photos indicate that there are very few areas within the study area that would provide habitat for whooping cranes during migration. The lack of viable habitat increases the likelihood that the USFWS and NDGFD will view wind development within the study area positively.

USFWS has been taking a very cautious approach to energy projects within the migratory corridor and they should be consulted regarding potential impacts and probable avoidance or mitigation strategies. Based on guidance provided in an April 2009 issues paper (USFWS 2009), the USFWS is recommending the following for wind projects located within the whooping crane migratory corridor (such as the Sunflower Wind Project):

- Provide compensatory mitigation for every acre of habitat lost to the construction of wind turbines.
- Mitigate or provide conservation offsets for every acre of suitable wetland habitat within 0.5 mile of turbines.
- Maximize placement of collector or transmission lines underground
- Mark project aboveground collector or transmission lines with bird flight diverters.
- Mark existing aboveground transmission lines with bird flight diverters (equal length to the new aboveground lines associated with the project).

Currently, a group of wind energy developers (coordinated by American Wind Energy Association) is in the process of developing a region-wide Habitat Conservation Plan (HCP) for the whooping crane. At this time it is unclear what recommendations for wind turbine siting will be included in the HCP or how the HCP will apply to wind developers who were not part of the HCP process. However, it is likely that the release of the draft HCP (currently scheduled for late 2010) will change USFWS's approach to wind energy development in the whooping crane migratory corridor. At this time, we anticipate that the recommendations included above will still likely be included to some degree in the region-wide HCP.

Species of Conservation Priority —NDGFD has identified 100 SoCP across the state in its Wildlife Action Plan (Hagen et al. 2005). These species are considered important for conservation in the State of North Dakota but do not have any legal protection. The NDGFD has further refined its 100 SoCP into three categories, Levels I-III, with Level I species being of the greatest concern. Thirty-four SoCP species have been identified in the Missouri Slope geographic region, including thirteen Level I species, twelve Level II species, and nine Level III species. Table 9 shows Level I species that have been documented in Stark and Morton counties.

Table 9. Species of Conservation Priority in the Missouri Slope Region

Common Name	Scientific Name	Habitat Type	Habitat Details
Swainson's Hawk	*Buteo swainsoni*	Native Prairie/ Grassland/Forests	Require native prairie or cropland that includes thickets of natural tree growth, brush margins of native forested tracts, or shelterbelts and tree claims.
Ferruginous Hawk	*Buteo regalis*	Native Prairie	Confined to very limited areas of native prairie, usually those with hilly terrain or with low-grade topsoil that has not been altered by the plow or lower quality from overgrazing.
Upland Sandpiper	*Bartramia longicauda*	Native Prairie/ Grassland	Inhabit mixed-grass prairie, local extensive tracts of wet meadow, grazed tall-grass prairie, tame haylands, CRP fields, and mowed or burned railroad or highway rights-of-way.
Long-billed Curlew	*Numerius americanus*	Native Prairie/ Grassland	Dry, native grasslands.
Wilson's Phalarope	*Phalaropus tricolor*	Wetland	Found in swales along ephemeral streams and various types of ponds and lakes that contain expanses of shallow water that are interspersed with, or adjacent to, wet-meadow vegetation.
Sprague's Pipit	*Anthus spragueii*	Native Prairie	Native medium to intermediate height prairie. In short grass prairie landscape, can often be found in areas with taller grasses. More abundant in native prairie than in exotic vegetation. Requires relatively large areas of appropriate habitat.
Grasshopper Sparrow	*Ammodramus savannarum*	Native Prairie	Open prairies with intermittent brush, avoids heavy brush cover.
Baird's Sparrow	*Ammodramus bairdii*	Native Prairie /Grassland	Native prairie; structure may be more important then plant species composition. Nesting may take place in tame grasses (found in Crested Wheat, while avoids Smooth Brome). Areas with little to no grazing activity are required.
Lark Bunting	*Calamospiza melanocorys*	Native Prairie/ Grassland	Short-grass & mixed-grass communities as well as fallow fields, roadsides, and hayfields.
Chestnut-collared Longspur	*Calcarius ornatus*	Native Prairie/ Grassland	Located in tracts of heavily grazed or hayed mixed-grass prairie or mixed-grass/short-grass prairie.

Common Name	Scientific Name	Habitat Type	Habitat Details
Plains Spadefoot	*Spea bombifrons*	Native Prairie/ Grassland/Cropland	Found in the dry prairies, sagebrush communities, and farm fields.
Western Hognose Snake	*Heterodon nasicus*	Native Prairie	Prefers sandy or gravelly habitats like sand prairies, very open portions of prairies, or sand dunes with very little cover.
Black-tailed Prairie Dog	*Cynomys ludovicianus*	Native Prairie/ Grassland	Require short-grass prairie habitats. They avoid heavy brush and tall grass areas due to the reduced visibility these habitats impose.

Source: North Dakota Action Plan

Recommendations

Per USFWS Wind Turbine Guidelines Advisory Committee's recommendations[2], this report provides the preliminary information necessary for a Tier II wildlife analysis. However, to complete a Tier II analysis per the recommendations, a qualified biologist should conduct a site visit to examine the site for wildlife resources and field-check desktop wetland and landcover data. This information will be useful in understanding whether further quantitative and scientifically rigorous studies should be conducted to further assess the potential risk of the proposed project to wildlife (a Tier III analysis). Additionally, the USFWS in North Dakota has historically looked favorably on wind developers that have developed Avian and Bat Protection Plans.

2.8 STATE & LOCAL PERMITTING

The state of North Dakota currently requires a Certificate of Site Compatibility (N.D.C.C. Ch. 49-22) for any wind energy facility larger than 60 MW which is issued by the North Dakota Public Service Commission (NDPSC). Projects smaller than 60 MW are covered under county regulations, if they exist. Many counties in North Dakota have recently adopted, or are considering, ordinances specific to wind energy facility siting. Morton County has adopted a wind energy facility provision. Stark County is considering an ordinance governing wind energy facilities, but has not yet taken action to adopt one. NDPSC has typically asked wind developers to honor county ordinances when completing the site compatibility application process. Most counties also require conditional or special use permits to build wind energy facilities within county boundaries, but these permit applications often include information already generated for the state site compatibility application. Timelines for permit applications vary, but are typically 6-9 months for the NDPSC site compatibility process and 3-6 months for the county conditional/special use permit process.

Both the NDPSC and Morton County have setback requirements for wind turbines. A list of setbacks is shown in Table 10.

[2] http://www.fws.gov/habitatconservation/windpower/Wind_Turbine_Guidelines_Advisory_Committee_Recommendations_Secretary.pdf

Table 10. State and Local Setback Requirements for Wind Turbines

Setback Feature	NDPSC Voluntary Requirement	Morton County Requirement
Structures	1,500 feet from occupied residence	1,320 or 1.25 times height (whichever is greater) from occupied dwelling, commercial or publicly used structure or building, state or county park.
Public Roads Overhead Transmission	Turbine height (i.e. fall-down distance)	250 feet
Project boundary		1.5 rotor diameter (RD) (Can be modified with variance from affected property owner.
Non-leased Property	1.5 RD	

HT= Total turbine height, measure form highest point of blade.
RD= Rotor Diameter

2.9 CONCLUSIONS

Through due diligence and proactive project development, the potential critical issues associated with this study area may be minimized or avoided. According to HDR's review, the critical issues associated with this study area include:

- Location of the study area within the federally-listed whooping crane migratory corridor will require consultation with the USFWS but the lack of confirmed sightings near the study area and the minimal wetland habitat in the study area make significant concerns less likely.
- Potential interference with microwave beam paths in study area. HDR recommends a microwave beam path study to identify corridors within the study area that may not be viable for wind turbine installation.
- Potential impacts on undiscovered cultural resources

To minimize or avoid these critical issues and other impacts that may arise, HDR suggests continued coordination and consultation with the USFWS regarding potential wetland and grassland easements, and with NDGFD and North Dakota Parks and Recreation Department regarding impacts to the sensitive species listed in Table 8 and Table 9, as well as other species of birds and bats potentially occurring in the area. HDR additionally recommends that Infinity consider preparing and implementing an Avian and Bat Protection Plan for use during construction and operation of the project.

The initial agency response from the USFWS did not include any site specific information. The initial agency response from the NDGF included requests for wetland avoidance and routine monitoring for avian and bat mortality, but did not mention any site specific issues for the Sunflower study area. Complete response letters are included in Appendix D.

HDR recommends that Infinity consider the Wind Turbine Guidelines Advisory Committee recommendations to the USFWS (March 4, 2010) to protect wildlife resources while siting and developing a wind project at this site. This would include consulting with the USFWS and the NDGFD and completing a more detailed Tier II site characterization study. If appropriate, more detailed habitat assessments and/or targeted surveys (Tier III field studies) might also be conducted prior to construction to better predict wildlife impacts and identify potential mitigation options. If combined with post construction monitoring, these studies and surveys will improve the industry's understanding of how

select species may be impacted by wind energy development. For this project in particular, potential field studies requested by agencies appear in Table 11.

Table 11– Potential Field Studies and Anticipated Timelines

Field Study	Duration	Lead Time before PSC Application
Bat Surveys	9-12 months (spring-fall)	12-15 months
Avian Point County Surveys	9-12 months (spring and fall)	12-15 months
Endangered and Threatened Species Habitat Assessments (Tier II Field Studies)	1 month	2-3 months prior to avian/bat surveys
Wetland Delineations	1 month (during growing season)	6 months
Phase I Environmental Site Assessment	1 month	3 months
Cultural Resource Literature Review	1 month	3 months prior to Cultural Resource Field Surveys
Cultural Resource Field Surveys	2-3 months	6 months

Off-site noise modeling for wind projects has typically been included as part of the NDPSC site compatibility process and HDR recommends that a noise study be completed once a turbine layout has been finalized and a NDPSC site compatibility application is being prepared. The 1,500-foot voluntary setback requirement has typically been sufficient to reduce noise levels from wind turbines at the nearest sensitive noise receptors to below recommended levels. The low population of the study area reduces the likelihood that the wind turbine noise will impact area residences and that setback requirements from homes will significantly impact the site layout.

Visual simulations are becoming more common for projects completing the NDPSC site compatibility application, but are not required. HDR recommends a review of the project area to identify any key areas within the project viewshed that may generate visual impact concerns (e.g. public recreation areas, sensitive landowners, etc.). If key areas are encountered, visual simulations of the wind turbine layout from the locations are recommended.

HDR also recommends meeting with Stark and Morton counties and PSC to discuss the project and their permitting expectations prior to submittal of permit applications Although HDR was unable to confirm the public perception toward wind projects in Stark and Morton counties, obtaining local community support is critical for developers. We recommend that Infinity develop a public involvement plan to maximize public support.

3.0 PERMITS AND APPROVALS

This table provides a summary of the environmental permits that may be required by federal, state, and local permitting agencies, based on HDR's permitting experience with similar projects. Not all of these permits may be required. Conversely, other permits not listed below may be necessary depending on the issues identified as the project is developed.

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 Notice of Actual Construction or Alteration (Form 7461-2)	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 more than 200 feet tall; and/or turbines/structures less than 200 feet tall near an airport.	No fee.	One week to prepare application; submit notice at least 30 days prior to anticipated start of construction and after construction has been completed.	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 file may be covered under existing General Permits/Letters of Permission	Presence of waters of the U.S. that will be impacted by project	No fee.	Depends on level of fill and type of permit required (individual vs. nationwide)	http://www.usace.army.mil/

Regulatory Authority	Statute	Permit/ Approval	Description	Trigger	Fee	Application Timeline	Website
US Fish and Wildlife – Region Six	Section 7/9 /10 of Endangered Species Act (ESA)	Consultation pursuant to Section 7 or 10 of the Endangered Species Act - USFWS and project proponent (or federal agency) to coordinate on how to implement proposed project while avoiding impacts to federally-listed endangered species to the greatest extent feasible.	Determination that "take" is likely to occur during a proposed non-Federal activity and a decision by the landowner or project proponent to apply for an incidental take permit. Federal activities and non-Federal activities that receive Federal funding or require a Federal permit (other than a section 10 permit) typically obtain incidental take authority through the consultation process under section 7 of the ESA. Thus, the Habitat Conservation Plan (HCP) process is designed to address non-Federal land or water use or development activities that do not involve a Federal action that is subject to section 7 consultation.	Presence of endangered species near the study area and project potentially impacting the endangered species. If a federal permit or approval is required, Section 7 Consultation will be necessary.	No Fee	Prior to ground disturbing activities. Depending on project size and potential impacts to listed species – 1 to 6 months.	http://www.fws.gov/endangered/hcp/hcpbook.htm http://www.fws.gov/mountain-prairie/endspp/
	Compatibility Analysis for wetland/ grassland easements	USFWS and project proponent and consult on project compatibility and special use permit for special easements.	If turbines are placed in wetland or grassland easements then a compatibility determination by the wetland management district is required.	Placement of turbines in a wetland or grassland easement	No fee	Prior to ground disturbing activities. Depending on the number of easements the time for review could be longer – 1 to 3 months.	

Regulatory Authority	Statute	Permit/ Approval	Description	Trigger	Fee	Application Timeline	Website
U.S. Environmental Protection Agency	40 CFR 112	Spill Prevention and Counter-measure Control Plan	Would be required if any facility associated with the project (O&M or substation) has a tank holding more than 1,320 gallons.	Oil storage of more than 1,320 gallons of oil		A copy of the plan will need to be maintained on file with the owner/operator and reviewed by the certifying engineer every five years.	
State Approvals							
North Dakota Public Service Commission	Pursuant to North Dakota Century Code 49-22	Certificate of Site Compatibility	For facilities with greater than 60 MW nameplate capacity. PSC voluntary setback requirements are listed in Table 10.	Generation of power described in previous column.	Variable based on project size.	180 days prior to construction (minimum).	http://www.psc.state.nd.us/jurisdiction/electricity-laws.html
	Pursuant to North Dakota Century Code 49-22	Certificate of Corridor Compatibility and Route Permit	High voltage transmission line approval. Application for both approvals can be prepared/reviewed concurrently. Requires adherence to exclusionary criteria, avoidance criteria, selection criteria and policy criteria	Transmission line greater than 115 kV.	Variable based on project size.	180 days prior to construction days prior to construction (minimum).	http://www.psc.state.nd.us/jurisdiction/electricity-laws.html
North Dakota Department of Health	Clean Water Act	Section 401 Certification	Verify that project construction would comply with state water quality standards.	A 401 Water Quality Certification required if a Section 404 permit is required	No fee.	Same as a Section 404 Permit.	http://www.ndhealth.gov/WQ/
	National Pollutant Discharge Elimination System Act	General Permit (Construction)	For stormwater discharges from construction activities	Grading of more than 1 acre.	No fee for small construction activities	Permit to be filed prior to construction with a Stormwater Pollution Prevention Plan (SWPPP).	http://www.ndhealth.gov/WQ/Storm/Construction/ConstructionHome.htm

Regulatory Authority	Statute	Permit/ Approval	Description	Trigger	Fee	Application Timeline	Website
		Septic Tank and Drainfield Permit	Required for installation of septic system at O&M facility	Installation of a septic system		Prior to construction	
North Dakota Division of Emergency Services		Emergency Planning and Community Right-to-Know Act (EPCRA) Tier II report	Use of hazardous chemicals/materials.	Generate 220 pounds or more per month hazardous waste	$413	Submit annually.	http://www.nd.gov/des/uploads/resources/330/tieriireportinginfopacket.pdf
North Dakota Department of Transportation		Road Approach/ Access 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.		Prior to construction	
	North Dakota Century Code 24-01	Utility Permit/Risk Management Documents	Required to install utilities within state owned right-of-way	Project requires a utility line crossing of DOT right-of-way	Between $100-$200 per crossing	Prior to construction	http://www.dot.nd.gov/divisions/design/utilitypermits.htm
North Dakota Highway Patrol		Overheight/Overweight Permit	Required to transport oversize loads on state maintained roads.	Project construction requires oversize/ overweight truck loads.	Depends on load being carried between $20 and $100	Prior to construction	http://www.nd.gov/ndhp/permits/permits.html
State Historic Preservation Office (SHPO) and the Office of the State Archaeologist (OSA)	Pursuant to North Dakota Century Code 55-10; 49-22 and Section 106 Compliance	Review and Coordination	Field reviews for archaeological resources will likely be required by the North Dakota PSC as a condition of the Certificate of Site Compatibly. Section 106 Compliance is required if there is a federal permit or approval	Certificate of Site Compatibility Review by the ND PSC or federal permit/approval.	No Fee	Prior to construction	

Regulatory Authority	Statute	Permit/ Approval	Description	Trigger	Fee	Application Timeline	Website
North Dakota Department of Game and Fish		Wildlife conservation recommendations	Consultation will be required as part of by North Dakota PSC review of the Certificate of Site Compatibility	Certificate of Site Compatibility Review by ND PSC	No Fee		
North Dakota State Water Commission		Temporary Water Permit	Required for temporary use of surface or groundwater	Construction water used onsite		Prior to construction; permit is valid for up to one year	http://www.swc.state.nd.us/4dlink9/4dcgi/GetSubCategoryRecord/Permits/Water%20Permits
Local Regulations							
Stark and Morton County	County Regulations (Morton and Stark)	Conditional Use Permit	All proposed wind energy facilities in an agricultural zone must apply for a conditional use permit with County Planning Commission	Wind energy facility in agricultural zone	Contact County	Prior to construction. Process takes about 3 months.	
	County Regulations-Morton Only	Wind Energy Facilities	Construction requirements (materials used, proximity to buildings, etc). Setbacks are listed in Table 10.	Wind development	N/A	Prior to construction	http://www.co.morton.nd.us/vertical/Sites/%7B90CBB59C-38EA-4D41-861A-81C9D EBD6022%7D/uploads/%7B5A74CC6D-8D37-4C41-B6 76-1AE4A6040CDB%7D. PDF
	County Regulations (Morton and Stark)	Road Crossing/ Encroachment Permit	Required for installation of service connections or extensions of existing underground utilities including crossing of county highways or for placing temporary obstructions on the Right-of-Way.	Working in or utility crossing of county road right-of-way	Contact County	Prior to construction	
	County Regulations (Morton and Stark)	Building Permit	Required if O&M building is constructed	O&M Building	Contact County	Prior to construction	

4.0 REFERENCES

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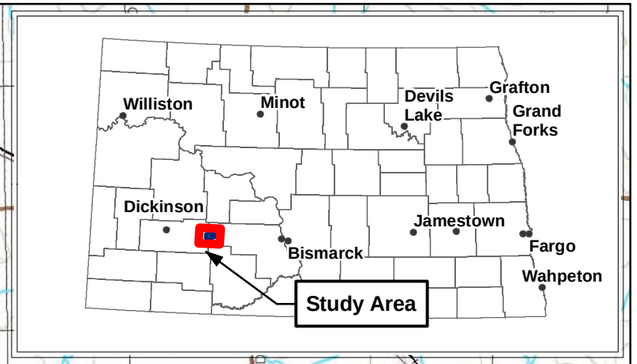
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Sunflower Wind Project

Figure 1 Study Area Location

Morton and Stark Counties, North Dakota



Study Area Boundary
Local Road
Unimproved Road
Highway
Railroad
Section Boundary
Township Boundary
Municipal Boundary
County Boundary
Stream/River

N

0 1 2
Miles

0 2,000 4,000
Meters

0 4,000 8,000
Feet

INFINITY WIND POWER

HDR

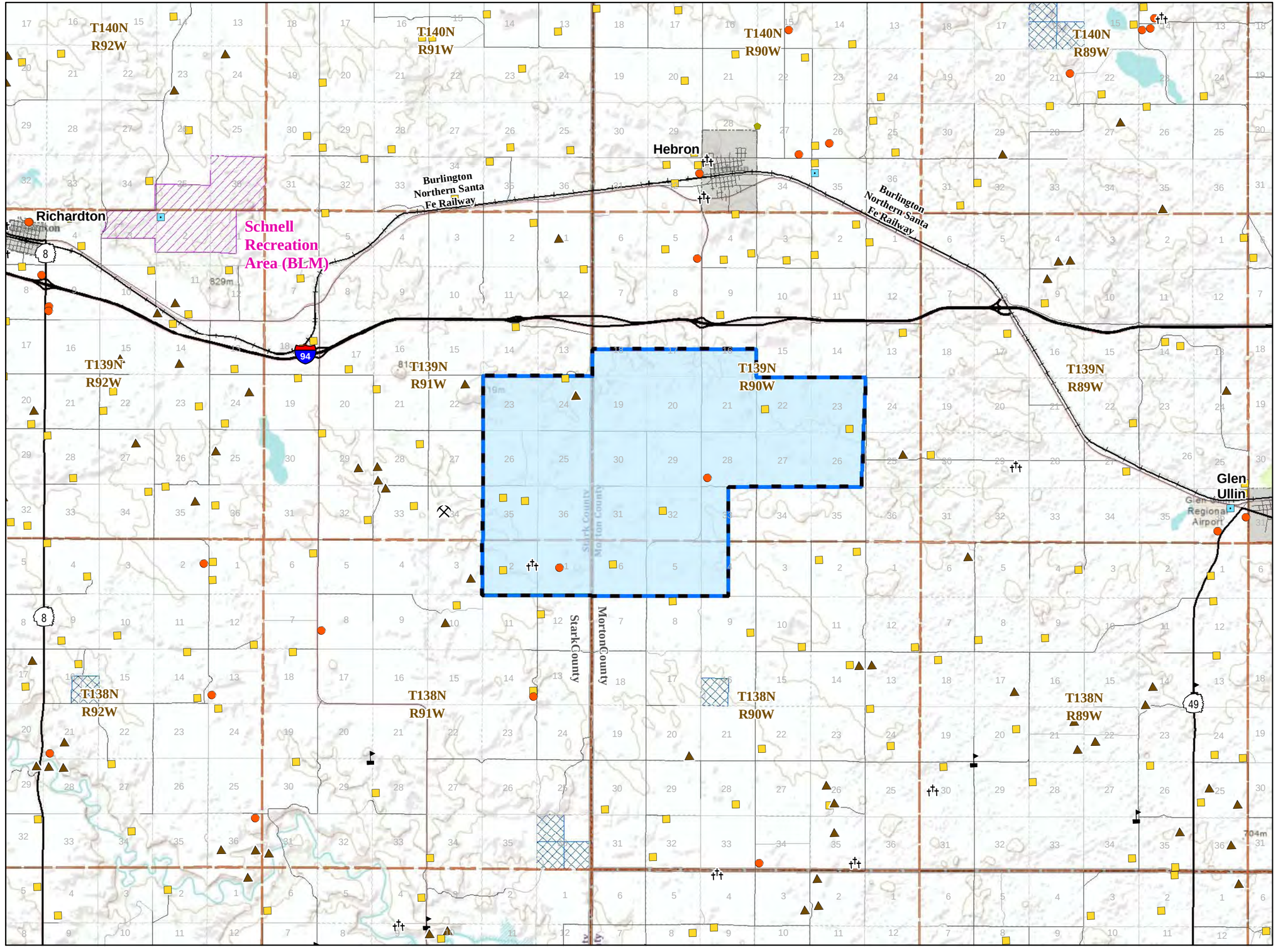
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Sunflower Wind Project

Figure 2 Public Land & Resource Map

Morton and Stark Counties, North Dakota



- Study Area Boundary
- Dwelling other than farm
- Farm Unit
- Recreation
- Dump or Landfill
- Cemetery
- Gravel Pit
- Mine Shaft or Drift
- School
- US Bureau of Land Management
- State Trust Land
- Highway
- Railroad
- Local Road
- Unimproved Road
- Section Boundary
- Township Boundary
- County Boundary
- Municipal Boundary

N

0 0.5 1 2 3
Miles

0 1,000 2,000 4,000
Meters

0 3,750 7,500 15,000
Feet

INFINITY WIND POWER

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Sunflower Wind Project

Figure 3
Land Cover

Morton and Stark Counties,
North Dakota

T139N R91W
T139N R90W
T138N R91W
T138N R90W
Stark County
Morton County

- Study Area Boundary
- Local Road
- Major Highway
- Railroad
- Section Boundary
- Township Boundary
- County Boundary

Land Cover Type

- Cropland
- Developed
- Planted Herbaceous Perennials
- Prairie
- Shrubland
- Wetland
- Woodland
- Barren Land

N

0 0.5 1
Miles

0 500 1,000
Meters

0 2,500 5,000
Feet

INFINITY WIND POWER
HDR

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Sunflower Wind Project

Figure 4
Airport and Utilities Map

Morton and Stark Counties,
North Dakota

SUNSET STRIP
SMITH STRIP
BEULAH
Beulah
McLean County
Dunn County
Mercer County
Oliver County
Center
MINNKOTA PRIVATE
WOLBERG'S PRIVATE
JURGENS AIRSTRIP
RICHARDTON
Dickinson
Richardton
Taylor
Hebron
CHASE AIRSTRIP
Gladstone
BRANDS
GLEN ULLIN RGNL
Glen Ullin
New Salem
Morton County
DICKINSON - THEODORE ROOSEVELT RGNL
Stark County
FITTERER'S STRIP
Almont
New England
Hettinger County
Grant County
Regent
Mott
New Leipzig
Elgin
ELGIN MUNI
Carson
Flasher

Study Area Boundary
25-mile Radius
Public Airport
Private Airport
Electric Utility
Gas Utility
Highway
Railroad
Municipal Boundary
County Boundary

N

0 5 10
Miles

0 5,000 10,000
Meters

0 20,000 40,000
Feet

INFINITY WIND POWER

HDR

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Sunflower Wind Project

Figure 5 FCC and Utilities Map

Morton and Stark Counties, North Dakota

T140N R92W
T140N R91W
T140N R90W
T140N R89W
Hebron
MDU-41.6
T139N R91W
T139N R90W
T139N R89W
T139N R92W
WAPA-230
Stark County
Morton County
T138N R91W
T138N R90W
T138N R89W
T138N R92W
T137N R89W
94
49
Dickinson-Theodore Roosevelt Regional Airport

- Microwave Tower
- Land Mobile Tower (Private)
- Land Mobile Tower (Commercial)
- Cellular Tower
- ASR Tower
- Study Area Boundary
- Electric Transmission Lines
- Gas Pipeline
- Highway
- Railroad
- Municipal Boundary
- County Boundary

N

0 1 2
Miles

0 2,000 4,000
Meters

0 5,000 10,000
Feet

INFINITY WIND POWER

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Sunflower Wind Project

Figure 6
Topography

Morton and Stark Counties,
North Dakota

T139N
R91W

T139N
R90W

Stark County
Morton County

Rest Area
Custer Lookout
Long Butte
Radio Towers
Springs
Spring
Heart Butte Creek
Heart Butte Cr
Gravel Pit

Study Area Boundary
Highway
Railroad
Section Boundary
Township Boundary
Municipal Boundary
County Boundary
Stream/River

N

0 0.5 1
Miles

0 1,000 2,000
Meters

0 2,000 4,000
Feet

INFINITY WIND POWER

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Sunflower Wind Project

Figure 7
Soils

Morton and Stark Counties,
North Dakota

T139N R91W
T139N R90W
T138N R91W
T138N R90W
Morton County
Stark County
Heart Butte Creek

Study Area Boundary

Farmland Classification (SSURGO)

- Farmland of statewide importance
- All areas are prime farmland
- Not prime farmland
- Not Classified

Section Boundary
Township Boundary
Municipal Boundary
County Boundary
Stream/River

N

0 0.5 1
Miles

0 500 1,000
Meters

0 2,000 4,000
Feet

INFINITY WIND POWER

HDR

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Sunflower Wind Project

Figure 8
Surface Water & Wetlands Map

Morton and Stark Counties,
North Dakota

- Study Area Boundary

NWI Wetlands

- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Lake, Pond or River
- Other

- Local Road
- Unimproved Road
- Highway
- Railroad
- Section Boundary
- Township Boundary
- Municipal Boundary
- County Boundary
- Stream/River

N

0 0.5 1
Miles

0 1,000 2,000
Meters

0 2,000 4,000
Feet

INFINITY WIND POWER

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Sunflower Wind Project

Figure 9 Whooping Crane and Breeding Bird Survey Map

Morton and Stark Counties, North Dakota

Golden Valley
Zap
Beulah
Beulah
Hazen
Billings County
Dunn County
Dunn County
Mercer County
Mercer County
Oliver County
Center
Dunn County
Mercer County
Morton County
Oliver County
Morton County
Stark County
Taylor
Hebron
South Heart
Gladstone
Glen Ullin
New Salem
Stark County
Morton County
Glenn Ullin Breeding Bird Survey Route
Almont
Morton County
Grant County
Stark County
Slope County
Stark County
Hettinger County
New England
Hettinger County
Grant County
Carson
Flasher
New Leipzig
Elgin
Mott
Leith

Whooping Crane Migration Corridor

Study Area
Dickinson
Bismarck

Study Area Boundary
Confirmed Whooping Crane Sitings (Through Fall 2007)
Breeding Bird Survey Route
Highway
Railroad
Municipal Boundary
County Boundary

US Migration Corridor

Buffer Miles

- 40 mi (75.08%)
- 50 mi (79.44%)
- 65 mi (85.04%)
- 85 mi (89.83%)
- 110 mi (94.83%)

N

0 4 8
Miles

0 7,500 15,000
Meters

0 35,000 70,000
Feet

INFINITY WIND POWER

HDR

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Appendix A –
Department of Defense Preliminary Screening Tool Results

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Federal Aviation Administration

« OE/AAA

DoD Preliminary Screening Tool

Disclaimer:

- The DoD Preliminary Screening Tool enables developers to obtain a preliminary review of potential impacts to Long-Range and Weather Radar(s), Military Training Route(s) and Special Airspace(s) prior to official OE/AAA filing. This tool will produce a map relating the structure to any of the DoD/DHS and NOAA resources listed above. The use of this tool is **100 % optional** and will provide a first level of feedback and single points of contact within the DoD/DHS and NOAA to discuss impacts/mitigation efforts on the military training mission and NEXRAD Weather Radars. **The use of this tool does not in any way replace the official FAA processes/procedures.**

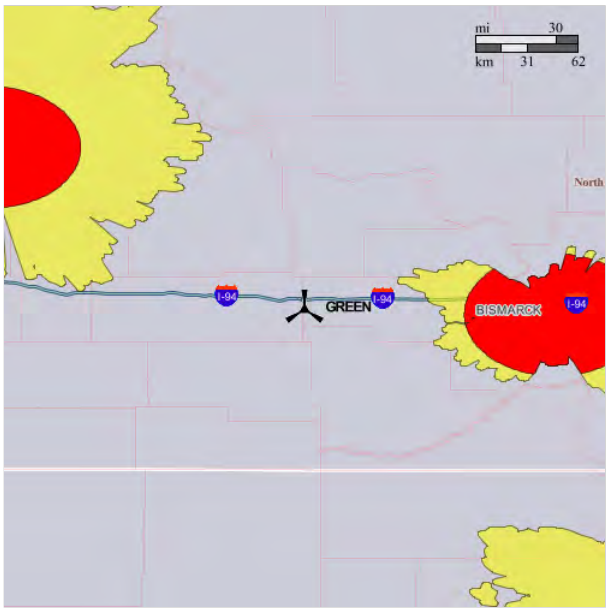
Instructions:

- Select a screening type for your initial evaluation. Currently the system supports pre-screening on:
  -Air Defense and Homeland Security radars(Long Range Radar)
  -Weather Surveillance Radar-1988 Doppler radars(NEXRAD)
  -Military Operations
- Enter either a single point or a polygon and click submit to generate a long range radar analysis map.
- Military Operations is only available for a single point.
- At least three points are required for a polygon, with an optional fourth point.
- The largest polygon allowed has a maximum perimeter of 100 miles.

Screening Type: Long Range Radar **Geometry Type:** Single Point

Point	Latitude				Longitude			
	Deg	Min	Sec	Dir	Deg	Min	Sec	Dir
1	46	49	24.54	N	102	5	6.31	W

Horizontal Datum: NAD83



Map Legend:

- **Green:** No anticipated impact to Air Defense and Homeland Security radars. Aeronautical study required.
- **Yellow:** Impact likely to Air Defense and Homeland Security radars. Aeronautical study required.
- **Red:** Impact highly likely to Air Defense and Homeland Security radars. Aeronautical study required.

Federal Aviation Administration

« OE/AAA

DoD Preliminary Screening Tool

Disclaimer:

- The DoD Preliminary Screening Tool enables developers to obtain a preliminary review of potential impacts to Long-Range and Weather Radar(s), Military Training Route(s) and Special Airspace(s) prior to official OE/AAA filing. This tool will produce a map relating the structure to any of the DoD/DHS and NOAA resources listed above. The use of this tool is **100 % optional** and will provide a first level of feedback and single points of contact within the DoD/DHS and NOAA to discuss impacts/mitigation efforts on the military training mission and NEXRAD Weather Radars. **The use of this tool does not in any way replace the official FAA processes/procedures.**

Instructions:

- Select a screening type for your initial evaluation. Currently the system supports pre-screening on:
  -Air Defense and Homeland Security radars(Long Range Radar)
  -Weather Surveillance Radar-1988 Doppler radars(NEXRAD)
  -Military Operations
- Enter either a single point or a polygon and click submit to generate a long range radar analysis map.
- Military Operations is only available for a single point.
- At least three points are required for a polygon, with an optional fourth point.
- The largest polygon allowed has a maximum perimeter of 100 miles.

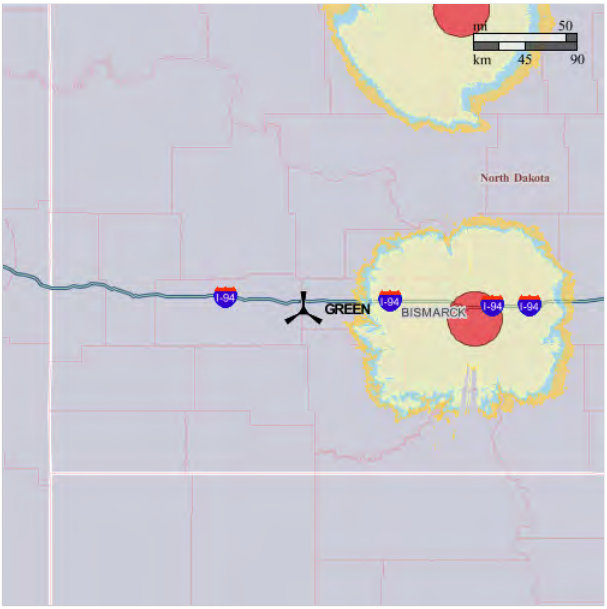
Screening Type: NEXRAD **Geometry Type:** Single Point

Point	Latitude				Longitude			
	Deg	Min	Sec	Dir	Deg	Min	Sec	Dir
1	46	49	24.54	N	102	5	6.31	W

Horizontal Datum: NAD83

Map Legend:

- **Green:** Minimal to no impact to Weather Surveillance Radar-1988 Doppler (WSR-88D) weather radar operations. National Telecommunications & Information Administration (NTIA) notification advised.
- **Yellow:** RLOS Coverage At or Below 130m AGL. Impact likely to WSR-88D weather radar operations. Turbines likely in radar line of sight. Impact study required. NTIA notification advised.
- **Blue:** RLOS Coverage At or Below 160m AGL. Impact likely to WSR-88D weather radar operations. Turbines likely in radar line of sight. Impact study required. NTIA notification advised.
- **Gold:** RLOS Coverage At or Below 200m AGL. Impact likely to WSR-88D weather radar operations. Turbines likely in radar line of sight. Impact study required. NTIA notification advised.
- **Red:** Impact highly likely to WSR-88D weather radar operations and wind turbine electronics. Turbines likely in radar line of sight. Aeronautical study required. NTIA notification strongly advised.



For more information, or to discuss the screening results, please contact NOAA at wind.energy.matters@noaa.gov

Federal Aviation Administration

« OE/AAA

DoD Preliminary Screening Tool

Disclaimer:

- The DoD Preliminary Screening Tool enables developers to obtain a preliminary review of potential impacts to Long-Range and Weather Radar(s), Military Training Route(s) and Special Airspace(s) prior to official OE/AAA filing. This tool will produce a map relating the structure to any of the DoD/DHS and NOAA resources listed above. The use of this tool is **100 % optional** and will provide a first level of feedback and single points of contact within the DoD/DHS and NOAA to discuss impacts/mitigation efforts on the military training mission and NEXRAD Weather Radars. **The use of this tool does not in any way replace the official FAA processes/procedures.**

Instructions:

- Select a screening type for your initial evaluation. Currently the system supports pre-screening on:
  -Air Defense and Homeland Security radars(Long Range Radar)
  -Weather Surveillance Radar-1988 Doppler radars(NEXRAD)
  -Military Operations
- Enter either a single point or a polygon and click submit to generate a long range radar analysis map.
- Military Operations is only available for a single point.
- At least three points are required for a polygon, with an optional fourth point.
- The largest polygon allowed has a maximum perimeter of 100 miles.

Screening Type: Military Operations **Geometry Type:** Single Point

Point	Latitude				Longitude			
	Deg	Min	Sec	Dir	Deg	Min	Sec	Dir
1	46	49	24.54	N	102	5	6.31	W

Horizontal Datum: NAD83

The preliminary review of your proposal does not return any likely impacts to military airspace. Please contact Dr. Thomas (Thom) H. Rennie at the USAF Regional Enviromental Coordinator at (214)767-4678 for confirmation and documentation.

The preliminary review of your proposal does not return any likely impacts to military airspace. Please contact Anthony M. Parisi, PE at the USN Regional Enviromental Coordinator at (805)989-9209 for confirmation and documentation.

The preliminary review of your proposal does not return any likely impacts to military airspace. Please contact LTC Pete Kowal at the USA Regional Enviromental Coordinator at (425)227-2955 for confirmation and documentation.

The preliminary review of your proposal does not return any likely impacts to military airspace. Please contact Mr. Pat Christman at the USMC Regional Enviromental Coordinator at (760)725-2674 for confirmation and documentation.

This is a preliminary review of your proposal and does not preclude official FAA processes.
Your search data is not retained and the privacy of all your searches is assured.



Any questions interpreting the map, please email Steve Sample with your question/s and phone number at steven.sample@pentagon.af.mil

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Appendix B –
Economic Coal Deposit Maps

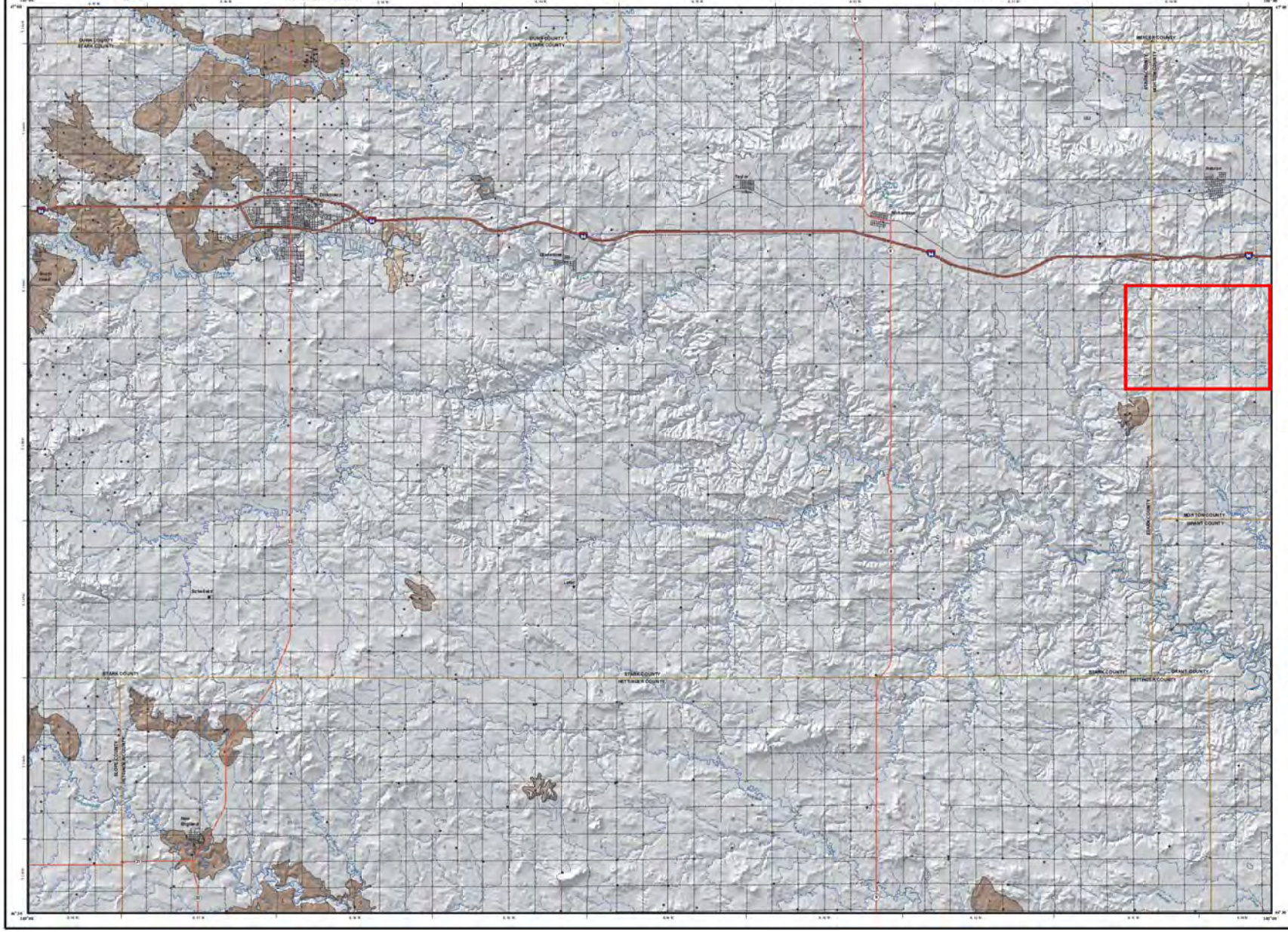
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North Dakota Geological Survey
100K Series: Dksn - e

Lignite Reserves

Dickinson 100K Sheet, North Dakota

Edward C. Murphy, State Geologist
Lynn D. Helms, Director Dept. of Mineral Resources



Edward C. Murphy
2005

There are just over one billion tons of economically mineable lignite within the Dickinson 100k Sheet (Murphy et al., in press). As much as 800 million tons of this reserve may be attributable to the Lehigh bed which extends throughout the northwestern corner of this map sheet. The Lehigh coal is more than 25 feet thick north of Dickinson (JK Ranch Deposit) and is 15 to 17 feet thick in the South Heart area (Murphy et al., 2000). JK Ranch (356 million tons), Belfield (201 million tons), West Dickinson (158 million tons), and Duck Creek (92 million tons) are the largest deposits in this map sheet (Murphy et al., in press).

The Lehigh bed is overlain by the Dickinson bed; both seams were mined in the Dickinson area. Underground mining began in the Lehigh area in the 1880s and switched to surface mining in the 1940s. The last coal mine to operate in Stark County was the JK Ranch mine which ceased operation in 1990. Great Northern Properties is currently studying the feasibility of establishing a coal mine and constructing a power plant south of the town of South Heart.

References
Murphy, E.C., Kruger, N.W., and Goven, G.E., 2000, The major coals in Billings, Golden Valley, and Stark counties, North Dakota: North Dakota Geological Survey Open-File Report 00-3, 42 p.
Murphy, E.C., 2006, in press, The Lignite Reserves of North Dakota: North Dakota Geological Survey Report of Investigation No. 104.

Study Area (HDR)

UNIT DESCRIPTIONS

Geology Undifferentiated

Area of Mined Lignite

Economic Coal Deposits

Economic coal deposits are those that meet the minimum criteria established by coal companies operating surface mines in North Dakota. These economic criteria include a minimum cumulative coal thickness of ten feet typically occuring in less than two beds, a minimum individual bed thickness of at least 2.5 feet, a ratio of overburden to coal thickness of not more than 10:1, a minimum of 25 feet of overburden, and a maximum depth to coal of approximately 150 feet.

Geologic Symbols

Extent of Local Lignite Reserves

Data Points

Includes coal exploration NDGS/USGS drill holes, test-surface mineral drill holes, oil & gas wells, and ND SWC drill holes.

Other Features

Water
Water - Intermittent
Water - Inundated
River/Stream - Perennial
River/Stream - Intermittent
Section Corners
County Boundary
Interstate Highway
State Highway
Paved Road
Unpaved Road

Scale 1:100,000

0 1 2 3 4
Miles

Mercator Projection 1927 North American Datum
Standard parallel 46°30 Central meridian 102°30
USGS NED Shaded Relief - Vertical Exaggeration 9x

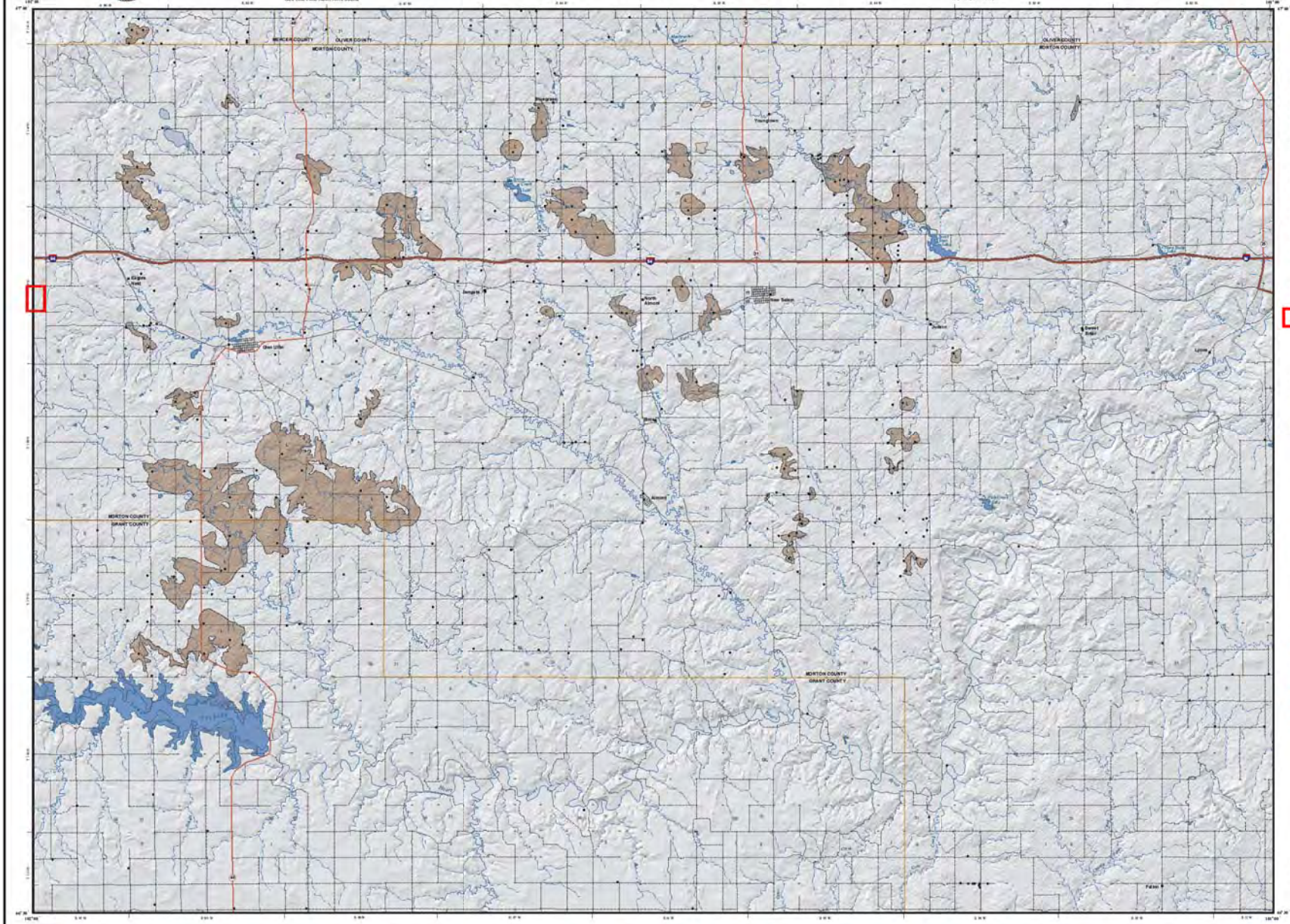
The North Dakota Geological Survey can publish on demand 1:24,000 scale quadrangle maps (24k - e series) of the mineable coal deposits in the Dickinson 100k sheet. These maps would include information on mineable coal thicknesses.

This project was supported, in part, by the U.S. Geological Survey, Department of Interior, under assistance awards 02ERAG0016 and 05ERAG0053.

Cartography | Compilation: D.Ayer, L.Anderson

North Dakota Geological Survey
100K Series: GlnU - c

Lignite Reserves
Glen Ullin 100K Sheet, North Dakota



Edward C. Murphy, State Geologist
Lynn D. Helms, Director Dept. of Mineral Resources

Edward C. Murphy

2006

The Glen Ullin 100k sheet contains approximately 726 million tons of economically mineable lignite. The Heart Butte Creek (T137N, Rs 88 & 89W in Grant County) and Heart Butte Creek North (T138N, Rs 88 & 89W in Morton County) deposits account for approximately one-third of the mineable coal (275 million tons) in this map sheet. The Sweet Briar deposit, west-northwest of Sweet Briar Lake, contains about 90 million tons and is the second largest deposit in this area. The Twin Buttes deposit, three miles northwest of Dengate, is the only other deposit in the Glen Ullin sheet that exceeds 50 million tons (59 million). The thickest known coal within this sheet is twelve feet.

The Sentinel Butte and Bullion Creek Formations are the dominant rock units at the surface throughout this map sheet. According to the records of the North Dakota Public Service Commission, approximately 75 coal mines operated at one time or another in this area. Many of the mines operated for a short period of time and produced less than 100 tons of coal per year. The earliest coal mine in North Dakota was opened near Sims in 1873. The McCormick Coal Company, later the Deep Mine Coal Company, mined a nine-foot-thick coal at a depth of 200 feet by underground methods along the western outskirts of the town of New Salem. The mine operated from 1922 to 1951. Coal mining ceased within the Glen Ullin sheet in the 1960s when the Richter Mine (T139N, R88W, Section 13) and Carbon Mine near Almont closed.

References
Murphy, E.C., 2006, The Lignite Reserves of North Dakota: North Dakota Geological Survey, Report of Investigation No. 106.

Study Area (HDR)

UNIT DESCRIPTIONS

Geology Undifferentiated

Geology Undifferentiated

Economic Coal Deposits

Economic coal deposits are those that meet the minimum criteria established by coal companies operating surface mines in North Dakota. These economic criteria include a minimum cumulative coal thickness of ten feet-typically occuring in less than two beds, a minimum individual bed thickness of at least 2.5 feet, a ratio of overburden to coal thickness of not more than 10:1, a minimum of 25 feet of overburden, and a maximum depth to coal of approximately 150 feet.

Geologic Symbols

- Extent of Local Lignite Reserves
- Data Points

Includes coal exploration NDGS/USGS drill holes, sub-surface mineral drill holes, oil & gas wells, and NDSWC drill holes.

Other Features

- Water
- Water - Intermittent
- Water - Inundated
- River/Stream - Perennial
- River/Stream - Intermittent
- Section Corners
- County Boundary
- Interstate Highway
- State Highways
- Paved Road
- Unpaved Road

Scale 1:100,000

0 1 2 3 4

Miles

Mercator Projection 1927 North American Datum
Standard parallel 46°30 Central meridian 101°30
USGS NED Shaded Relief - Vertical Exaggeration 9x

The North Dakota Geological Survey can publish on demand 1:24,000 scale quadrangle maps (24k - c series) of the mineable coal deposits in the Glen Ullin 100k sheet. These maps would include information on mineable coal thicknesses.

This project was supported, in part, by the U.S. Geological Survey, Department of Interior, under assistance awards 02ERAG0016 and 05ERAG0053.

Appendix C –
North American Breeding Bird Survey Results

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Species List

North American Breeding Bird Survey Route

GLEN ULLIN

Species	Birds/route	Route Change	Regional Change	Id Tips
Pied-billed Grebe *Podilymbus podiceps*	0.27	Route Change	Regional Change	Id Tips
Double-crest. Cormorant *Phalacrocorax auritus*	0.47	Route Change	Regional Change	Id Tips
American Bittern *Botaurus lentiginosus*	0.60	Route Change	Regional Change	Id Tips
Turkey Vulture *Cathartes aura*	0.07	Route Change	Regional Change	Id Tips
Canada Goose *Branta canadensis*	8.13	Route Change	Regional Change	Id Tips
Gadwall *Anas strepera*	1.33	Route Change	Regional Change	Id Tips
Mallard *Anas platyrhynchos*	22.27	Route Change	Regional Change	Id Tips
Blue-winged Teal *Anas discors*	1.47	Route Change	Regional Change	Id Tips
Northern Shoveler *Anas clypeata*	0.13	Route Change	Regional Change	Id Tips
Northern Pintail *Anas acuta*	0.67	Route Change	Regional Change	Id Tips
Northern Harrier *Circus cyaneus*	3.20	Route Change	Regional Change	Id Tips
Cooper's Hawk *Accipiter cooperii*	0.07	Route Change	Regional Change	Id Tips
Swainson's Hawk *Buteo swainsoni*	2.07	Route Change	Regional Change	Id Tips
Red-tailed Hawk *Buteo jamaicensis*	1.00	Route Change	Regional Change	Id Tips
Ferruginous Hawk	0.27	Route Change	Regional Change	Id Tips

Buteo regalis				
American Kestrel *Falco sparverius*	0.47	Route Change	Regional Change	Id Tips
Prairie Falcon *Falco mexicanus*	0.07	Route Change	Regional Change	Id Tips
Gray Partridge *Perdix perdix*	0.93	Route Change	Regional Change	Id Tips
Ring-necked Pheasant *Phasianus colchicus*	102.73	Route Change	Regional Change	Id Tips
Sharp-tailed Grouse *Tympanuchus phasianellus*	2.60	Route Change	Regional Change	Id Tips
Wild Turkey *Meleagris gallopavo*	0.67	Route Change	Regional Change	Id Tips
Sora *Porzana carolina*	0.40	Route Change	Regional Change	Id Tips
American Coot *Fulica americana*	0.47	Route Change	Regional Change	Id Tips
Killdeer *Charadrius vociferus*	9.60	Route Change	Regional Change	Id Tips
Willet *Catoptrophorus semipalmatu*	0.33	Route Change	Regional Change	Id Tips
Upland Sandpiper *Bartramia longicauda*	16.67	Route Change	Regional Change	Id Tips
Marbled Godwit *Limosa fedoa*	4.53	Route Change	Regional Change	Id Tips
Common Snipe *Gallinago gallinago*	3.53	Route Change	Regional Change	Id Tips
Wilson's Phalarope *Phalaropus tricolor*	0.80	Route Change	Regional Change	Id Tips
Ring-billed Gull *Larus delawarensis*	0.73	Route Change	Regional Change	Id Tips
Rock Dove *Columba livia*	2.47	Route Change	Regional Change	Id Tips
Mourning Dove *Zenaida macroura*	84.87	Route Change	Regional Change	Id Tips
Black-billed Cuckoo *Coccyzus erythropthalmus*	0.13	Route Change	Regional Change	Id Tips
Great Horned Owl *Bubo virginianus*	0.53	Route Change	Regional Change	Id Tips
Burrowing Owl *Athene cunicularia*	0.33	Route Change	Regional Change	Id Tips
Short-eared Owl *Asio flammeus*	1.07	Route Change	Regional Change	Id Tips

Common Nighthawk *Chordeiles minor*	0.80	Route Change	Regional Change	Id Tips
Belted Kingfisher *Ceryle alcyon*	0.13	Route Change	Regional Change	Id Tips
Red-headed Woodpecker *Melanerpes erythrocephalus*	0.07	Route Change	Regional Change	Id Tips
Downy Woodpecker *Picoides pubescens*	0.07	Route Change	Regional Change	Id Tips
Hairy Woodpecker *Picoides villosus*	0.07	Route Change	Regional Change	Id Tips
Northern Flicker *Colaptes spp.*	0.67	Route Change	Regional Change	Id Tips
Willow Flycatcher *Empidonax traillii*	0.47	Route Change	Regional Change	Id Tips
Willow/Alder Flycatcher *Empidonax spp.*	0.47	Route Change	Regional Change	Id Tips
Least Flycatcher *Empidonax minimus*	0.80	Route Change	Regional Change	Id Tips
Say's Phoebe *Sayornis saya*	1.53	Route Change	Regional Change	Id Tips
Western Kingbird *Tyrannus verticalis*	23.00	Route Change	Regional Change	Id Tips
Eastern Kingbird *Tyrannus tyrannus*	23.73	Route Change	Regional Change	Id Tips
Loggerhead Shrike *Lanius ludovicianus*	0.73	Route Change	Regional Change	Id Tips
Warbling Vireo *Vireo gilvus*	1.53	Route Change	Regional Change	Id Tips
Red-eyed Vireo *Vireo olivaceus*	0.07	Route Change	Regional Change	Id Tips
Black-billed Magpie *Pica pica*	0.33	Route Change	Regional Change	Id Tips
American Crow *Corvus brachyrhynchos*	1.47	Route Change	Regional Change	Id Tips
Horned Lark *Eremophila alpestris*	134.13	Route Change	Regional Change	Id Tips
Tree Swallow *Tachycineta bicolor*	1.07	Route Change	Regional Change	Id Tips
N. Rough-winged Swallow *Stelgidopteryx serripennis*	3.93	Route Change	Regional Change	Id Tips
Bank Swallow *Riparia riparia*	40.07	Route Change	Regional Change	Id Tips
Cliff Swallow	7.20	Route Change	Regional Change	Id Tips

Petrochelidon pyrrhonota				
Barn Swallow *Hirundo rustica*	11.60	Route Change	Regional Change	Id Tips
Black-capped Chickadee *Poecile atricapillus*	0.07	Route Change	Regional Change	Id Tips
Rock Wren *Salpinctes obsoletus*	0.20	Route Change	Regional Change	Id Tips
House Wren *Troglodytes aedon*	3.33	Route Change	Regional Change	Id Tips
Sedge Wren *Cistothorus platensis*	0.20	Route Change	Regional Change	Id Tips
Eastern Bluebird *Sialia sialis*	0.07	Route Change	Regional Change	Id Tips
American Robin *Turdus migratorius*	12.40	Route Change	Regional Change	Id Tips
Gray Catbird *Dumetella carolinensis*	0.07	Route Change	Regional Change	Id Tips
Brown Thrasher *Toxostoma rufum*	1.33	Route Change	Regional Change	Id Tips
European Starling *Sturnus vulgaris*	3.40	Route Change	Regional Change	Id Tips
Sprague's Pipit *Anthus spragueii*	0.20	Route Change	Regional Change	Id Tips
Cedar Waxwing *Bombycilla cedrorum*	1.53	Route Change	Regional Change	Id Tips
Yellow Warbler *Dendroica petechia*	4.13	Route Change	Regional Change	Id Tips
Common Yellowthroat *Geothlypis trichas*	3.73	Route Change	Regional Change	Id Tips
Chipping Sparrow *Spizella passerina*	0.53	Route Change	Regional Change	Id Tips
Clay-colored Sparrow *Spizella pallida*	3.27	Route Change	Regional Change	Id Tips
Vesper Sparrow *Pooecetes gramineus*	4.53	Route Change	Regional Change	Id Tips
Lark Sparrow *Chondestes grammacus*	1.00	Route Change	Regional Change	Id Tips
Lark Bunting *Calamospiza melanocorys*	195.13	Route Change	Regional Change	Id Tips
Savannah Sparrow *Passerculus sandwichensis*	15.93	Route Change	Regional Change	Id Tips
Grasshopper Sparrow *Ammodramus savannarum*	23.67	Route Change	Regional Change	Id Tips

Baird's Sparrow *Ammodramus bairdii*	5.53	Route Change	Regional Change	Id Tips
Le Conte's Sparrow *Ammodramus leconteii*	0.07	Route Change	Regional Change	Id Tips
Song Sparrow *Melospiza melodia*	0.27	Route Change	Regional Change	Id Tips
Chestnut-col. Longspur *Calcarius ornatus*	68.53	Route Change	Regional Change	Id Tips
Black-headed Grosbeak *Pheucticus melanocephalus*	0.13	Route Change	Regional Change	Id Tips
Lazuli Bunting *Passerina amoena*	0.07	Route Change	Regional Change	Id Tips
Dickcissel *Spiza americana*	1.40	Route Change	Regional Change	Id Tips
Bobolink *Dolichonyx oryzivorus*	16.87	Route Change	Regional Change	Id Tips
Red-winged Blackbird *Agelaius phoeniceus*	110.87	Route Change	Regional Change	Id Tips
Western Meadowlark *Sturnella neglecta*	193.73	Route Change	Regional Change	Id Tips
Yellow-head. Blackbird *Xanthocephalus xanthocepha*	3.40	Route Change	Regional Change	Id Tips
Brewer's Blackbird *Euphagus cyanocephalus*	10.00	Route Change	Regional Change	Id Tips
Common Grackle *Quiscalus quiscula*	47.53	Route Change	Regional Change	Id Tips
Brown-headed Cowbird *Molothrus ater*	113.47	Route Change	Regional Change	Id Tips
Orchard Oriole *Icterus spurius*	1.00	Route Change	Regional Change	Id Tips
Baltimore Oriole *Icterus galbula*	0.80	Route Change	Regional Change	Id Tips
Bullock's Oriole *Icterus bullockii*	0.13	Route Change	Regional Change	Id Tips
American Goldfinch *Carduelis tristis*	4.07	Route Change	Regional Change	Id Tips
House Sparrow *Passer domesticus*	33.53	Route Change	Regional Change	Id Tips

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Appendix D –

US Fish and Wildlife Service

And

North Dakota Fish and Game Department

Response Letters

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"VARIETY IN HUNTING AND FISHING"

NORTH DAKOTA GAME AND FISH DEPARTMENT

100 NORTH BISMARCK EXPRESSWAY BISMARCK, NORTH DAKOTA 58501-5095 PHONE 701-328-6300 FAX 701-328-6352

RECEIVED

OCT 27 2010

HDR Engineering, Inc.

October 22, 2010

Bruce Moreira
Environmental Scientist
HDR Engineering, Inc.
701 Xenia Avenue South, Suite 600
Minneapolis, MN 55416

Dear Mr. Moriera:

RE: Antelope Hills Wind Project – Mercer County, North Dakota
Sunflower Wind Project – Morton & Stark Counties, North Dakota
Silver Sage Wind Project – Oliver County, North Dakota

The North Dakota Game and Fish Department has reviewed this project for wildlife concerns.

Our primary concern with wind power development is the disturbance of native prairie associated with construction of turbines, access roads, and other associated facilities. We ask that work within native prairie be avoided to the extent possible. This could include micro-siting turbines onto adjacent previously disturbed land, locating access roads on existing section line trails rather than across undisturbed native prairie, etc.

The Golden Valley Wildlife Management Area (WMA) is located in the west half of section 32, T146N, R89W, within the project boundary of the Antelope Hills Wind Project. The Wilbur Boldt WMA is located in the northeast quarter of section 34, T142N, R83W, immediately adjacent to the project boundary of the Silver Sage Wind Project. We ask that wind turbines be set-back from WMA's a sufficient distance to minimize possible disturbance to wildlife.

The National Wetland Inventory indicates numerous wetlands within the proposed project area. We recommend that any unavoidable wetland impacts be replaced in kind, above-ground appurtenances not be placed in wetland areas, and no alterations be made to existing drainage patterns.

We also recommend that routine monitoring for avian and bat mortality be included as part of the facility maintenance plan for the life of the project. We would appreciate being kept informed as this project progresses, and if possible, we would like the GPS coordinates for each turbine after the site has been established.

Sincerely,

Paul Schadewald
Chief
Conservation & Communication Division

js

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
3425 Miriam Avenue
Bismarck, North Dakota 58501

DEC 1 2010

Mr. Bruce Moreira
Environmental Scientist
HDR Engineering, Inc.
701 Xenia Avenue South, Suite 600
Minneapolis, Minnesota 55416

Re: Sunflower Wind Project, Morton, and Stark Counties
Antelope Hills Wind Project, Mercer County
Silver Sage Wind Project, Oliver County

Dear Mr. Moreira:

This is in response to your August 6, 2010, solicitation of views and comments letters for the proposed Sunflower, Antelope Hills, and Silver Sage Wind Projects. The proposed projects would be developed by Sunflower Wind Project, LLC, Antelope Hills Wind Project, LLC, and Silver Sage Wind Project, LLC, all subsidiaries of Infinity Wind Power (Infinity).

The projects would consist of typical wind project construction, including erecting wind turbines and constructing associated facilities such as gravel access roads, an underground electrical collector system, electrical collector substation, and overhead transmission lines. The final locations of the turbines, access roads, and the electrical collector system have not yet been identified.

The following areas may be affected by the project:

Sunflower Wind Project:
Morton County: T. 138 N., R. 90 W., Sections 4-6
T. 139 N., R. 90 W., Sections 16-23, 26-33
Stark County: T. 138 N., R. 91 W., Sections 1, 2
T. 139 N., R. 91 W., Sections 23-25, 35, 36

Antelope Hills Wind Project:
Mercer County: T. 145 N., R. 88 W., Section 6, 7
T. 145 N., R. 89 W., Section 1-12
T. 145 N., R. 90 W., Sections 1-2, 11, 12
T. 146 N., R. 89 W., Sections 29-32
T. 146 N., R. 86 W., Sections 14, 15, 21-28, 33-36

Silver Sage Wind Project:

Oliver County: T. 142 N., R. 83 W., Section 13, 14, 23-26, 35, 36
T. 142 N., R. 82 W., Sections 8, 16-18, 19-22, 27-34
T. 141 N., R. 82 W., Section 3, 4

We offer the following comments under the authority of and in accordance with the Migratory Bird Treaty Act (16 U.S.C. 703 et seq.), Bald and Golden Eagle Protection Act (BGEPA) (16 U.S.C. 668-668d, 54 Stat. 250), Executive Order 13186 "Responsibilities of Federal Agencies to Protect Migratory Birds", the Endangered Species Act (ESA) (16 U.S.C. 1531 et seq.), the National Wildlife Refuge System Improvement Act of 1997 (Public Law 105-57), and the National Environmental Policy Act (NEPA).

The U.S. Fish and Wildlife Service (Service) holds certain resources in trust and manages them for the benefit of the American people. These resources include migratory birds, inter-jurisdictional fish, federally-listed threatened and endangered species of plants and animals and their habitats, and units of the National Wildlife Refuge system. One goal of Service policy is that conservation of fish and wildlife resources receive equal consideration with other features of resource development, and that conservation actions are coordinated with those other forms of development. Another goal is to conserve, protect, and enhance fish and wildlife and their habitats to facilitate the balanced development of the Nation's natural resources.

Migratory Birds

Adequate consideration for avian and other wildlife resources early in the site evaluation process can help to minimize impacts and facilitate project review. Wind developers are encouraged to avoid impacts to prairie and other native habitats to the maximum extent practicable. Avoidance of impacts can be most effectively achieved by taking a landscape scale view, beginning with the process of prospecting for suitable sites for wind power development. Companies should assess not only those factors that indicate favorable conditions for development, such as a consistent wind resource, access to transmission, willing landowners, available financing, etc., but also anticipated impacts to wildlife and their habitats. Equal consideration should be accorded to wildlife resource conservation as to other features of development. When considering a project in a particular wind resource area, companies should use all available tools to ensure they have taken all practicable steps to avoid impacts to native habitats. This can be accomplished by utilizing GIS products depicting significant areas of contiguous prairie to site development in areas that are already impacted or fragmented. This analysis and potential site comparison should be accomplished prior to making any significant financial commitments, including entering into lease agreements with landowners. The Service's Interim Wind Turbine Siting Guidelines encourage project proponents to conduct a Potential Impact Index (PII) analysis on several potential sites within wind resource areas to assist in their selection of a wind power site that minimizes the potential to impact migratory birds and other wildlife. If the Service's interim guidelines were not used to evaluate potential sites for development, the project developer should indicate which method(s) they used to assess avian and other wildlife resource impacts before selecting this site for development. The alternatives analysis for the project should describe the

potential project sites that were evaluated and why they were rejected based on potential trust resource impacts.

The Service has coordinated with the Avian Power Line Interaction Committee (APLIC) to develop guidelines to assist companies in formulating Avian Protection Plans (APP). The guidelines can be accessed from APLIC's website at http://www.aplic.org/. These plans are utility specific and designed to reduce operational risks that result from avian interactions with electric utility facilities, but we suggest they may be adapted to wind energy facilities. Wind energy projects have the potential to negatively affect bats as well as avian species. Therefore, we encourage project developers to formulate an Avian and Bat Protection Plan (ABPP) if bats migrate through or may be present in the project area. The Service has issued an August 03, 2010, white paper with guidance related to the development of project specific ABPPs (enclosed) for renewable energy facilities. Some of the things that the Service looks for in an APP or ABPP are typically a statement of company policy confirming the company's commitment to work cooperatively towards the protection of migratory birds and bats; identification of the process under which the company will obtain and comply with all necessary permits, including, but not limited to, nest relocation, temporary possession, depredation, salvage/disposal, and scientific collection; discussion of the company's plan for monitoring and reporting all incidents of avian or bat injury or mortality; a commitment to make all reasonable efforts to construct and modify infrastructure to reduce the incidence of avian and bat mortality; a mechanism to review existing practices, ensuring quality control and allowing for adaptive management; and a plan for providing adequate training for all appropriate utility personnel. An APP or ABPP reporting system is important to help the company pinpoint areas of concern by tracking both the specific locations where mortalities may be occurring, as well as the extent of such mortalities and the remedial actions taken/planned to address identified problem areas.

To minimize the electrocution hazard to birds, the Service, with support from the Rural Utilities Service, recommends that new or updated overhead power lines be constructed in accordance with the current guidelines for preventing raptor electrocutions. The recommended guidelines can be found in "2006 Suggested Practices for Avian Protection on Power Lines". To increase power line visibility and reduce bird fatalities resulting from collisions with power lines, the Service recommends all new power lines that cross or run adjacent to rivers or large wetlands be modified according to "Mitigating Bird Collisions with Power Lines: The State of the Art in 1994". Both publications can be obtained by writing or calling the Edison Electric Institute, P.O. Box 266, Waldorf, Maryland 20604-0266, (1-800-334-5453) or visiting their website at www.eei.org.

The MBTA prohibits the taking, killing, possession, and transportation, (among other actions) of migratory birds, their eggs, parts, and nests, except when specifically permitted. While the Act has no provision for allowing unintentional take, the Service realizes that some birds may be killed during wind project construction and operation even if all known reasonable and effective measures to protect birds are used. The Office of Law Enforcement (OLE) carries out its mission to protect migratory birds through investigations and enforcement, as well as by fostering relationships with individuals, companies, and industries that have taken effective steps to avoid take of migratory birds and by encouraging others to implement measures to avoid take

of migratory birds. It is not possible to absolve individuals, companies, or agencies from liability even if they implement bird mortality avoidance or other similar protective measures. However, OLE focuses its resources on investigating and prosecuting individuals and companies that take migratory birds without identifying and implementing all reasonable, prudent, and effective measures to avoid that take. Companies are encouraged to work closely with Service biologists to identify available protective measures when developing project plans and/or avian protection plans, and to implement those measures prior to/during project construction and operation.

To the extent practicable, construction should be scheduled for late summer or fall/early winter so as not to disrupt waterfowl or other wildlife during the breeding season (February 1 to July 15). If work is proposed to take place during the breeding season or at any other time which may result in the take of migratory birds, their eggs, or active nests, the Service recommends that the project proponent take all practicable measures to avoid and minimize take, such as maintaining adequate buffers, to protect the birds until the young have fledged. The Service further recommends that if field surveys for nesting birds are conducted with the intent of avoiding take, that any documentation of the presence of migratory birds, eggs, and active nests, along with information regarding the qualifications of the biologist(s) performing the surveys, and any avoidance measures implemented at the project site be maintained. Should surveys or other available information indicate a significant impact to migratory birds, the Service requests that this office be contacted for further consultation on the extent of the impact and the long-term implications of the intended use of the project on migratory bird populations.

Bald and Golden Eagles

The BGEPA, prohibits anyone from taking bald eagles, including their parts, nests, or eggs without a permit issued by the Secretary of the Interior. The Act provides criminal and civil penalties for persons who take, possess, sell, purchase, barter, offer to sell, purchase or barter, transport, export or import, at any time or any manner, any bald eagle ... [or any golden eagle], alive or dead, or any part, nest, or egg thereof. The Act defines take as pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb. "Disturb means to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, 1) injury to an eagle, 2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior." In addition to immediate impacts, this definition also covers impacts that result from human-induced alterations initiated around a previously used nest site during a time when eagles are not present, if, upon the eagles return, such alterations agitate or bother an eagle to a degree that injures an eagle or substantially interferes with normal breeding, feeding, or sheltering habits and causes, or is likely to cause, a loss of productivity or nest abandonment.

While the bald eagle tends to be more closely associated with forested areas near water (Buehler 2000), they have been found nesting in single trees several miles from the nearest water body. Especially early in the nesting season, eagles can be very sensitive to disturbance near the nest site and may abandon their nest as a result of low disturbance levels, even from foot traffic. A

buffer of at least 1/2 mile should be maintained for all bald and golden eagle nests. A permit is required for any take of golden eagles or their nests. Permits to take golden eagles or their nests are available only for legitimate emergencies and as part of a program to protect golden eagles.

The Service is not currently aware of any bald or golden eagle nests in the immediate vicinity of the project areas. There are numerous documented bald eagle nests in Mercer, Morton, and Oliver Counties. The Service recommends surveying for bald and golden eagle nests out ½ mile from the proposed project areas. If any nests are found during the survey, the Service recommends that Infinity document the location and contact the Service for further coordination. The Service has developed national guidelines regarding bald eagle management and recommends that Infinity review these guidelines during the project planning process. The guidelines are available at http://www.fws.gov/southdakotafieldoffice/NationalBaldEagle ManagementGuidelines.pdf.

Threatened and Endangered Species

A list of federally threatened and endangered species that may occur within the proposed project's area of influence is (enclosure 1). This list fulfills requirements of the Service under the ESA.

If a Federal agency authorizes, funds, or carries out a proposed action, the responsible Federal agency, or its delegated agent, is required to evaluate whether the action "may affect" listed species or critical habitat. This includes funding available from the U.S. Treasury Department under the American Recovery and Reinvestment Act. If the Federal agency or its designated agent determines the action "may affect, is likely to adversely affect" listed species or result in destruction or adverse modification of critical habitat, the responsible Federal agency shall request formal section 7 consultation with this office. If the evaluation shows a "no effect" determination for listed species or critical habitat, further consultation is not necessary. If a private entity receives Federal funding for a construction project, or if any Federal permit or license is required, the Federal agency may designate the fund recipient or permittee as its agent for purposes of informal section 7 consultation. The funding, permitting, or licensing Federal agency is responsible to ensure that it's actions comply with the ESA, including obtaining concurrence from the Service for any action that may affect a threatened or endangered species or result in the destruction or adverse modification of designated critical habitat.

The Aransas Wood Buffalo Population (AWBP) of whooping cranes is the only self sustaining migratory population of whooping cranes remaining in the wild. These birds breed in the wetlands of Wood Buffalo National Park in Alberta and the Northwest Territories of northern Canada, and overwinter on the Texas coast. Whooping cranes in the AWBP annually migrate through North Dakota during their spring and fall migrations.

Endangered whooping cranes have been documented using stopover habitat in the vicinity of this proposed project area. The proposed project areas are located within those portions of the whooping crane migration corridor that include 75-95% of all confirmed whooping crane

sightings in North Dakota (enclosure 2). The presence of suitable roosting and feeding habitat for whooping cranes, and location within the whooping crane migration corridor, document the potential for whooping crane presence in the proposed project area. A wind energy project in this wind resource area has the potential to affect whooping cranes during their annual spring and fall migration through North Dakota. Potential effects may be direct (e.g. collision mortality) or indirect (e.g. avoidance of the site resulting in cranes seeking alternate habitat). The best available information indicates that whooping cranes avoid stopover habitat that is developed with wind energy appurtenances, particularly wind turbines. This avoidance may deny them the use of important habitat, and thus may result in an adverse effect in the form of harm by significant habitat modification. Whooping cranes use migration stopover habitat opportunistically and may not use the same stopovers annually. Whooping cranes often stop wherever they happen to be late in the day when they find conditions no longer suitable for migration. This tendency can make for a very unpredictable pattern of stopover use, depending on daily weather conditions. The Service recommends mapping wetlands at the project site within one (1) mile of all turbines, identifying potentially suitable whooping crane stopover habitat, and analyzing the potential effects to migrating whooping cranes from loss of use of this habitat for migration stopovers.

The interactions of whooping cranes with wind turbines and wind farms are currently not fully known, although it is expected that these large birds with relatively low maneuverability are susceptible to mortality via collisions with turbines. The highest known source of mortality to fledged whooping cranes is from striking power lines. Currently, collisions with power lines have accounted for the death or serious injury of at least 46 whooping cranes since 1956. If power lines will be constructed in association with this project, the Service recommends they be placed underground to avoid collision mortality. If underground construction is not practicable, we recommend installation and maintenance of visual marking devices on all new power lines within one mile of potentially suitable whooping crane stopover habitat, and an equal length of existing power line in the whooping crane migration corridor within one mile of potentially suitable whooping crane habitat.

Any party is responsible to ensure that their activities comply with pertinent Federal Laws, including the ESA, BGEPA, and the MBTA, even in the absence of a Federal nexus. If an activity is likely to result in "take" of a federally-listed species, the project proponent or landowner has the option of developing a Habitat Conservation Plan (HCP) in consultation with FWS. Using the voluntary guidelines referenced above will help to ensure compliance with the MBTA and BGEPA. The Service requests that Infinity respond to the Service indicating how Infinity intends to demonstrate compliance with applicable Federal wildlife laws. While the projects' potential for take has not yet been determined, Infinity should note that if "take" of any federally listed threatened or endangered species is anticipated, Infinity is advised to develop an HCP and apply for an Incidental Take Permit (ITP).

Fish and Wildlife Service Property Interests

The Service administers Waterfowl Production Areas owned in fee title as well as wetland and

grassland easements throughout North Dakota. A review of Service realty records for the proposed project area indicates Service property interests are located in the proposed project area. Wetland easements are legal agreements with private landowners that permanently protect wetland basins from being drained, burned, leveled, or filled. Grassland easements are legal agreements with landowners that permanently protect grassland vegetation, primarily native prairie, from being destroyed or developed. Grassland easements prevent these grasslands from being converted to cropland. Mowing, haying, and grass seed harvesting must be delayed on grassland easements until after July 15 each year to protect grassland nesting birds. The primary responsibility in protecting these interests is to review all proposed uses to ensure that the requests are compatible with Service easement regulations and various laws and policies. These comments and suggestions are made in an attempt to accomplish three goals: 1) avoid impacts to Service grassland and wetland easements in the project area as much as possible; 2) if unavoidable, ensure that any proposed turbine and associated infrastructure impacts (roads, buried collection lines, transmission lines, sub-stations, etc.) on any Service easement areas are kept to an absolute minimum; and 3) investigate all potential alternatives to eliminate or reduce impacts to easement areas to protect the integrity of the easement.

High Value Habitat Avoidance

High value wildlife habitat types in North Dakota include native prairies, wetlands, wooded draws, and riparian forests. We recommend that construction of wind towers and appurtenant facilities in the above habitat types be avoided whenever possible.

Since the 1800s, North Dakota has lost approximately 75 percent of its native grasslands, primarily due to crop production. Native prairie has significant natural resource values including:

- Provides habitat for a number of migratory and resident grassland birds whose populations are declining.
- Provides nesting habitat for millions of waterfowl.
- Contains 200-300 plant species, which provide genetic diversity important to agriculture and medicine.
- Provides habitat for thousands of insects including the Dakota skipper, a candidate species for listing under the ESA, and other butterflies (Ex: Regal fritillary, Tawny crescent).
- Crucial for soil and water conservation.
- Provides recreational opportunities (hunting, bird watching/wildlife observation, hiking).
- Living laboratories for scientific research.

Our review of NWI maps indicates that wetland areas are located within the project areas. NWI data can be accessed directly by visiting their website at (wetlands.fws.gov). Section 404 of the Clean Water Act regulates placement of fill materials in certain wetlands. A Corps of Engineers' 404 permit may be required if fill material will be placed in aquatic sites, including wetlands.

The project proponent should contact Mr. Dan Cimarosti, Regulatory Office, Corps of Engineers, 1513 South 12th Street, Bismarck, North Dakota 58504 (701-255-0015), to determine their permit requirements. If a 404 permit is required, the Service will also provide recommendations on this project to the Corps.

Construction activities should be conducted in a manner that will minimize impacts to the wildlife and the existing habitat in the project area. To help avoid impacts, we recommend the project proponent:

- Reseed disturbed native prairie with a diverse native grass/forb seed mixture. Obtain seed stock from nurseries within 250 miles of the project area to insure the particular cultivars are well adapted to the local climate.
- Minimize grassland disturbance by using fewer, larger turbines, and limiting new road construction.
- Design meteorological towers to be self standing (no guywires). If towers must be guyed, install and maintain appropriate visual line marking devices to reduce the potential for avian collision mortality
- Locate appurtenant facilities to avoid placement of fill in wetlands along the route.
- Install and maintain appropriate erosion control measures to reduce sedimentation and water quality degradation of wetlands and streams near the project area.
- Replace unavoidable wetland losses with functionally equivalent wetlands.

Research, Monitoring, and Assessment

We recommend project proponents conduct collision monitoring studies designed to determine the effect of several factors, such as site selection, turbine designs, the layout of wind plants, wind plant operations, habitat alteration, and changes in available perching and nesting sites, on bird deaths. Annual reports outlining the results of these monitoring studies should be submitted to this office. The Avian Subcommittee of the National Wind Coordinating Committee (NWCC) has developed a guidance document to assist wind energy developers in designing studies that will produce credible and comparable results of avian interaction with wind power plants. The NWCC document, "Studying Wind Energy/Bird Interactions: A Guidance Document. Metrics and methods for determining or monitoring potential impacts on birds at existing and proposed wind energy sites," can be obtained by contacting the National Wind Coordination Committee, c/o RESOLVE, 1255 23rd Street, Suite 275, Washington, D.C. 20037, or by visiting their website at (www.nationalwind.org).

We wish to stress the importance of implementing the recommendations contained in this letter, and of coordinating in a substantive and ongoing way with this office as your project planning proceeds. The way in which your company implements the Service's recommendations will determine whether or not your projects can be certified as complying with Federal wildlife laws.

Thank you for the opportunity to provide comments. If you require further information as

project planning proceeds, please contact Breanne Vander Naald of my staff, or contact me directly, at (701) 250-4481, or at the letterhead address.

Sincerely,

Jeffrey K. Towner

Jeffrey K. Towner
Field Supervisor
North Dakota Field Office

Enclosures (3)

cc: Army Corps of Engineers, Bismarck
(Attn: Dan Cimarosti)
Director, ND Game & Fish, Bismarck
(Attn: Paul Schadewald)

ENVIRONMENTAL & STATISTICAL CONSULTANTS

4007 State Street, Suite 109, Bismarck, ND 58503
Phone: 701-250-1756 ◆ www.west-inc.com ◆ Fax: 701-250-1761

July 11, 2013

Casey Willis
Sunflower Wind Project, LLC
3760 State Street, Suite 102
Santa Barbara, CA 93105

RE: Sunflower Raptor Nest Surveys

Dear Mr. Willis,

As part of agency approved baseline survey efforts, surveys for raptor nests were completed at the Sunflower Wind Energy Project (Project) on April 2, 2013 by a qualified biologist from Western EcoSystems Technology, Inc. Surveys were completed from the air in a helicopter before leaf out when raptors would be actively tending to a nest or incubating eggs. Aerial surveys were conducted in accordance with the guidance provided in the U.S. Fish and Wildlife Service (USFWS) Inventory and Monitoring Protocols (Pagel et al. 2010). An experienced raptor ecologist and a helicopter pilot skilled at this type of survey were used. Raptors are defined here as kites, accipiters, buteos, harriers, eagles, falcons, and owls. Surveys focused on locating large, stick nest structures in suitable raptor nesting substrate (trees, transmission lines, cliff faces, etc.) within the proposed Project and a one mile buffer. Additionally, a second buffer was surveyed out to 10 miles to document any eagle nests (Figure 1). Efforts were made to minimize disturbance to nesting raptors; the greatest possible distance at which the species could be identified was maintained, with distances varying depending upon nest location and wind conditions.

In general, all potential eagle and raptor nest habitat was surveyed, flying at speeds of 60-75 mph throughout the proposed Project and associated buffers. Additionally, one known bald eagle (*Haliaeetus leucocephalus*) nest location provided by the North Dakota Game and Fish Department (NDGFD 2013) was surveyed for nest status and condition. The survey was conducted between 0800 hours and 1700 hours. The locations of all potential raptor nests were recorded using a hand-held Global Positioning System (GPS); coordinates were set at Universal Transverse Mercator (UTMs) North American Datum (NAD) 83 unit. This included all confirmed and potential nests regardless of their activity status. To determine the status of a nest, the biologist relied on clues that included behavior of adults and presence of eggs, young, or

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whitewash. Attempts were made to identify the species of raptor associated with each active nest. Additionally, date, nest condition, and habitat were recorded. Nests located incidentally during ongoing avian point count surveys started in spring 2013 have also been included with the nest survey results reported below.

During the 2013 aerial survey and/or incidentally during avian point counts, 18 raptor nests representing five species were documented within the Project and associated buffers (Tables 1 and 2; Figures 1 indicates bald eagle nests and 10 mile buffer and Figure 2 indicates raptor nets within 1 mile buffer). Of these nests, the historic eagle nest noted by the NDGFD was confirmed as an occupied bald eagle nest, four nests were identified as potential inactive bald eagle nests (i.e. large enough for a bald eagle to use), one occupied/active burrowing owl (*Athene cunicularia*) nest, three occupied/active great horned owl (*Bubo virginianus*) nests, three occupied/active red-tailed hawk (*Buteo jamaicensis*) nests, three occupied/active Swainson's hawk (Buteo swainsoni) nests, and three inactive raptor nests (Table 1, Figures 1 and 2). No potential or occupied bald eagle nests were located within the project or 1 mile buffer, all were approximately 8 miles or more from the project boundary (Figure 1)

Incidental observations included seven separate sightings of bald eagles flying or perched within the 10-mile buffer, as well as a potential bald eagle winter roost site along the Heart River (Table 3, Figure 1). The potential bald eagle winter roost consisted of several bald eagles of different ages perched in trees along the river during the morning hours. It is not known if this is a regular roost location.

If you have any questions or require additional information, please feel free to call me at 701-250-1756.

Sincerely,

Clayton Derby
Senior Manager

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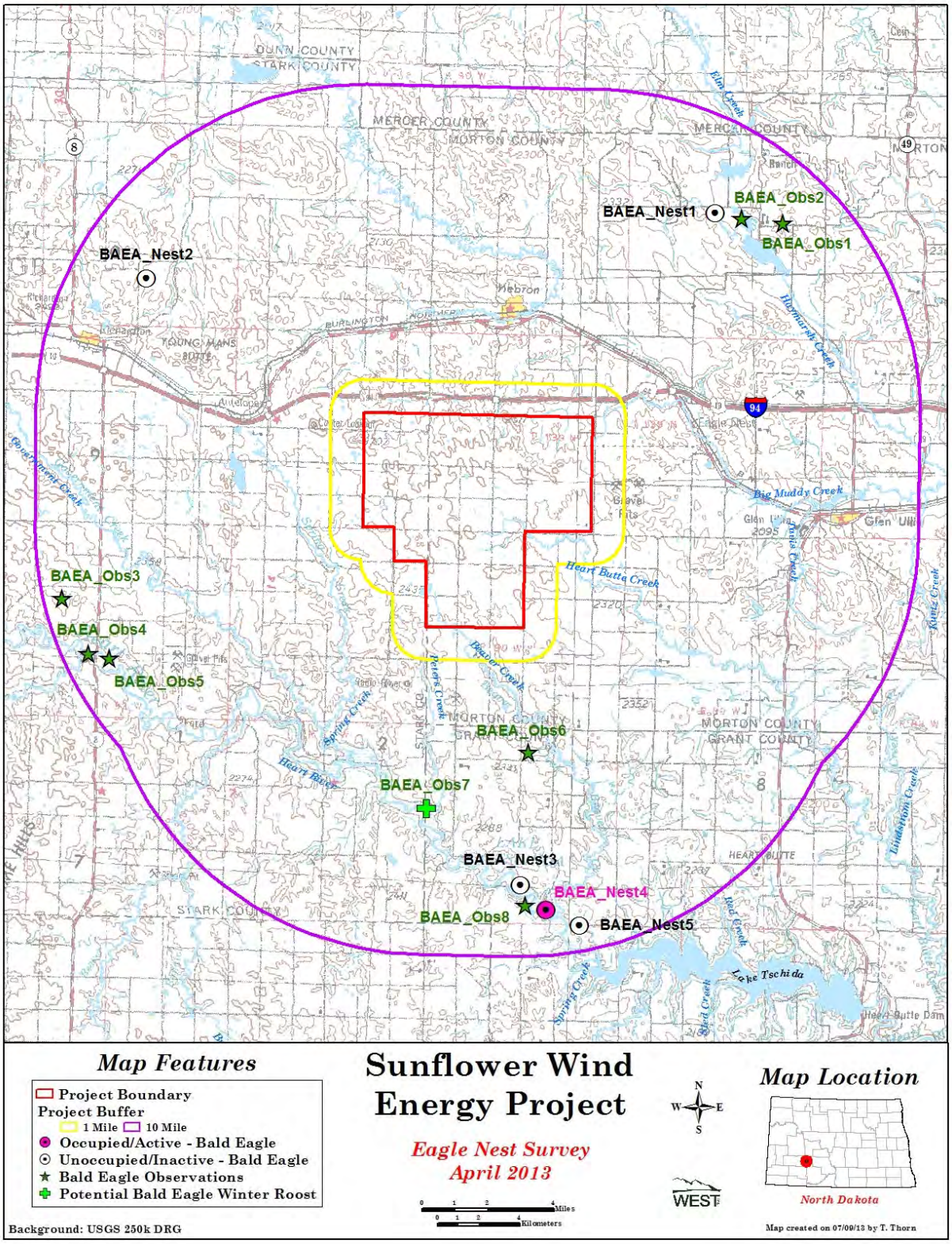


Figure 1. Bald eagle nests and bald eagle incidental observations documented at the Sunflower Wind Energy Project and 10-mile buffer in spring 2013.

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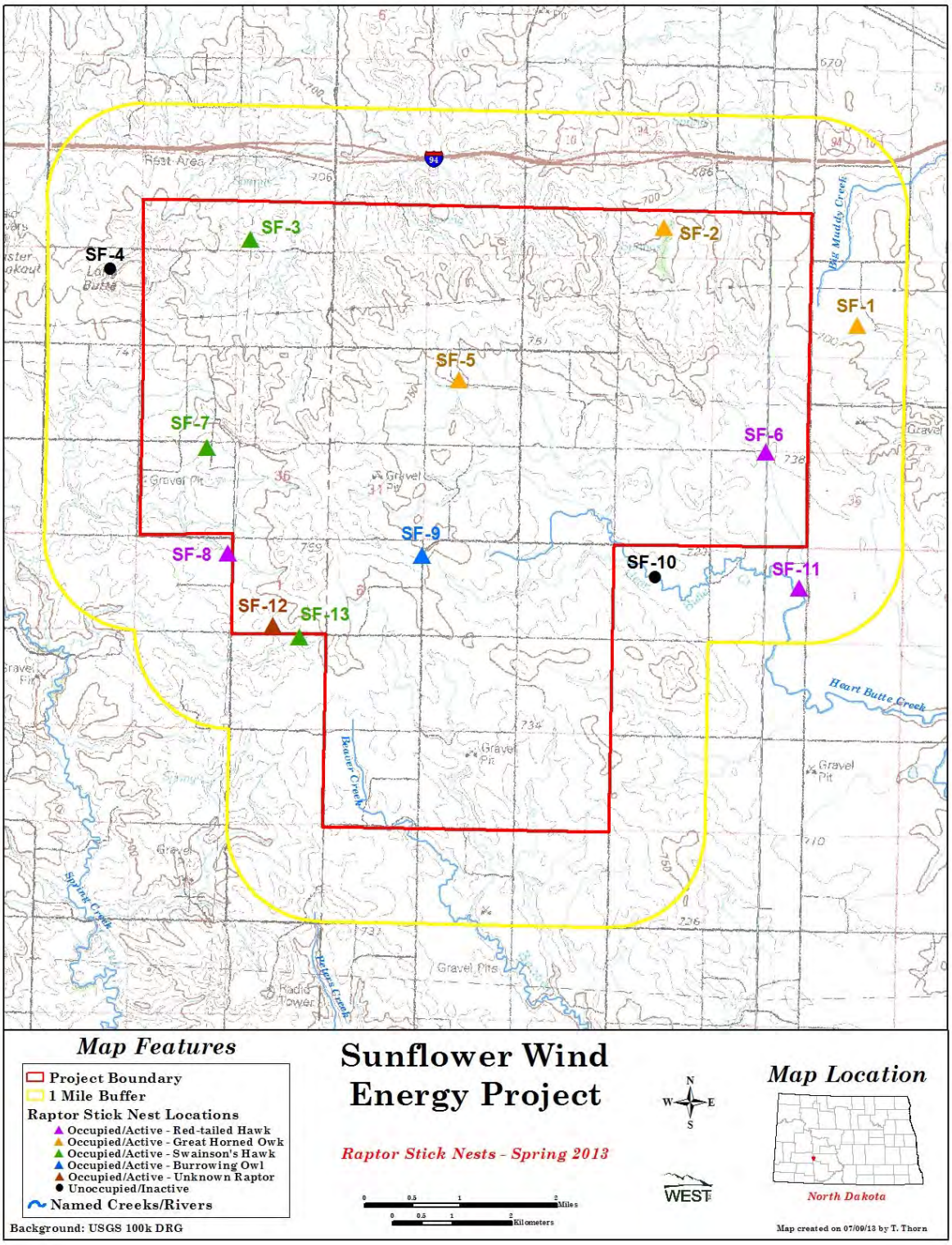


Figure 2. Raptor nests documented at the Sunflower Wind Energy Project in spring 2013.

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Table 1. Bald eagle nests and potential bald eagle nests identified during the 2013 survey for the Sunflower Wind Energy Project (NAD83, Zone 13).

Unique ID	Northing	Easting	Species	Nest Substrate	Status at time of Survey	Condition	Comments
BAEA_Nest1	5203810	734794	Potential Bald Eagle	Tree	Unoccupied – inactive	Good	Very large nest, eagle activity in the area
BAEA_Nest2	5198996	707105	Potential Bald Eagle	Tree	Unoccupied – inactive	Good	Very large nest with potential to be used by an eagle
BAEA_Nest3	5170347	727116	Potential Bald Eagle	Tree	Unoccupied – inactive	Good	Very large nest, eagle activity in the area
BAEA_Nest4	5169145	728457	Bald Eagle	Tree	Historic Occupied – active	Good	One adult sitting low in nest and second perched in tree close by
BAEA_Nest5	5168496	730096	Potential Bald Eagle	Tree	Unoccupied – inactive	Fair	Three nests stacked in one tree, eagle activity in the area

Table 2. Non-eagle raptor nests identified during the 2013 survey for the Sunflower Wind Energy Project (NAD83, Zone 14).

Unique ID	Northing	Easting	Species	Nest Substrate	Status at time of Survey	Condition
SF-1	5191511	272694	Great Horned Owl	Tree	Occupied – active	Good
SF-2	5193220	269476	Great Horned Owl	Tree	Occupied – active	Good
SF-3	5193152	262521	Swainson's Hawk	Tree	Occupied – active	Good
SF-4	5192701	260147	Unknown Raptor	Tree	Unoccupied – inactive	Good
SF-5	5190730	265989	Great Horned Owl	Tree	Occupied – active	Good
SF-6	5189415	271112	Red-tailed Hawk	Tree	Occupied – active	Good
SF-7	5189679	261729	Swainson's Hawk	Tree	Occupied – active	Good
SF-8	5187890	262038	Red-tailed Hawk	Tree	Occupied – active	Good
SF-9	5187793	265302	Burrowing Owl	Ground	Occupied – active	Good
SF-10	5187352	269208	Unknown Raptor	Tree	Unoccupied – inactive	Good
SF-11	5187127	271628	Red-tailed Hawk	Tree	Occupied – active	Good
SF-12	5186667	262774	Unknown Raptor	Tree	Occupied – active	Good
SF-13	5186465	263210	Swainson's Hawk	Tree	Occupied – active	Good

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Table 3. Nest density for the Sunflower Wind Energy Project, based on raptor nest surveys.

Species	# of nests within Project	# of nests within 1-mi buffer of Project	# of nests within 10-mi buffer of Project	Density		
				Project (# of nests/mi^2)	1-mi buffer of Project (#nests/mi^2)	10-mi buffer of Project (#nests/mi^2)
Bald Eagle – Occupied, active	0	0	1	0	0	< 0.01
Potential Bald Eagle – Unoccupied, inactive	0	0	4	0	0	0.01
Burrowing Owl	1	0	0	0.03	0	0
Great horned Owl – Occupied, active	2	1	0	0.06	0.02	0
Red-tailed hawk – Occupied, active	1	2	0	0.03	0.03	0
Swainson's hawsk – Occupied, active	2	1	0	0.06	0.02	0
Unknown raptor – Occupied, active	1	0	0	0.03	0	0
Unknown raptor – Unoccupied, inactive	0	2	0	0	0.03	0
Total	**7**	**6**	**5**	**0.21**	**0.10**	**0.01**

Table 4. Bald eagle incidental observations during 2013 nest surveys for the Sunflower Wind Energy Project (NAD83, Zone 14).

Unique ID	Northing	Easting	Comments
BAEA_Obs1	5202750	281500	1 adult and 1 2nd year juvenile eating carrion
BAEA_Obs2	5203000	279500	1 adult perched in tree
BAEA_Obs3	5185000	245750	1 adult flying
BAEA_Obs4	5182250	247000	1 adult flying
BAEA_Obs5	5182000	248000	1 2nd year juvenile flying
BAEA_Obs6	5177000	268500	1 adult perched in tree
BAEA_Obs7	5175000	263000	1 2nd year juvenile and 8 adult eagles perched in the same tree, potential winter roost site
BAEA_Obs8	5169500	268200	2 adults flying

Wildlife Baseline Studies for the Sunflower Wind Project Morton and Stark Counties, North Dakota

2013 Sharp-tailed Grouse Lek Report

Prepared for:

Sunflower Wind Project, LLC,
a subsidiary of Infinity Wind Power
3760 State St., Suite 102
Santa Barbara, CA 93105

Prepared by:

Clayton Derby and Terri Thorn

Western EcoSystems Technology, Inc.
4007 State St., Suite 109
Bismarck, North Dakota

June 22, 2013

WEST Inc.
Environmental & Statistical Consultants

NATURAL RESOURCES ◆ SCIENTIFIC SOLUTIONS

Draft Pre-Decisional Document - Privileged and Confidential - Not For Distribution

EXECUTIVE SUMMARY

Western EcoSystems Technology, Inc. conducted sharp-tailed grouse lek aerial surveys in April and May 2013 at the Sunflower Wind Project which is located in Morton and Stark Counties, North Dakota. This report presents results of those surveys.

Approximately 308.1 kilometers (191.5 miles) of transects were surveyed during each of three time periods (April 10-11, April 22-23, and May 6-7). Eight confirmed (birds observed in courtship behavior at the same location during more than one survey) and five possible (birds observed in courtship behavior during only one survey) leks were recorded during the three survey periods. Six confirmed and three possible leks were observed within the project boundary while two confirmed and two possible leks were recorded outside the Sunflower Wind Project.

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INTRODUCTION

Sunflower Wind Project, LLC, a subsidiary of Infinity Wind Power (Infinity), is proposing to construct a wind energy facility in Morton and Stark Counties North Dakota referred to as the Sunflower Wind Project (SWP). Infinity contracted Western EcoSystems Technology, Inc. (WEST) to develop and implement a standardized protocol for baseline wildlife studies at the SWP to estimate impacts of the proposed wind energy facility on wildlife and to assist with siting turbines to minimize impacts to wildlife resources.

This report presents results of aerial sharp-tailed grouse (*Tympanuchus phasianellus*) lek surveys conducted during April and May 2013. Data includes sharp-tailed grouse lek locations, number observed, and lek status.

STUDY AREA

The SWP, currently about 21,647 acres (ac; 89 square kilometers [km^2]; 34 square miles [mi^2]) is located in west-central North Dakota and more specifically western Morton and eastern Stark Counties. The landscape within the SWP is generally flat with more rolling lands in the northern third of the project area. Historically, the SWP's landscape was dominated by grasslands but has since been converted largely to agricultural use with crop production and livestock grazing the primary practices. Trees and shrubs can be found around farmsteads, within planted shelter belts, and along/within drainages. Wetlands are scattered throughout the SWP with many being man-made.

METHODS

The objective of the aerial sharp-tailed grouse lek survey was to determine the approximate location of sharp-tailed grouse leks and provide a general sense of sharp-tailed grouse use within and immediately adjacent to the SWP during peak lekking activity (early April through mid-May). Survey methodology was similar to that used for greater prairie chickens (*Tympanuchus cupido*) in Oklahoma (Martin and Knopf 1981) and other wind sites in North and South Dakota.

North/south running transects started 800 meters (m; 0.5 miles [mi]) outside the east/west project boundary and were placed at 400 m (0.25 mi) intervals, covering the entire SWP (Figure 1). The length of each transect varied based on the project boundary but each transect extended 800 m (0.5 mi) beyond the boundary. Each transect was flown by fixed-winged aircraft at an approximate height of 30 to 45 m (100 – 150 feet) during three separate survey periods. Surveys were conducted approximately two weeks apart and occurred during the normal sharp-tailed grouse lekking period on the Northern Plains. Surveys began between 15 minutes before sunrise and sunrise depending on cloud cover and lasted for up to 2.5 hours.

The location of any sharp-tailed grouse observed was recorded with a global positioning system (GPS) unit. The number, activity, and lek status at each location was recorded.

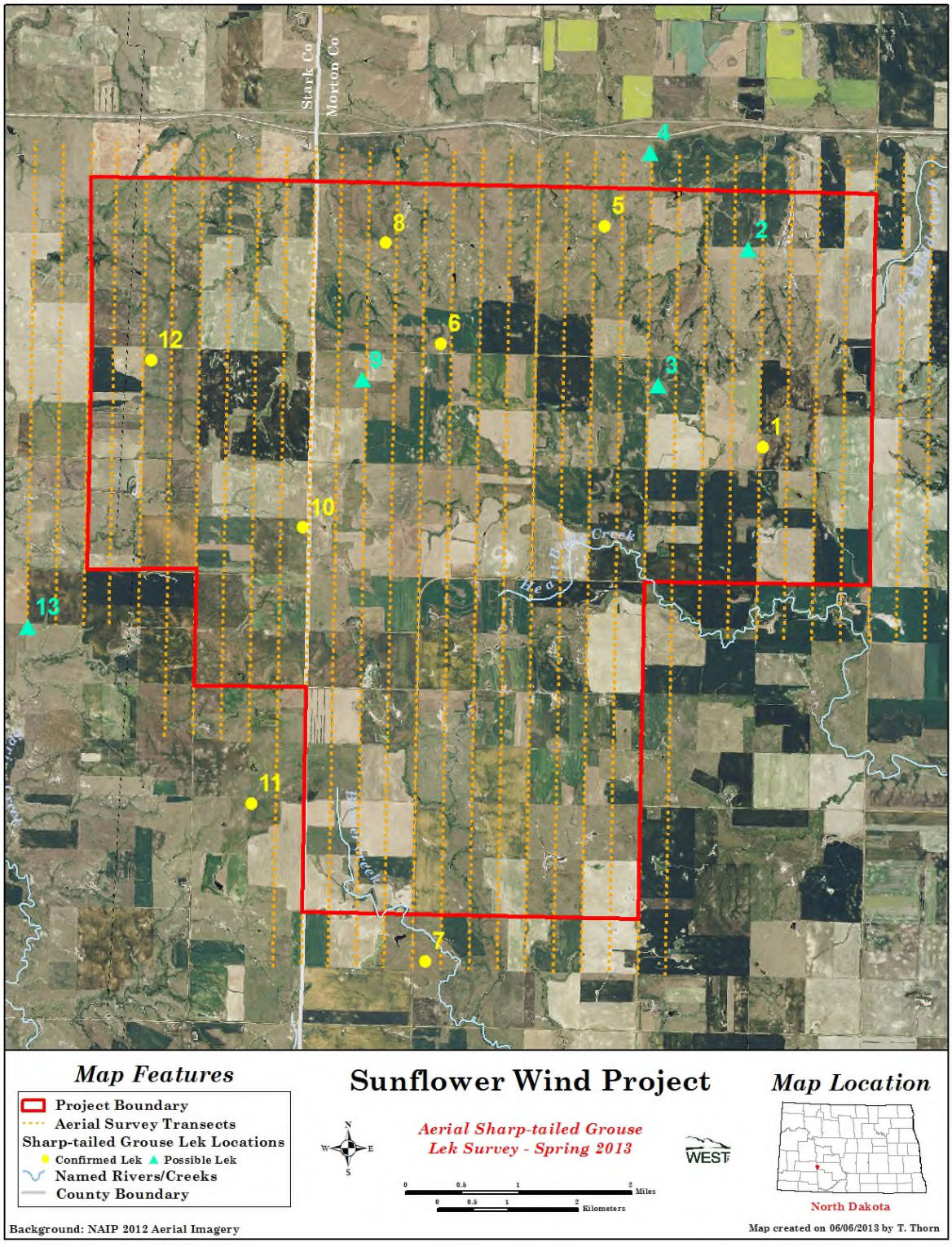


Figure 1. Sharp-tailed grouse leks at the Sunflower Wind Project during spring 2013.

RESULTS

Approximately 308.1 km (191.5 mi) of transects were surveyed during each of three time periods: (April 10-11, April 22-23, and May 6-7). Eight confirmed (birds observed in courtship behavior at the same location during more than one survey) and five possible (birds observed in courtship behavior during only one survey) leks were recorded during the three survey periods (Table 1; Figure 1). Six confirmed and three possible leks were observed within the project boundary while two confirmed and two possible leks were recorded outside the SWP (Figure 1). The nine leks within the SWP yields a density of one lek per 3.8 mi^2. The maximum number of sharp-tailed grouse record on leks ranged from seven at lek nine to 30 at lek 12 (Table 1). The majority of leks were observed within the northern half of the study area (Figure 1). All leks were recorded within grassland/hayland habitat.

Table 1. Summary of aerial sharp-tailed grouse lek surveys conducted during spring 2013 at the Sunflower Wind Project.

Lek ID	Date First Observed	Other Dates Observed	Highest Total	Lek
1	4/10	4/22, 5/06	21	confirmed
2	4/10		12	possible
3	4/10		14	possible
4	4/22		8	possible
5	4/10	4/22, 5/06	8	confirmed
6	4/10	4/22	9	confirmed
7	4/22	5/06	18	confirmed
8	4/10	4/22	16	confirmed
9	4/22		7	possible
10	4/11	4/23, 5/07	25	confirmed
11	4/11	4/23, 5/07	29	confirmed
12	4/11	4/23, 5/07	30	confirmed
13	5/07		18	possible

DISCUSSION

The majority of the SWP was lightly snow covered during the first survey period. The SWP was heavily snow covered during the second survey period due to a major winter storm on April 13th and 14th. It did not appear that snow cover, even significant snow cover, deterred sharp-tailed grouse from mating activities as evidenced by the number of leks initially observed or confirmed during the first two survey periods (Table 1).

Considering the preferred habitat requirements of sharp-tailed grouse, it is not surprising that the majority of leks were found within or adjacent to short grass habitat. This habitat type is

found mainly along the north and west side of the study area. This survey was not intended to estimate the sharp-tailed grouse population in and around the SWP but the relative large number of birds recorded at some leks (30 at lek 12, 29 at lek 11, and 25 at lek 10) may suggest a healthy sharp-tailed grouse population within the area.

REFERENCES

Martin, S.A. and F.L. Knopf. 1981. Aerial Survey of Greater Prairie Chicken Leks. Wildlife Society Bulletin 9(3): 219-221.

Wildlife Baseline Studies for the Sunflower Wind Resource Area Morton and Stark Counties, North Dakota

FPIC Interim Report

March 2013 – August 2013



Prepared for:

Sunflower Wind Project, LLC

a subsidiary of Infinity Wind Power
3760 State St., Suite 102
Santa Barbara, California 93105

Prepared by:

Clayton Derby, Terri Thorn, and Kimberly Bay

Western EcoSystems Technology, Inc.
4007 State Street, Suite 109
Bismarck, North Dakota 58503

November 8, 2013

Draft Pre-Decisional Document - Privileged and Confidential - Not For Distribution

EXECUTIVE SUMMARY

Sunflower Wind Project, LLC, (Sunflower) a subsidiary of Infinity Wind Power, has proposed a wind energy facility in Morton and Stark Counties, North Dakota, referred to as the Sunflower Wind Project (SFWP). Sunflower contracted Western EcoSystems Technology, Inc. (WEST) to conduct surveys and monitor wildlife resources in the SFWP to estimate the impacts of facility construction and operations on wildlife. The following seasonal interim report contains results for fixed-point bird use surveys and incidental wildlife observations. Seasonal interim reports are designed to give Infinity an early warning of high wildlife use or if sensitive species are observed within the study area.

Fixed-point surveys included in this report were conducted from March 20, 2013, through August 21, 2013, at 10 points established throughout the SFWP. A total of 152 60-minute (min) fixed-point surveys were completed, and 65 unique bird species were identified; a total of 5,792 individual birds within 1,247 separate groups were recorded.

Passerines were the most abundant bird type observed, accounting for 84.2% of all observations. This was primarily due to relatively high numbers of Lapland longspurs (1,530 individuals but in only two groups). Waterbirds, represented almost entirely by sandhill cranes, were the second most abundant bird type observed in the study area, representing 6.1% of all observations. A total of 79 diurnal raptors were observed, accounting for 1.4% of all individuals recorded. Northern harrier and Swainson's hawk were the most commonly observed raptor species (20 and 19 individuals, respectively). Two individual bald eagles were observed in the spring.

One bald eagle was observed from fixed-point two, soaring in a southeasterly direction for eight min before it was lost from sight. The other bald eagle observation was recorded flying into the survey plot at fixed-point one from the south. It remained perched on a transmission line tower for the remaining seven min of the 60-min survey period.

There were no federally listed endangered, threaten or candidate species observed. Sixteen unique sensitive species totaling 248 individuals were recorded during all surveys at the SFWP. Six North Dakota Level I sensitive species were observed along with 10 North Dakota Level II sensitive species.

Fourteen unique bird species and four unidentified bird categories were observed incidentally, totaling 958 birds within 69 separate groups during the study. Three species, tundra swan, prairie falcon, and Say's phoebe, were only seen incidentally at the SFWP. Six mammal and one amphibian species were also recorded incidentally at the SFWP. Two North Dakota State Level I sensitive species (Swainson's hawk and upland sandpiper) were recorded incidentally within the project area.

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Figure 3. Comparison of summer diurnal raptor use during fixed-point surveys at the Sunflower Wind Project from March 20, 2013, to August 21, 2013, and other US wind energy facilities. 11

INTRODUCTION

In 2013, Sunflower Wind Project, LLC (Sunflower), a subsidiary of Infinity Wind Power, contracted Western EcoSystems Technology, Inc. (WEST) to conduct surveys and monitor wildlife resources for the Sunflower Wind Project (SFWP) to estimate the impacts of wind energy facility construction and operations on wildlife. The following document contains results for fixed-point bird use surveys and incidental wildlife observations during spring and summer 2013 at the SFWP.

The purpose of this interim report is to bring items of biological interest to Sunflower's attention, such as seasonal diurnal raptor use and the presence of sensitive species. This interim report presents preliminary data on number of observations by species and bird type, eagle use, and sensitive species observations. The final report will include results for all data collected.

STUDY AREA

The SFWP is located in Morton and Stark Counties, North Dakota, approximately three miles (4.8 kilometers [km]) south of the town of Hebron (Figure 1). The baseline wildlife surveys included a 21,947 acre area (ac; 89 square kilometers [km^2]; 34 square miles [mi^2]) located in west-central North Dakota and more specifically western Morton and eastern Stark Counties. The SFWP project itself would be located on approximately 9,000 acres. The landscape within the SWP is generally flat with more rolling lands in the northern third of the project area. Elevation ranges from 679 meters (m; 2,228 feet [ft]) to 817 m (2,679 ft). Historically, the SFWP's landscape was dominated by grasslands, but has since been converted largely to agricultural use with crop production and livestock grazing being the primary practices. Trees and shrubs can be found around farmsteads, within planted shelter belts, and along/within drainages. Wetlands are scattered throughout the SFWP, with many being man-made.

Cultivated cropland and herbaceous/pasture/hay lands are approximately equal in amount and compose almost 95% of the study area. Of the remaining 5%, 3.5% is developed, while wetlands, forest, and barren lands, in that order, make up the rest of the landscape (USGS NLCD 2006, Fry et al. 2011). Common agricultural crops include small grains, corn (*Zea mays*), sunflowers (*Helianthus annuus*), and alfalfa (*Medigo sativa*).

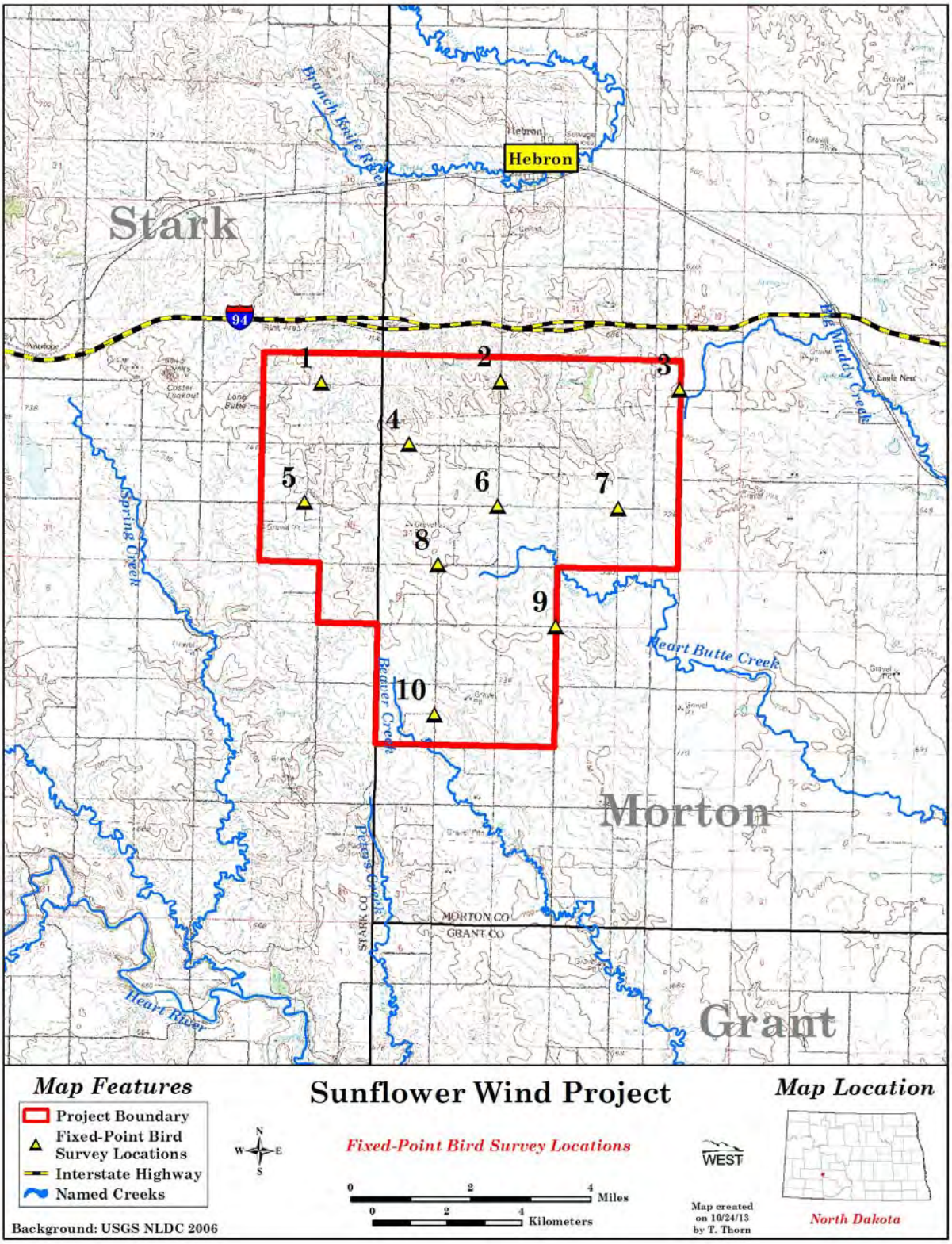


Figure 1. Fixed-point bird survey locations at the Sunflower Wind Project.

METHODS

Fixed-Point Bird Use Surveys

The objective of the fixed-point bird use surveys was to estimate the seasonal and spatial use of the study area by birds, particularly diurnal raptors (defined here as kites, accipiters, buteos, harriers, eagles, falcons, and osprey). Fixed-point bird surveys (variable circular plots) were conducted using methods described by Reynolds et al. (1980).

Survey Plots

Ten points were selected to survey representative habitats and topography of the SFWP, while achieving relatively even coverage of the study area (Figure 1). Each survey plot was a 1,600-m (5,250-ft or 1-mile) radius circle centered on the point.

Survey Methods

Each survey plot was surveyed for 60 minutes (min). Every bird observed during the first 20 min of each fixed-point bird use survey was recorded by a unique observation number. In some cases, the tally of observations may represent repeated sightings of the same individual. Observations of large birds beyond a 800-m (2,625-ft) radius were recorded, but were not included in statistical analyses. For small birds, observations beyond a 100 m (328 ft) radius were excluded. Large birds included waterbirds, waterfowl, rails and coots, grebes and loons, gulls and terns, shorebirds, diurnal raptors, owls, vultures, upland game birds, doves/pigeons, and large corvids (e.g., ravens, magpies, and crows), and goatsuckers. Passerines (excluding large corvids), kingfishers, swifts/hummingbirds, woodpeckers, and most cuckoos were considered small birds. During the next 40 min of the survey period, only eagles were recorded out to the 1,600-m radius.

The date, start and end time of the survey period, and weather information (e.g., temperature, wind speed, wind direction, and cloud cover) were recorded for each survey. Species or best possible identification, number of individuals, sex and age class (if possible), distance from plot center when first observed, closest distance, altitude above ground, activity (behavior), and habitat(s) were recorded for each observation. Bird behavior and habitat type were recorded based on the point of first observation. Approximate flight height and distance from plot center at first observation were recorded to the nearest 5-m (16-ft) interval. Other information recorded about the observation included whether or not the observation was auditory only and the 10-min interval of the 20-min survey in which it was first observed. Eagle observations had distance from observer, activity and flight height recorded by minute for as long as they were observed within 60-min survey period. Flight direction was recorded on the field map.

Observation Schedule

Sampling intensity was designed to document bird use and behavior by habitat and season within the study area. Fixed-point bird use surveys were conducted from March 2013 through August 2013. Surveys were conducted approximately once per week during the spring (March

through May) and every other week during the summer (June through August). Surveys were carried out during daylight hours and survey periods varied to approximately cover all daylight hours during a season. To the extent practical, each point was surveyed roughly the same number of times.

Incidental Wildlife Observations

Incidental wildlife observations provide records of wildlife seen outside of the standardized surveys. All diurnal raptors, unusual or unique birds, sensitive species, mammals, reptiles, and amphibians were recorded in a similar fashion to standardized surveys. The observation number, date, time, species, number of individuals, sex/age class, distance from observer, activity, height above ground (for bird species) and habitat were recorded. The location of sensitive species was recorded by reference to site specific features and/or by Universal Transverse Mercator (UTM) coordinates using a hand-held Global Positioning System (GPS) unit.

RESULTS

Surveys were completed within the SFWP from March 20, 2013, through August 21, 2013. Sixty-eight unique bird species, six mammal species, and one amphibian species were identified during the wildlife studies at the SFWP.

Fixed-Point Bird Use Surveys

A total of 152 60-min fixed-point bird use surveys were conducted within SFWP during 17 visits from March to August, 2013. Ninety-eight fixed-point surveys were conducted in the spring during 11 visits, while 54 fixed-point surveys were conducted in summer through August 21 during six visits. Not all point count locations were accessible during all surveys due to road conditions.

Sixty-five unique bird species were observed during fixed-point bird use surveys; a total of 5,792 individual birds were observed within 1,247 separate groups (defined as one or more individual) during the fixed-point surveys (Table 1). Passerines were the most abundant bird type observed, accounting for 84.2% of all observations. This was primarily due to relatively high numbers of Lapland longspurs (*Calcarius lapponicus*; 1,530 individuals but in only two groups). This species represents almost one-third of all passerines observed, but less than 1% of passerine groups recorded. Other common observed passerine species include common redpoll (*Acanthis flammea*; 642 individuals in 19 groups), horned lark (*Eremophila alpestris*; 627 individuals in 191 groups), and red-winged blackbirds (*Agelaius phoeniceus*; 653 individuals in 120 groups). Waterbirds, represented almost entirely by sandhill cranes (*Grus canadensis*), were the second most abundant bird type observed in the study area, representing 6.1% of all observations. A total of 79 diurnal raptors were observed, accounting for 1.4% of all individuals recorded. Northern harrier (*Circus cyaneus*) and Swainson's hawk (*Buteo swainsoni*) were the most commonly observed raptor species (20 and 19 individuals, respectively; Table 1). Two individual bald eagles (*Haliaeetus leucocephalus*) were observed in the spring (Table 1).

One bald eagle was observed from fixed-point two, soaring in a southeasterly direction for eight min before it was lost from sight. The other bald eagle observation was recorded flying into the survey plot at fixed-point one from the south. It remained perched on a transmission line tower for the remaining seven min of the 60-min survey period.

Table 1. Summary of group and individual observations by species and bird type for summer, fall, and overall seasons during fixed-point bird use surveys at the Sunflower Wind Project[a] from March 20, 2013, to August 21, 2013.

		Spring		Summer		Overall	
Species	**Scientific Name**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**
Waterbirds		**2**	**352**	**0**	**0**	**2**	**352**
sandhill crane	*Grus canadensis*	1	350	0	0	1	350
unidentified waterbird		1	2	0	0	1	2
Waterfowl		**53**	**115**	**6**	**9**	**59**	**124**
blue-winged teal	*Anas discors*	1	2	0	0	1	2
Canada goose	*Branta canadensis*	22	53	1	1	23	54
gadwall	*Anas strepera*	1	4	0	0	1	4
mallard	*Anas platyrhynchos*	15	26	2	2	17	28
northern pintail	*Anas acuta*	4	8	1	1	5	9
northern shoveler	*Anas clypeata*	0	0	1	1	1	1
redhead	*Aythya americana*	1	2	0	0	1	2
unidentified duck		9	20	1	4	10	24
Shorebirds		**36**	**67**	**20**	**46**	**56**	**113**
Common snipe	*Gallinago gallinago*	2	2	0	0	2	2
killdeer	*Charadrius vociferus*	13	15	10	35	23	50
marbled godwit	*Limosa fedoa*	1	2	1	1	2	3
unidentified shorebird		6	22	0	0	6	22
upland sandpiper	*Bartramia longicauda*	6	6	8	9	14	15
willet	*Catoptrophorus semipalmatus*	4	14	0	0	4	14
Wilson's snipe	*Gallinago delicata*	4	6	1	1	5	7
Diurnal Raptors		**52**	**58**	**17**	**21**	**69**	**79**
Accipiters		*1*	*1*	*0*	*0*	*1*	*1*
sharp-shinned hawk	*Accipiter striatus*	1	1	0	0	1	1
Buteos		*21*	*25*	*9*	*11*	*30*	*36*
red-tailed hawk	*Buteo jamaicensis*	11	12	3	3	14	15
rough-legged hawk	*Buteo lagopus*	2	2	0	0	2	2
Swainson's hawk	*Buteo swainsoni*	8	11	6	8	14	19
Northern Harrier		*16*	*17*	*3*	*3*	*19*	*20*
northern harrier	*Circus cyaneus*	16	17	3	3	19	20
Eagles		*2*	*2*	*0*	*0*	*2*	*2*
bald eagle	*Haliaeetus leucocephalus*	2	2	0	0	2	2
Falcons		*1*	*1*	*0*	*0*	*1*	*1*
American kestrel	*Falco sparverius*	1	1	0	0	1	1
Other Raptors		*11*	*12*	*5*	*7*	*16*	*19*
unidentified hawk		3	3	0	0	3	3
unidentified raptor		8	9	5	7	13	16
Owls		**5**	**7**	**4**	**7**	**9**	**14**
burrowing owl	*Athene cunicularia*	3	5	4	7	7	12
great horned owl	*Bubo virginianus*	2	2	0	0	2	2
Vultures		**3**	**5**	**1**	**1**	**4**	**6**
turkey vulture	*Cathartes aura*	3	5	1	1	4	6

Table 1. Summary of group and individual observations by species and bird type for summer, fall, and overall seasons during fixed-point bird use surveys at the Sunflower Wind Project[a] from March 20, 2013, to August 21, 2013.

		Spring		Summer		Overall	
Species	**Scientific Name**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**
Upland Game Birds		**87**	**129**	**10**	**10**	**97**	**139**
ring-necked pheasant	*Phasianus colchicus*	80	90	10	10	90	100
sharp-tailed grouse	*Tympanuchus phasianellus*	7	39	0	0	7	39
Doves/Pigeons		**24**	**38**	**20**	**29**	**44**	**67**
mourning dove	*Zenaida macroura*	22	35	20	29	42	64
rock pigeon	*Columba livia*	2	3	0	0	2	3
Large Corvids		**6**	**10**	**0**	**0**	**6**	**10**
American crow	*Corvus brachyrhynchos*	6	10	0	0	6	10
Passerines		**679**	**4548**	**211**	**327**	**890**	**4875**
American goldfinch	*Spinus tristis*	0	0	1	1	1	1
American robin	*Turdus migratorius*	22	61	3	3	25	64
American tree sparrow	*Spizella arborea*	4	36	0	0	4	36
bank swallow	*Riparia riparia*	0	0	1	2	1	2
barn swallow	*Hirundo rustica*	8	14	6	19	14	33
bobolink	*Dolichonyx oryzivorus*	12	25	4	4	16	29
Brewer's blackbird	*Euphagus cyanocephalus*	7	24	1	4	8	28
brown-headed cowbird	*Molothrus ater*	58	288	9	15	67	303
brown thrasher	*Toxostoma rufum*	0	0	2	2	2	2
chipping sparrow	*Spizella passerina*	3	3	1	1	4	4
clay-colored sparrow	*Spizella pallida*	4	4	1	1	5	5
cliff swallow	*Petrochelidon pyrrhonota*	0	0	1	2	1	2
common grackle	*Quiscalus quiscula*	15	40	9	12	24	52
common redpoll	*Acanthis flammea*	19	642	0	0	19	642
eastern kingbird	*Tyrannus tyrannus*	7	7	31	43	38	50
European starling	*Sturnus vulgaris*	4	81	1	27	5	108
field sparrow	*Spizella pusilla*	1	1	0	0	1	1
grasshopper sparrow	*Ammodramus savannarum*	3	4	3	3	6	7
horned lark	*Eremophila alpestris*	169	586	22	41	191	627
Lapland longspur	*Calcarius lapponicus*	2	1530	0	0	2	1530
lark bunting	*Calamospiza melanocorys*	1	2	9	11	10	13
loggerhead shrike	*Lanius ludovicianus*	1	1	0	0	1	1
red-winged blackbird	*Agelaius phoeniceus*	87	611	33	42	120	653
Savannah sparrow	*Passerculus sandwichensis*	13	20	9	10	22	30
snow bunting	*Plectrophenax nivalis*	2	48	0	0	2	48
song sparrow	*Melospiza melodia*	8	10	0	0	8	10
unidentified blackbird		0	0	2	3	2	3
unidentified bluebird		2	2	0	0	2	2
unidentified passerine		14	249	2	3	16	252
unidentified sparrow		11	12	2	2	13	14
vesper sparrow	*Pooecetes gramineus*	3	3	7	8	10	11
western kingbird	*Tyrannus verticalis*	7	12	15	30	22	42
western meadowlark	*Sturnella neglecta*	190	227	35	37	225	264
yellow-headed blackbird	*Xanthocephalus xanthocephalus*	1	4	0	0	1	4
yellow warbler	*Setophaga petechia*	1	1	1	1	2	2
Goatsuckers		**0**	**0**	**1**	**1**	**1**	**1**
common nighthawk	*Chordeiles minor*	0	0	1	1	1	1

Table 1. Summary of group and individual observations by species and bird type for summer, fall, and overall seasons during fixed-point bird use surveys at the Sunflower Wind Project[a] from March 20, 2013, to August 21, 2013.

		Spring		Summer		Overall	
Species	**Scientific Name**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**
Woodpeckers		**7**	**7**	**1**	**3**	**8**	**10**
hairy woodpecker	*Picoides villosus*	1	1	0	0	1	1
northern flicker	*Colaptes auratus*	5	5	1	3	6	8
red-headed woodpecker	*Melanerpes erythrocephalus*	1	1	0	0	1	1
Unidentified Birds		**2**	**2**	**0**	**0**	**2**	**2**
unidentified bird (small)		2	2	0	0	2	2
Total		**956**	**5,338**	**291**	**454**	**1247**	**5,792**

[a] regardless of distance from observer.

Sensitive Species Observations

Sixteen unique sensitive species totaling 248 individuals were recorded during all surveys at the SFWP (Table 2). This tally may represent repeated observations of the same individual. There were no federally listed endangered, threaten or candidate species recorded. Six North Dakota Level I sensitive species (defined as species with declining status either in North Dakota or across their range) were observed, along with 10 North Dakota Level II sensitive species (defined as species with moderate level of conservation priority; Hagen et al. 2005; Table 2). Bald eagles are also protected under the Bald and Golden Eagle Protection Act (BGEPA 1940).

Table 2. Summary of sensitive species observed at the Sunflower Wind Project during fixed-point bird use surveys (FP) and as incidental wildlife observations (Inc.) from March 20, 2013, to August 21, 2013.

			FP		Inc.		Total	
Species	**Scientific Name**	**Status**	**# grps**	**# obs**	**# grps**	**# obs**	**# grps**	**# obs**
sharp-tailed grouse	*Tympanuchus phasianellus*	S2	7	39	7	30	14	69
northern harrier	*Circus cyaneus*	S2	19	20	9	13	28	33
Swainson's hawk	*Buteo swainsoni*	S1	14	19	8	13	22	32
bobolink	*Dolichonyx oryzivorus*	S2	16	29	0	0	16	29
upland sandpiper	*Bartramia longicauda*	S1	14	15	1	3	15	18
willet	*Catoptrophorus semipalmatus*	S1	4	14	0	0	4	14
burrowing owl	*Athene cunicularia*	S2	7	12	1	1	8	13
lark bunting	*Calamospiza melanocorys*	S1	10	13	0	0	10	13
northern pintail	*Anas acuta*	S2	5	9	0	0	5	9
grasshopper sparrow	*Ammodramus savannarum*	S1	6	7	0	0	6	7
marbled godwit	*Limosa fedoa*	S1	2	3	0	0	2	3
loggerhead shrike	*Lanius ludovicianus*	S2	1	1	1	1	2	2
bald eagle	*Haliaeetus leucocephalus*	S2; EA	2	2	0	0	2	2
redhead	*Aythya americana*	S2	1	2	0	0	1	2
prairie falcon	*Falco mexicanus*	S2	0	0	1	1	1	1
red-headed woodpecker	*Melanerpes erythrocephalus*	S2	1	1	0	0	1	1
Total	**16 species**		**109**	**186**	**28**	**62**	**137**	**248**

S1 = Level I state species of concern (Hagen et al. 2005); S2 = Level II state species of concern (Hagen et al. 2005); EA = Federal Bald and Golden Eagle Protection Act (BGEPA 1940).

Incidental Wildlife Observations

Fourteen unique bird species and four unidentified bird categories were observed incidentally, totaling 958 birds within 69 separate groups during the study (Table 3). Over two-thirds of the total observations were of sandhill cranes. Three species, tundra swan (*Cygnus columbianus*), prairie falcon (*Falco mexicanus*), and Say's phoebe (*Sayornis saya*), were only seen incidentally at the SFWP. Six mammal and one amphibian species were also recorded incidentally at the SFWP (Table 3). Two North Dakota State Level I sensitive species (Swainson's hawk and upland sandpiper [*Bartramia longicauda*]) were recorded incidentally within the project (Table 2).

Table 3. Incidental wildlife observed while conducting all surveys at the Sunflower Wind Project from March 20, 2013, to August 21, 2013.

Species	Scientific Name	# grps	# obs
sandhill crane	*Grus canadensis*	9	654
tundra swan	*Cygnus columbianus*	1	2
upland sandpiper	*Bartramia longicauda*	1	3
American kestrel	*Falco sparverius*	6	7
northern harrier	*Circus cyaneus*	9	13
prairie falcon	*Falco mexicanus*	1	1
red-tailed hawk	*Buteo jamaicensis*	12	14
Swainson's hawk	*Buteo swainsoni*	8	13
unidentified accipiter		1	1
unidentified hawk		2	5
unidentified raptor		3	4
burrowing owl	*Athene cunicularia*	1	1
turkey vulture	*Cathartes aura*	4	6
gray partridge	*Perdix perdix*	1	2
sharp-tailed grouse	*Tympanuchus phasianellus*	7	30
loggerhead shrike	*Lanius ludovicianus*	1	1
Say's phoebe	*Sayornis saya*	1	1
unidentified crowned sparrow		1	200
Bird Subtotal		**69**	**958**
coyote	*Canis latrans*	3	3
mule deer	*Odocoileus hemionus*	1	5
porcupine	*Erethizon dorsatum*	2	2
pronghorn	*Antilocapra americana*	11	57
thirteen-lined ground squirrel	*Spermophilus tridecemlineatus*	4	8
white-tailed jackrabbit	*Lepus townsendii*	1	1
Mammal Subtotal		**22**	**76**
western chorus frog	*Pseudacris triserata triseriata*	2	20
Amphibian Subtotal		**2**	**20**

DISCUSSION

The surveys implemented at SFWP during spring and summer of 2013 are part of a larger study effort. Seasonal interim reports are designed to give Infinity an early warning if high wildlife use is documented during surveys or if a sensitive species is observed.

Bird Use Surveys

Species diversity of birds observed reflected the grassland and agricultural habitat within the SFWP. Species of open grassland habitats were dominant, but species that utilize woodlands and wetlands were also observed interspersed within the study area.

By far, the spring season had the higher number of bird observations (5,338) compared to summer (454). Although the spring season had almost twice as many surveys conducted, it is unlikely that doubling the number of surveys in summer would have resulted in the total number of birds observed to approach those recorded in spring. Lapland longspur and common redpoll had the highest number of individuals recorded and were only observed in the spring. In total, there were 26 bird species that were recorded in spring that were not recorded in the summer, while there were only four species that were observed in the summer that were not recorded in the spring.

Overall, diurnal raptors were also more common in the spring; birds observed during the spring probably included migrating individuals. The Swainson's hawk was the most abundant diurnal raptor recorded during the summer (Table 1).

Comparison of Seasonal Diurnal Raptor Use

Diurnal raptors have received much attention due to high rates of fatalities at the Altamont Pass wind energy facility in California, which has the highest recorded overall diurnal raptor fatality rate of any wind energy facility (Erickson et al. 2002b). Based on the results from other wind resource areas, mean diurnal raptor use (number of diurnal raptors divided by the number of 800-m plots and the total number of surveys) in the SFWP during both the spring and summer of 2013 was low to moderate (0.53 and 0.35 diurnal raptors/plot/20 min survey, respectively) relative to data collected at other existing and proposed wind energy facilities with data for spring or summer seasons (Figures 2 and 3).

Sensitive Species

No federally endangered, threatened or candidate species were recorded during surveys within the SFWP. There were six North Dakota Level I and 10 Level II sensitive species recorded. Two State Level II bald eagles were observed during fixed-point surveys. Bald eagles are also legally protected under the Bald and Golden Eagle Protection Act (BGEPA 1940).

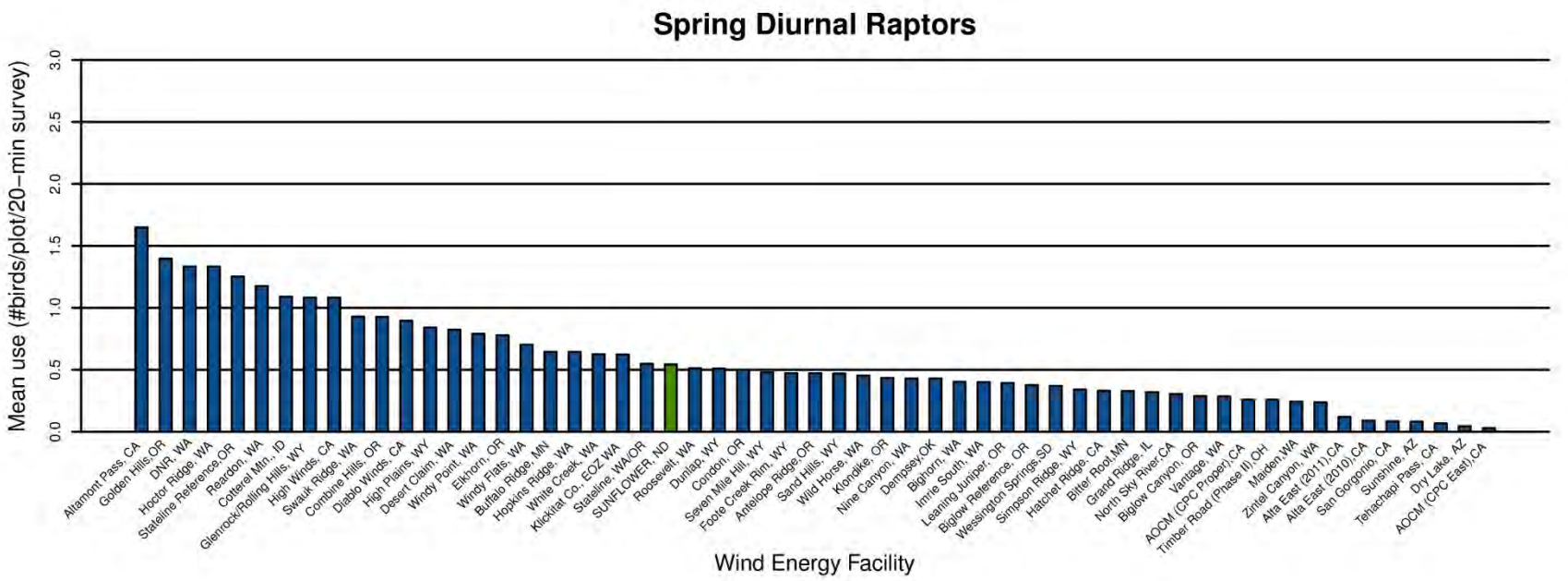


Figure 2. Comparison of spring diurnal raptor use during fixed-point surveys at the Sunflower Wind Project from March 20, 2013, to August 21, 2013, and other US wind energy facilities.

Data from the following sources:

Study and Location	Reference	Study and Location	Reference	Study and Location	Reference
Sunflower Wind Project, ND	This study.				
Altamont Pass, CA	Orloff and Flannery 1992	White Creek, WA	NWC and WEST 2004	Simpson Ridge, WY	Johnson et al. 2000b
Golden Hills, OR	Jeffrey et al. 2008	Klickitat Co., EOZ WA	WEST and NWC 2003	Hatchet Ridge, CA	Young et al. 2007a
DNR, WA	Johnson et al. 2006c	Stateline, WA/OR	Erickson et al. 2003a	Bitter Root, MN	Derby and Dahl 2009
Hoctor Ridge, WA	Johnson et al. 2006d	Roosevelt, WA	NWC and WEST 2004	Grand Ridge, IL	Derby et al. 2009
Stateline Reference, OR	URS et al. 2001	Dunlap, WY	Johnson et al. 2009a	North Sky River, CA	Erickson et al. 2011
Reardon, WA	WEST 2005b	Condon, OR	Erickson et al. 2002b	Biglow Canyon, OR	WEST 2005c
Cotterel Mtn., ID	BLM 2006	Seven Mile Hill, WY	Johnson et al. 2008b	Vantage, WA	WEST 2007
Glenrock/Rolling Hills, WY	Johnson et al. 2008a	Foote Creek Rim, WY	Johnson et al. 2000b	AOCM (CPC Proper), CA	Chatfield et al. 2010
High Winds, CA	Kerlinger et al. 2005	Antelope Ridge, OR	WEST 2009	Timber Road (Phase II), OH	Good et al. 2010
Swauk Ridge, WA	Erickson et al. 2003b	Sand Hills, WY	Johnson et al. 2006a	Maiden, WA	Young et al. 2002
Combine Hills, OR	Young et al. 2003c	Wild Horse, WA	Erickson et al. 2003d	Zintel Canyon, WA	Erickson et al. 2002a, 2003c
Diablo Winds, CA	WEST 2006	Klondike, OR	Johnson et al. 2002	Alta East (2011), CA	Chatfield et al. 2011
High Plains, WY	Johnson et al. 2009b	Nine Canyon, WA	Erickson et al. 2001	Alta East (2010), CA	Chatfield et al. 2011
Desert Claim, WA	Young et al. 2003b	Dempsey, OK	Derby et al. 2010	San Gorgonio, CA	Anderson et al. 2000, Erickson et al. 2002b
Windy Point, WA	Johnson et al. 2006b	Bighorn, WA	Johnson and Erickson 2004	Sunshine, AZ	WEST and the CPRS 2006
Elkhorn, OR	WEST 2005a	Imrie South, WA	Johnson et al. 2006e	Tehachapi Pass, CA	Anderson et al. 2000, Erickson et al. 2002b
Windy Flats, WA	Johnson et al. 2007b	Leaning Juniper, OR	Kronner et al. 2005	Dry Lake, AZ	Young et al. 2007b
Buffalo Ridge, MN	Johnson et al. 2000a	Biglow Reference, OR	WEST 2005c	AOCM (CPC East), CA	Chatfield et al. 2010
Hopkins Ridge, WA	Young et al. 2003a	Wessington Springs, SD	Derby et al. 2008		

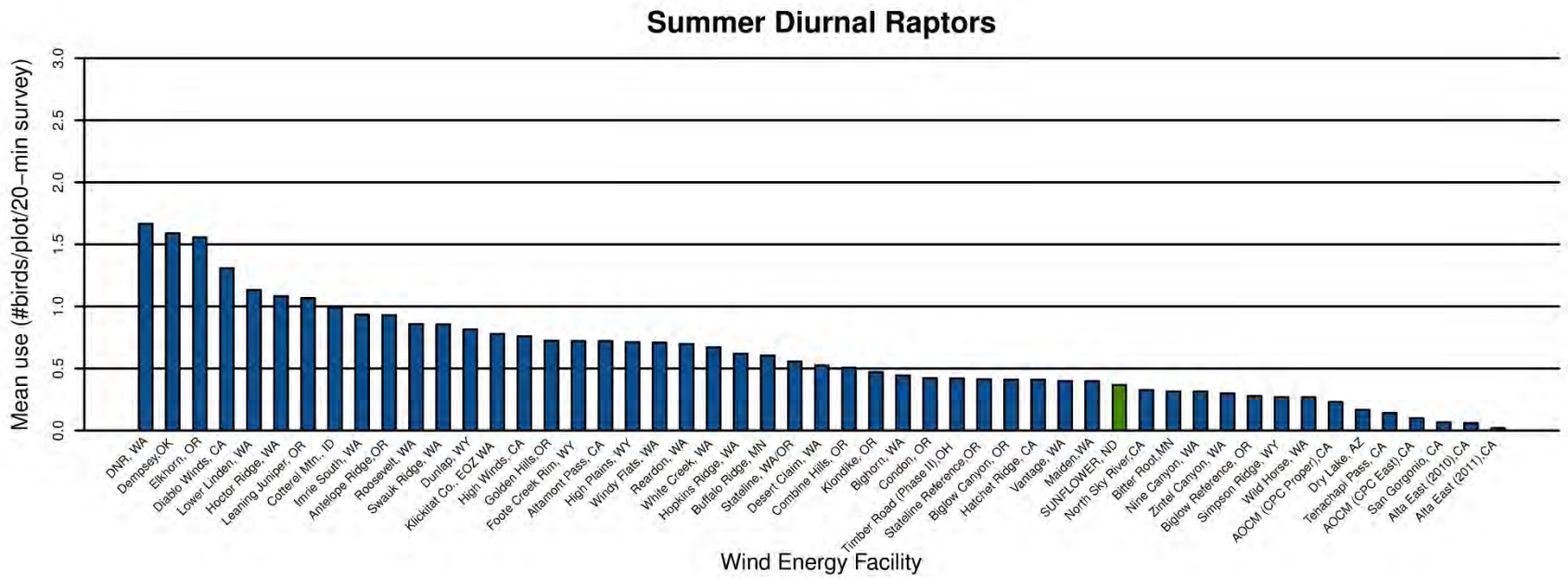


Figure 3. Comparison of summer diurnal raptor use during fixed-point surveys at the Sunflower Wind Project from March 20, 2013, to August 21, 2013, and other US wind energy facilities.

Data from the following sources:

Study and Location	Reference	Study and Location	Reference	Study and Location	Reference
Sunflower Wind Project, ND	This study.				
DNR, WA	Johnson et al. 2006c	Altamont Pass, CA	Orloff and Flannery 1992	Vantage, WA	WEST 2007
Dempsey, OK	Derby et al. 2010	High Plains, WY	Johnson et al. 2009b	Maiden, WA	Young et al. 2002
Elkhorn, OR	WEST 2005a	Windy Flats, WA	Johnson et al. 2007b	North Sky River, CA	Erickson et al. 2011
Diablo Winds, CA	WEST 2006	Reardon, WA	WEST 2005b	Bitter Root, MN	Derby and Dahl 2009
Lower Linden, WA	Johnson et al. 2007a	White Creek, WA	NWC and WEST 2005	Nine Canyon, WA	Erickson et al. 2001
Hoctor Ridge, WA	Johnson et al. 2006d	Hopkins Ridge, WA	Young et al. 2003a	Zintel Canyon, WA	Erickson et al. 2002a, 2003c
Leaning Juniper, OR	Kronner et al. 2005	Buffalo Ridge, MN	Johnson et al. 2000a	Biglow Reference, OR	WEST 2005c
Cotterel Mtn., ID	BLM 2006	Stateline, WA/OR	Erickson et al. 2003a	Simpson Ridge, WY	Johnson et al. 2000b
Imrie South, WA	Johnson et al. 2006e	Desert Claim, WA	Young et al. 2003b	Wild Horse, WA	Erickson et al. 2003d
Antelope Ridge, OR	WEST 2009	Combine Hills, OR	Young et al. 2003c	AOCM (CPC Proper), CA	Chatfield et al. 2010
Roosevelt, WA	NWC and WEST 2004	Klondike, OR	Johnson et al. 2002	Dry Lake, AZ	Young et al. 2007b
Swauk Ridge, WA	Erickson et al. 2003b	Bighorn, WA	Johnson and Erickson 2004	Tehachapi Pass, CA	Anderson et al. 2000, Erickson et al. 2002b
Dunlap, WY	Johnson et al. 2009a	Condon, OR	Erickson et al. 2002b	AOCM (CPC East), CA	Chatfield et al. 2010
Klickitat Co., EOZ WA	WEST and NWC 2003	Timber Road (Phase II), OH	Good et al. 2010	San Gorgonio, CA	Anderson et al. 2000, Erickson et al. 2002b
High Winds, CA	Kerlinger et al. 2005	Stateline Reference, OR	URS et al. 2001	Alta East (2010), CA	Chatfield et al. 2011
Golden Hills, OR	Jeffrey et al. 2008	Biglow Canyon, OR	WEST 2005c	Alta East (2011), CA	Chatfield et al. 2011
Foote Creek Rim, WY	Johnson et al. 2000b	Hatchet Ridge, CA	Young et al. 2007a		

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ENVIRONMENTAL & STATISTICAL CONSULTANTS

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February 11, 2014

Casey Willis
Sunflower Wind Project, LLC.
3760 State Street, Suite 102
Santa Barbara, CA 93105

RE: Sunflower Avian Use Fall and Winter Update

Dear Mr. Willis,

Western EcoSystems Technology, Inc. (WEST) was contracted to conduct avian use point counts at the proposed Sunflower project area in central North Dakota. See attached map, and corresponding point count locations currently being surveyed. Surveys started in mid-March 2013 and are continuing to date. Surveys were done weekly during the spring and fall migration periods and twice per month during the summer and winter period. Each point is surveyed for one hour during each visit.

WEST provided an interim report detailing observations and initial analysis of data from project start on March 20 through August 21, 2013. This memo updates information collected during surveys conducted between late August 2013 and early February 2014. During the fall and winter surveys to date, a total of 61 raptors observations were documented spread among seven species, including observations at all distances from the observer during point counts. The most common raptor species observed was northern harrier. One bald eagle and four golden eagles were observed during point counts. See the attached table for a complete list of species and observations made during the point counts from late August 2013 through early February 2014. The overall species and numbers appear to be reflective of a grassland landscape in central North Dakota.

Please let me know if you have any questions or need further details.

Sincerely,

Clayton Derby
Senior Manager

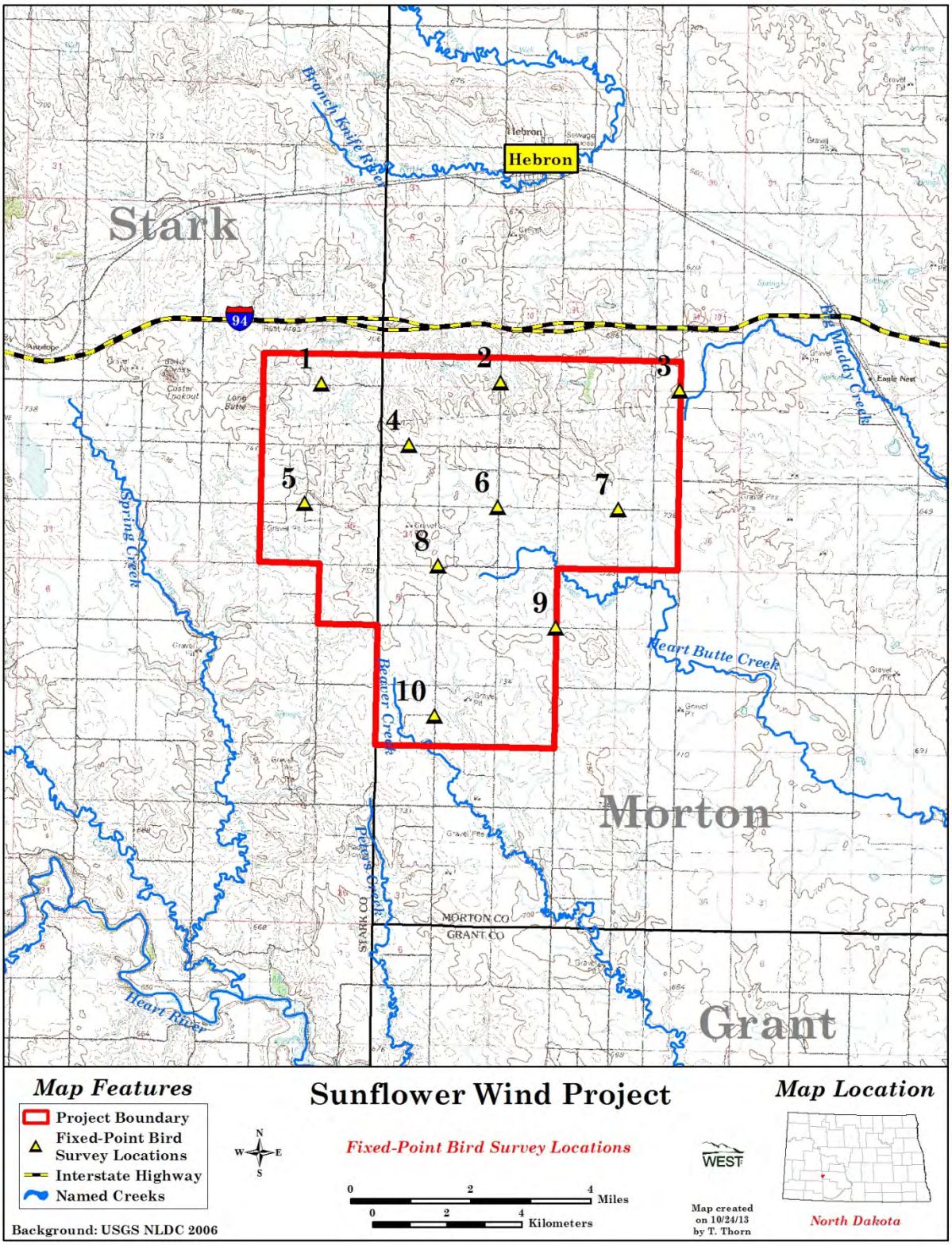


Figure 1. Avian use survey points within the Sunflower project area.

Table 1. Species observed during avian point counts within the Sunflower project area, late August 2013 through early February 2014.

Common Name	Total Observations
American Crow	1
American Goldfinch	15
American Robin	2
Bald Eagle	1
Barn Swallow	38
Black-billed Magpie	1
Brown-headed Cowbird	2
Brewer's Blackbird	30
Canada Goose	45
Clay-colored Sparrow	1
Common Grackle	10
Ferruginous Hawk	1
Golden Eagle	4
Gray Partridge	2
Greater White-fronted Goose	150
Horned Lark	216
House Sparrow	18
Killdeer	8
Lincoln's Sparrow	1
Mourning Dove	12
Northern Flicker	1
Northern Harrier	23
Rough Legged Hawk	10
Ring-necked Pheasant	102
Red-tailed Hawk	12
Rusty Blackbird	8
Red-winged Blackbird	22
Sandhill Cranes	35
Savannah Sparrow	12
Snow Bunting	97
Snow Goose	27
Sharp-tailed Grouse	26
Swainson's Hawk	10
Turkey Vulture	5
Vesper Sparrow	1
Western Meadowlark	48

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November 15, 2013

Casey Willis
Sunflower Wind Project, LLC
3760 State St., Suite 102
Santa Barbara, CA 93105

RE: Sunflower Wind Project Habitat Mapping

Dear Mr. Willis,

Vegetation types (or Habitat) were delineated using ArcGIS, ArcMap 10.1 within the Sunflower Wind Project (SFWP) and a one mile buffer (Buffer). Using 2012 USDA NAIP aerial imagery in combination with 2006 USGS NLCD land use/land cover, 2004 ND Gap land use/land cover, and 2010 and 2011 USDA NASS land classification, all land within the two areas was digitized and assigned one of seven habitat types (excluding National Wetland Inventory [NWI] wetlands; Table 1). NWI data was used to represent water within the two study areas. Those water features (mostly created stock dams and dugouts) visible on the aerial imagery but not in the NWI data were digitized as "water" habitat.

The SFWP, as described, contained slightly more than 21,980 acres and the one mile buffer contained approximately 3,000 less acres than the SFWP. Cropland and grassland made up the vast majority of land cover in both areas (96.8% of the SFWP and 93.5% of the Buffer) with cropland making up the highest percentage of both (Table 1). In descending order, the following habitat types made up the remaining area of the SFWP: developed, NWI wetlands, deciduous trees, shrubs, unknown trees, and water while the only difference in the Buffer was slightly more deciduous trees than NWI wetlands (Table 1). The percentage of each habitat type was similar between the two areas (Table 1).

Habitat types were spread out across the SFWP and Buffer (Figure 1). There was a slight predominance of larger grasslands tracts in the northern third of the SFWP and a higher amount of developed area (associated with Interstate 94) in the northern part of the Buffer (Figure 1).

Let me know if you have any questions or need further details.

Sincerely,

Clayton Derby
Senior Manager

Table 1. Digitized Land Cover within the Sunflower Wind Project and 1 mile buffer.

	SFWP		Buffer	
Habitat Type	**Acres**	**%**	**Acres**	**%**
Cropland	12,940.3	58.9	9,978.2	53.0
Grassland	8,323.8	37.9	7,619.3	40.5
Developed	485.1	2.2	967.52	5.1
NWI[a] Wetlands	110.3	0.5	104.0	0.6
Deciduous Trees	102.5	0.5	135.7	0.7
Shrubs	16.8	0.1	14.7	0.1
Unknown Trees	2.7	<0.1		
Water	1.3	<0.1	4.9	<0.1
Total	**21,982.8**		**18,824.3**	

[a] USFWS National Wetland Inventory

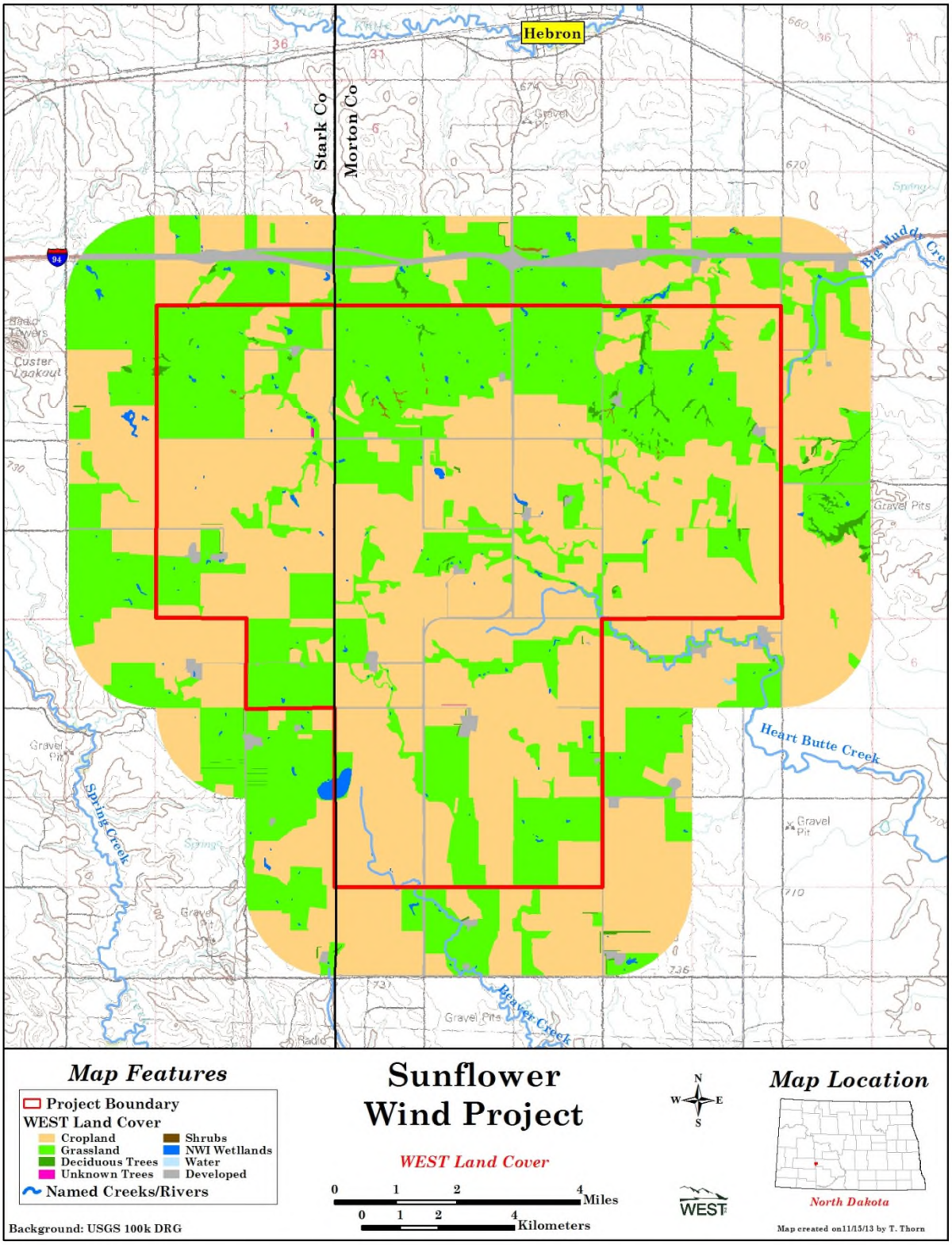


Figure 1. Digitized Land cover within the Sunflower Wind Project and 1 mile buffer.

Bat Activity Studies for the Sunflower Wind Project, Morton and Stark Counties, North Dakota

Final Report

June 2013 – October 2013



Prepared for:

Sunflower Wind Project, LLC

3760 State Street, Suite 102
Santa Barbara, California 93105

Prepared by:

Clayton Derby, Goniela Iskali, and Terri Thorn

Western EcoSystems Technology, Inc.
415 West 17th Street, Suite 200
Cheyenne, Wyoming 82001

December 10, 2013

Draft Pre-Decisional Document - Privileged and Confidential - Not For Distribution

EXECUTIVE SUMMARY

In June 2013, Western EcoSystems Technology, Inc. initiated a bat acoustic survey for the proposed Sunflower Wind Project (SWP) in Morton and Stark Counties, North Dakota. The bat acoustic survey conducted at the SWP was designed to estimate levels of bat activity within the SWP during summer and fall.

Acoustic surveys were conducted at three meteorological (met) tower stations in hay fields from June 12 through October 23, 2013. Four AnaBat™ SD2 detectors were utilized for the survey. Three acoustic monitoring stations were placed near the ground (one meter [m; 3.3 feet (ft)]) and one of these stations was paired with a detector unit with a microphone placed at approximately 45 m (147.6 ft) on the met tower using a modified bat-hat. All stations were monitored on a weekly or bi-monthly basis.

In total, AnaBat units recorded 537 bat passes in 477 detector-nights for a combined mean (± standard error) of 1.15 ± 0.12 bat passes per detector-night (Table 3). Ground detectors recorded 448 bat passes on 351 detector-nights for a mean of 1.30 ± 0.14 bat passes per detector-night, while the raised station recorded 89 bat passes on 126 detector nights for a mean of 0.71 ± 0.11 per detector-night.

Bat activity varied between seasons, with low activity in the summer and higher activity higher in the fall. Low-frequency bat pass rates peaked during late August, while high-frequency bat pass rates peaked during early August. Higher activity during the late summer and early fall may be due to the presence of both post-lactating adult female bats and newly volant juvenile bats as well as migrating bats.

For all detector locations, 54.6% of bat passes were classified as high-frequency (e.g., eastern red bats), while 45.4% of bat passes were classified as low-frequency (e.g., hoary bats and silver-haired bats).

Bat activity recorded at the SWP by ground detectors during the fall migration period (1.70 ± 0.20 bat passes per detector-night) was one of the lower call rates recorded when compared to all the facilities in the Midwest as well as compared with all facilities in North America which reported similarly-collected data.

STUDY PARTICIPANTS

Western EcoSystems Technology

Clayton Derby	Project Manager
Goniela Iskali	Bat Biologist and Report Compiler
Kimberly Bay	Data and Report Manager
Terri Thorn	GIS Technician
Andrea Palochak	Technical Editor
Cathy Clayton	Field Technician

REPORT REFERENCE

Derby, C., G. Iskali, and T. Thorn. 2013. Bat Activity Studies for the Sunflower Wind Project, Morton and Stark Counties, North Dakota. Final Report: June 2013 – October 2013. Prepared for Infinity Wind Power, Santa Barbara, California. Prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming.

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INTRODUCTION

Sunflower Wind Project, LLC (Sunflower), a wholly owned subsidiary of Infinity Wind Power, is considering the development of a wind energy facility in the Sunflower Wind Project (SWP) in Morton and Stark Counties, North Dakota. Sunflower contracted Western EcoSystems Technology, Inc. (WEST) to complete a study of bat activity following the recommendations of the US Fish and Wildlife Service's (USFWS) Land-Based Wind Energy Guidelines (WEG; USFWS 2012) based on methods outlined in Kunz et al. (2007a). WEST conducted acoustic monitoring surveys to estimate levels of bat activity within the SWP during summer and fall. The following report describes the results of acoustic monitoring surveys conducted at the SWP between June 12 and October 23, 2013.

STUDY AREA

The SWP is located in Morton and Stark Counties, North Dakota, approximately three miles (4.8 kilometers [km]) south of the town of Hebron (Figures 1 and 2). The SWP, currently about 21,983 acres (89 square kilometers [km^2]; 34 square miles [mi^2]) is located in west-central North Dakota, and more specifically western Morton and eastern Stark Counties. The landscape within the SWP is generally flat with more rolling lands in the northern third of the project area. Elevation ranges from 679 meters (m; 2,228 feet [ft]) to 817 m (2,679 ft). Historically, the SWP's landscape was dominated by grasslands but has since been converted largely to agricultural use with crop production and livestock grazing the primary practices. Trees and shrubs can be found around farmsteads, within planted shelter belts, and along/within drainages. Wetlands are scattered throughout the SWP with many being man-made.

Cultivated cropland and herbaceous/pasture/hay lands are approximately equal in amount and comprise almost 95% of the study area. Of the remaining 5%, 3.5% is developed, while wetlands, forest, and barren lands, in that order, make up the rest of the landscape (Table 1; Figure 2; USGS NLCD 2006, Fry et al. 2011). Common agricultural crops include small grains, corn (*Zea mays*), sunflowers (*Helianthus annuus*), and alfalfa (*Medicago sativa*).

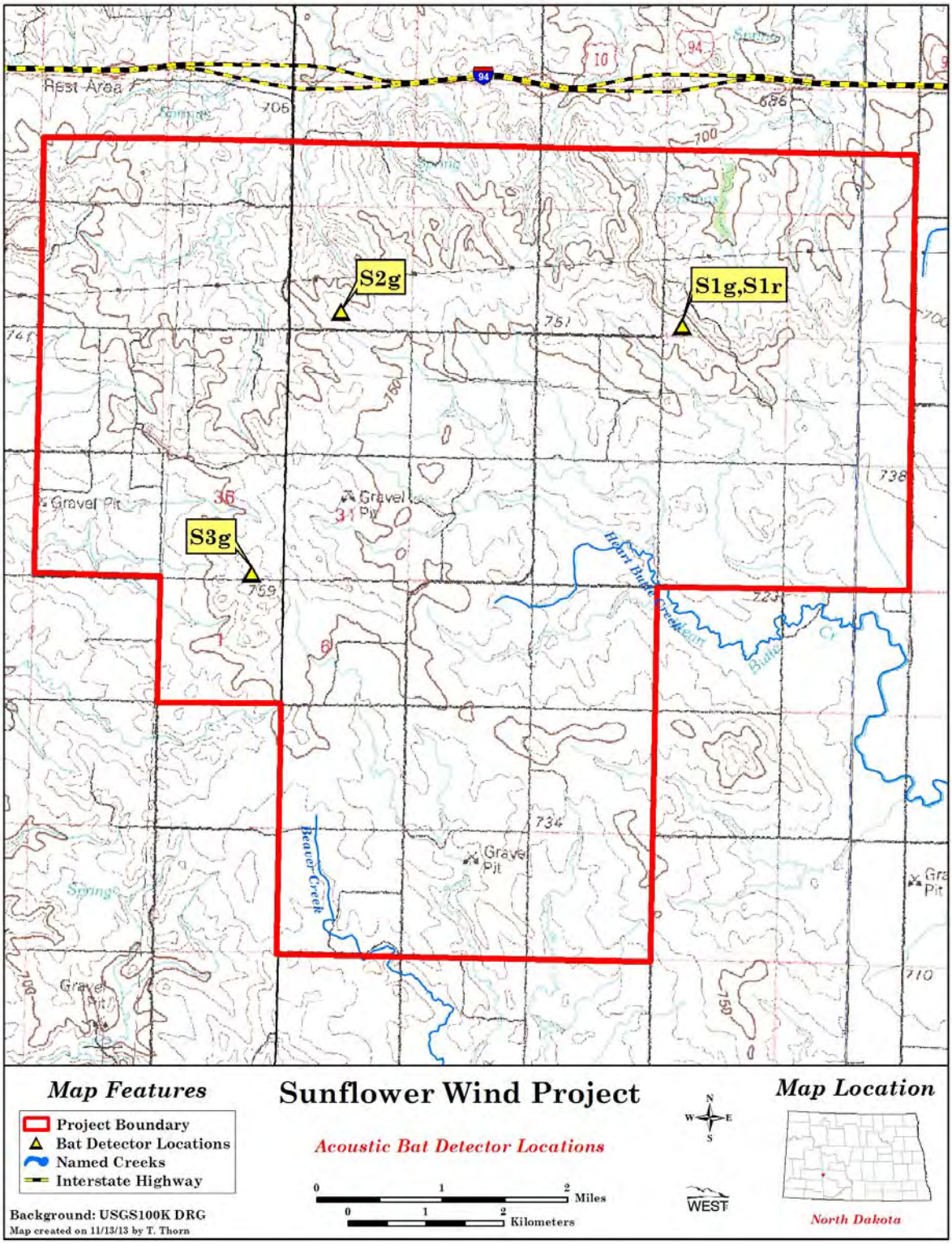


Figure 1. Topographic map showing the location of the Sunflower Wind Project and AnaBat stations.

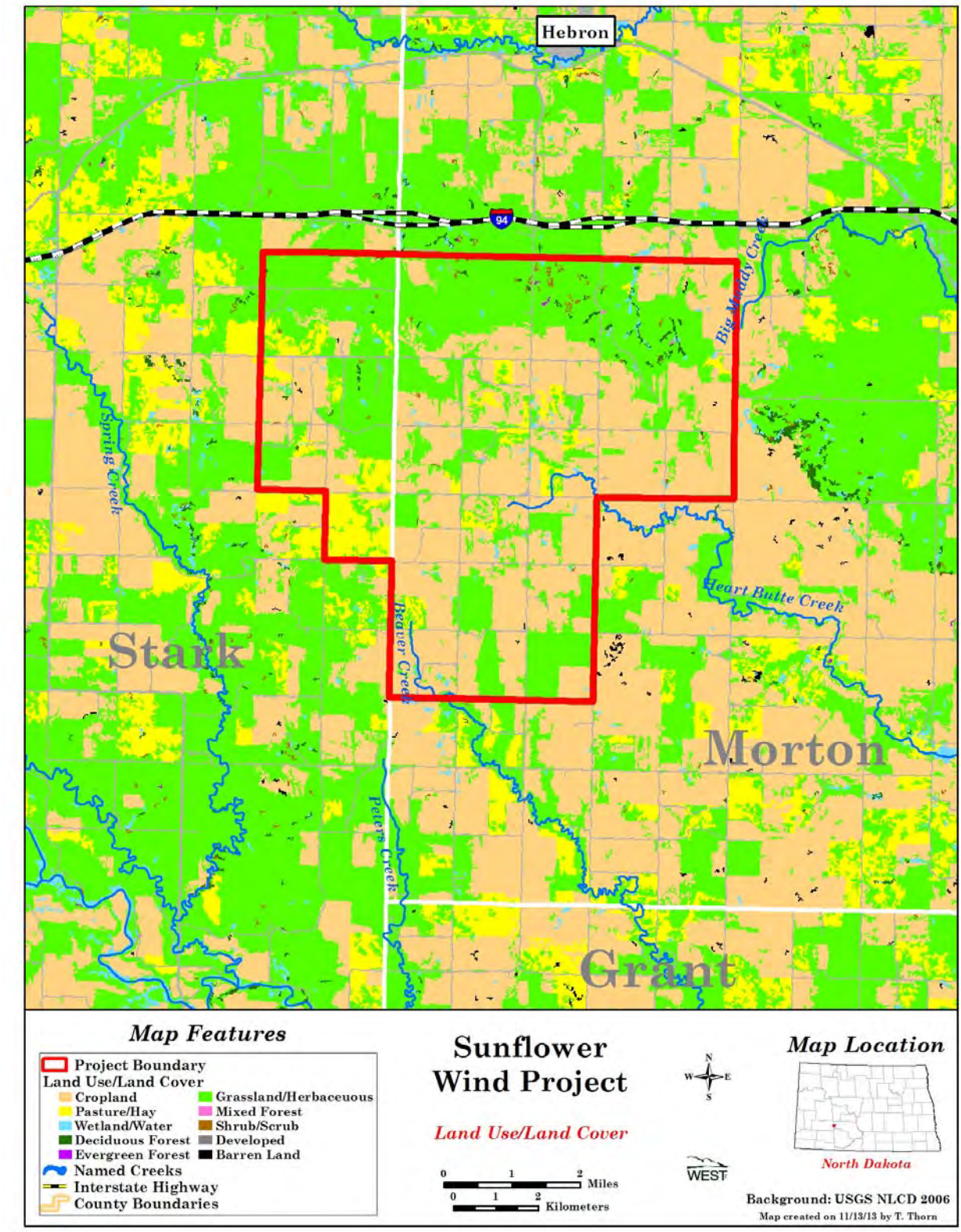


Figure 2. Land cover in the Sunflower Wind Project (USGS NLCD 2006).

Table 1. Land cover in the Sunflower Wind Project according to the United States Geological Survey National Land Cover Dataset (USGS NLCD 2006).

Land Cover	Acres	% Composition
Cultivated Crops	10,493.79	47.74
Grassland/Herbaceous	8,965.43	40.78
Pasture/Hay	1,394.77	6.34
Developed, Open Space	703.38	3.20
Woody Wetlands	110.59	0.50
Deciduous Forest	100.58	0.46
Shrub/Scrub	62.75	0.29
Developed, Low Intensity	58.52	0.27
Emergent Herbaceous Wetland	46.51	0.21
Open Water	30.93	0.14
Barren Land (rock/sand/clay)	8.23	0.04
Evergreen Forest	4.45	0.02
Mixed Forest	3.34	0.02
Total	**21,983.27**	**100**

Overview of Bat Diversity

Ten species of bats may potentially occur in North Dakota and in the SWP (Table 2). One of these, the northern long-eared bat, is a sensitive species that was recently proposed to be listed as endangered by the USFWS (2013). The northern long-eared bat, along with several once common and abundant bat species such as the little brown bat (*Myotis lucifugus*) are experiencing population declines due to the spread of white-nose syndrome (Frick et al. 2010; Center for Biological Diversity 2010). The northern long-eared bat uses caves and underground mines for hibernation. There are no karst regions or mines within the SWP for hibernation. The nearest karst region is approximately 130 miles from SWP and located in southeastern Montana (USGS 2013). During the summer, it relies upon forested habitat and it roosts in tree cavities and underneath exfoliating bark (BCI 2013) and forages over open water areas within and near forested areas. There are limited trees within the SWP (Figure 2); the closest area of denser tree growth around water is the Heart River, approximately 8 miles south of the SWP.

Table 2. Bat species with potential to occur within the Sunflower Wind Project (Harvey et al. 1999, BCI 2003) categorized by echolocation call frequency.

Common Name	Scientific Name
High-Frequency (> 30 kHz)	
eastern red bat[1,3]	*Lasiurus borealis*
western small-footed bat	*Myotis ciliolabrum*
little brown bat[1]	*Myotis lucifugus*
western long-eared bat[1]	*Myotis evotis*
northern long-eared bat[1,2]	*Myotis septentrionalis*
long-legged bat[1]	*Myotis volans*
Low-Frequency (< 30 kHz)	
big brown bat[1]	*Eptesicus fuscus*
hoary bat[1,3]	*Lasiurus cinereus*
silver-haired bat[1,3]	*Lasionycteris noctivagans*
fringed bat	*Myotis thysanodes*

[1] species known to have been killed at wind energy facilities (Species reported by Anderson et al. 2004, Kunz et al. 2007b, Baerwald 2008);
[2] proposed for listing as a federally endangered species (USFWS 2013); and
[3] long-distance migrant.

METHODS

Bat Acoustic Surveys

WEST conducted acoustic monitoring studies to estimate levels of bat activity throughout the SWP during summer and fall. Bat detectors are a primary acoustic survey tool used in baseline wind development surveys to calculate an index of bat activity; the levels of bat activity provide some insight into possible impacts of development on bats (Arnett 2007, Kunz et al. 2007a).

Survey Stations

Four AnaBat™ SD2 ultrasonic bat detectors (Titley Scientific™, Australia) were used during the study. Two AnaBat SD2 detectors were paired at one of the meteorological (met) towers, with one detector at ground level approximately 1 m (3.3 ft) above ground level (AGL) and another approximately 45 m (148 ft) AGL (Figure 1). The other two AnaBat units (ground level) were placed at two other met tower locations (Figure 1). Species activity levels and composition can vary with altitude (Baerwald and Barclay 2009, Collins and Jones 2009), so it is important to monitor at different heights (Kunz et al. 2007b). Ground-based detectors likely detect a more complete sample of the bat species present within the project area, whereas elevated detectors may give a more accurate assessment of risk to bat species flying at rotor swept heights (Kunz et al. 2007b).

Each AnaBat unit was inside a plastic weather-resistant container that had a hole cut in the side through which the microphone extended. Each microphone was encased in a 45-degree angle poly-vinyl chloride (PVC) tube, and holes were drilled in the PVC tube to allow water to drain. Raised AnaBat microphones were elevated on met towers using a pulley system. Bat-Hat weatherproof housing (EME Systems, Berkeley California) was modified by replacing the Plexiglas reflector plate with a 45-degree angle PVC elbow. The Bat-Hat was altered because

detectors protected using un-modified Bat-Hats may detect lower activity and species richness than are present at a site, while detectors protected with a 45-degree PVC elbow have been found to detect similar numbers and quality of bat calls as detectors exposed to the environment (Britzke et al. 2010).

Survey Schedule

Bats were surveyed at the SWP from June 12 to October 23, 2013, and units were programmed to turn on approximately 30 minutes (min) before sunset and turn off approximately 30 min after sunrise each night.

Data Collection and Call Analysis

AnaBat detectors use a broadband high-frequency microphone to detect the echolocation calls of bats. Incoming echolocation calls are digitally processed and stored by the detector. Incoming echolocation calls are digitally processed and stored on a high capacity compact flash card. The resulting files can be viewed in appropriate software (i.e., Analook©) as digital sonograms that show changes in echolocation call frequency over time. Frequency versus time displays were used to separate bat calls from other types of ultrasonic noise (e.g., wind, insects, etc.) and to identify the call frequency classification and (when possible) the species of bat that generated the calls.

The detection range of AnaBat detectors depends on a number of factors (e.g., echolocation call characteristics, microphone sensitivity, habitat, the orientation of the bat, atmospheric conditions; Limpens and McCracken 2004), but is generally less than 30 m (98 ft) due to atmospheric absorption of echolocation pulses (Fenton 1991). To standardize acoustic sampling effort across the project, AnaBat units were calibrated and sensitivity levels were set to six (Larson and Hayes 2000), a level that balanced the goal of recording bat calls against the need to reduce interference from other sources of ultrasonic noise (Brooks and Ford 2005).

For each survey location, bat passes were sorted by their minimum frequency into two groups based on their minimum frequency that correspond roughly to species groups of interest. For example, most species of *Myotis* bats, as well as eastern red bats (*Lasiurus borealis*), echolocate at frequencies greater than 30 kilohertz (kHz), and are considered high-frequency bats (HF), whereas species such as the big brown bat (*Eptesicus fuscus*), silver-haired bat (*Lasionycteris noctivagans*), and hoary bat (*Lasiurus cinereus*) typically emit echolocation calls below 30 kHz and are considered low-frequency bats. To establish which species may have produced passes in each category, a list of species expected to occur in the study area was compiled from range maps (Table 2; BCI 2003).

Statistical Analysis

The standard metric used for measuring bat activity was the number of bat passes per detector-night, and this metric was used as an index of bat activity in the project area. A bat pass was defined as a sequence of at least two echolocation calls (pulses) produced by an individual bat with no pause between calls of more than one second (White and Gehrt 2001, Gannon et al. 2003). A detector-night was defined as one detector operating for one entire night. The terms

bat pass and bat call are used interchangeably. Bat passes per detector-night was calculated for all bats, and for HF and LF categories. Bat pass rates represent indices of bat activity and do not represent numbers of individuals. The number of bat passes was determined by an experienced bat acoustic analyst using Analook. All multi-detector averages in this report were calculated by averaging the average activity of each detector.

The period of peak sustained bat activity was defined as the 7-day period with the highest average bat activity. If multiple 7-day periods equaled the peak sustained bat activity rate, all dates in these 7-day periods were reported. This and all multi-detector averages in this report were calculated as an un-weighted average of total activity at each detector.

To highlight seasonal activity patterns, the study was divided into two survey periods: summer (June 13 – July 31), and fall (August 1 – October 23). Mean bat activity was also calculated for a standardized fall migration period (FMP), defined here as July 30 – October 14. The FMP represents the period between dissolution of maternity colonies and onset of the swarming and hibernation seasons. This period was defined by WEST as a standard for comparison with activity from other wind energy facilities. During this time bats begin moving toward wintering areas, and many species of bats initiate reproductive behaviors (Cryan 2008). This period of increased landscape-scale movement and reproductive behavior is often associated with increased levels of bat fatalities at operational wind energy facilities (Arnett et al. 2008).

Risk Assessment

To assess potential for bat fatalities, bat activity in the SWP was compared to existing data at other wind energy facilities in the Midwest. Among studies measuring both activity and fatality rates, most data were collected during the fall using AnaBat detectors placed at ground level near met towers. Therefore, to make valid comparisons to the publically available data, this report uses the activity rate recorded at ground detectors during the FMP as a standard for comparison with activity data from other wind energy facilities. Given the relatively small number of publicly-available studies and the significant ecological differences between geographically dispersed facilities, the risk assessment is qualitative, rather than quantitative.

RESULTS

Bat Acoustic Surveys

Bat activity was monitored at the three sampling locations between June 12 and October 23, 2013, resulting in a total of 477 detector-nights (89.7% of the potential sampling period; Figure 3). The primary causes of lost data were weather related when excessive wind knocked down two of the AnaBat detectors, and battery failure. AnaBat units at fixed ground stations recorded 448 bat passes on 351 detector-nights for a mean (± standard error) of 1.30 ± 0.14 bat passes per detector-night, while the raised station recorded 89 bat passes on 126 detector nights for a mean of 0.71 ± 0.11 per detector-night (Table 3, Figure 4). In total, AnaBat units recorded 537 bat passes on 477 detector-nights for a mean of 1.15±0.12 bat passes per detector-night (Table

3). In addition, excessive noise was detected for about three weeks from August 13 to September 3, 2013, likely due to bee hives that were installed near station S3g (Figure 5).

Spatial Variation

Bat activity in the SWP was consistently higher at the ground units (Figure 4, Table 3). On average, activity at ground detectors (1.30 ± 0.14) was nearly twice as high as at the raised detector (0.71 ± 0.11; Table 3, Figures 4 and 6). Bat activity varied between the four met tower locations. Among ground units, S3G recorded the fewest bat passes per detector-night (0.88 ± 0.17), while unit S1G recorded the most (1.65 ± 0.19; Table 3, Figure 4).

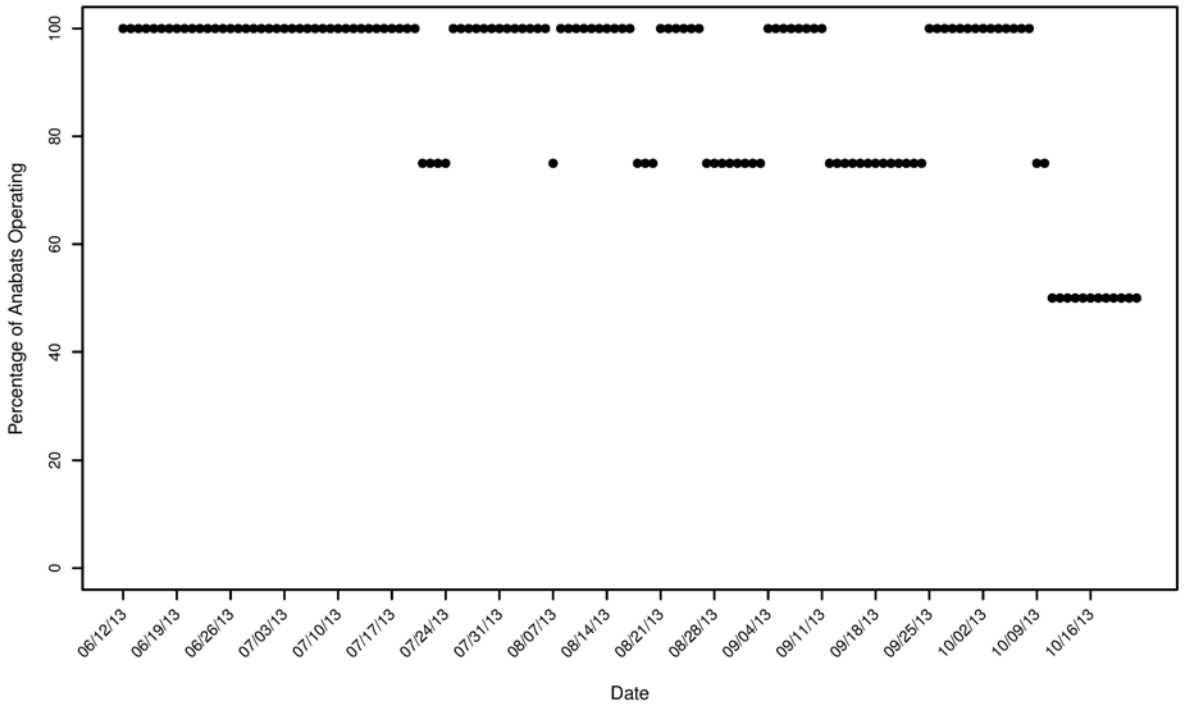


Figure 3. Operational status of AnaBat detectors operating at the Sunflower Wind Project during each night of the study period June 12 to October 23, 2013.

Table 3. Results of acoustic bat surveys conducted at fixed stations within the Sunflower Wind Project from June 12 to October 23, 2013. Passes are separated by call frequency: high frequency (HF) and low frequency (LF).

AnaBat Station	Location	# of HF Bat Passes	# of LF Bat Passes	Total Bat Passes	Detector-Nights	Bat Passes/ Night*
S1G	ground	105	81	186	113	1.65±0.19
S1R	raised	15	74	89	126	0.71±0.10
S2G	ground	90	56	146	106	1.38±0.18
S3G	ground	83	33	116	132	0.88±0.17
Total Ground		278	170	448	351	1.30±0.14
Total Raised		15	74	89	126	0.71±0.11
Total		293	244	537	477	1.15±0.12

*± bootstrapped standard error.

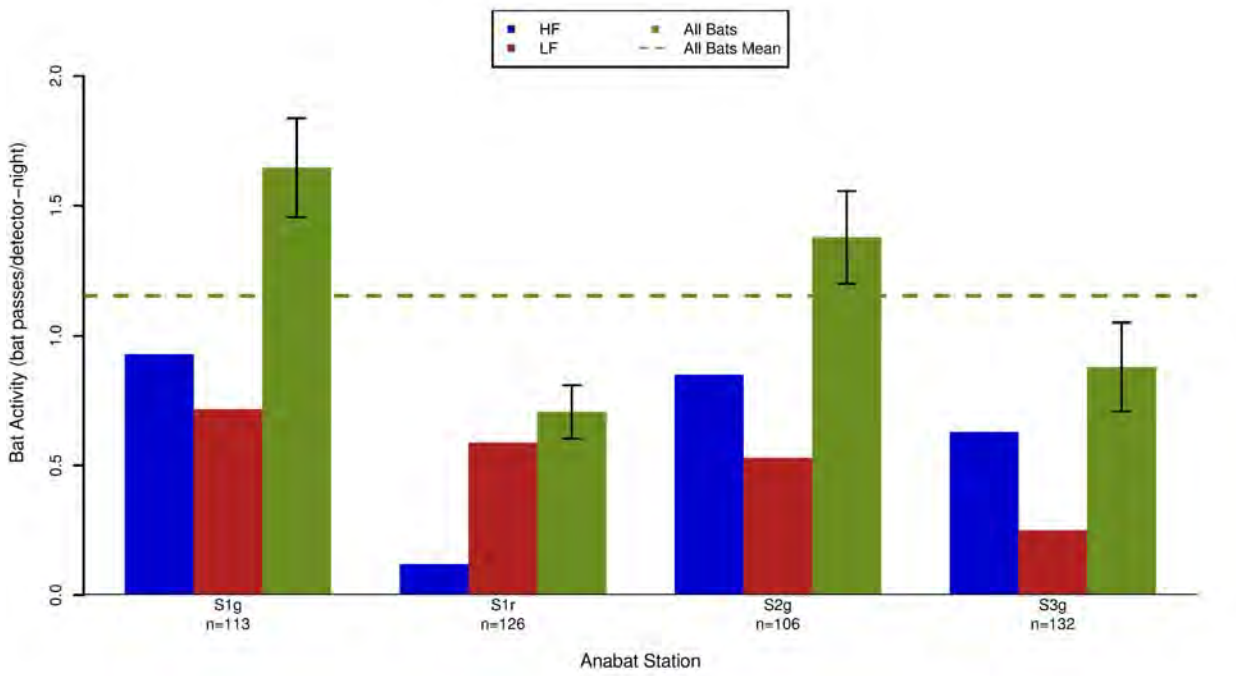


Figure 4. Number of high-frequency (HF) and low-frequency (LF) bat passes per detector-night recorded at AnaBat stations in the Sunflower Wind Project between June 12 to October 23, 2013. The bootstrapped standard errors are represented by the black error bars on the 'All Bats' columns.

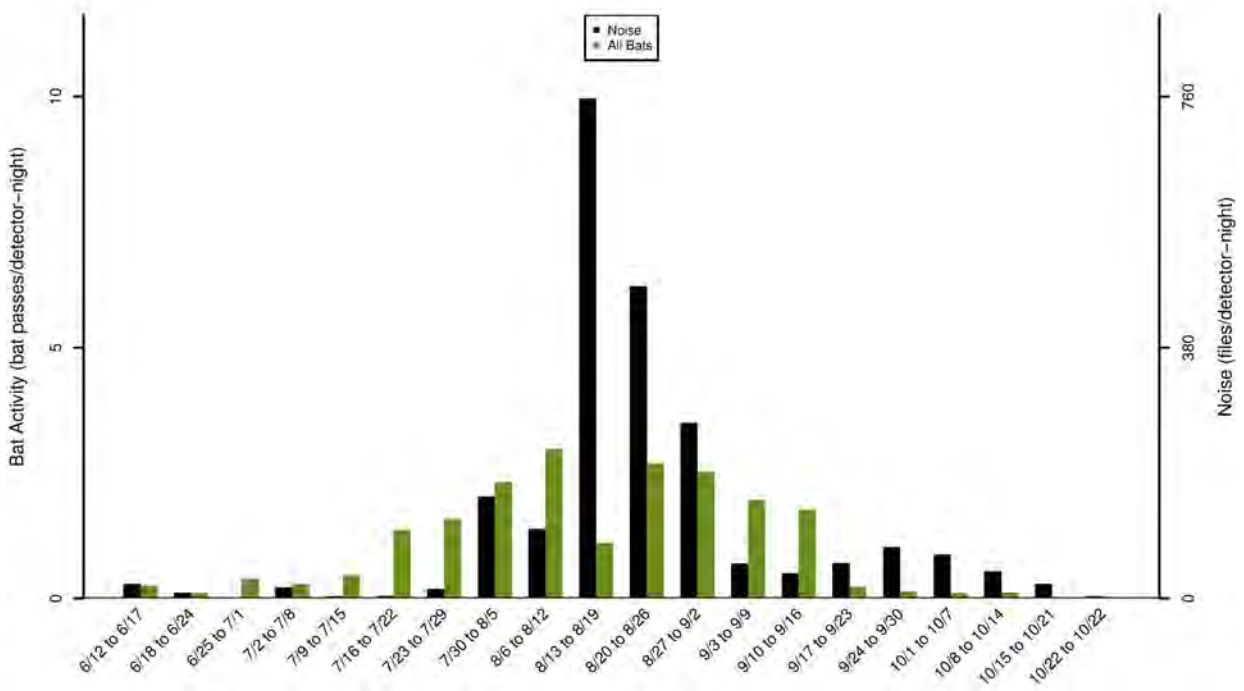


Figure 5. Activity and noise comparison at fixed AnaBat stations for all bats in the Sunflower Wind Project from June 12 to October 23, 2013.

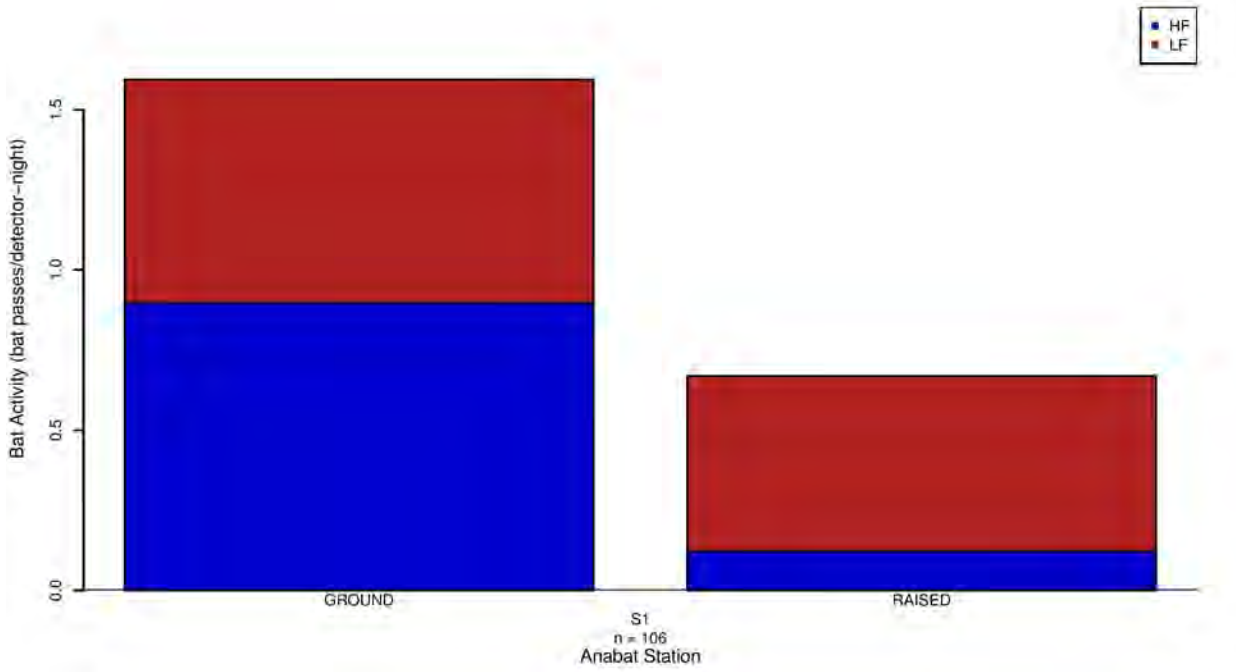


Figure 6. Number of high-frequency (HF) and low-frequency (LF) bat passes per detector-night recorded at the paired AnaBat station (S1) between June 12 to October 23, 2013.

Temporal Variation

Bat activity at fixed stations was relatively low in the summer and higher in the fall (Table 4; Figure 7). Bat activity peaked from August 4 to August 10 at 3.35 bat passes per detector-night (Table 5). After the peak, overall bat activity gradually decreased for the remainder of the study period (Figure 8). Comparing weekly activity at paired ground and raised detectors indicates a subtle shift during the course of the season; activity was generally higher at ground detectors throughout the summer and fall, but LF calls were higher at the raised station during the fall and FMP (Table 4; Figure 9).

Table 4. The number of bat passes per detector-night recorded at met towers stations in the Sunflower Wind Project during each season in 2013, separated by call frequency: high-frequency (HF), low-frequency (LF), and all bats (AB).

Station	Call Frequency	Summer June 12 – Jul 31	Fall Aug 1 – Oct 23	Fall Migration Jul 30 – Oct 14
S1g	LF	0.38	0.98	1.00
	HF	0.66	1.14	1.14
	AB	1.04	2.13	2.14
S1r	LF	0.13	0.85	0.93
	HF	0.09	0.14	0.18
	AB	0.22	0.99	1.11
S2g	LF	0.18	0.84	0.83
	HF	0.74	0.95	0.95
	AB	0.92	1.79	1.78

Table 4. The number of bat passes per detector-night recorded at met towers stations in the Sunflower Wind Project during each season in 2013, separated by call frequency: high-frequency (HF), low-frequency (LF), and all bats (AB).

Station	Call Frequency	Summer June 12 – Jul 31	Fall Aug 1 – Oct 23	Fall Migration Jul 30 – Oct 14
S3g	LF	0.06	0.37	0.39
	HF	0.56	0.67	0.8
	AB	0.62	1.04	1.2
Ground Totals	**LF**	0.21±0.06	0.73±0.11	0.74±0.11
	HF	0.65±0.12	0.92±0.13	0.96±0.13
	AB	0.86±0.16	1.65±0.20	1.70±0.20
Raised Totals	**LF**	0.13±0.06	0.85±0.16	0.93±0.17
	HF	0.09±0.05	0.14±0.04	0.18±0.05
	AB	0.22±0.09	0.99±0.18	1.11±0.19
Overall	**LF**	0.19±0.04	0.76±0.11	0.79±0.11
	HF	0.51±0.09	0.72±0.10	0.77±0.10
	AB	0.70±0.12	1.48±0.18	1.55±0.18

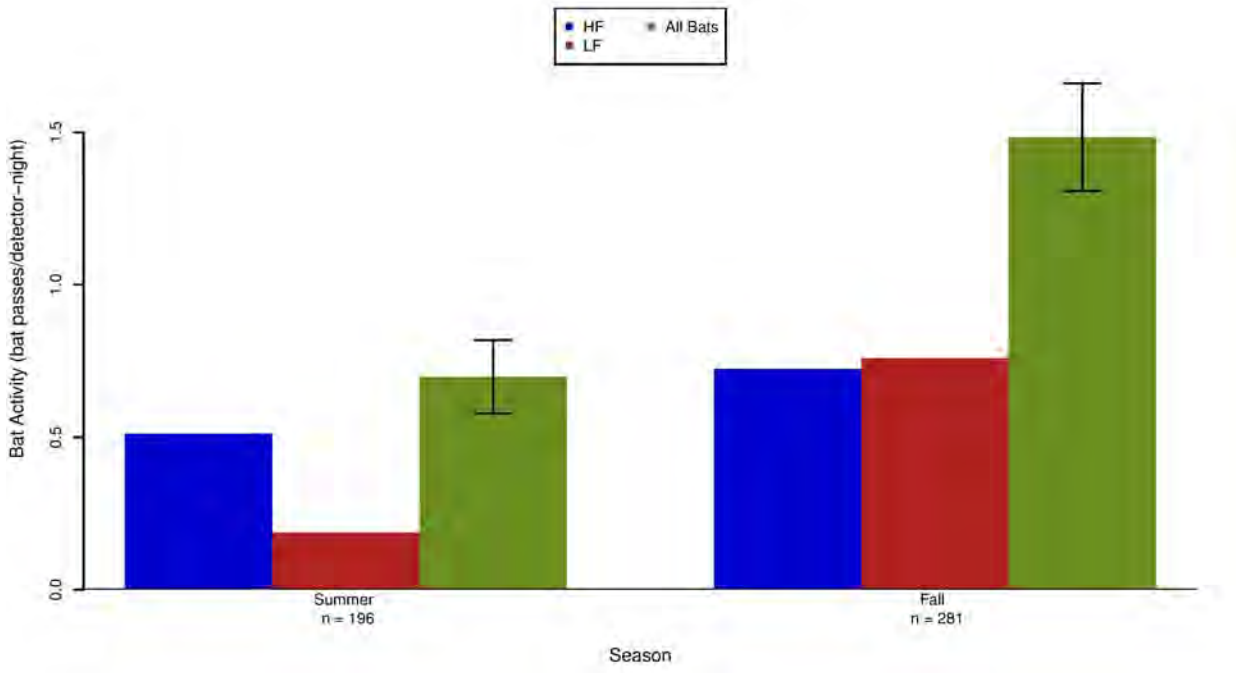


Figure 7. Seasonal bat activity by high-frequency (HF), low-frequency (LF), and all bats at the Sunflower Wind Project from June 12 to October 23, 2013. The bootstrapped standard errors are represented by black bars on the 'All Bats' columns.

Table 5. Periods of peak activity for high-frequency (HF), low-frequency (LF), and all bats at the Sunflower Wind Project for the study period June 12 – October 23, 2013.

Species Group	Start Date of Peak Activity	End Date of Peak Activity	Bat Passes per Detector-Night
HF	August 4	August 10	2.10
LF	August 27	September 04	1.76
All Bats	August 4	August 10	3.35

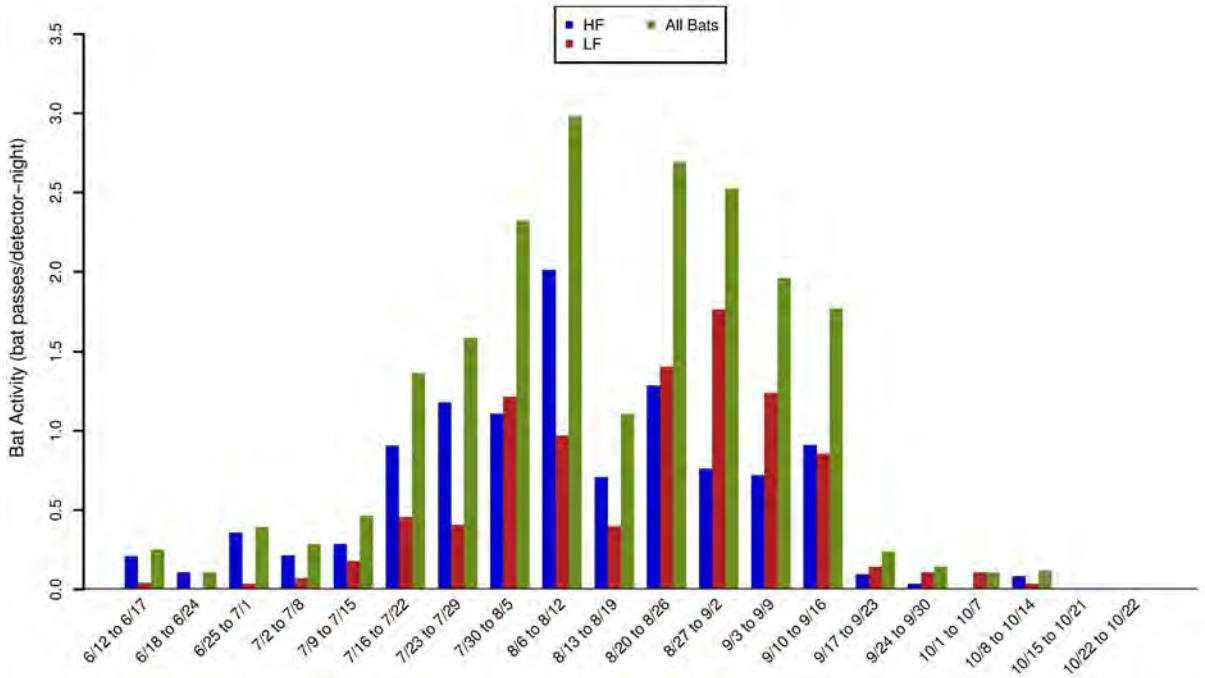


Figure 8. Weekly patterns of bat activity by high-frequency (HF), low-frequency (LF), and all bats at the Sunflower Wind Project for the study period June 12 to October 23, 2013.

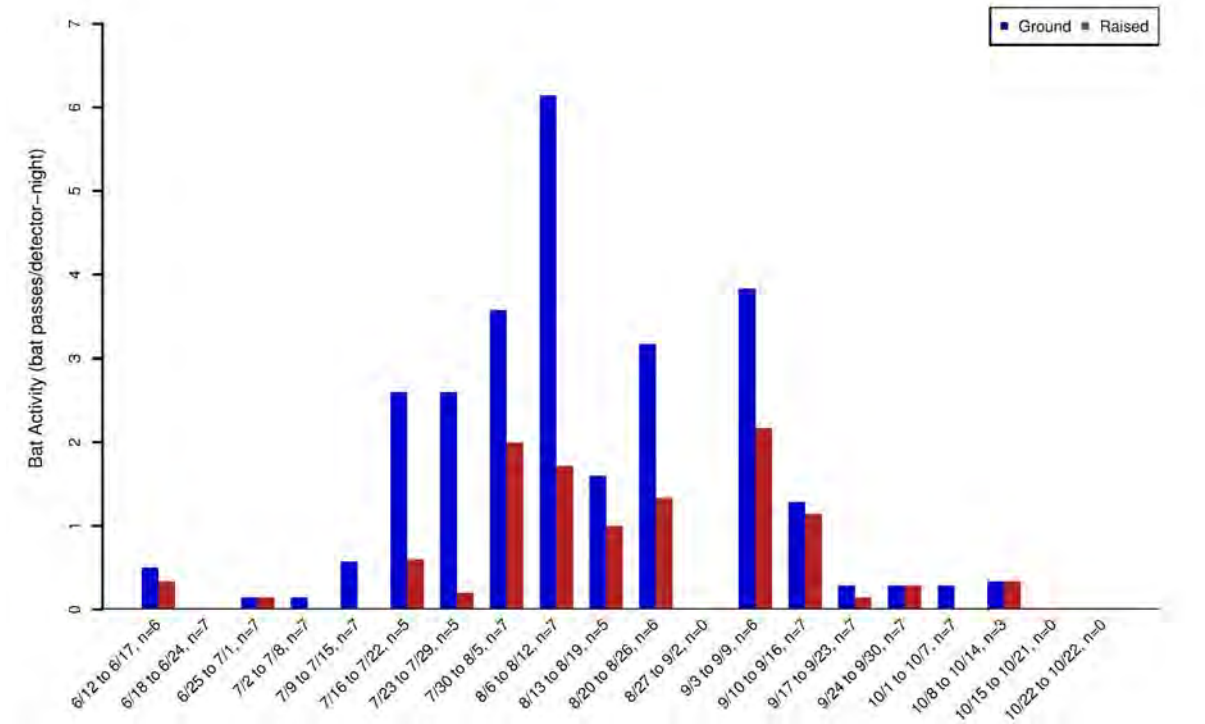


Figure 9. Weekly patterns of bat activity from June 12 to October 23, 2013, at ground and raised met tower stations at the Sunflower Wind Project.

DISCUSSION

Potential Bat Impacts

Assessing the potential impacts of wind energy development on bats at the SWP is complicated because the causes of bat fatalities at turbines are poorly understood (Kunz et al. 2007a, 2007b; Baerwald et al. 2008; Cryan and Barclay 2009; Long et al. 2010a, 2010b) and monitoring elusive, night-flying animals is inherently difficult (O'Shea et al. 2003). Although installed capacity for wind energy has increased rapidly in recent years, release of study results from these existing wind energy facilities has lagged the influx of newly proposed facilities (Kunz et al. 2007b); therefore, it is often the case that information gleaned from existing wind energy facilities is not available to inform assessments at proposed facilities. To date, post-construction monitoring studies of wind energy facilities suggest that:

1) Bat fatality rates show a rough positive correlation with bat activity (Kunz et al. 2007b);

2) The majority of fatalities occur during the post-breeding or fall migration season (August and September; Johnson 2005, Arnett et al. 2008);

3) Migratory tree-roosting species (e.g., eastern red, hoary, and silver-haired bats) compose approximately 75% of reported bats killed (Arnett et al. 2008, Gruver et al. 2009), and;

4) The level of bat fatalities may depend on many variables, including local environmental characteristics and/or specific weather conditions, but no single predictive factor has yet been identified.

Overall Bat Activity

Among publicly-available studies of bat activity at wind energy facilities, most data were collected only during the fall using AnaBat detectors placed near the ground in vegetation cover typical of turbine placement, rather than near features attractive to bats. Therefore, to generate a standardized metric of activity for comparison, this report relies on mean bat activity for the ground detectors during the fall migration period (FMP) to compare activity at the SWP to other studies with similarly-collected data (Figure 10, Appendix A).

While inconsistencies among studies (e.g., differences in study period length and timing, type of equipment, placement of equipment, and presentation of data; Appendix A) complicate comparisons across studies, some generalizations can be made. Considering only the detectors near ground-level at the met towers, bat activity recorded within the SWP during the standardized FMP (1.70 bat passes per detector-night) was the lowest estimate out of all the facilities in Midwest and the third lowest out of all the facilities in North America with similarly-collected data (Appendix A). However, this includes estimates from facilities in different regions, with different habitats and different bat species.

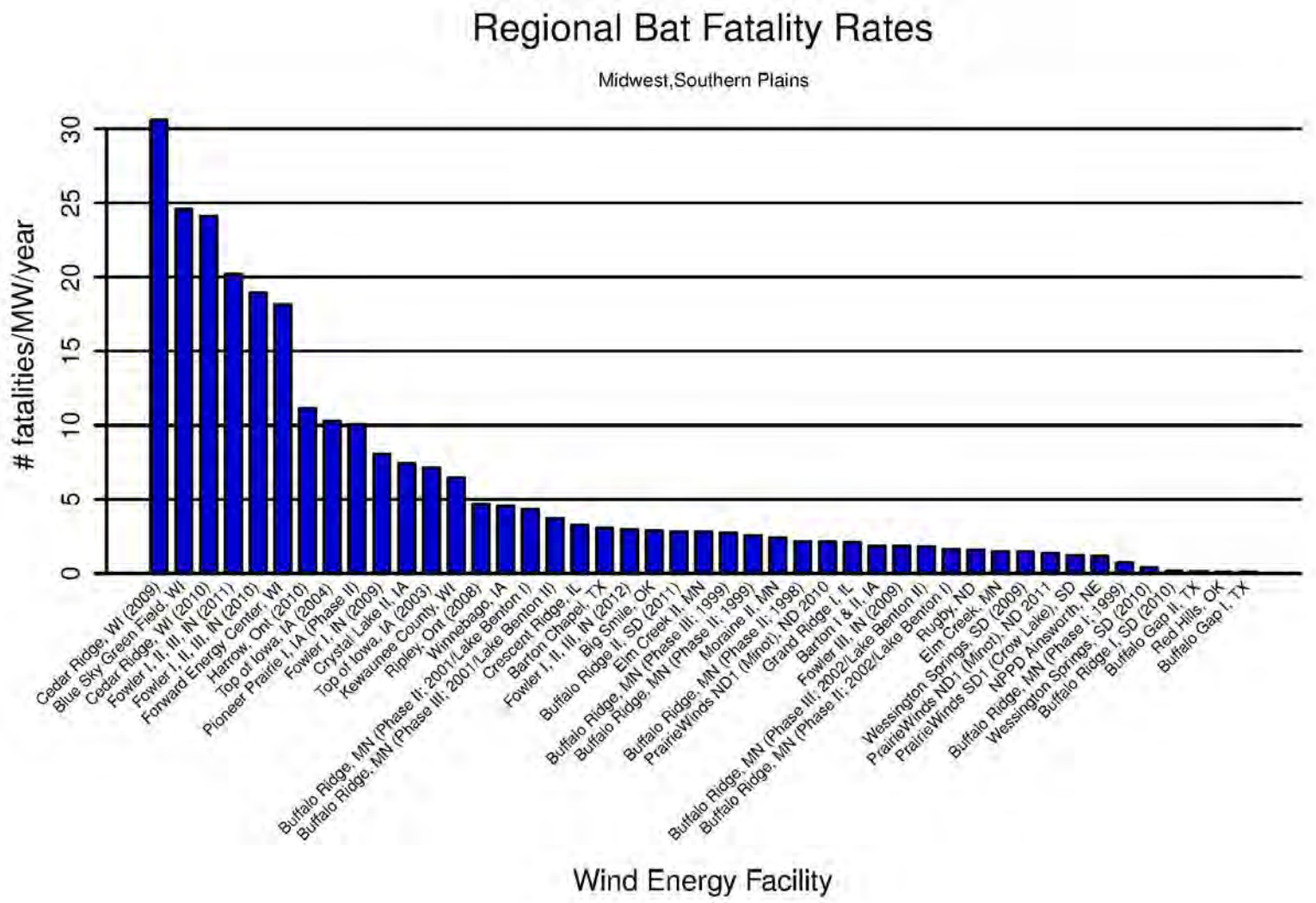


Figure 10. Fatality rates for bats (number of bats per megawatt per year) from publicly-available studies at wind energy facilities in the Midwest and Southern Plains of North America.

Figure 10 (*continued*). Fatality rates for bats (number of bats per megawatt per year) from publicly-available studies at wind energy facilities in the Midwest and Southern Plains of North America.

Data from the following sources:

Wind Energy Facility	Reference	Wind Energy Facility	Reference	Wind Energy Facility	Reference
Cedar Ridge, WI (09)	BHE Environmental 2010	Buffalo Ridge, MN (Ph. II; 01/Lake Benton I)	Johnson et al. 2004	Fowler III, IN (09)	Good et al. 2011
Blue Sky Green Field, WI	Gruver et al. 2009	Buffalo Ridge, MN (Ph. III; 01/Lake Benton II)	Johnson et al. 2004	Buffalo Ridge, MN (Ph. III; 02/Lake Benton II)	Johnson et al. 2004
Cedar Ridge, WI (10)	BHE Environmental 2011	Crescent Ridge, IL	Kerlinger et al. 2007	Buffalo Ridge, MN (Ph. II; 02/Lake Benton I)	Johnson et al. 2004
Fowler I, II, III, IN (11)	Good et al. 2012	Barton Chapel, TX	WEST 2011	Rugby, ND	Derby et al. 2011b
Fowler I, II, III, IN (10)	Good et al. 2011	Fowler I, II, III, IN (12)	Good et al. 2013	Elm Creek, MN	Derby et al. 2010c
Forward Energy Center, WI	Grodsky and Drake 2011	Big Smile, OK	Derby et al. 2013a	Wessington Springs, SD (09)	Derby et al. 2010f
Harrow, Ont. (10)	NRSI 2011	Buffalo Ridge II, SD (11)	Derby et al. 2012a	PrairieWinds ND1 (Minot), ND (11)	Derby et al. 2012c
Top of Iowa, IA (04)	Jain 2005	Elm Creek II, MN	Derby et al. 2012b	PrairieWinds SD1 (Crow Lake), SD	Derby et al. 2012d
Pioneer Prairie, IA (Ph. II)	Chodachek et al. 2012	Buffalo Ridge, MN (Ph. III; 99)	Johnson et al. 2000	NPPD Ainsworth, NE	Derby et al. 2007
Fowler I, IN (09)	Good et al. 2011	Buffalo Ridge, MN (Ph. II; 99)	Johnson et al. 2000	Buffalo Ridge, MN (Ph. I; 99)	Johnson et al. 2000
Crystal Lake II, IA	Derby et al. 2010a	Moraine II, MN	Derby et al. 2010d	Wessington Springs, SD (10)	Derby et al. 2011d
Top of Iowa, IA (03)	Jain 2005	Buffalo Ridge, MN (Ph. II; 98)	Johnson et al. 2000	Buffalo Ridge I, SD (10)	Derby et al. 2010b
Kewaunee County, WI	Howe et al. 2002	PrairieWinds ND1 (Minot), ND (10)	Derby et al. 2011c	Buffalo Gap II, TX	Tierney 2009
Ripley, Ont (08)	Jacques Whitford 2009	Grand Ridge I, IL	Derby et al. 2010g	Red Hills, OK	Derby et al. 2013b
Winnebago, IA	Derby et al. 2010e	Barton I & II, IA	Derby et al. 2011a	Buffalo Gap I, TX	Tierney 2007

It is unclear whether monitoring bat activity near ground level accurately represents activity at all heights (Hayes and Gruver 2000). Some research suggests that bat activity in the rotor-swept heights may be more representative of bat exposure to turbines (Baerwald and Barclay 2009). At the SWP, fall bat migration activity recorded by the 45 m detector (1.11 bat passes per detector-night; Table 4) was lower than at the 1 m detectors (1.70 bat passes per night). While bat activity at 45 m (148 ft) detectors might better represent activity in the rotor-swept height (RSH), it is not directly comparable to activity rates reported at other North American studies.

Spatial Variation

Detection rates at the ground detectors varied between met towers; however, the raised unit consistently recorded approximately half the number of bat calls as the corresponding ground detectors. The met towers were located in hay fields and represent potential turbine locations. Because bat activity was generally lower at the raised met tower station than ground level stations, there may a lower potential risk of collision with turbines than if the call rates were similar at both the ground and at the raised station.

Temporal Variation

The highest bat activity occurred within the SWP during the fall, with peak activity in early August (Table 5). Higher activity in early August likely corresponds with the reproductive seasons of bats, when pups are being weaned and foraging rates are high among adult females and newly volant juveniles as well as fall migration. When data collection for this report ended on October 23, 2013, there was a consistent trend of decreasing bat activity from previous weeks, indicating that additional peaks in bat activity after October 23 are unlikely (Figures 8 and 9).

Most bat fatality studies at wind energy facilities in the US have shown a peak in fatality in August and September (the fall migration period) and generally lower mortality earlier in the summer and very low mortality during the spring (Johnson 2005, Arnett et al. 2008). While the survey effort varied among the different studies, a general association between the timing of increased bat call rates and timing of mortality was suggested in the studies that combine AnaBat and fatality surveys, with both call rates and fatalities peaking during the FMP. Based on the available data, it is expected that bat fatalities at the SWP, while likely low overall, will be highest during late summer and early fall at potential turbine locations (i.e., met towers).

Species Composition

Eight of the ten bat species likely to occur in the SWP are known fatalities at wind energy facilities (Table 2). Approximately 54.6% of passes recorded at all met tower stations were by high-frequency bats, suggesting higher relative abundance of species such as eastern red bats and little brown bats as well as other potential species *(*Table 2). Met tower stations represent potential turbine locations and it is expected that bat species flying at RSH and detected at raised stations are the most vulnerable to collision with turbine blades. In some regions, eastern red bats compose the majority of bat fatalities found during searches (Arnett et al. 2008).

Low-frequency bats (e.g., hoary bat, silver-haired bat, and big brown bat) were the most common frequency group detected at the raised station during the fall and FMP (Table 4). Some LF species, such as hoary bat and silver-haired bat, have been found as fatalities in higher proportions than other species (Arnett et al. 2008). High-frequency species (e.g., eastern red bats and most *Myotis* species) were detected at the raised station less frequently (16.8% of calls; Table 3). Some HF bat carcasses (e.g., little brown bat) have been found in relatively high proportions during fatality monitoring studies (e.g., Kerns and Kerlinger 2004, Jain 2005, Brown and Hamilton 2006b, Gruver et al. 2009). However, *Myotis* species are typically less commonly recorded in the RSH or as fatalities at post-construction studies at wind energy facilities than other species, such as hoary and eastern red bats (Kunz et al. 2007b, Arnett et al. 2008).

Potential Bat Fatality Rates

Bat fatality rates from studies at wind energy facilities across North America have ranged from 0.08 (Chatfield et al. 2012) to 39.70 bat fatalities/MW/year (Fiedler et al. 2007; Appendix A). In general, fatality rates exhibit a high degree of variation for most regions. Thus far, bat fatality rates at wind energy facilities located in agricultural regions of the Dakotas, Illinois, Indiana, Iowa, Minnesota, Wisconsin, and Ontario have ranged from 0.16 to 30.61 bats/MW/year (Appendix A). The reports of moderate to high levels of bat fatalities in agricultural settings in Iowa (Jain 2005, Chodachek et al. 2012); Ontario, Canada (Natural Resource Solutions, Inc. [NRSI] 2011); and Wisconsin (Gruver et al. 2009; BHE Environmental 2010, 2011) suggest that the lack of forested areas does not guarantee low bat fatality rates at wind energy facilities.

Bat activity recorded at the SWP by ground detectors at met towers during the FMP (1.70 ± 0.20 bat passes per detector-night) was the lowest activity when compared to all publicly-available reports from facilities in Midwest and the third lowest when compared to all facilities in North America with similarly-collected activity data (Appendix A), potentially indicating low direct impacts to bats. However, the efficacy of using pre-construction bat activity surveys to predict post-construction fatality rates is unclear. This may be due to a lack of consistent methodologies between projects. Some bat species may also be attracted to turbines out of curiosity, or for mating, foraging, or roosting opportunities (Cryan and Barclay 2009). These two factors further complicate the interpretation of existing data. The pre-construction bat studies completed at the SWP will add to the growing body of research regarding the impacts of wind energy development on bats and will provide a valuable comparison to post-construction studies to be completed at the SWP.

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Appendix A. North American Fatality Summary Tables

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Appendix A1. Wind energy facilities in North America with comparable activity and fatality data for bats, separated by geographic region.

Wind Energy Facility	Bat Activity Estimate[A]	Bat Activity Dates	Fatality Estimate[B]	No. of Turbines	Total MW
Sunflower, ND	**1.70**				
	Midwest				
Cedar Ridge, WI (2009)	9.97[C,D,E,F]	7/16/07-9/30/07	30.61	41	67.6
Blue Sky Green Field, WI	7.7[F]	7/24/07-10/29/07	24.57	88	145
Cedar Ridge, WI (2010)	9.97[C,D,E,F]	7/16/07-9/30/07	24.12	41	68
Fowler I, II, III, IN (2011)			20.19	355	600
Fowler I, II, III, IN (2010)			18.96	355	600
Forward Energy Center, WI	6.97	8/5/08-11/08/08	18.17	86	129
Harrow, Ont (2010)			11.13	24 (four 6-turb facilities)	39.6
Top of Iowa, IA (2004)	35.7	5/26/04-9/24/04	10.27	89	80
Pioneer Prairie I, IA (Phase II)			10.06	62	102.3
Fowler I, IN (2009)			8.09	162	301
Crystal Lake II, IA			7.42	80	200
Top of Iowa, IA (2003)			7.16	89	80
Kewaunee County, WI			6.45	31	20.46
Ripley, Ont (2008)			4.67	38	76
Winnebago, IA			4.54	10	20
Buffalo Ridge, MN (Phase II; 2001/Lake Benton I)	2.2[D]	6/15/01-9/15/01	4.35	143	107.25
Buffalo Ridge, MN (Phase III; 2001/Lake Benton II)	2.2[D]	6/15/01-9/15/01	3.71	138	103.5
Crescent Ridge, IL			3.27	33	49.5
Fowler I, II, III, IN (2012)			2.96	355	600
Elm Creek II, MN			2.81	62	148.8
Buffalo Ridge II, SD (2011)			2.81	105	210
Buffalo Ridge, MN (Phase III; 1999)			2.72	138	103.5
Buffalo Ridge, MN (Phase II; 1999)			2.59	143	107.25
Moraine II, MN			2.42	33	49.5
Buffalo Ridge, MN (Phase II; 1998)			2.16	143	107.25
PrairieWinds ND1 (Minot), ND 2010			2.13	80	115.5
Grand Ridge I, IL			2.10	66	99
Barton I & II, IA			1.85	80	160
Fowler III, IN (2009)			1.84	60	99
Buffalo Ridge, MN (Phase III; 2002/Lake Benton II)	1.9[D]	6/15/02-9/15/02	1.81	138	103.5
Buffalo Ridge, MN (Phase II; 2002/Lake Benton I)	1.9[D]	6/15/02-9/15/02	1.64	143	107.25
Rugby, ND			1.6	71	149
Elm Creek, MN			1.49	67	100
Wessington Springs, SD (2009)			1.48	34	51
PrairieWinds ND1 (Minot), ND 2011			1.39	80	115.5
PrairieWinds SD1 (Crow Lake), SD			1.23	108	162
NPPD Ainsworth, NE			1.16	36	20.5
Buffalo Ridge, MN (Phase I; 1999)			0.74	73	25
Wessington Springs, SD (2010)			0.41	34	51
Buffalo Ridge I, SD (2010)			0.16	24	50.4

Appendix A1. Wind energy facilities in North America with comparable activity and fatality data for bats, separated by geographic region.

Wind Energy Facility	Bat Activity Estimate[A]	Bat Activity Dates	Fatality Estimate[B]	No. of Turbines	Total MW
Southern Plains					
Barton Chapel, TX			3.06	60	120
Big Smile, OK			2.90	66	132
Buffalo Gap II, TX			0.14	155	233
Red Hills, OK			0.11	82	123
Buffalo Gap I, TX			0.10	67	134
Northeast					
Mountaineer, WV (2003)			31.69	44	66
Mount Storm, WV (2009)	30.09	7/15/09-10/7/09	17.53	132	264
Noble Wethersfield, NY			16.30	84	126
Criterion, MD (2011)			15.61	28	70
Mount Storm, WV (2010)	36.67[G]	4/18/10-10/15/10	15.18	132	264
Locust Ridge, PA (Phase II; 2010)			14.38	51	102
Locust Ridge, PA (Phase II; 2009)			14.11	51	102
Casselman, PA (2008)			12.61	23	34.5
Maple Ridge, NY (2006)			11.21	120	198
Cohocton/Dutch Hills, NY (2010)			10.32	50	125
Wolfe Island, Ont (July-December 2010)			9.50	86	197.8
Maple Ridge, NY (2007)			9.42	195	321.75
Cohocton/Dutch Hill, NY (2009)			8.62	50	125
Casselman, PA (2009)			8.60	23	34.5
Noble Bliss, NY (2008)			7.80	67	100
Criterion, MD (2012)			7.62	28	70
Mount Storm, WV (2011)			7.43	132	264
Mount Storm, WV (Fall 2008)	35.2	7/20/08-10/12/08	6.62	82	164
Wolfe Island, Ont (July-December 2009)			6.42	86	197.8
Maple Ridge, NY (2008)			4.96	195	321.75
Noble Clinton, NY (2009)	1.9[C]	8/1/09-09/31/09	4.50	67	100
Casselman Curtailment, PA (2008)			4.40	23	35.4
Noble Altona, NY			4.34	65	97.5
Noble Ellenburg, NY (2009)	16.1[C]	8/16/09-09/15/09	3.91	54	80
Noble Bliss, NY (2009)			3.85	67	100
Lempster, NH (2010)			3.57	12	24
Noble Ellenburg, NY (2008)			3.46	54	80
Noble Clinton, NY (2008)	2.1[C]	8/8/08-09/31/08	3.14	67	100
Lempster, NH (2009)			3.11	12	24
Mars Hill, ME (2007)			2.91	28	42
Wolfe Island, Ont (July-December 2011)			2.49	86	197.8
Noble Chateaugay, NY			2.44	71	106.5
High Sheldon, NY (2010)			2.33	75	112.5
Beech Ridge, WV			2.03	67	100.5
Munnsville, NY (2008)			1.93	23	34.5
High Sheldon, NY (2011)			1.78	75	112.5
Stetson Mountain II, ME (2010)			1.65	17	25.5
Stetson Mountain I, ME (2009)	28.5; 0.3[H]	7/10/09-10/15/09	1.40	38	57
Mars Hill, ME (2008)			0.45	28	42
Stetson Mountain I, ME (2011)			0.28	38	57
Kibby, ME (2011)			0.12	44	132
Southeast					
Buffalo Mountain, TN (2005)			39.70	18	28.98
Buffalo Mountain, TN (2000-2003)	23.7[E]		31.54	3	1.98

Appendix A1. Wind energy facilities in North America with comparable activity and fatality data for bats, separated by geographic region.

Wind Energy Facility	Bat Activity Estimate[A]	Bat Activity Dates	Fatality Estimate[B]	No. of Turbines	Total MW
Rocky Mountains					
Summerview, Alb (2008)	7.65[D]	07/15/06-07-09/30/06-07	11.42	39	70.2
Summerview, Alb (2006)			10.27	39	70.2
Judith Gap, MT (2006/2007)			8.93	90	135
Foote Creek Rim, WY (Phase I; 1999)			3.97	69	41.4
Judith Gap, MT (2009)			3.20	90	135
Foote Creek Rim, WY (Phase I; 2001-2002)	2.2[D,E]	6/15/01-9/1/01	1.57	69	41.4
Foote Creek Rim, WY (Phase I; 2000)	2.2[D,E]	6/15/00-9/1/00	1.05	69	41.4
Southwest					
Dry Lake I, AZ	8.8	4/29/10-11/10/10	3.43	30	63
Dry Lake II, AZ	11.5	5/11/11-10/26/11	1.66	31	65
Pacific Northwest					
Biglow Canyon, OR (Phase II; 2009/2010)			2.71	65	150
Nine Canyon, WA			2.47	37	48.1
Stateline, OR/WA (2003)			2.29	454	299
Elkhorn, OR (2010)			2.14	61	101
White Creek, WA (2007-2011)			2.04	89	204.7
Biglow Canyon, OR (Phase I; 2008)			1.99	76	125.4
Leaning Juniper, OR			1.98	67	100.5
Big Horn, WA			1.90	133	199.5
Combine Hills, OR (Phase I; 04/05)			1.88	41	41
Linden Ranch, WA			1.68	25	50
Pebble Springs, OR			1.55	47	98.7
Hopkins Ridge, WA (2008)			1.39	87	156.6
Harvest Wind, WA (2010-2012)			1.27	43	98.9
Elkhorn, OR (2008)			1.26	61	101
Vansycle, OR			1.12	38	24.9
Klondike III (Phase I), OR			1.11	125	223.6
Stateline, OR/WA (2002)			1.09	454	299
Stateline, OR/WA (2006)			0.95	454	299
Tuolumne (Windy Point I), WA			0.94	62	136.6
Klondike, OR			0.77	16	24
Combine Hills, OR (2011)			0.73	104	104
Hopkins Ridge, WA (2006)			0.63	83	150
Biglow Canyon, OR (Phase I; 2009)			0.58	76	125.4
Biglow Canyon, OR (Phase II; 2010/2011)			0.57	65	150
Hay Canyon, OR			0.53	48	100.8
Klondike II, OR			0.41	50	75
Windy Flats, WA			0.41	114	262.2
Vantage, WA			0.40	60	90
Wild Horse, WA			0.39	127	229
Goodnoe, WA			0.34	47	94
Marengo II, WA (2009/2010)			0.27	39	70.2
Biglow Canyon, OR (Phase III; 2010/2011)			0.22	76	174.8
Marengo I, WA (2009/2010)			0.17	78	140.4
Klondike IIIa (Phase II), OR			0.14	51	76.5
Kittitas Valley, WA (2011-2012)			0.12	48	100.8

Appendix A1. Wind energy facilities in North America with comparable activity and fatality data for bats, separated by geographic region.

Wind Energy Facility	Bat Activity Estimate[A]	Bat Activity Dates	Fatality Estimate[B]	No. of Turbines	Total MW
		California			
Shiloh I, CA			3.92	100	150
Shiloh II, CA			2.72	75	150
High Winds, CA (2004)			2.51	90	162
Dillon, CA			2.17	45	45
High Winds, CA (2005)			1.52	90	162
Alta Wind I, CA (2011)	4.42[I]	6/26/2009 - 10/31/2009	1.28	100	150
Diablo Winds, CA			0.82	31	20.46
Alite, CA			0.24	8	24
Alta Wind II-V, CA (2011)	0.78	6/26/2009 - 10/31/2009	0.08	190	570

A = Bat passes per detector-night
B = Number of fatalities per megawatt per year
C = Activity rate based on data collected at various heights all other activity rates are from ground-based units only
D = Activity rate was averaged across phases and/or years
E = Activity rate calculated by WEST from data presented in referenced report
F= Activity rate based on pre-construction monitoring; data for all other activity and fatality rates were collected concurrently
G = Activity rate based on data collected from ground-based units excluding reference stations during the spring, summer, and fall seasons
H = The overall activity rate of 28.5 is from reference stations located along forest edges which may be attractive to bats; the activity rate of 0.3 is from one unit placed on a nacelle
I = Average of ground-based detectors at CPC Proper (Phase I) for late summer/fall period only

Appendix A1 (*continued*). Wind energy facilities in North America with comparable fatality data for bats.

Project, Location	Activity Reference	Fatality Reference	Project, Location	Activity Reference	Fatality Reference
Alite, CA		Chatfield et al. 2010	Kewaunee County, WI		Howe et al. 2002
Alta Wind I, CA (11)	Solick et al. 2010	Chatfield et al. 2012	Kibby, ME (11)		Stantec 2012
Alta Wind II-V, CA (11)	Solick et al. 2010	Chatfield et al. 2012	Kittitas Valley, WA (11-12)		Stantec Consulting Services 2012
Barton I&II, IA		Derby et al. 2011a	Klondike, OR		Johnson et al. 2003
Barton Chapel, TX		WEST 2011	Klondike II, OR		NWC and WEST 2007
Beech Ridge, WV		Tidhar et al. 2013	Klondike III (Phase I), OR		Gritski et al. 2010
Big Horn, WA		Kronner et al. 2008	Klondike IIIa (Phase II), OR		Gritski et al. 2011
Big Smile, OK		Derby et al. 2013a	Leaning Juniper, OR		Gritski et al. 2008
Biglow Canyon, OR (Ph. I; 08)		Jeffrey et al. 2009a	Lempster, NH (09)		Tidhar et al. 2010
Biglow Canyon, OR (Ph. I; 09)		Enk et al. 2010	Lempster, NH (10)		Tidhar et al. 2011
Biglow Canyon, OR (Ph. II; 09/10)		Enk et al. 2011a	Linden Ranch, WA		Enz and Bay 2011
Biglow Canyon, OR (Ph. II; 10/ 11)		Enk et al. 2012b	Locust Ridge, PA (Ph. II; 09)		Arnett et al. 2011
Biglow Canyon, OR (Ph. III; 10/ 11)		Enk et al. 2012a	Locust Ridge, PA (Ph. II; 10)		Arnett et al. 2011
Blue Sky Green Field, WI	Gruver 2008	Gruver et al. 2009	Maple Ridge, NY (06)		Jain et al. 2007
Buffalo Gap I, TX		Tierney 2007	Maple Ridge, NY (07)		Jain et al. 2009a
Buffalo Gap II, TX		Tierney 2009	Maple Ridge, NY (08)		Jain et al. 2009d
Buffalo Mountain, TN (00-03)	Fiedler 2004	Nicholson et al. 2005	Marengo I, WA (09)		URS Corporation 2010b
Buffalo Mountain, TN (05)		Fiedler et al. 2007	Marengo II, WA (09)		URS Corporation 2010c
Buffalo Ridge, MN (Ph. I; 99)		Johnson et al. 2000	Mars Hill, ME (07)		Stantec 2008
Buffalo Ridge, MN (Ph. II; 98)		Johnson et al. 2000	Mars Hill, ME (08)		Stantec 2009a
Buffalo Ridge, MN (Ph. II; 99)		Johnson et al. 2000	Moraine II, MN		Derby et al. 2010d
Buffalo Ridge, MN (Ph. II; 01/Lake Benton I)	Johnson et al. 2004	Johnson et al. 2004	Mount Storm, WV (Fall 08)	Young et al. 2009b	Young et al. 2009b
Buffalo Ridge, MN (Ph. II; 02/Lake Benton I)	Johnson et al. 2004	Johnson et al. 2004	Mount Storm, WV (09)	Young et al. 2009a, 2010b	Young et al. 2009a, 2010b
Buffalo Ridge, MN (Ph. III; 99)		Johnson et al. 2000	Mount Storm, WV (10)	Young et al. 2010a, 2011b	Young et al. 2010a, 2011b
Buffalo Ridge, MN (Ph. III; 01/Lake Benton II)	Johnson et al. 2004	Johnson et al. 2004	Mount Storm, WV (11)		Young et al. 2011a, 2012b
Buffalo Ridge, MN (Ph. III; 02/Lake Benton II)	Johnson et al. 2004	Johnson et al. 2004	Mountaineer, WV (2003)		Kerns and Kerlinger 2004
Buffalo Ridge I, SD (10)		Derby et al. 2010b	Munnsville, NY (08)		Stantec 2009b
Buffalo Ridge II, SD (11)		Derby et al. 2012a	Nine Canyon, WA		Erickson et al. 2003
Casselman, PA (08)		Arnett et al. 2009a	Noble Altona, NY		Jain et al. 2011b
Casselman, PA (09)		Arnett et al. 2010	Noble Bliss, NY (08)		Jain et al.2009e
Casselman Curtailment, PA (08)		Arnett et al. 2009b	Noble Bliss, NY (09)		Jain et al. 2010a
Cedar Ridge, WI (09)	BHE Environmental 2008	BHE Environmental 2010	Noble Chateaugay, NY		Jain et al. 2011c
Cedar Ridge, WI (10)	BHE Environmental 2008	BHE Environmental 2011	Noble Clinton, NY (08)	Reynolds 2010a	Jain et al. 2009c
Cohocton/Dutch Hill, NY (09)		Stantec 2010	Noble Clinton, NY (09)	Reynolds 2010a	Jain et al. 2010b
Cohocton/Dutch Hill, NY (10)		Stantec 2011	Noble Ellenburg, NY (08)		Jain et al. 2009b
Combine Hills, OR		Young et al. 2006	Noble Ellenburg, NY (09)	Reynolds 2010b	Jain et al. 2010c
Combine Hills, OR (11)		Enz et al. 2012	Noble Wethersfield, NY		Jain et al. 2011a
Crescent Ridge, IL		Kerlinger et al. 2007	NPPD Ainsworth, NE		Derby et al. 2007
Criterion, MD (11)		Young et al. 2012a	Pebble Springs, OR		Gritski and Kronner 2010b
Criterion, MD (12)		Young et al. 2013	Pioneer Prairie, IA (Ph. II)		Chodachek et al. 2012
Crystal Lake II, IA		Derby et al. 2010a	PrairieWinds ND1 (Minot), ND		Derby et al. 2011c
Diablo Winds, CA		WEST 2006, 2008	PrairieWinds ND1 (Minot), ND (11)		Derby et al. 2012c
Dillon, CA		Chatfield et al. 2009	PrairieWinds SD1, SD		Derby et al. 2012d
Dry Lake I, AZ	Thompson et al. 2011	Thompson et al. 2011	Red Hills, OK		Derby et al. 2013b
Dry Lake II, AZ	Thompson and Bay 2012	Thompson and Bay 2012	Ripley, Ont (08)		Jacques Whitford 2009
Elkhorn, OR (08)		Jeffrey et a. 2009b	Rugby, ND		Derby et al. 2011b
Elkhorn, OR (10)		Enk et al. 2011b	Shiloh I, CA		Kerlinger et al. 2009
Elm Creek, MN		Derby et al. 2010c	Shiloh II, CA		Kerlinger et al. 2010b
Elm Creek II, MN		Derby et al. 2012b	Stateline, OR/WA (02)		Erickson et al. 2004
Foote Creek Rim, WY (Ph. I; 99)		Young et al. 2003a	Stateline, OR/WA (03)		Erickson et al. 2004
Foote Creek Rim, WY (Ph. I;	Gruver 2002	Young et al. 2003a,	Stateline, OR/WA (06)		Erickson et al. 2007

Appendix A1 (*continued*). Wind energy facilities in North America with comparable fatality data for bats.

Project, Location	Activity Reference	Fatality Reference	Project, Location	Activity Reference	Fatality Reference
00)		2003b			
Foote Creek Rim, WY (Ph. I; 01-02)	Gruver 2002	Young et al. 2003a, 2003b	Stetson Mountain, ME (09)	Stantec 2009c	Stantec 2009c
Forward Energy Center, WI	Watt and Drake 2011	Grodsky and Drake 2011	Stetson Mountain I, ME (11)		Normandeau Associates 2011
Fowler I, IN (09)		Good et al. 2011	Stetson Mountain II, ME (10)		Normandeau Associates 2010
Fowler III, IN (09)		Good et al. 2011	Summerview, Alb (06)		Brown and Hamilton 2006b
Fowler I, II, III, IN (10)		Good et al. 2011	Summerview, Alb (08)	Baerwald 2008	Baerwald 2008
Fowler I, II, III, IN (11)		Good et al. 2012	Top of Iowa, IA (03)		Jain 2005
Fowler I, II, III, IN (12)		Good et al. 2013	Top of Iowa, IA (04)	Jain 2005	Jain 2005
Goodnoe, WA		URS Corporation 2010a	Tuolumne (Windy Point I), WA		Enz and Bay 2010
Grand Ridge, IL		Derby et al. 2010g	Vansycle, OR		Erickson et al. 2000
Harrow, Ont. (10)		NRSI 2011	Vantage, WA		Ventus 2012
Harvest Wind, WA (10-12)		Downes and Gritski 2012a	Wessington Springs, SD (09)		Derby et al. 2010f
Hay Canyon, OR		Gritski and Kronner 2010a	Wessington Springs, SD (10)		Derby et al. 2011d
High Sheldon, NY (10)		Tidhar et al. 2012a	White Creek, WA (07-11)		Downes and Gritski 2012b
High Sheldon, NY (11)		Tidhar et al. 2012b	Wild Horse, WA		Erickson et al. 2008
High Winds, CA (04)		Kerlinger et al. 2006	Windy Flats, WA		Enz et al. 2011
High Winds, CA (05)		Kerlinger et al. 2006	Winnebago, IA		Derby et al. 2010e
Hopkins Ridge, WA (06)		Young et al. 2007	Wolfe Island, Ont (Jul-Dec 09)		Stantec Ltd. 2010b
Hopkins Ridge, WA (08)		Young et al. 2009c	Wolfe Island, Ont (Jul-Dec 10)		Stantec Ltd. 2011b
Judith Gap, MT (06-07)		TRC 2008	Wolfe Island, Ont (Jul-Dec 11)		Stantec Ltd. 2012
Judith Gap, MT (09)		Poulton and Erickson 2010			

Appendix A2. Fatality estimates for North American wind-energy facilities.

Project	Bat Fatalities (bats/MW/ year)	Predominant Habitat Type	Citation
Alite, CA	0.24	Shrub/scrub & grassland	Chatfield et al. 2010
Alta Wind I, CA (2011)	1.28	Woodland, grassland, shrubland	Chatfield et al. 2012
Alta Wind II-V, CA (2011)	0.08	Desert scrub	Chatfield et al. 2012
Barton I & II, IA	1.85	Agriculture	Derby et al. 2011a
Barton Chapel, TX	3.06	Agriculture/forest	WEST 2011
Beech Ridge, WV	2.03	Forest	Tidhar et al. 2013
Big Horn, WA	1.9	Agriculture/grassland	Kronner et al. 2008
Big Smile, OK	2.9	Grassland, agriculture	Derby et al. 2013a
Biglow Canyon, OR (Phase I; 2008)	1.99	Agriculture/grassland	Jeffrey et al. 2009a
Biglow Canyon, OR (Phase I; 2009)	0.58	Agriculture/grassland	Enk et al. 2010
Biglow Canyon, OR (Phase II; 2009/2010)	2.71	Agriculture	Enk et al. 2011a
Biglow Canyon, OR (Phase II; 2010/2011)	0.57	Grassland/shrub-steppe, agriculture	Enk et al. 2012b
Biglow Canyon, OR (Phase III; 2010/2011)	0.22	Grassland/shrub-steppe, agriculture	Enk et al. 2012a
Blue Sky Green Field, WI	24.57	Agriculture	Gruver et al. 2009
Buffalo Gap I, TX	0.1	Grassland	Tierney 2007
Buffalo Gap II, TX	0.14	Forest	Tierney 2009
Buffalo Mountain, TN (2000-2003)	31.54	Forest	Nicholson et al. 2005
Buffalo Mountain, TN (2005)	39.7	Forest	Fiedler et al. 2007
Buffalo Ridge, MN (Phase I; 1999)	0.74	Agriculture	Johnson et al. 2000
Buffalo Ridge, MN (Phase II; 1998)	2.16	Agriculture	Johnson et al. 2000
Buffalo Ridge, MN (Phase II; 1999)	2.59	Agriculture	Johnson et al. 2000
Buffalo Ridge, MN (Phase II; 2001/Lake Benton I)	4.35	Agriculture	Johnson et al. 2004
Buffalo Ridge, MN (Phase II; 2002/Lake Benton I)	1.64	Agriculture	Johnson et al. 2004
Buffalo Ridge, MN (Phase III; 1999)	2.72	Agriculture	Johnson et al. 2000
Buffalo Ridge, MN (Phase III; 2001/Lake Benton II)	3.71	Agriculture	Johnson et al. 2004
Buffalo Ridge, MN (Phase III; 2002/Lake Benton II)	1.81	Agriculture	Johnson et al. 2004
Buffalo Ridge I, SD (2010)	0.16	Agriculture/grassland	Derby et al. 2010b
Buffalo Ridge II, SD (2011)	2.81	Agriculture, grassland	Derby et al. 2012a
Casselman Curtailment, PA (2008)	4.4	Forest	Arnett et al. 2009a
Casselman, PA (2008)	12.61	Forest	Arnett et al. 2010
Casselman, PA (2009)	8.6	Forest, pasture, grassland	Arnett et al. 2009b

Appendix A2. Fatality estimates for North American wind-energy facilities.

Project	Bat Fatalities (bats/MW/ year)	Predominant Habitat Type	Citation
Cedar Ridge, WI (2009)	30.61	Agriculture	BHE Environmental 2010
Cedar Ridge, WI (2010)	24.12	Agriculture	BHE Environmental 2011
Cohocton/Dutch Hill, NY (2009)	8.62	Agriculture/forest	Stantec 2010
Cohocton/Dutch Hills, NY (2010)	10.32	Agriculture, forest	Stantec 2011
Combine Hills, OR (Phase I; 04/05)	1.88	Agriculture/grassland	Young et al. 2006
Combine Hills, OR (2011)	0.73	Grassland/shrub-steppe, agriculture	Enz et al. 2012
Crescent Ridge, IL	3.27	Agriculture	Kerlinger et al. 2007
Criterion, MD (2011)	15.61	Forest, agriculture	Young et al. 2012a
Criterion, MD (2012)	7.62	Forest, agriculture	Young et al. 2013
Crystal Lake II, IA	7.42	Agriculture	Derby et al. 2010a
Diablo Winds, CA	0.82	NA	WEST 2006, 2008
Dillon, CA	2.17	Desert	Chatfield et al. 2009
Dry Lake I, AZ	3.43	Desert grassland/forested	Thompson et al. 2011
Dry Lake II, AZ	1.66	Desert grassland/forested	Thompson and Bay 2012
Elkhorn, OR (2008)	1.26	Shrub/scrub & agriculture	Jeffrey et al. 2009b
Elkhorn, OR (2010)	2.14	Shrub/scrub & agriculture	Enk et al. 2011b
Elm Creek, MN	1.49	Agriculture	Derby et al. 2010c
Elm Creek II, MN	2.81	Agriculture, grassland	Derby et al. 2012b
Foote Creek Rim, WY (Phase I; 1999)	3.97	Grassland	Young et al. 2003a
Foote Creek Rim, WY (Phase I; 2000)	1.05	Grassland	Young et al. 2003a
Foote Creek Rim, WY (Phase I; 2001-2002)	1.57	Grassland	Young et al. 2003a
Forward Energy Center, WI	18.17	Agriculture	Grodsky and Drake 2011
Fowler I, IN (2009)	8.09	Agriculture	Good et al. 2011
Fowler III, IN (2009)	1.84	Agriculture	Good et al. 2011
Fowler I, II, III, IN (2010)	18.96	Agriculture	Good et al. 2011
Fowler I, II, III, IN (2011)	20.19	Agriculture	Good et al. 2012
Fowler I, II, III, IN (2012)	2.96	Agriculture	Good et al. 2013
Goodnoe, WA	0.34	Grassland and shrub-steppe	URS Corporation 2010a
Grand Ridge I, IL	2.1	Agriculture	Derby et al. 2010g
Harrow, Ont (2010)	11.13	Agriculture	Natural Resource Solutions Inc. (NRSI) 2011
Harvest Wind, WA (2010-2012)	1.27	Grassland/shrub-steppe	Downes and Gritski 2012a
Hay Canyon, OR	0.53	Agriculture	Gritski and Kronner 2010a
High Sheldon, NY (2010)	2.33	Agriculture	Tidhar et al. 2012a
High Sheldon, NY (2011)	1.78	Agriculture	Tidhar et al. 2012b
High Winds, CA (2004)	2.51	Agriculture/grassland	Kerlinger et al. 2006
High Winds, CA (2005)	1.52	Agriculture/grassland	Kerlinger et al. 2006
Hopkins Ridge, WA (2006)	0.63	Agriculture/grassland	Young et al. 2007
Hopkins Ridge, WA (2008)	1.39	Agriculture/grassland	Young et al. 2009c
Judith Gap, MT (2006/2007)	8.93	Agriculture/grassland	TRC 2008

Appendix A2. Fatality estimates for North American wind-energy facilities.

Project	Bat Fatalities (bats/MW/ year)	Predominant Habitat Type	Citation
Judith Gap, MT (2009)	3.2	Agriculture/grassland	Poulton and Erickson 2010
Kewaunee County, WI	6.45	Agriculture	Howe et al. 2002
Kibby, ME (2011)	0.12	Forest; commercial forest	Stantec 2012
Kittitas Valley, WA (2011-2012)	0.12	Sagebrush-steppe, grassland	Stantec Consulting Services 2012
Klondike, OR	0.77	Agriculture/grassland	Johnson et al. 2003
Klondike II, OR	0.41	Agriculture/grassland	NWC and WEST 2007
Klondike III (Phase I), OR	1.11	Agriculture/grassland	Gritski et al. 2010
Klondike IIIa (Phase II), OR	0.14	Grassland/shrub-steppe and agriculture	Gritski et al. 2011
Leaning Juniper, OR	1.98	Agriculture	Gritski et al. 2008
Lempster, NH (2009)	3.11	Grasslands/forest/rocky embankments	Tidhar et al. 2010
Lempster, NH (2010)	3.57	Grasslands/forest/rocky embankments	Tidhar et al. 2011
Linden Ranch, WA	1.68	Grassland/shrub-steppe, agriculture	Enz and Bay 2011
Locust Ridge, PA (Phase II; 2009)	14.11	Grassland	Arnett et al. 2011
Locust Ridge, PA (Phase II; 2010)	14.38	Grassland	Arnett et al. 2011
Maple Ridge, NY (2006)	11.21	Agriculture/forested	Jain et al. 2007
Maple Ridge, NY (2007)	9.42	Agriculture/forested	Jain et al. 2009a
Maple Ridge, NY (2008)	4.96	Agriculture/forested	Jain et al. 2009d
Marengo I, WA (2009/2010)	0.17	Agriculture	URS Corporation 2010b
Marengo II, WA (2009/2010)	0.27	Agriculture	URS Corporation 2010c
Mars Hill, ME (2007)	2.91	Forest	Stantec 2008
Mars Hill, ME (2008)	0.45	Forest	Stantec 2009a
Moraine II, MN	2.42	Agriculture/grassland	Derby et al. 2010d
Mount Storm, WV (Fall 2008)	6.62	Forest	Young et al. 2009b
Mount Storm, WV (2009)	17.53	Forest	Young et al. 2009a, 2010b
Mount Storm, WV (2010)	15.18	Forest	Young et al. 2010a, 2011b
Mount Storm, WV (2011)	7.43	Forest	Young et al. 2011a, 2012b
Mountaineer, WV (2003)	31.69	Forest	Kerns and Kerlinger 2004
Munnsville, NY (2008)	1.93	Agriculture/forest	Stantec 2009b
Nine Canyon, WA	2.47	Agriculture/grassland	Erickson et al. 2003
Noble Altona, NY	4.34	Forest	Jain et al. 2011b
Noble Bliss, NY (2008)	7.8	Agriculture/forest	Jain et al.2009e
Noble Bliss, NY (2009)	3.85	Agriculture/forest	Jain et al. 2010a
Noble Chateaugay, NY	2.44	Agriculture	Jain et al. 2011c
Noble Clinton, NY (2008)	3.14	Agriculture/forest	Jain et al. 2009c
Noble Clinton, NY (2009)	4.5	Agriculture/forest	Jain et al. 2010b
Noble Ellenburg, NY (2008)	3.46	Agriculture/forest	Jain et al. 2009b
Noble Ellenburg, NY (2009)	3.91	Agriculture/forest	Jain et al. 2010c
Noble Wethersfield, NY	16.3	Agriculture	Jain et al. 2011a
NPPD Ainsworth, NE	1.16	Agriculture/grassland	Derby et al. 2007
Pebble Springs, OR	1.55	Grassland	Gritski and Kronner 2010b
Pioneer Prairie I, IA (Phase II)	10.06	Agriculture, grassland	Chodachek et al. 2012

Appendix A2. Fatality estimates for North American wind-energy facilities.

Project	Bat Fatalities (bats/MW/ year)	Predominant Habitat Type	Citation
PrairieWinds ND1 (Minot), ND 2010	2.13	Agriculture	Derby et al. 2011c
PrairieWinds ND1 (Minot), ND 2011	1.39	Agriculture, grassland	Derby et al. 2012c
PrairieWinds SD1 (Crow Lake), SD	1.23	Grassland	Derby et al. 2012d
Red Hills, OK	0.11	Grassland	Derby et al. 2013b
Ripley, Ont (2008)	4.67	Agriculture	Jacques Whitford 2009
Rugby, ND	1.6	Agriculture	Derby et al. 2011b
Shiloh I, CA	3.92	Agriculture/grassland	Kerlinger et al. 2010a
Shiloh II, CA	2.72	Agriculture	Kerlinger et al. 2010b
Stateline, OR/WA (2002)	1.09	Agriculture/grassland	Erickson et al. 2004
Stateline, OR/WA (2003)	2.29	Agriculture/grassland	Erickson et al. 2004
Stateline, OR/WA (2006)	0.95	Agriculture/grassland	Erickson et al. 2007
Stetson Mountain I, ME (2009)	1.4	Forest	Stantec 2009c
Stetson Mountain I, ME (2011)	0.28	Forested	Normandeau Associates 2011
Stetson Mountain II, ME (2010)	1.65	Forested	Normandeau Associates 2010
Summerview, Alb (2006)	10.27	Agriculture	Brown and Hamilton 2006b
Summerview, Alb (2008)	11.42	Agriculture/grassland	Baerwald 2008
Top of Iowa, IA (2003)	7.16	Agriculture	Jain 2005
Top of Iowa, IA (2004)	10.27	Agriculture	Jain 2005
Tuolumne (Windy Point I), WA	0.94	Grassland/shrub-steppe, agriculture and forest	Enz and Bay 2010
Vansycle, OR	1.12	Agriculture/grassland	Erickson et al. 2000
Vantage, WA	0.4	Shrub-steppe, grassland	Ventus Environmental Solutions 2012
Wessington Springs, SD (2009)	1.48	Grassland	Derby et al. 2010f
Wessington Springs, SD (2010)	0.41	Grassland	Derby et al. 2011d
White Creek, WA (2007-2011)	2.04	Grassland/shrub-steppe, agriculture	Downes and Gritski 2012b
Wild Horse, WA	0.39	Grassland	Erickson et al. 2008
Windy Flats, WA	0.41	Grassland/shrub-steppe, agriculture	Enz et al. 2011
Winnebago, IA	4.54	Agriculture/grassland	Derby et al. 2010e
Wolfe Island, Ont (July-December 2009)	6.42	Grassland	Stantec Ltd. 2010b
Wolfe Island, Ont (July-December 2010)	9.5	Grassland	Stantec Ltd. 2011b
Wolfe Island, Ont (July-December 2011)	2.49	Grassland	Stantec Ltd. 2012

Appendix A3. All post-construction monitoring studies, project characteristics, and select study methodology.

Project Name	Total # of turbines	Total MW	Tower size (m)	Number turbines searched	Plot Size	Length of Study	Survey Frequency
Alite, CA	8	24	80	8	200 m x 200 m	1 year	Weekly (spring, fall), bi-monthly (summer, winter)
Alta Wind I, CA (2011)	100	150	80	25	120-m radius circle	12.5 months	Every two weeks
Alta Wind II-V, CA (2011)	190	570	NA	41	120-m radius circle	14.5 months	Every two weeks
Barton Chapel, TX	60	120	78	30	200 m x 200 m	1 year	10 turbines weekly, 20 monthly
Barton I & II, IA	80	160	100	35 (9 turbines were dropped in June 2010 due to landowner issues) 26 turbines were searched for the remainder of the study	200 m x 200 m	1 year	Weekly (spring, fall; migratory turbines), monthly (summer, winter; non-migratory turbines)
Beech Ridge, WV	67	100.5	80	67	40 m radius	7 months	Every two days
Big Horn, WA	133	199.5	80	133	180 m x 180 m	1 year	Bi-monthly (spring, fall), monthly (winter, summer)
Big Smile, OK	66	132	NA	17 (plus one met tower)	100 x 100	1 year	Weekly (spring, summer, fall), monthly (winter)
Biglow Canyon, OR (Phase I; 2008)	76	125.4	80	50	110 m x 110 m	1 year	Bi-monthly (spring, fall), monthly (winter, summer)
Biglow Canyon, OR (Phase I; 2009)	76	125.4	80	50	110 m x 110 m	1 year	Bi-monthly (spring, fall), monthly (winter, summer)
Biglow Canyon, OR (Phase II; 2009/2010)	65	150	80	50	250 m x 250 m	1 year	Bi-monthly (spring, fall), monthly (winter, summer)
Biglow Canyon, OR (Phase II; 2010/2011)	65	150	NA	50	252 m x 252 m	1 year	Bi-weekly(spring, fall), monthly (summer, winter)
Biglow Canyon, OR (Phase III; 2010/2011)	76	174.8	NA	50	252 m x 252 m	1 year	Bi-weekly(spring, fall), monthly (summer, winter)

Appendix A3. All post-construction monitoring studies, project characteristics, and select study methodology.

Project Name	Total # of turbines	Total MW	Tower size (m)	Number turbines searched	Plot Size	Length of Study	Survey Frequency
Blue Sky Green Field, WI	88	145	80	30	160 m x 160 m	Fall, spring	Daily(10 turbines), weekly (20 turbines)
Buena Vista, CA	38	38	45-55	38	75-m radius	1 year	Monthly to bi-monthly starting in September 2008
Buffalo Gap I, TX	67	134	NA	21	215 m x 215 m	10 months	Every 3 weeks
Buffalo Gap II, TX	155	233	80	36	215 m x 215 m	14 months	Every 21 days
Buffalo Mountain, TN (2000-2003)	3	1.98	65	3	50-m radius	3 years	Bi-weekly, weekly, bi-monthly
Buffalo Mountain, TN (2005)	18	28.98	V47 = 65; V80 = 78	18	50-m radius	1 year	Bi-weekly, weekly, bi-monthly, and 2 to 5 day intervals
Buffalo Ridge, MN (1994/1995)	73	25	37	1994:10 plots (3 turbines/plot), 20 addition plots in Sept & Oct 1994, 1995: 30 turbines search every other week (Jan-Mar), 60 searched weekly (Apr, July, Aug) 73 searched weekly (May-June and Sept-Oct), 30 searched weekly (Nov-Dec)	100 x 100m	20 months	Varies. See number turbines searched or page 44 of report
Buffalo Ridge, MN (Phase I; 1996)	73	25	36	21	126 m x 126 m	1 year	Bi-monthly (spring, summer, and fall)
Buffalo Ridge, MN (Phase I; 1997)	73	25	36	21	126 m x 126 m	1 year	Bi-monthly (spring, summer, and fall)
Buffalo Ridge, MN (Phase I; 1998)	73	25	36	21	126 m x 126 m	1 year	Bi-monthly (spring, summer, and fall)
Buffalo Ridge, MN (Phase I; 1999)	73	25	36	21	126 m x 126 m	1 year	Bi-monthly (spring, summer, and fall)
Buffalo Ridge, MN (Phase II; 1998)	143	107.25	50	40	126 m x 126 m	1 year	Bi-monthly (spring, summer, and fall)

Appendix A3. All post-construction monitoring studies, project characteristics, and select study methodology.

Project Name	Total # of turbines	Total MW	Tower size (m)	Number turbines searched	Plot Size	Length of Study	Survey Frequency
Buffalo Ridge, MN (Phase II; 1999)	143	107.25	50	40	126 m x 126 m	1 year	Bi-monthly (spring, summer, and fall)
Buffalo Ridge, MN (Phase II; 2001/Lake Benton I)	143	107.25	50	83	60 m x 60 m	Summer, fall	Bi-monthly
Buffalo Ridge, MN (Phase II; 2002/Lake Benton I)	143	107.25	50	103	60 m x 60 m	Summer, fall	Bi-monthly
Buffalo Ridge, MN (Phase III; 1999)	138	103.5	50	30	126 m x 126 m	1 year	Bi-monthly (spring, summer, and fall)
Buffalo Ridge, MN (Phase III; 2001/Lake Benton II)	138	103.5	50	83	60 m x 60 m	Summer, fall	Bi-monthly
Buffalo Ridge, MN (Phase III; 2002/Lake Benton II)	138	103.5	50	103	60 m x 60 m	Summer, fall	Bi-monthly
Buffalo Ridge I, SD (2010)	24	50.4	79	24	200 m x 200 m	1 year	Weekly (migratory), monthly (non-migratory)
Buffalo Ridge II, SD (2011)	105	210	78	65 (60 road and pad, 5 turbine plots)	100 x 100m	1 year	Weekly (spring, summer, fall), monthly (winter)
Casselman, PA (2008)	23	34.5	80	10	126 m x 120 m	7 months	Daily
Casselman, PA (2009)	23	34.5	80	10	126 m x 120 m	7.5 months	Daily searches
Casselman Curtailment, PA (2008)	23	35.4	80	12 experimental; 10 control	126 m x 120 m	2.5 months	Daily
Castle River, Alb (2001)	60	39.6	50	60	50-m radius	2 years	Weekly, bi-weekly
Castle River, Alb (2002)	60	39.6	50	60	50-m radius	2 years	Weekly, bi-weekly
Cedar Ridge, WI (2009)	41	67.6	80	20	160 m x 160 m	Spring, summer, fall	Daily, every 4 days; late fall searched every 3 days

Appendix A3. All post-construction monitoring studies, project characteristics, and select study methodology.

Project Name	Total # of turbines	Total MW	Tower size (m)	Number turbines searched	Plot Size	Length of Study	Survey Frequency
Cedar Ridge, WI (2010)	41	68	80	20	160 m x 160 m	1 year	Five turbines were surveyed daily, 15 turbines surveyed every 4 days in rotating groups each day. All 20 surveyed every three days during late fall
Cohocton/Dutch Hill, NY (2009)	50	125	80	17	130 m x 130 m	Spring, summer, fall	Daily (5 turbines), weekly (12 turbines)
Cohocton/Dutch Hills, NY (2010)	50	125	80	17	120 m x 120 m	Spring, summer, fall	Daily, weekly
Combine Hills, OR (Phase I; 04/05)	41	41	53	41	90-m radius	1 year	Monthly
Combine Hills, OR (2011)	104	104	53	52 (plus 1 MET tower)	180 m x 180 m	1 year	Bi-weekly(spring, fall), monthly (summer, winter)
Condon, OR	84	NA	NA	NA	NA	NA	NA
Crescent Ridge, IL	33	49.5	80	33	70-m radius	1 year	Weekly (fall, spring)
Criterion, MD (2011)	28	70	80	28	40-50m radius	7.3 months	Daily
Criterion, MD (2012)	28	70	80	14	40-50m radius	7.5 months	Weekly
Crystal Lake II, IA	80	200	80	16 turbines through week 6, and then 15 for duration of study	100 m x 100 m	Spring, summer, fall	3 times per week for 26 weeks
Diablo Winds, CA	31	20.46	50 and 55	31	75 m x 75 m	2 years	Monthly
Dillon, CA	45	45	69	15	200 m x 200 m	1 year	Weekly, bi-monthly in winter
Dry Lake I, AZ	30	63	78	15	160 m x 160 m	1 year	Bi-monthly (spring, fall), monthly (winter, summer)
Dry Lake II, AZ	31	65	78	31: 5 (full plot), 26 (road & pad)	160 m x 160 m	1 year	Twice weekly (spring, summer, fall), weekly (winter)
Elkhorn, OR (2008)	61	101	80	61	220 m x 220 m	1 year	Monthly

Appendix A3. All post-construction monitoring studies, project characteristics, and select study methodology.

Project Name	Total # of turbines	Total MW	Tower size (m)	Number turbines searched	Plot Size	Length of Study	Survey Frequency
Elkhorn, OR (2010)	61	101	80	31	220 m x 220 m	1 year	Bi-monthly (spring, fall), monthly (winter, summer)
Elm Creek, MN	67	100	80	29	200 m x 200 m	1 year	Weekly, monthly
Elm Creek II, MN	62	148.8	80	30	200 x 200m (2 random migration search areas 100 x 100m)	1 year	20 searched every 28 days, 10 turbines every 7 days during migration)
Erie Shores, Ont	66	99	80	66	40-m radius	2 years	Weekly, bi-monthly, 2-3 times weekly (migration)
Foote Creek Rim, WY (Phase I; 1999)	69	41.4	40	69	126 m x 126 m	1 year	Monthly
Foote Creek Rim, WY (Phase I; 2000)	69	41.4	40	69	126 m x 126 m	1 year	Monthly
Foote Creek Rim, WY (Phase I; 2001-2002)	69	41.4	40	69	126 m x 126 m	1 year	Monthly
Forward Energy Center, WI	86	129	80	29	160 m x 160 m	2 years	11 turbines daily, 9 every 3 days, 9 every 5 days
Fowler I, IN (2009)	162	301	78 (Vestas), 80 (Clipper)	25	160 m x 160 m	Spring, summer, fall	Weekly, bi-weekly
Fowler I, II, III, IN (2010)	355	600	Vestas = 80, Clipper = 80, GE = 80	36 turbines, 100 road and pads	80 m x 80 m for turbines ; 40-m radius for roads and pads	Spring, fall	Daily, weekly

Appendix A3. All post-construction monitoring studies, project characteristics, and select study methodology.

Project Name	Total # of turbines	Total MW	Tower size (m)	Number turbines searched	Plot Size	Length of Study	Survey Frequency
Fowler I, II, III, IN (2011)	355	600	Vestas = 80, Clipper = 80, GE = 80	177 road and pads (spring), 9 turbines & 168 roads and pads (fall)	Turbines (80 m circular plot), roads and pads (out to 80 m)	Spring, fall	Daily, weekly
Fowler I, II, III, IN (2012)	355	600	Vestas = 80, Clipper = 80, GE = 80	118 roads and pads	Roads and pads (out to 80 m)	2.5 months	Weekly
Fowler III, IN (2009)	60	99	78	12	160 m x 160 m	10 weeks	Weekly, bi-weekly
Goodnoe, WA	47	94	80	24	180 m x 180 m	1 year	14 days during migration periods, 28 days during non-migration periods
Grand Ridge I, IL	66	99	80	30	160 m x 160 m	1 year	Weekly, monthly
Harrow, Ont (2010)	24 (four 6-turb facilities)	39.6	NA	12 in July, 24 Aug-Oct	50-m radius from turbine base	4 months	Twice-weekly
Harvest Wind, WA (2010-2012)	43	98.9	80	32	180 m x 180 m & 240 m x 240 m	2 years	Twice a week, weekly and monthly
Hay Canyon, OR	48	100.8	79	20	180 m x 180 m	1 year	Bi-monthly (spring, fall), monthly (winter, summer)
High Sheldon, NY (2010)	75	112.5	80	25	115 m x 115 m	7 months	Daily (8 turbines), weekly (17 turbines)
High Sheldon, NY (2011)	75	112.5	80	25	115 m x 115 m	7 months	Daily (8 turbines), weekly (17 turbines)
High Winds, CA (2004)	90	162	60	90	75-m radius	1 year	Bi-monthly

Appendix A3. All post-construction monitoring studies, project characteristics, and select study methodology.

Project Name	Total # of turbines	Total MW	Tower size (m)	Number turbines searched	Plot Size	Length of Study	Survey Frequency
High Winds, CA (2005)	90	162	60	90	75-m radius	1 year	Bi-monthly
Hopkins Ridge, WA (2006)	83	150	67	41	180 m x 180 m	1 year	Monthly, weekly (subset of 22 turbines spring and fall migration)
Hopkins Ridge, WA (2008)	87	156.6	67	41-43	180 m x 180 m	1 year	Bi-monthly (spring, fall), monthly (winter, summer)
Jersey Atlantic, NJ	5	7.5	80	5	130 m x 120 m	9 months	Weekly
Judith Gap, MT (2006/2007)	90	135	80	20	190 m x 190 m	7 months	Monthly
Judith Gap, MT (2009)	90	135	80	30	100 m x 100 m	5 months	Bi-monthly
Kewaunee County, WI	31	20.46	65	31	60 m x 60 m	2 years	Bi-weekly (spring, summer), daily (spring, fall migration), weekly (fall, winter)
Kibby, ME (2011)	44	132	124	22 turbines	75-m diameter circular plots	22 weeks	Avg 5-day
Kittitas Valley, WA (2011-2012)	48	100.8	80	48	100 m x 102 m	1 year	Bi weekly from Aug 15 - Oct 31 and March 16 - May 15; every 4 weeks from Nov 1 - March 15 and May 16 - Aug 14
Klondike, OR	16	24	80	16	140 m x 140 m	1 year	Monthly
Klondike II, OR	50	75	80	25	180 m x 180 m	1 year	Bi-monthly (spring, fall), monthly (summer, winter)
Klondike III (Phase I), OR	125	223.6	GE = 80; Siemens= 80, Mitsubishi = 80	46	240 m x 240 m (1.5MW) 252 m x 252 m (2.3MW)	2 year	Bi-monthly (spring, fall migration), monthly (summer, winter)

Appendix A3. All post-construction monitoring studies, project characteristics, and select study methodology.

Project Name	Total # of turbines	Total MW	Tower size (m)	Number turbines searched	Plot Size	Length of Study	Survey Frequency
Klondike IIIa (Phase II), OR	51	76.5	GE = 80	34	240 m x 240 m	2 years	Bi-monthly (spring, fall), monthly (summer, winter)
Leaning Juniper, OR	67	100.5	80	17	240 m x 240 m	2 years	Bi-monthly (spring, fall), monthly (winter, summer)
Lempster, NH (2009)	12	24	78	4	120 m x 130 m	6 months	Daily
Lempster, NH (2010)	12	24	78	12	120 m x 130 m	6 months	Weekly
Linden Ranch, WA	25	50	80	25	110 m x 110 m	1 year	Bi-weekly(spring, fall), monthly (summer, winter)
Locust Ridge, PA (Phase II; 2009)	51	102	80	15	120m x 126m	6.5 months	Daily
Locust Ridge, PA (Phase II; 2010)	51	102	80	15	120m x 126m	6.5 months	Daily
Madison, NY	7	11.55	67	7	60-m radius	1 year	Weekly (spring, fall), monthly (summer)
Maple Ridge, NY (2006)	120	198	80	50	130 m x 120 m	5 months	Daily (10 turbines), every 3 days (10 turbines), weekly (30 turbines)
Maple Ridge, NY (2007)	195	321.75	80	64	130 m x 120 m	7 months	Weekly
Maple Ridge, NY (2008)	195	321.75	80	64	130 m x 120 m	7 months	Weekly
Marengo I, WA (2009/2010)	78	140.4	67	39	180 m x 180 m	1 year	Bi-monthly (spring, fall), monthly (winter, summer)
Marengo II, WA (2009/2010)	39	70.2	67	20	180 m x 180 m	1 year	Bi-monthly (spring, fall), monthly (winter, summer)
Mars Hill, ME (2007)	28	42	80.5	28	76-m diameter, extended plot 238-m diameter	Spring, summer, fall	Daily (2 random turbines), weekly (all turbines): extended plot searched once per season

Appendix A3. All post-construction monitoring studies, project characteristics, and select study methodology.

Project Name	Total # of turbines	Total MW	Tower size (m)	Number turbines searched	Plot Size	Length of Study	Survey Frequency
Mars Hill, ME (2008)	28	42	80.5	28	76-m diameter, extended plot 238-m diameter	Spring, summer, fall	Weekly: extended plot searched once per season
McBride, Alb (2004)	114	75	50	114	4 parallel transects 120-m wide	1 year	Weekly, bi-weekly
Melancthon, Ont (Phase I)	45	NA	NA	45	35m radius	5 months	Weekly, twice weekly
Meyersdale, PA (2004)	20	30	80	20	130 m x 120 m	6 weeks	Daily (half turbines), weekly (half turbines)
Moraine II, MN	33	49.5	82.5	30	200 m x 200 m	1 year	Weekly (migratory), monthly (non-migratory)
Mount Storm, WV (2009)	132	264	78	44	Varied	4.5 months	Weekly (28 turbines), daily (16 turbines)
Mount Storm, WV (2010)	132	264	78	24	20 to 60 m from turbine	6 months	Daily
Mount Storm, WV (2011)	132	264	78	24	Varied	6 months	Daily
Mount Storm, WV (Fall 2008)	82	164	78	27	Varied	3 months	Weekly (18 turbines), daily (9 turbines)
Mountaineer, WV (2003)	44	66	80	44	60-m radius	7 months	Weekly, monthly
Mountaineer, WV (2004)	44	66	80	44	130 m x 120 m	6 weeks	Daily, weekly
Munnsville, NY (2008)	23	34.5	69.5	12	120 m x 120 m	Spring, summer, fall	Weekly
Nine Canyon, WA	37	48.1	60	37	90-m radius	1 year	Bi-monthly (spring, summer, fall), monthly (winter)
Noble Altona, NY	65	97.5	80	22	120 m x 120 m	Spring, summer, fall	Daily, weekly

Appendix A3. All post-construction monitoring studies, project characteristics, and select study methodology.

Project Name	Total # of turbines	Total MW	Tower size (m)	Number turbines searched	Plot Size	Length of Study	Survey Frequency
Noble Bliss, NY (2008)	67	100	80	23	120 m x 120 m	Spring, summer, fall	Daily (8 turbines), 3-day (8 turbines), weekly (7 turbines)
Noble Bliss, NY (2009)	67	100	80	23	120 m x 120 m	Spring, summer, fall	Weekly, 8 turbines searched daily from July 1 to August 15
Noble Chateaugay, NY	71	106.5	80	24	120 m x 120 m	Spring, summer, fall	Weekly
Noble Clinton, NY (2008)	67	100	80	23	120 m x 120 m	Spring, summer, fall	Daily (8 turbines), 3-day (8 turbines), weekly (7 turbines)
Noble Clinton, NY (2009)	67	100	80	23	120 m x 120 m	Spring, summer, fall	Daily (8 turbines), weekly (15 turbines), all turbines weekly from July 1 to August 15
Noble Ellenburg, NY (2008)	54	80	80	18	120 m x 120 m	Spring, summer, fall	Daily (6 turbines), 3-day (6 turbines), weekly (6 turbines)
Noble Ellenburg, NY (2009)	54	80	80	18	120 m x 120 m	Spring, summer, fall	Daily (6 turbines), weekly (12 turbines), all turbines weekly from July 1 to August 15
Noble Wethersfield, NY	84	126	80	28	120 m x 120 m	Spring, summer, fall	Weekly
NPPD Ainsworth, NE	36	20.5	70	36	220 m x 220 m	Spring, summer, fall	Bi-monthly
Oklahoma Wind Energy Center, OK	68	102	70	68	20m radius	3 months (2 years)	Bi-monthly
Pebble Springs, OR	47	98.7	79	20	180 m x 180 m	1 year	Bi-monthly (spring, fall), monthly (winter, summer)
Pine Tree, CA	90	135	65	40	NA	1 year	Bi-weekly
Pioneer Prairie I, IA (Phase II)	62	102.3	80	62 (57 road/pad) 5 full search plots	80 x 80m	1 year	Weekly (spring and fall), every two weeks (summer), monthly (winter)
PrairieWinds ND1 (Minot), ND 2010	80	115.5	89	35	Minimum of 100 m x 100 m	3 seasons	Bi-monthly
PrairieWinds ND1 (Minot), ND 2011	80	115.5	80	35	Minimum 100 x 100m	3 season	Twice monthly

Appendix A3. All post-construction monitoring studies, project characteristics, and select study methodology.

Project Name	Total # of turbines	Total MW	Tower size (m)	Number turbines searched	Plot Size	Length of Study	Survey Frequency
PrairieWinds SD1 (Crow Lake), SD	108	162	80	50	200 x 200m	1 year	Twice monthly (spring, summer, fall), monthly (winter)
Prince Wind Farm, Ont (2006)	126	189	80	38	63-m radius	4 months	Daily, weekly
Prince Wind Farm, Ont (2007)	126	189	80	38 turbines from January 1st - July 8th, 126 turbines from July 9th-October 31st	63- to 45-m radius	10 months	Daily, weekly
Prince Wind Farm, Ont (2008)	126	189	80	126	45m radius	6.5 months	Daily, 3x/week, 2x/week
Red Canyon, TX	56	84	70	28	200 m x 200 m in fall and winter; 160 m x 160 m in spring and summer	1 year	Every 14 days in fall and winter; 7 days in spring, 3 days in summer
Red Hills, OK	82	123	NA	20 (plus one met tower)	100 x 100	1 year	Weekly (spring, summer, fall), monthly (winter)
Ripley, Ont (2008)	38	76	64	38	80 m x 80 m	Spring, fall	Twice weekly for odd turbines; weekly for even turbines.
Ripley, Ont (Fall 2009)	38	76	64	38	80 m x 80 m	6 weeks	Twice weekly for odd turbines; weekly for even turbines.
Rugby, ND	71	149	78	32	200 m x 200 m	1 year	Weekly (spring, fall; migratory turbines), monthly (non-migratory turbines)
San Gorgonio, CA	3000	NA	24.4-42.7	NA	50-m radius	2 years	Quarterly
Searsburg, VT (2007)	11	7	65	11	20- to 55-m radius	Spring, fall	Weekly (fall migration)
Shiloh I, CA	100	150	65	100	105-m radius	3 years	Weekly

Appendix A3. All post-construction monitoring studies, project characteristics, and select study methodology.

Project Name	Total # of turbines	Total MW	Tower size (m)	Number turbines searched	Plot Size	Length of Study	Survey Frequency
Shiloh II, CA	75	150	33 turbs = 115; 42 turbs = 125	25	100m radius	1 yr	Once/week
SMUD Solano, CA	22	15	65	22	60-m radius	1 year	Bi-monthly
Stateline, OR/WA (2002)	454	299	50	124	Minimum 126 m x 126 m	17 months	Bi-weekly, monthly
Stateline, OR/WA (2003)	454	299	50	153	Minimum 126 m x 126 m	1 year	Bi-weekly, monthly
Stateline, OR/WA (2006)	454	299	50	39	Variable turbine strings	1 year	Bi-weekly
Stetson Mountain I, ME (2009)	38	57	80	19	76-m diameter	27 weeks (spring, summer, fall)	Weekly
Stetson Mountain I, ME (2011)	38	57	80	19	Varied	6 months	Weekly
Stetson Mountain II, ME (2010)	17	25.5	80	17	Varied	6 months	Weekly (3 turbines twice a week)
Summerview, Alb (2006)	39	70.2	67	39	140 m x 140 m	1 year	Weekly, bi-weekly (May to July, September)
Summerview, Alb (2008)	39	70.2	65	39	52-m radius; 2 spiral transects 7 m apart	Summer, fall (2 years)	Daily (10 turbines), weekly (29 turbines)
Tehachapi, CA	3300	NA	14.7 to 57.6	201	50-m radius	20 months	Quarterly
Top of Iowa, IA (2003)	89	80	71.6	26	76 m x 76 m	Spring, summer, fall	Once every 2 to 3 days
Top of Iowa, IA (2004)	89	80	71.6	26	76 m x 76 m	Spring, summer, fall	Once every 2 to 3 days

Appendix A3. All post-construction monitoring studies, project characteristics, and select study methodology.

Project Name	Total # of turbines	Total MW	Tower size (m)	Number turbines searched	Plot Size	Length of Study	Survey Frequency
Tuolumne (Windy Point I), WA	62	136.6	80	21	180 m x 180 m	1 year	Monthly throughout the year, a sub-set of 10 turbines were also searched weekly during the spring, summer, and fall
Vansycle, OR	38	24.9	50	38	126 m x 126 m	1 year	Monthly
Vantage, WA	60	90	80	30	240 m x 240 m	1 year	Monthly, a subset of 10 searched weekly during migration
Wessington Springs, SD (2009)	34	51	80	20	200 m x 200 m	Spring, summer, fall	Bi-monthly
Wessington Springs, SD (2010)	34	51	80	20	200 m x 200 m	8 months	Bi-weekly (spring, summer, fall)
White Creek, WA (2007-2011)	89	204.7	80	89	180 m x 180 m & 240 m x 240 m	4 years	Twice a week, weekly and monthly
Wild Horse, WA	127	229	67	64	110 m from two turbines in plot	1 year	Monthly, weekly (fall, spring migration at 16 turbines)
Windy Flats, WA	114	262.2	NA	36 (plus 1 MET tower)	180 m x 180 m (120m at MET tower)	1 year	Monthly (spring, summer, fall, and winter), weekly (spring and fall migration)
Winnebago, IA	10	20	78	10	200 m x 200 m	1 year	Weekly (migratory), monthly (non-migratory)
Wolfe Island, Ont (May-June 2009)	86	197.8	80	86	60-m radius	Spring	43 twice weekly, 43 weekly
Wolfe Island, Ont (July-December 2009)	86	197.8	80	86	60-m radius	Summer, fall	43 twice weekly, 43 weekly
Wolfe Island, Ont (January-June 2010)	86	197.8	80	86	60-m radius	6 months	43 twice weekly, 43 weekly
Wolfe Island, Ont (July-December 2010)	86	197.8	80	86	50-m radius	6 months	43 twice weekly, 43 weekly

Appendix A3. All post-construction monitoring studies, project characteristics, and select study methodology.

Project Name	Total # of turbines	Total MW	Tower size (m)	Number turbines searched	Plot Size	Length of Study	Survey Frequency
Wolfe Island, Ont (January-June 2011)	86	197.8	80	86	50-m radius	6 months	43 twice weekly, 43 weekly
Wolfe Island, Ont (July-December 2011)	86	197.8	80	86	50-m radius	6 months	43 twice weekly, 43 weekly

Appendix A3 (*continued*). All post-construction monitoring studies, project characteristics, and select study methodology.

Data from the following sources:

Project, Location	Reference	Project, Location	Reference
Alite, CA	Chatfield et al. 2010	Klondike II, OR	NWC and WEST 2007
Alta Wind I, CA (11)	Chatfield et al. 2012	Klondike III (Phase I), OR	Gritski et al. 2010
Alta Wind II-V, CA (11)	Chatfield et al. 2012	Klondike IIIa (Phase II), OR	Gritski et al. 2011
Barton I & II, IA	Derby et al. 2011a	Leaning Juniper, OR	Gritski et al. 2008
Barton Chapel, TX	WEST 2011	Lempster, NH (09)	Tidhar et al. 2010
Beech Ridge, WV	Tidhar et al. 2013	Lempster, NH (10)	Tidhar et al. 2011
Big Horn, WA	Kronner et al. 2008	Linden Ranch, WA	Enz and Bay 2011
Big Smile, OK	Derby et al. 2013a	Locust Ridge, PA (Phase II; 09)	Arnett et al. 2011
Biglow Canyon, OR (Phase I; 08)	Jeffrey et al. 2009a	Locust Ridge, PA (Phase II; 10)	Arnett et al. 2011
Biglow Canyon, OR (Phase I; 09)	Enk et al. 2010	Madison, NY	Kerlinger 2002b
Biglow Canyon, OR (Phase II; 09/10)	Enk et al. 2011a	Maple Ridge, NY (06)	Jain et al. 2007
Biglow Canyon, OR (Phase II; 10/11)	Enk et al. 2012b	Maple Ridge, NY (07)	Jain et al. 2009a
Biglow Canyon, OR (Phase III; 10/11)	Enk et al. 2012a	Maple Ridge, NY (08)	Jain et al. 2009d
Blue Sky Green Field, WI	Gruver et al. 2009	Marengo I, WA (09)	URS Corporation 2010b
Buena Vista, CA	Insignia Environmental 2009	Marengo II, WA (09)	URS Corporation 2010c
Buffalo Gap I, TX	Tierney 2007	Mars Hill, ME (07)	Stantec 2008
Buffalo Gap II, TX	Tierney 2009	Mars Hill, ME (08)	Stantec 2009a
Buffalo Mountain, TN (00-03)	Nicholson et al. 2005	McBride, Alb (04)	Brown and Hamilton 2004
Buffalo Mountain, TN (05)	Fiedler et al. 2007	Melancthon, Ont (Phase I)	Stantec Ltd. 2008
Buffalo Ridge, MN (94/95)	Osborn et al. 1996, 2000	Meyersdale, PA (04)	Arnett et al. 2005
Buffalo Ridge, MN (Phase I; 96)	Johnson et al. 2000	Moraine II, MN	Derby et al. 2010d
Buffalo Ridge, MN (Phase I; 97)	Johnson et al. 2000	Mount Storm, WV (Fall 08)	Young et al. 2009b
Buffalo Ridge, MN (Phase I; 98)	Johnson et al. 2000	Mount Storm, WV (09)	Young et al. 2009a, 2010b
Buffalo Ridge, MN (Phase I; 99)	Johnson et al. 2000	Mount Storm, WV (10)	Young et al. 2010a, 2011b
Buffalo Ridge, MN (Phase II;98)	Johnson et al. 2000	Mount Storm, WV (11)	Young et al. 2011a, 2012b
Buffalo Ridge, MN (Phase II; 99)	Johnson et al. 2000	Mountaineer, WV (03)	Kerns and Kerlinger 2004
Buffalo Ridge, MN (Phase II; 01/Lake Benton I)	Johnson et al. 2004	Mountaineer, WV (04)	Arnett et al. 2005
Buffalo Ridge, MN (Phase II; 02/Lake Benton I)	Johnson et al. 2004	Munnsville, NY (08)	Stantec 2009b
Buffalo Ridge, MN (Phase III; 99)	Johnson et al. 2000	Nine Canyon, WA	Erickson et al. 2003
Buffalo Ridge, MN (Phase III; 01/Lake Benton II)	Johnson et al. 2004	Noble Altona, NY	Jain et al. 2011b
Buffalo Ridge, MN (Phase III; 02/Lake Benton II)	Johnson et al. 2004	Noble Bliss, NY (08)	Jain et al.2009e
Buffalo Ridge I, SD (10)	Derby et al. 2010b	Noble Bliss, NY (09)	Jain et al. 2010a
Buffalo Ridge II, SD (11)	Derby et al. 2012a	Noble Chateaugay, NY	Jain et al. 2011c
Casselman, PA (08)	Arnett et al. 2009a	Noble Clinton, NY (08)	Jain et al. 2009c
Casselman, PA (09)	Arnett et al. 2010	Noble Clinton, NY (09)	Jain et al. 2010b
Casselman Curtailment, PA (08)	Arnett et al. 2009b	Noble Ellenburg, NY (08)	Jain et al. 2009b
Castle River, Alb (01)	Brown and Hamilton 2006a	Noble Ellenburg, NY (09)	Jain et al. 2010c
Castle River, Alb (02)	Brown and Hamilton 2006a	Noble Wethersfield, NY	Jain et al. 2011a
Cedar Ridge, WI (09)	BHE Environmental 2010	NPPD Ainsworth, NE	Derby et al. 2007
Cedar Ridge, WI (10)	BHE Environmental 2011	Oklahoma Wind Energy Center, OK	Piorkowski and O'Connell 2010
Cohocton/Dutch Hill, NY (09)	Stantec 2010	Pebble Springs, OR	Gritski and Kronner 2010b
Cohocton/Dutch Hills, NY (10)	Stantec 2011	Pine Tree, CA	BioResource Consultants 2010
Combine Hills, OR	Young et al. 2006	Pioneer Prairie I, IA (Phase II)	Chodachek et al. 2012
Combine Hills, OR (11)	Enz et al. 2012	PrairieWinds ND1 (Minot), ND	Derby et al. 2011c
Condon, OR	Fishman Ecological Services 2003	PrairieWinds ND1 (Minot), ND (11)	Derby et al. 2012c
Crescent Ridge, IL	Kerlinger et al. 2007	PrairieWinds SD1, SD	Derby et al. 2012d
Criterion, MD (11)	Young et al. 2012a	Prince Wind Farm, Ont (06)	Natural Resource Solutions 2009
Criterion, MD (12)	Young et al. 2013	Prince Wind Farm, Ont (07)	Natural Resource Solutions 2009
Crystal Lake II, IA	Derby et al. 2010a	Prince Wind Farm, Ont (08)	Natural Resource Solutions 2009
Diablo Winds, CA	WEST 2006, 2008	Red Canyon, TX	Miller 2008
Dillon, CA	Chatfield et al. 2009	Red Hills, OK	Derby et al. 2013b
Dry Lake I, AZ	Thompson et al. 2011	Ripley, Ont (08)	Jacques Whitford 2009
Dry Lake II, AZ	Thompson and Bay 2012	Ripley, Ont (Fall 09)	Golder Associates 2010
Elkhorn, OR (08)	Jeffrey et a. 2009b	Rugby, ND	Derby et al. 2011b
Elkhorn, OR (10)	Enk et al. 2011b	San Gorgonio, CA	Anderson et al. 2005
Elm Creek, MN	Derby et al. 2010c	Searsburg, VT (07)	Kerlinger 2002a
Elm Creek II, MN	Derby et al. 2012b	Shiloh I, CA	Kerlinger et al. 2009
Erie Shores, Ont	James 2008	Shiloh II, CA	Kerlinger et al. 2010b
Foote Creek Rim, WY (Phase I; 99)	Young et al. 2003a	SMUD Solano, CA	Erickson and Sharp 2005
Foote Creek Rim, WY (Phase I; 00)	Young et al. 2003a	Stateline, OR/WA (02)	Erickson et al. 2004
Foote Creek Rim, WY (Phase I; 01-02)	Young et al. 2003a	Stateline, OR/WA (03)	Erickson et al. 2004
Forward Energy Center, WI	Grodsky and Drake 2011	Stateline, OR/WA (06)	Erickson et al. 2007
Fowler I, IN (09)	Good et al. 2011	Stetson Mountain I, ME (09)	Stantec 2009c
Fowler I, II, III, IN (10)	Good et al. 2011	Stetson Mountain I, ME (11)	Normandeau Associates 2011
Fowler I, II, III, IN (11)	Good et al. 2012	Stetson Mountain II, ME (10)	Normandeau Associates 2010

Appendix A3 (*continued*). All post-construction monitoring studies, project characteristics, and select study methodology.

Data from the following sources:

Project, Location	Reference	Project, Location	Reference
Fowler I, II, III, IN (12)	Good et al. 2013	Summerview, Alb (06)	Brown and Hamilton 2006b
Fowler III, IN (09)	Good et al. 2011	Summerview, Alb (08)	Baerwald 2008
Goodnoe, WA	URS Corporation 2010a	Tehachapi, CA	Anderson et al. 2004
Grand Ridge I, IL	Derby et al. 2010g	Top of Iowa, IA (03)	Jain 2005
Harrow, Ont (10)	Natural Resource Solutions 2011	Top of Iowa, IA (04)	Jain 2005
Harvest Wind, WA (10-12)	Downes and Gritski 2012a	Tuolumne (Windy Point I), WA	Enz and Bay 2010
Hay Canyon, OR	Gritski and Kronner 2010a	Vansycle, OR	Erickson et al. 2000
High Sheldon, NY (10)	Tidhar et al. 2012a	Vantage, WA	Ventus Environmental Solutions 2012
High Sheldon, NY (11)	Tidhar et al. 2012b	Wessington Springs, SD (09)	Derby et al. 2010f
High Winds, CA (04)	Kerlinger et al. 2006	Wessington Springs, SD (10)	Derby et al. 2011d
High Winds, CA (05)	Kerlinger et al. 2006	White Creek, WA (07-11)	Downes and Gritski 2012b
Hopkins Ridge, WA (06)	Young et al. 2007	Wild Horse, WA	Erickson et al. 2008
Hopkins Ridge, WA (08)	Young et al. 2009c	Windy Flats, WA	Enz et al. 2011
Jersey Atlantic, NJ	NJAS 2008a, 2008b, 2009	Winnebago, IA	Derby et al. 2010e
Judith Gap, MT (06-07)	TRC 2008	Wolfe Island, Ont (May-June 09)	Stantec Ltd. 2010a
Judith Gap, MT (09)	Poulton and Erickson 2010	Wolfe Island, Ont (July-Dec 09)	Stantec Ltd. 2010b
Kewaunee County, WI	Howe et al. 2002	Wolfe Island, Ont (Jan-June 10)	Stantec Ltd. 2011a
Kibby, ME (11)	Stantec 2012	Wolfe Island, Ont (July-Dec 10)	Stantec Ltd. 2011b
Kittitas Valley, WA (11-12)	Stantec Consulting 2012	Wolfe Island, Ont (Jan-June 11)	Stantec Ltd. 2011c
Klondike, OR	Johnson et al. 2003	Wolfe Island, Ont (July-Dec 11)	Stantec Ltd. 2012

Whooping Crane Habitat Review
Sunflower Wind Project
Morton and Stark Counties, North Dakota

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NATURAL RESOURCES ◆ SCIENTIFIC SOLUTIONS

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INTRODUCTION

The Sunflower Wind Project (SFWP) is proposed for development by Sunflower Wind Project LLC (Sunflower), a wholly owned subsidiary of Infinity Wind Power (Infinity), in Morton and Stark Counties, North Dakota. Sunflower requested that Western EcoSystems Technology, Inc. (WEST) implement a desktop review and analysis of potential whooping crane habitat resources within the SFWP and to compare these resources to areas outside of the project boundary to the north, south, east, and west. The habitat review and analysis evaluates whether or not the proposed SFWP area represents high, average, or low potential whooping crane habitat as compared to alternate locations. From this analysis all parties can then discuss what impacts there may be to whooping cranes from development of the SFWP.

PROJECT AREA

The SFWP is located in Morton and Stark Counties, North Dakota, approximately three miles (mi; 4.8 kilometers [km]) south of the town of Hebron (Figure 1). The SFWP, currently about 21,947 acres (ac; 89 square kilometers [km2]; 34 square miles [mi2]) is located in west-central North Dakota and more specifically western Morton and eastern Stark Counties. The landscape within the SFWP is generally flat with more rolling lands in the northern third of the project area. Elevation ranges from 679 meters (m; 2,228 feet [ft]) to 817 m (2,679 ft). Historically, the SFWP's landscape was dominated by grasslands but has since been converted largely to agricultural use with crop production and livestock grazing the primary practices. Trees and shrubs can be found around farmsteads, within planted shelter belts, and along/within drainages. Wetlands are scattered throughout the SFWP with many being man-made.

Cultivated cropland and herbaceous/pasture/hay lands are approximately equal in amount and comprise almost 95% of the study area. Of the remaining 5%, 3.5% is developed while wetlands, forest, and barren lands, in that order, make up the rest of the landscape (Fry et al. 2011; Figure 2). Common agricultural crops include small grains, corn, sunflowers, and alfalfa.

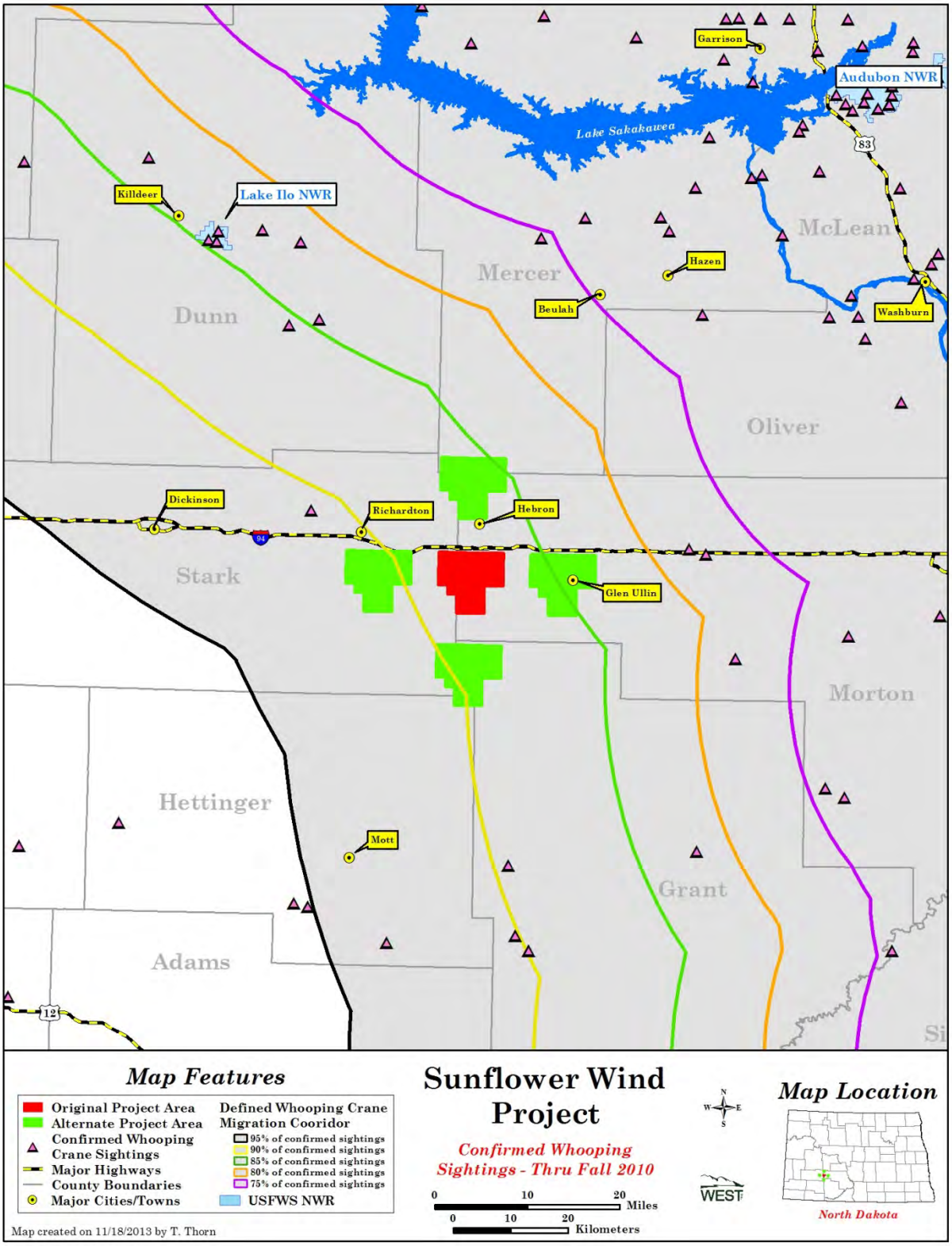


Figure 1. Location of the Sunflower Wind Project, alternate areas, and whooping crane observations.

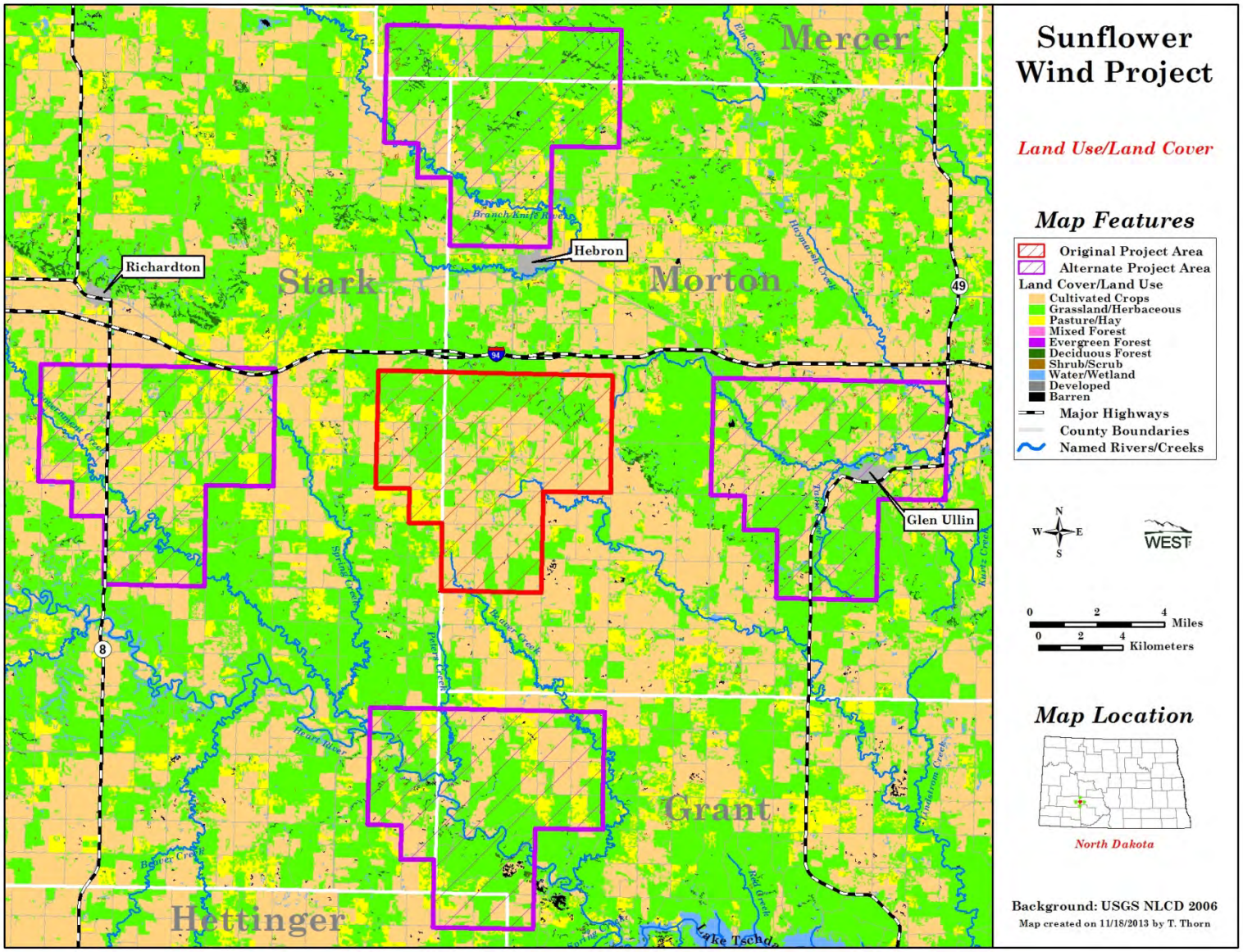


Figure 2. Land Use/Land Cover within and around the Sunflower Wind Project.

METHODS

A desktop review was completed using ArcGIS, ArcMap 10.1, land cover information from the National Land Cover Database (NLCD 2006), wetland data from the National Wetland Inventory (NWI), 2012 NAIP aerial imagery, and the current project boundary as provided by Sunflower. A site visit was not completed by WEST for this exercise specifically, but WEST has conducted other surveys at the SFWP and confirmed that the mapping generally agrees with current conditions.

The potential whooping crane habitat analysis included a comparison of land cover within the proposed SFWP boundary and four alternate areas of the same dimensions located adjacent (based on the SFWP's boundary extent) to the SFWP boundary in the four cardinal directions (see Figures 1, 2, and 3). A recently developed potentially suitable habitat assessment (Watershed Institute 2012) was also used to quantify and compare whooping crane habitat within the study areas. This assessment first screens all wetlands within the study areas for minimum size, visual obstructions, and disturbances. Those wetlands left are then quantified by their size, density of wetlands around them, distance to food, whether they are natural or man-made, and their water regime as a means to quantify suitability. This work was initially done in Kansas and the results were compared to Quivira National Wildlife Refuge, a traditional migratory stopover area. In Kansas, it was determined that a score of 12 or higher represented potentially suitable whooping crane habitat.

RESULTS

There are 10,494 ac of cropland within the proposed project area, or 47.7% of the total area. Grass and herbaceous lands make up approximately 40.8% of the project area while pasture/hay and developed lands occupy another 6.3% and 3.5% respectively. Water, forest, shrub/scrub, and barren habitats comprise the remaining 1.7% of the SFWP (Table 1).

Croplands, Grasslands, and Other Habitats

The percentage of cropland varied between the project area and comparison areas, with the SFWP containing the most (47.7%) and the north comparison area the least (25.2%; Table 1). The other three reference areas had cropland percentages ranging between 31.4% and 43.9% (Table 1). All cropland has the potential as foraging areas for whooping cranes but crop type could influence the extent of use of a particular field during any one migration season.

Percentages of grassland/herbaceous habitat also varied between analyzed areas with the north (62.1%) reference area having the most and the SFWP and west area the least (40.8% and 38.2% respectively; Table 1). The east and south reference areas had grassland/herbaceous percentages approximately in the middle of the high and low percentages calculated (Table 1). The influence of grassland habitats on migrating whooping crane behavior

is unknown; however, short grasslands (i.e. grazed pasture) adjacent to wetlands may provide loafing areas and cranes may utilize grasslands to some degree for foraging.

All other habitat types comprised approximately 11.5% of the SFWP's area. This is at the low end of the range (11.3% - 17.9%) of other habitats occurring within the alternate areas (Table 1). Pasture/hay and developed lands made up the bulk of the remaining habitats in all areas (Table 1).

Table 1. Land Use/Land Cover within the Sunflower Wind Project and adjacent areas.

	SFWP		North		East		South		West	
Habitat Type	**Acres**	**%**	**Acres**	**%**	**Acres**	**%**	**Acres**	**%**	**Acres**	**%**
Cultivated Crops	10,493.8	47.7	5,540.7	25.2	8,407.4	38.3	6,902.7	31.4	9,648.4	43.9
Grassland/Herbaceous	8,965.4	40.8	13,646.3	62.1	11,032.6	50.2	11,755.9	53.5	8,406.0	38.2
Pasture/Hay	1,394.8	6.3	1,460.6	6.6	566.6	2.6	1,818.2	8.3	2,701.6	12.3
Developed	761.9	3.5	374.9	1.7	1,144.6	5.2	753.5	3.4	901.8	4.1
Water/Wetlands	188.0	0.9	308.0	1.4	454.7	2.1	343.8	1.6	248.4	1.1
Forests	108.4	0.5	541.2	2.5	197.8	0.9	267.9	1.2	57.6	0.3
Shrub/Scrub	62.8	0.3	91.2	0.4	105.7	0.5	34.1	0.2	18.5	0.1
Barren	8.2	<0.1	20.5	0.1	6.5	<0.1	9.1	<0.1	4.5	<0.1

National Land Cover Database 2006; Fry et al. 2011.

Wetlands

NWI wetland data was used for this analysis because it represents wetland features to a higher degree than the NLCD. For this analysis, it is assumed that all wetlands are potential whooping crane roosting areas under one water regime or another (e.g., drought, normal, or flood). The SFWP had the second lowest number, total acres, mean size, and size range of wetland basins compared to the reference areas (Table 2). The west reference area had the highest number of basins (194), total acres (393.6 ac) and largest size range (<0.1 to 200 ac). Wetland basins within the west area also had the second highest mean size (Table 2). The south reference area had the fewest number of wetland basins (61) but largest wetland mean size (4.1 ac; Table 2). These numbers are somewhat misleading due to the presence of the Heart River bisecting this reference area (Figure 3). The Heart River was one basin accounting for approximately 175 of the 250 total wetland acres within the area. The northern study area had the second highest number of wetland basins (164) but the lowest total wetland acres, smallest mean wetland size (0.6), and narrowest wetland size range (<0.1 to 5.0; Table 2). For the east reference area, the numbers for the four wetland statics were in the middle compared to the other reference areas and the SFWP (Table 2).

Freshwater emergent (52.8%) and freshwater ponds (44.4%) made up the highest percentages of wetland types in the SFWP, with freshwater forested/shrub and other wetlands making up the remaining approximately 2.8% of wetlands (Table 3). The north reference area had similar

wetland types and percentages as the SFWP with a small amount of riverine and other wetlands (Table 3). Almost 70% of the south alternate area was comprised of riverine wetlands due to the presence of the Heart River. The bulk of the wetland types composing the east reference area were freshwater ponds (45.9%) and lakes (39.6%) while freshwater emergent wetlands dominated (93.2%) the type of wetlands in the western study area (Table 3). See Figure 3 for distribution of wetland types within the analyzed areas.

To summarize, the SFWP had the second lowest number, total acres, mean size, and size range of wetland basins compared to the reference areas and was dominated by freshwater emergent wetlands and ponds. The west alternate area had the highest number, total acres, and widest size range of wetlands of all the areas with the bulk of the wetlands being freshwater emergent. The north reference area had a relatively high number of freshwater emergent wetlands and freshwater ponds but they were small in size. The south study area contained the fewest wetland basins but these wetlands had the highest mean size. The Heart River, represented by a single riverine basin, comprised approximately 70% of the total wetland acres of this area. Wetland statistics for the east alternate area were basically in the middle of range for all study areas. This area was the only one to contain any NWI lake habitat.

Table 2. Comparison of the number of wetland basins and mean size within the Sunflower Wind Project and adjacent areas.

Area	Basins	Total - acres	Mean Size - acres	Range - acres
SFWP	126	110.3	0.9	0.1 – 28.4
North	164	106.3	0.6	<0.1 – 5.0
South	61	250.0	4.1	0.1 – 174.6
East	139	206.7	1.5	0.1 – 38.9
West	194	393.6	2.0	<0.1 – 200.0

Data Source: NWI data with wetland parts dissolved.

Table 3. Wetland types within the Sunflower Wind Project and adjacent areas.

	SFWP		North		East		South		West	
Wetland Type	Acres	%	Acres	%	Acres	%	Acres	%	Acres	%
Freshwater Emergent	58.2	52.8	43.5	41.0	28.7	13.9	48.2	19.3	366.7	93.2
Freshwater Forested/Shrub	0.9	0.8			0.5	0.2	10.0	4.0	4.0	1.0
Freshwater Pond	48.9	44.4	61.4	57.8	94.9	45.9	18.6	7.4	22.2	5.6
Riverine			0.2	0.2			173.1	69.3		
Lake					81.8	39.6				
Other	2.3	2.1	1.1	1.0	0.7	0.3	0.1	<0.1	0.4	0.1

Data Source: NWI 2010.

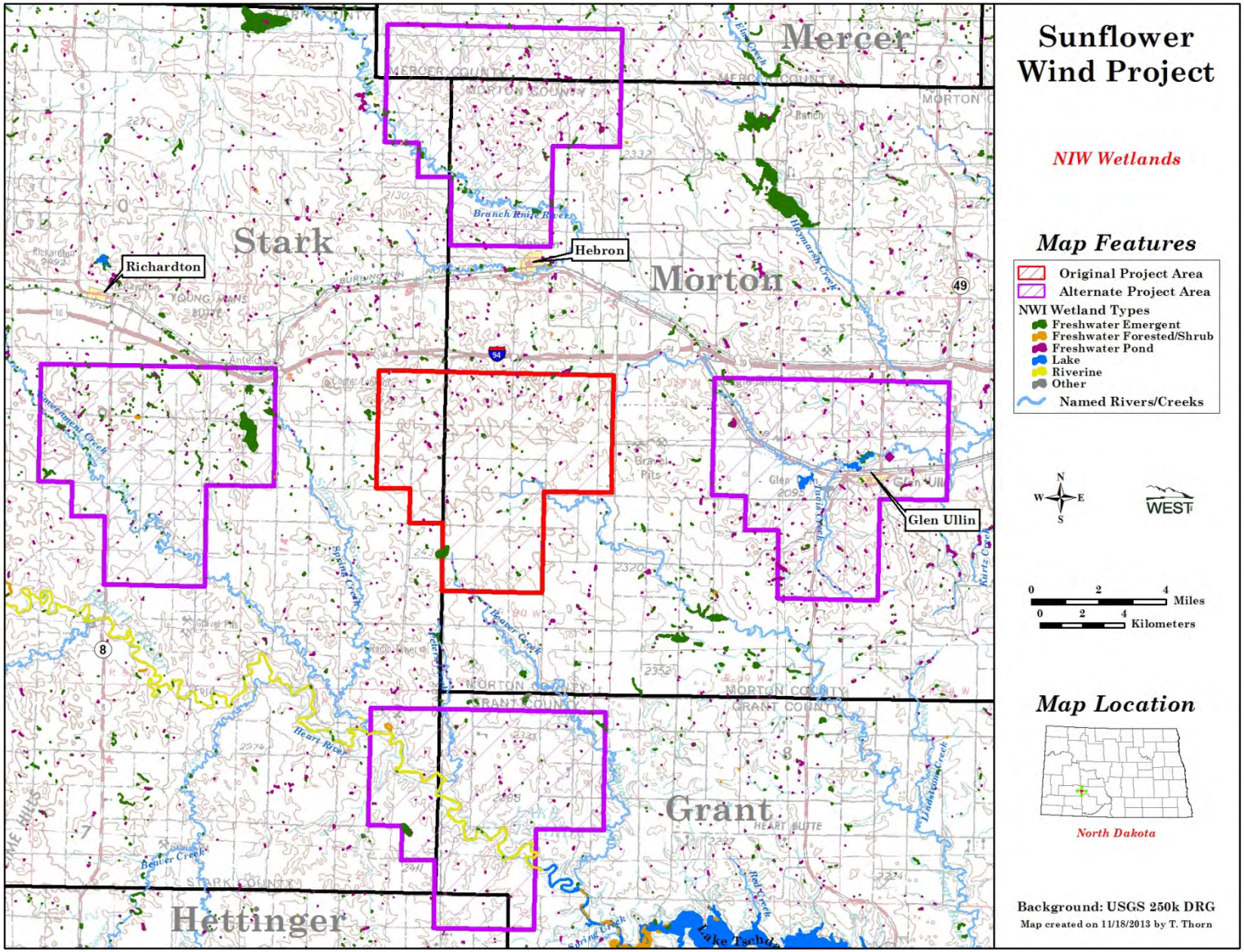


Figure 3. NWI wetlands within and around the Sunflower Wind Project.

Whooping Crane Suitable Habitat Assessment

The habitat assessment model identified 74 wetland basins within the SFWP as potentially suitable whooping crane roosting habitat. The mean suitability score for these wetlands was 8.5 with the scores ranging from four to 13 (Table 4). This mean suitability score and range was similar to the score and range for the four reference areas. The west reference area had the highest (9.0) mean suitability score (Table 4). The overall rankings are generally below what was determined as suitable potential habitat in Kansas (a mean score of 12 or more; Watershed Institute 2012).

Table 4. Comparison of suitable whooping crane habitat within the Sunflower Wind Project and adjacent areas.

Area	Basins	Total - acres	Mean Score	Score range
SFWP	74	91.7	8.5	4 – 13
North	68	66.9	8.2	5 – 11
South	34	39.8	8.1	6 – 13
East	54	102.9	8.6	6 – 14
West	54	274.8	9.0	7 – 14

Data Derived From: Potentially Suitable Habitat Assessment, Watershed Institute 2012.

Whooping Crane Migration Corridor and Confirmed Sightings

The SFWP and all four review areas are located inside the defined (95% of confirmed sightings) whooping crane migration corridor and no whooping cranes have been documented within these areas (CWCTP 2009; Figure 1). The closest confirmed sighting (through fall 2010) to the SFWP is approximately 15 mi (24.1 km) northwest of the boundary (Figure 1). This same sighting is approximately 6 mi (9.7 km) from the west alternative's boundary (Figure 1). It should be noted that reported whooping crane observations are mostly random events by the public or focused around refuges and other areas of management interest and not the result of a systematic search. Therefore, just because an area has no documented whooping crane sightings, does not mean that birds do not use the area.

DISCUSSION

Whooping cranes are currently listed as endangered under the Endangered Species Act (32 FR 4001, 1967 March 11) except where nonessential experimental populations exist (66 FR 33903-33917, 2001 June 26; 62 FR 38932-38939, 1997 July 21; and 58 FR 5647-5658, 1993 January 22). In the US, the whooping crane was listed as threatened with extinction in 1967 and endangered in 1970 – both listings were "grandfathered" into the Endangered Species Act of 1973 (ESA 1973). The 2012 – 2013 winter population within the primary wintering grounds was estimated at 257 birds (178 – 362, 95% confidence interval.). There was another 22 whooping cranes thought to be outside of the primary wintering grounds when systematic surveys were

conducted (USFWW 2013). Whooping cranes typically migrate from their breeding grounds in Wood Buffalo National Park, Canada to their wintering areas in Aransas National Wildlife Refuge, Texas. During the migration, most birds pass through central North Dakota.

The US Fish and Wildlife Service (USFWS) defined a migration corridor for whooping cranes based on the historical sightings of whooping cranes from the early 1960's through 2009 (CWCTP 2009). This corridor encompasses approximately 95% of the observations and is sub-divided into 5% increments starting at 75%. The SFWP is within the area encompassing 85% to 90% of confirmed whooping crane sightings and is approximately 71 mi (114.2 km) west of the migration corridor centerline (CWCTP 2009; Figure 1). The USFWS has expressed concern with wind and other above ground developments (e.g., transmission lines) that are built anywhere within the defined corridor, but with more emphasis placed on those projects within the region that encompasses 75% of the observations.

Confirmed whooping sightings to the north and south of the project indicates the potential for whooping cranes to fly through the area during migration. Whooping cranes generally migrate at 305-1830 m (1,000-6,000 ft) altitude, well above turbine height (Stehn 2007), and thus for the most part are unlikely to collide with turbines. However, as whooping cranes ascend and descend during takeoff and landing, or migrate during inclement weather, they may fly at lower altitudes and may fly at altitudes corresponding to the rotor-swept areas. In summary, low altitude flight is generally of short duration in the morning and evenings with more time and distance covered at higher elevation during typical migration flight; reducing potential risk to whooping cranes.

No whooping cranes have been reported as being killed or injured by wind turbines (NWCC 2004), but one sandhill crane (*Grus canadensis*) was reported at the Altamont wind energy facility in California (Smallwood and Karas 2009), it is unclear if this was a result of turbine collision or collision with a power line. Two sandhill cranes were also apparently struck by turbines during a recent study of wintering cranes in Texas (Navarrete and Griffis 2011a). It appears that cranes are not overly susceptible to collision with turbines given that 100,000's sandhill cranes migrate twice annually through the Great Plains and none have been documented as wind turbine collision fatalities in this region during migration (Derby et al. 2012).

Besides direct mortality, concern has also been raised regarding potential displacement impacts that wind facilities may have on whooping cranes. For example, if whooping cranes avoid wind facilities, the likelihood of impacts with turbines is further decreased but the availability of habitat in the project area may be diminished, causing cranes to have to fly further to find suitable habitat to roost and forage. To date, very little quantitative data is available to help address displacement impacts on whooping cranes or sandhill cranes. A recent presentation by Navarrete and Griffis (2011b) suggests that the mean density of sandhill cranes wintering in the high plains of Texas increased the further away from studied wind facilities and this distribution was not a random event. It is unclear if a similar pattern is found in cranes during migration or at other wintering areas.

Although developed for transmission line impacts on whooping crane habitat in Kansas, the Watershed Institute's (2012) potentially suitable habitat assessment for whooping cranes can help to quantify potential whooping crane habitat in and around a proposed wind energy project. This tool indicates that the range of scores and average score at the SFWP is similar to the four other study areas, indicate that overall the site is not unique in providing potential habitat for the species during migration. In addition, the average score and most of the individual wetland scores are much lower than the reference score of 12 developed for quality habitat at the Quivira National Wildlife Refuge.

SUMMARY

In analyzing the potential for significant impacts from wind development on whooping crane stopover habitat, Stehn (2007) suggests assessing whether there is "lots of suitable stopover habitat in the general area … or is the proposed wind farm site the only suitable whooping crane stopover habitat for miles around". This issue was investigated by comparing the potential whooping crane stopover habitat (using wetlands as this indicator) in the project area to surrounding (in the four cardinal directions) areas of the same dimensions, located adjacent (based on the BWP's boundary extent) to the BWP boundary. A Geographic Information System (GIS) was used to calculate the amount of the various habitats and in the case of wetlands, number of individual basins and their type, in each of the areas compared to the proposed SFWP (Tables 1, 2, and 3). This analysis shows that both roosting (i.e. wetlands) and foraging (i.e. croplands) habitats are available in the SFWP and alternate areas. Potential whooping habitat within the SFWP appears to be most similar to that in the east and west reference areas and more suitable than that found in the north and south alternate areas. Based on results from suitable habitat assessment, potential whooping crane use wetlands are similar in attractiveness in all studied areas with the SFWP having the most potential basins (Table 4). While whooping cranes likely migrate over the SFWP and there is potential for roosting or foraging use at the SFWP, the SFWP does not provide significant potential habitat nor does it provide unique habitat compared to adjacent areas.

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Screening Level Acoustic Assessment

for the

Sunflower Wind Project

Stark and Morton Counties, North Dakota

Prepared for

Sunflower Wind Project, LLC

Prepared by

TETRA TECH

February 2014

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Figure 4. Operational Leq Sound Levels under Anomalous Meteorological Conditions – Vestas V110-2.0

List of Attachments

Attachment 1: Tabulated Results

Acronyms and Abbreviations

BMPs	Best Management Practices
dB	decibel
dBA	A-weighted decibel
IEC	International Electrotechnical Commission
ISO	International Organization for Standardization
NSR	Noise Sensitive Receptor
PEIS	Programmatic Environmental Impact Statement
Project	Sunflower Wind Energy Project
Sunflower	Sunflower Wind Project, LLC
UGP	Upper Great Plains
WTG	wind turbine generator

1.0 INTRODUCTION

Sunflower Wind Project, LLC (Sunflower) is proposing to construct and operate the Sunflower Wind Energy Project (Project) in accordance with the North Dakota Energy Conversion Facility Siting Criteria (North Dakota 2013). The Project is located approximately 3 miles south of Hebron, North Dakota, with portions of the Project Area in Morton and Stark counties, North Dakota. Tetra Tech has completed the following screening level acoustic assessment to determine the feasibility of the Project to operate within applicable noise criteria. Additionally, construction noise levels have been qualitatively assessed. The results of the acoustic assessment demonstrate that the Project would comply with regulatory limits and/or guidelines at all noise sensitive receptors (NSRs).

2.0 APPLICABLE REGULATION

Tetra Tech completed a review of regulations and identified the following laws, regulations, or guidelines applicable to the Project at the federal, state, and county levels.

North Dakota Chapter 69-06-08-01(4) provides for the State's noise requirements with respect to wind energy projects:

> *Additional avoidance areas for wind energy conversion facilities. A wind energy conversion facility site must not include a geographic area where, due to operation of the facility, the sound levels within one hundred feet of an inhabited residence or a community building will exceed fifty dBA [A-weighted decibels]. The sound level avoidance area criteria may be waived in writing by the owner of the occupied residence or the community building.*

The Morton County Zoning Ordinance and the Stark County Zoning Ordinance provide additional regulations at the county level. The Morton County regulations are limited to a qualitative discussion; however, Stark County provides numeric sound level limits for sustained noise of 80 decibels (dB) during the day and 70 dB at night.

3.0 FACILITY CONSTRUCTION SOUND LEVELS

Project construction may cause short-term but unavoidable noise impacts. The sound levels resulting from construction activities vary significantly depending on several factors, such as the type and age of equipment, the specific equipment manufacturer and model, the operations being performed, and the overall condition of the equipment and exhaust system mufflers. The list of construction equipment that may be used on the Project and estimates of near and far sound source levels are presented in Table 1. No blasting or pile driving is anticipated during Project construction.

Table 1. Estimated L_{max} Sound Pressure Levels from Construction Equipment		
Equipment	**Estimated Sound Pressure Level at 50 feet (dBA)**	**Estimated Sound Pressure Level at 2000 feet (dBA)**
Crane	85	53
Forklift	80	48
Backhoe	80	48
Grader	85	53
Man basket	85	53
Dozer	83 - 88	51 - 56
Loader	83 - 88	51 - 56
Scissor Lift	85	53
Truck	84	52
Welder	73	41
Compressor	80	48
Concrete Pump	77	45

Data compiled in part from the following sources:

Federal Highway Administration, "Roadway Construction Noise Model User's Guide," Report FHWA-HEP-05-054 / DOT-VNTSC-FHWA-05-01, January 2006.

Power Plant Construction Noise Guide, Bolt Beranek and Newman, Inc. 1977.

Federal Highway Administration, "Procedures for Abatement of Highway Traffic Noise and Construction Noise." Code of Federal Regulations, Title 23, Part 772, 1992.

Construction activity would also generate traffic that would have potential noise effects, such as trucks travelling to and from the site on public roads. Sound generated by construction activities is generally exempt from state and local noise regulation. Construction would be limited to daytime hours between 7 a.m. and 7 p.m., and reasonable efforts would be made to minimize the impact of noise resulting from construction activities. The Project Engineering, Procurement and Construction (EPC) contractor would notify the community of the expected Project construction schedule and duration.

4.0 FACILITY OPERATIONAL SOUND LEVELS

Sound power level data are used in acoustic models to predict received sound pressure levels at observer locations. The Project has a nameplate (gross) generating capacity of 110 megawatts (MW) and the layouts under consideration include alternate wind turbine generator (WTG) locations to achieve this capacity. Table 2 includes the two WTG types, the number of WTGs under consideration to achieve the nameplate capacity, and the broadband sound power level associated with each. The Project layout utilized for this study includes more than the target number of turbine locations needed to meet the Project's nameplate capacity to account for alternate locations. All of these locations were used in the model; however, the actual number of WTGs used for the final Project design would be no greater than that indicated in Table 2.

Table 2. WTG Candidates and Layout Configurations						
WTG Model	**Maximum Number of WTG in Project**	**Number of WTG Locations Studied**	**MW per WTG**	**Hub Height (m)**	**Rotor Diameter (m)**	**Sound Power Level (dBA)[1/]**
GE 1.85-87	59	76	1.85	80	87	106.5
Vestas V110-2.0	55	64	2.0	80	110	107.5

1/ A k-factor (or uncertainty factor) of 2 dBA was applied to the overall A-weighted sound power level.

WTG sound power levels are determined in accordance with International Electrotechnical Commission (IEC) Standard 61400-11, Wind Turbine Generator Systems—Part 11: Wind turbine generator systems – Acoustic Noise Measurement Techniques. This methodology has been developed to allow for comparison between WTG manufacturers using consistent reporting and measurement techniques. The IEC test is an accepted standard providing a uniform methodology for measuring the noise emissions of a WTG from cut-in through full rotational wind speeds. The IEC testing standard defines deviation values σ_T, σ_R and σ_P for measured apparent sound power levels as described by IEC/TS 61400-14, where σ_T is the total standard deviation, σ_R is the standard deviation for test reproducibility, and σ_P is the standard deviation for product variation. To account for this inherent deviation associated with the IEC testing methodology, a confidence interval of k = 2 dBA was applied to the broadband dBA WTG sound power level values. The combination of the modeling parameters used and the inclusion of the 2 dBA term are expected to result in a reasonable and conservative assessment of Project sound levels.

Sound power specifications and octave band frequency data were obtained by Sunflower from the manufacturers of the WTGs under consideration. It is assumed that the WTGs for the Project would have similar sound power profiles as those used in the acoustic modeling; however, it is possible that the final manufacturer warranty values may vary slightly. Table 3 provides a summary of the sound power data correlated by wind speed for each WTG model at reference rotor hub height assuming a roughness length[1] coefficient of 0.05 meters. As shown in Table 3, generally wind speeds lower than those corresponding to full rated power also result in lower sound levels.

[1] The roughness length describes the change in wind speed at increased elevation and may vary based on site specific terrain conditions.

Table 3. WTG Broadband Sound Power Levels (dBA) Correlated with Wind Speed											
WTG Sound Power Level at Reference Wind Speed											
Wind Speed (m/s)	3 m/s	4 m/s	5 m/s	6 m/s	7 m/s	8 m/s	9 m/s	10 m/s	11 m/s	12 m/s	13 m/s
GE 1.85-87	93.9	97.0	102.2	105.9	106.5	106.5	106.5	106.5	106.5	106.5	106.5
Vestas V110-2.0	97.3	99.6	103.8	107.5	106.1	106.1	106.1	106.3	106.5	106.7	107.0

Source: GE 2013, Vestas 2013

The Project collector substation was not included in the acoustic assessment because setback distances to the nearest NSR are relatively large at 0.75-miles and it is assumed that received sound levels would attenuate to low levels at the nearest NSR. The Project substation and interconnection yard would be located immediately adjacent to Western's existing 230 kilovolt transmission line, and no Project transmission line would be required.

5.0 ACOUSTIC MODELING METHODOLOGY

To assess the noise emission of a wind farm prior to construction and to estimate compliance status with permitting requirements, it is necessary to have prediction models with which a noise emission source level measured at a given reference point can be certified. A generally accepted approach for modeling a WTG as an idealized point source is described in the International Organization for Standardization (ISO) 9613-2, Attenuation of Sound during Propagation Outdoors. The standard specifies methods to enable noise levels in the community to be predicted from sources of known sound emission and provides a summary of existing knowledge on outdoor sound. The calculation methodologies described in the standard are relied on by professionals in the field of acoustics.

Standard acoustic engineering methods conforming to ISO 9613-2 were incorporated into the Project acoustic modeling using DataKustic GmbH's CadnaA, the computer-aided noise abatement program (v 4.4.145). The engineering methods specified in this standard consist of full octave band algorithms that incorporate geometric spreading due to wave divergence, reflection from surfaces, atmospheric absorption, screening by topography and obstacles, ground effects, source directivity, heights of sources and receptors, seasonal foliage effects, and meteorological conditions. Operational broadband sound pressure levels were calculated assuming that all WTGs inclusive of the alternates are operating continuously and concurrently at the maximum manufacturer-rated sound level. The sound energy was then summed to determine the equivalent continuous A-weighted downwind sound pressure level at a given point of reception such as a NSR.

Topographical information was imported into the acoustic model using the official U.S. Geological Survey 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 G=0 for

acoustically hard, reflective surfaces and G=1 for absorptive surfaces and soft ground. In this case, the Project area agricultural lands used for cultivation are assumed to be moderately reflective and therefore a ground absorption factor of G=0.5 was applied. Sound attenuation through foliage and diffraction around and over existing structures such as buildings was ignored under all acoustic modeling scenarios. Sound attenuation by the atmosphere is not strongly dependent on temperature and humidity; however, a temperature of 10°C (50°F) and a relative humidity of 70 percent were selected as reasonably representative of conditions favorable to sound propagation.

Inherent to the ISO 9613-2 and IEC61400-11 standards are downwind conditions. That is, the WTG sound power levels and modeling methods are representative of when the wind is blowing from the WTG to the receptor. In fact, the ISO 9613-2 modeling method unrealistically assumes that downwind conditions exist in all directions, between each WTG and each receptor simultaneously, even though that is physically impossible. Therefore, lower levels are expected in the upwind direction. Conversely, there may be meteorological conditions from time to time that may aid in the long range propagation of sound. These anomalous meteorological conditions may include wind gradients that bend sound downwards, which principally affect long range sound propagation. Received sound levels during anomalous meteorological conditions were also estimated using a range dependent correction factor.

Sound power levels were modeled at each NSR within the Project Area and a minimum one-mile buffer area. Potential NSRs were identified based on the North Dakota standard quoted above as occupied residences or community buildings. Within the Project Area and the minimum one-mile buffer a total of 42 structures were identified, of which 16 are residential structures and are therefore potential NSRs. The 16 NSRs included residences known to be occupied and those whose occupancy status was not known, as well as one residential structure that is known to be unoccupied. Although the state noise standard is specific to occupied residences, this last one remains in the analysis because it may be occupied at some future point during the lifetime of the Project. There are no community buildings in the analysis area. Figures 1 through 4 show the location of all structures, and indicate the occupancy status of identified residences.

6.0 ACOUSTIC MODELING RESULTS

Acoustic modeling was completed for Project operation for two cases: (1) highest specified operational sound level according to the WTG manufacturer's specifications under typical downwind propagation conditions; and (2) highest specified operational sound level according to the WTG manufacturer's specifications under anomalous meteorological conditions. As mentioned above, the final Project layout design would consist of fewer WTGs than were analyzed, therefore this assessment is representative of the worse-case. Noise was modeled at a distance of 100 feet from each residential structure in consideration of the North Dakota noise standard quoted above.

The acoustic modeling results were compared to the State's numerical limits of 50 dBA. Table 4 summarizes the number of NSRs within selected sound pressure level ranges (in dBA) under each of the modeled operational conditions. The tabulated results are independent of the existing acoustic environment (i.e. are representative of expected Project-generated sound levels only). Table A-1 (Attachment 1) presents the received sound levels at each of the 16 individual NSRs for each WTG type by receptor ID and UTM coordinates. The assessment included prediction and plotting of sound level contours from the Project. Sound contour maps displaying the corresponding typical downwind and anomalous meteorological operational sound levels in color-coded isopleths are presented in Figures 1 to 4. Isopleths are projected onto scaled aerial photographs at a height of 5 feet above grade (i.e., at the approximate height of a person's ears while standing). In conclusion, modeling results, as shown in Tables 4 and A-1, indicate that the Project will comply with the applicable state noise limits for wind energy projects.

Table 4. Number of NSRs by Sound Level Range and Exceedance Condition for each WTG Layout

Sound Level Range (dBA)	GE 1.85-87		Vestas V110-2.0	
	Typical Downwind	Anomalous Meteorological	Typical Downwind	Anomalous Meteorological
Less than 35	6	3	4	2
35 - 40	2	4	2	5
40 - 45	4	5	5	5
45-50	4	4	3	4
50-55+	0	0	0	0
>50 (North Dakota Limit)	0	0	0	0

7.0 REFERENCES

North Dakota 2013. North Dakota Energy Conversion Facility Siting Criteria.

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ATTACHMENT 1: TABULATED RESULTS

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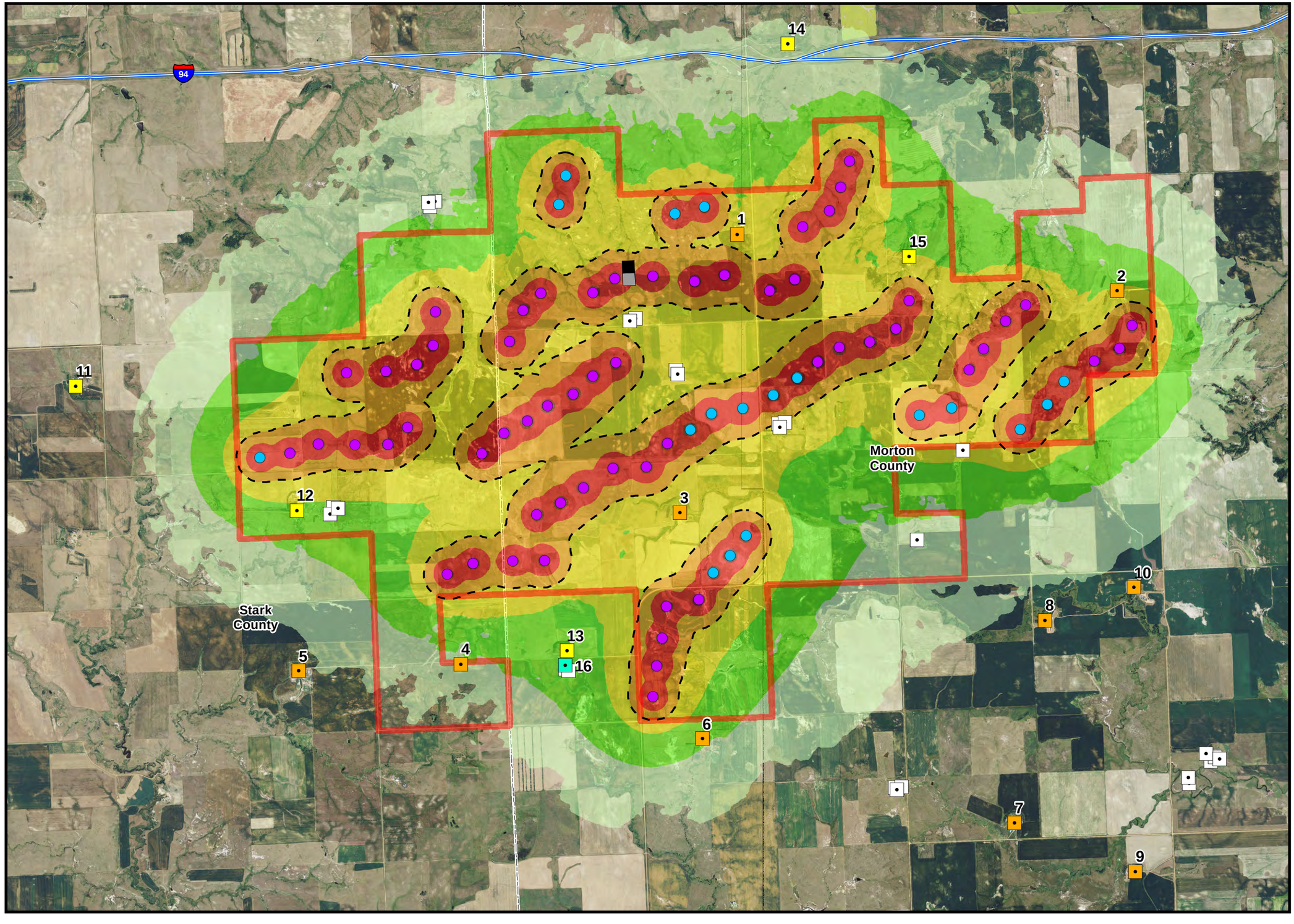
Table A-1. Tabulated Acoustic Modeling Results						
NSR ID	UTM Coordinates (m)		Sound Levels (dBA L_{eq}) GE 1.85-87		Sound Levels (dBA L_{eq}) Vestas V110-2.0	
	Easting	Northing	Typical Downwind	Anomalous Meteorological	Typical Downwind	Anomalous Meteorological
1	724362	5191939	48	49	50	50
2	728996	5191251	46	47	43	44
3	723663	5188543	47	48	48	49
4	720993	5186693	39	41	40	42
5	719013	5186610	34	36	35	37
6	723940	5185782	41	42	42	42
7	727748	5184755	26	28	27	30
8	728120	5187231	34	37	35	37
9	729223	5184162	20	23	21	24
10	729204	5187628	34	36	34	36
11	716294	5190086	32	34	33	36
12	718990	5188568	44	45	45	46
13	722287	5186857	43	44	43	44
14	724981	5194263	36	38	37	39
15	726461	5191668	46	46	46	47
16	722267	5186683	42	43	42	44

Sunflower Wind Project

Application for North Dakota Certificate of Site Compatibility

Figure 1
Operational Leq Sound Levels under Typical Downwind Conditions
GE 1.85-87

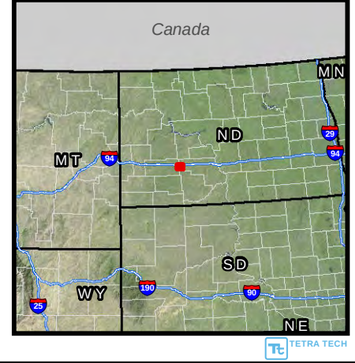
Morton and Stark Counties, ND
February 2014



- Project Area
- Turbine Location
- Alternate Turbine Location
- Occupied Residence
- Unoccupied Residence
- Residential Structure (Occupation Unknown)
- Other Nonresidential Structure
- Proposed Interconnection
- Proposed Substation
- County Boundary
- Interstate Highway
- North Dakota Limit 50 dBA

Sound Isopleths (dBA)

- 35-40
- 40-45
- 45-50
- 50-55
- 55-60
- 60 or greater



TETRA TECH

1:45,000 WGS84 UTM Zone 13N

0 2 4 Miles

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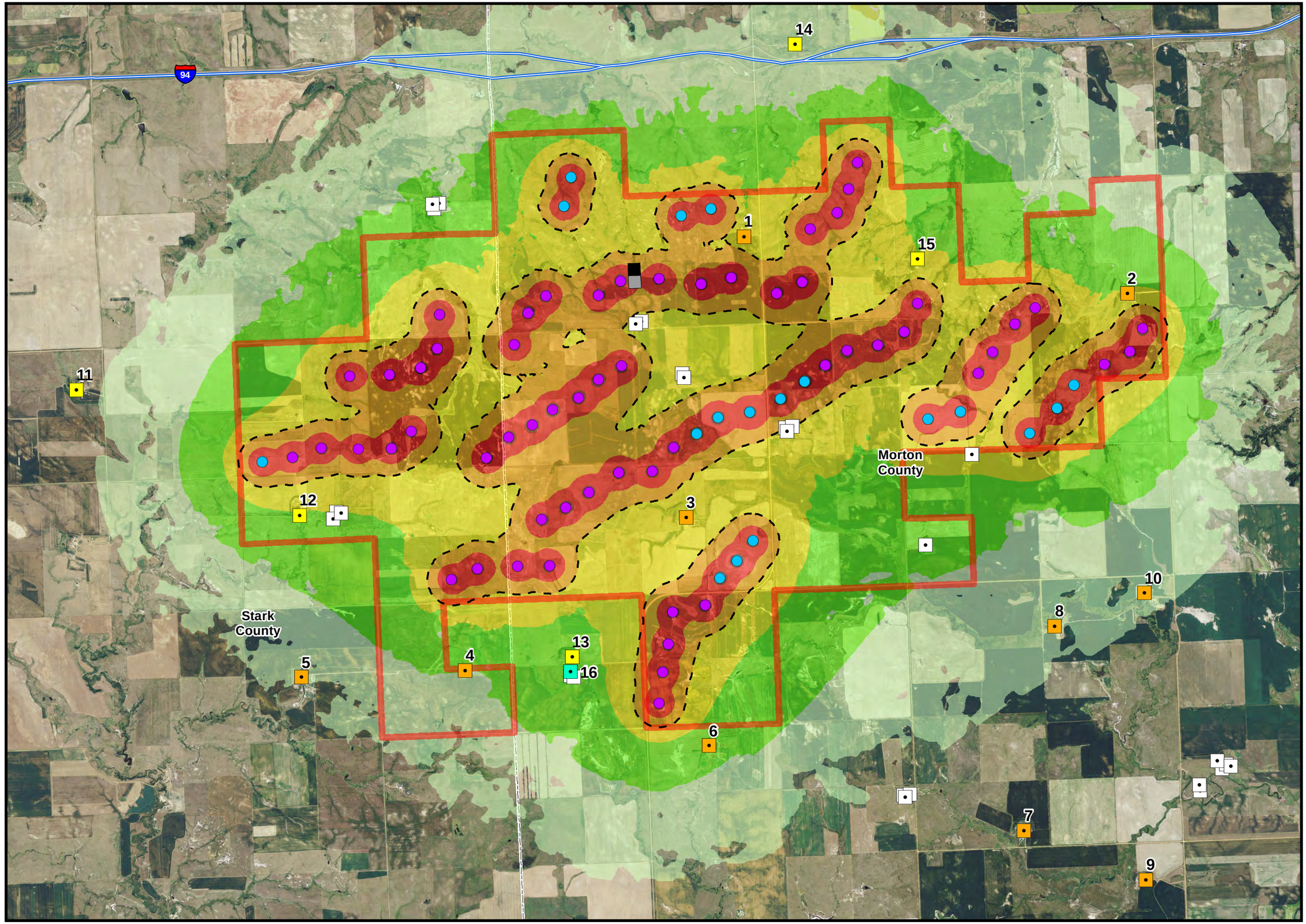
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Sunflower Wind Project

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Figure 2
Operational Leq Sound Levels under Anomalous Downwind Conditions
GE 1.85-87

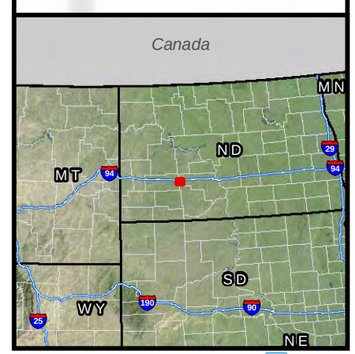
Morton and Stark Counties, ND
February 2014



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- 60 or greater



1:45,000 WGS84 UTM Zone 13N

0 2 4 Miles

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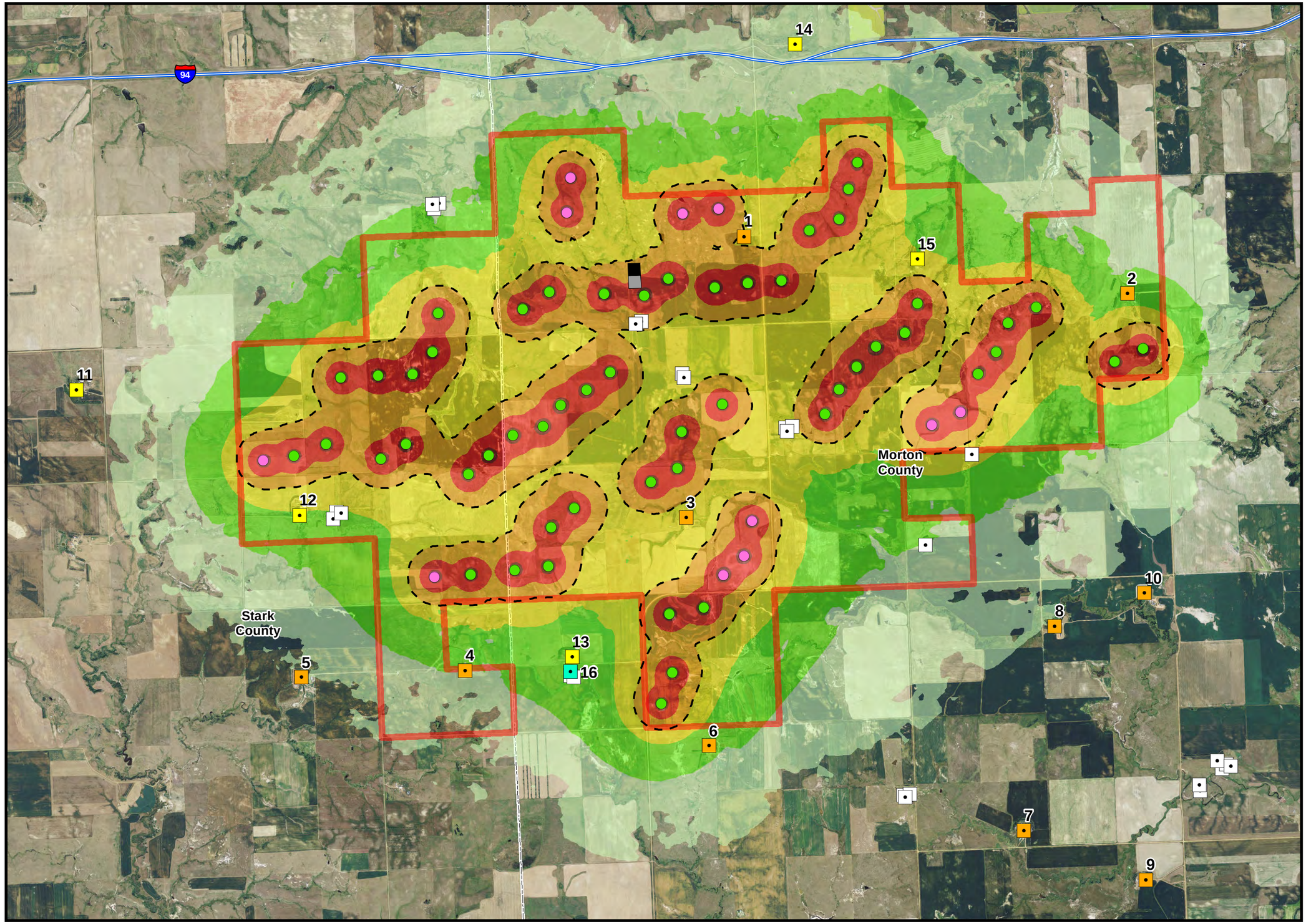
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Sunflower Wind Project

Application for North Dakota Certificate of Site Compatibility

Figure 3
Operational Leq Sound Levels under Typical Downwind Conditions
Vestas V110-2.0

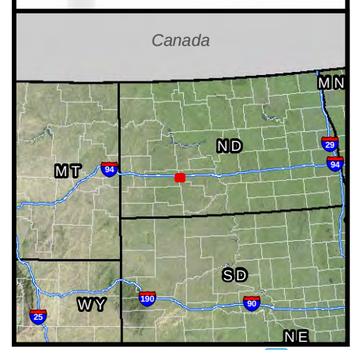
Morton and Stark Counties, ND
February 2014



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- 55-60
- 60 or greater



1:45,000 WGS84 UTM Zone 13N

0 2 4 Miles

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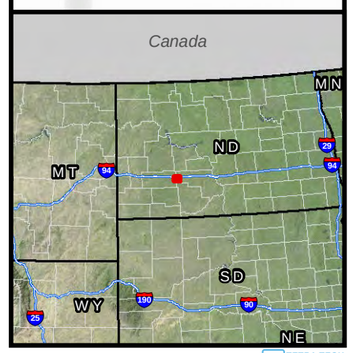
Figure 4
Operational Leq Sound Levels under Anomalous Downwind Conditions
Vestas V110-2.0

Morton and Stark Counties, ND
February 2014

- Project Area
- Turbine Location
- Alternate Turbine Location
- Occupied Residence
- Unoccupied Residence
- Residential Structure (Occupation Unknown)
- Other Nonresidential Structure
- Proposed Interconnection
- Proposed Substation
- County Boundary
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- North Dakota Limit 50 dBA

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- 55-60
- 60 or greater



1:45,000 WGS84 UTM Zone 13N

0 2 4 Miles

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Shadow Flicker Impact Analysis
for the
Sunflower Wind Energy Project
Stark and Morton Counties, North Dakota

Prepared for

Sunflower Wind Project, LLC

Prepared by



February 2014

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Attachment A. Detailed Summary of WindPro Shadow Flicker Analysis Results

Acronyms and Abbreviations

Hz	Hertz
Project	Sunflower Wind Energy Project
rpm	rotations per minute
Sunflower	Sunflower Wind Project, LLC
UTM	Universal Transverse Mercator

1.0 OVERVIEW

Sunflower Wind Project, LLC (Sunflower), is proposing to develop the Sunflower Wind Energy Project (Project) in Morton and Stark counties, North Dakota. The Project would install up to 59 wind turbines with a maximum nameplate capacity of 110 megawatts, with the number of turbines depending on the size and model of turbine used. Tetra Tech has conducted the following shadow flicker analysis for the Project to support the Project's application for a Certificate of Site Compatibility under the North Dakota Public Services Commission.

2.0 PROJECT COMPONENTS

The two wind turbine models being considered for the Project, and evaluated for potential shadow flicker impacts, have the following characteristics:

- **Vestas V-110** – 3-blade, 110-meter diameter rotor, with a hub height of 80 meters and generating capacity of 2.0 MW. The Vestas V-110 has a normal high rotor speed of approximately 14.9 rotations per minute (rpm) which translates to a blade pass frequency of 0.7 Hertz (Hz) which is less than 1 alternation per second. The Project would utilize up to 55 Vestas V-110 turbines; however, 64 potential Vestas turbine locations are included in this impact analysis to account for alternate locations that may be used.

- **General Electric (GE) 1.85-87** – 3-blade 87-meter diameter rotor, with a hub height of 80 meters and generating capacity of 1.85 MW. The GE 1.85-87 has a normal high rotor speed of 18.5 rpm which translates to a blade pass frequency of 0.93 Hz (less than 1 alternation per second). The Project would utilize up to 59 GE 1.85-87 turbines; however, 76 potential GE turbine locations are included in this impact analysis to account for alternate locations that may be used.

The 64 potential Vestas turbine locations and the 76 GE potential turbine locations overlap to a large degree, so that together they represent a total of 85 unique potential turbine locations. Because the layout has not been finalized, the shadow flicker impact analysis considered all 85 potential turbine locations.

3.0 SHADOW FLICKER BACKGROUND

A wind turbine's moving blades can cast a moving shadow on locations within a certain distance of a turbine. These moving shadows are called shadow flicker, and can be a temporary phenomenon experienced at nearby residences or public gathering places. The impact area depends on the time of year and day (which determine the sun's azimuth and altitude angles) and the wind turbine's physical characteristics (height, rotor diameter, blade width, and

orientation of the rotor blades). Shadow flicker impact to surrounding properties generally occurs during low angle sunlight conditions, typically during sunrise and sunset times of the day. However, when the sun angle gets very low (less than 3 degrees), sunlight passes through more atmosphere and becomes too diffused to form a coherent shadow. Shadow flicker will not occur when the sun is obscured by clouds or fog, at night, or when the source turbine(s) are not operating.

Shadow flicker intensity is defined as the difference in brightness at a given location in the presence and absence of a shadow. Shadow flicker intensity diminishes with greater receptor-to-turbine separation distance. Shadow flicker intensity for receptor-to-turbine distances beyond 2,500 meters (8,202 feet) is very low and generally considered imperceptible. In general, increasing proximity to turbines may make shadow flicker more noticeable, with the largest number of shadow flicker hours, along with greatest shadow flicker intensity, occurring nearest the wind turbines.

Shadow flicker frequency is related to the wind turbine's rotor blade speed and the number of blades on the rotor. From a health standpoint, the low flicker frequencies associated with wind turbines, are harmless, and public concerns that flickering light from wind turbines can have negative health effects, such as triggering seizures in people with epilepsy are unfounded. Epilepsy Action (working name for the British Epilepsy Foundation) states that there is no evidence that wind turbines can cause seizures (Epilepsy Action 2008). However, they recommend that wind turbine flicker frequency be limited to 3 Hz. (For comparison, strobe lights used in discotheques have frequencies which range from about 3 Hz to 10 Hz (1 Hz = 1 flash per second). Since the proposed Project's wind turbine blade pass frequency is approximately 0.7-0.93 Hz (less than 1 alternation per second), no negative health effects to individuals with photosensitive epilepsy are anticipated.

Shadow flicker impacts are not regulated in applicable state or federal law, and there is no permitting threshold with regard to hours per year of anticipated impacts to a receptor from a wind energy project.

4.0 WINDPRO SHADOW FLICKER ANALYSIS

An analysis of potential shadow flicker impacts from the Project was conducted using the WindPro software package. The analysis evaluated the following two turbine scenarios:

- Scenario A – 64 potential Vestas V-110 turbine locations (only 55 of these turbines would be constructed)
- Scenario B – 76 potential GE 1.85-87 turbine locations (only 59 of these turbines would be constructed)

The WindPro analysis was conducted to determine shadow flicker impacts under realistic impact conditions (actual expected shadow). This analysis calculated the total amount of time

(hours and minutes per year) that shadow flicker could occur at receptors surrounding the Project. The realistic impact condition scenario is based on the following assumptions:

- The elevation and position geometries of the wind turbines and surrounding receptors (potentially occupied residences). Elevations were determined using US Geological Survey digital elevation model data. Positions geometries were determined using geographic information system and referenced to Universal Transverse Mercator (UTM) Zone 13 (NAD83).

- The position of the sun and the incident sunlight relative to the wind turbine and receptors on a minute-by-minute basis over the course of a year.

- Historical sunshine availability (percent of total hours available). Historical sunshine rates for the area (as summarized by the National Climatic Data Center [NCDC 2008] for nearby Bismarck, North Dakota) used in this analysis are as follows:

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
53%	53%	58%	58%	61%	64%	73%	72%	65%	58%	43%	47%

- Estimated wind turbine operations and orientation (based on approximately 4 years of wind data, including wind speed / wind direction frequency distribution, measured at on-site meteorological towers).

- Receptor viewpoints (i.e., house windows) are assumed to always be directly facing turbine to sun line of sight (“greenhouse mode”).

WindPro incorporates terrain elevation contour information and the analysis accounts for terrain elevation differences. The sun’s path with respect to each turbine location is calculated by the software to determine the cast shadow paths every minute over a full year. Sun angles less than 3 degrees above the horizon were excluded, for the reasons identified earlier in this section. It should be noted however, that WindPro provides a conservative estimate of shadow flicker as obstacles such as trees, haze, and visual obstructions (window facing, coverings) are not fully accounted despite the likelihood of their reducing or eliminating shadow flicker impacts to receptors.

A total of 42 structures were identified within a minimum buffer of one mile of the proposed Project turbines; of these, 16 were residential structures and are considered potential shadow-flicker receptors for the purpose of this analysis. A receptor in the model is defined as a 1 meter squared area (approximate size of a typical window), 3.28 feet (1 meter) above ground level. Approximate eye level is set at 4.94 feet (1.5 meters). Figure 1 shows the locations of identified structures and the 16 potential shadow flicker receptors, along with the 85 potential turbine locations considered for Scenarios A and B.

5.0 SHADOW FLICKER ANALYSIS RESULTS

As expected, WindPro predicts that shadow flicker impacts will be greatest at locations nearer to the wind turbines. Figures 2A and 2B describe the WindPro predicted shadow flicker impact areas for turbine Scenarios A and B, respectively. A detailed WindPro shadow flicker analysis summary, for each of the modeled receptor location, is provided in Attachment A.

Tables 1 and 2 present the WindPro predicted shadow flicker impacts for the 16 identified receptors for each of the two turbines modelled. Because the Project is using a minimum turbine siting setback requirement of 1,320 feet (402 meters) to occupied residences, the most sensitive receptors are generally not located in the high potential shadow flicker impact zones. The maximum predicted shadow flicker impact at any occupied residence receptor is 36 hours 24 minutes per year (Receptor 1 in Scenario A), which is approximately 0.8 percent of the potential available daylight hours. This structure is owned by a landowner that is participating in the Project.

Table 1. WindPro Predicted Shadow Flicker Impacts for Receptors – Scenario A (Vestas V-110 Turbines)

Receptor ID	Shadow Hours per Year (expected) [hh:mm / year]	Receptor Type	Receptor Occupation Status
1	36:24	Home	Yes
2	5:04	Home	Yes
3	18:26	Home	Yes
4	0:00	Home	Yes
5	0:00	Home	Yes
6	0:00	Home	Yes
7	0:00	Home	Yes
8	0:00	Home	Yes
9	0:00	Home	Yes
10	0:00	Home	Yes
11	0:00	Home	Unknown
12	1:47	Home	Unknown
13	7:11	Home	Unknown
14	0:00	Home	Unknown
15	17:35	Home	Unknown
16	9:37	Home	No

Table 2. WindPro Predicted Shadow Flicker Impacts for Receptors – Scenario B (GE 1.85-87 Turbines)			
Receptor ID	**Shadow Hours per Year (expected) [hh:mm / year]**	**Receptor Type**	**Receptor Occupation Status**
1	31:17	Home	Yes
2	4:20	Home	Yes
3	17:41	Home	Yes
4	0:00	Home	Yes
5	1:19	Home	Yes
6	0:00	Home	Yes
7	0:00	Home	Yes
8	0:00	Home	Yes
9	0:00	Home	Yes
10	0:00	Home	Yes
11	0:00	Home	Unknown
12	0:59	Home	Unknown
13	6:57	Home	Unknown
14	0:00	Home	Unknown
15	6:49	Home	Unknown
16	7:56	Home	No

The shadow flicker impact prediction statistics are summarized in Tables 3 and 4.

Table 3. Statistical Summary of WindPro Predicted Shadow Flicker Impacts at Modeled Receptor Locations – Scenario A (Vestas V-110 Turbines)	
Cumulative Shadow Flicker Time (expected)	**Number of Receptors**
Total	16
= 0 Hours	9
> 0 Hours < 10 Hours	4
≥ 10 Hours < 20 Hours	2
≥ 20 Hours < 30 Hours	0
≥ 30 Hours	1

Table 4. Statistical Summary of WindPro Predicted Shadow Flicker Impacts at Modeled Receptor Locations – Scenario B (GE 1.85-87 Turbines)	
Cumulative Shadow Flicker Time (expected)	**Number of Receptors**
Total	16
= 0 Hours	8
> 0 Hours < 10 Hours	6
≥ 10 Hours < 20 Hours	1
≥ 20 Hours < 30 Hours	0
≥ 30 Hours	1

The slightly higher shadow flicker impacts for Scenario A (Vestas turbines) can be explained by the longer blades for this turbine.

6.0 CONCLUSION

The analysis of potential shadow flicker impacts from the Project on nearby receptors shows that shadow flicker impacts within the area of study are expected to be minor and well within acceptable ranges for avoiding health hazards. Shadow flicker is not expected to be a significant environmental impact.

The analysis was deliberately conservative and actual shadow flicker is expected to occur for less than the modeled durations. The analysis assumes that the receptors all have a direct in-line view of the incoming shadow flicker sunlight and does not account for trees or other obstructions which may block sunlight. In reality, the windows of many houses will not face the sun directly for the key shadow flicker impact times. Adding to the analysis' conservatism, Sunflower will construct fewer wind turbines than were included in the modeled results.

7.0 REFERENCES

Epilepsy Action. 2008. Information Web Page on Photosensitive Epilepsy. British Epilepsy Association. http://www.epilepsy.org.uk/info/photo_other.html. Accessed 3/1/10.

National Climatic Data Center (NCDC). 2008. Sunshine Average Percent of Possible. http://www.ncdc.noaa.gov/oa/climate/online/ccd/pctpos.txt. Accessed 3/1/10

Attachment A: Detailed Summary of WindPro Shadow Flicker Analysis Results

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Table A-1. WindPro Shadow Flicker Analysis Results Summary - Scenario A (Vestas V-110 Turbines)

Receptor ID	UTM-E (m)	UTM-N (m)	WindPro Predicted Expected Shadow Flicker (Hours per Year)	Receptor Type	Occupied Status
1	724,362	5,191,938	36:24	Home	Yes
2	728,996	5,191,250	5:04	Home	Yes
3	723,663	5,188,542	18:26	Home	Yes
4	720,993	5,186,693	0:00	Home	Yes
5	719,013	5,186,609	0:00	Home	Yes
6	723,940	5,185,782	0:00	Home	Yes
7	727,748	5,184,755	0:00	Home	Yes
8	728,120	5,187,230	0:00	Home	Yes
9	729,223	5,184,161	0:00	Home	Yes
10	729,204	5,187,627	0:00	Home	Yes
11	716,294	5,190,086	0:00	Home	Unknown
12	718,990	5,188,567	1:47	Home	Unknown
13	722,287	5,186,857	7:11	Home	Unknown
14	724,981	5,194,263	0:00	Home	Unknown
15	726,461	5,191,667	17:35	Home	Unknown
16	722,267	5,186,682	9:37	Home	No

Table A-2. WindPro Shadow Flicker Analysis Results Summary - Scenario B (GE 1.85-87 Turbines)

Receptor ID	UTM-E (m)	UTM-N (m)	WindPro Predicted Expected Shadow Flicker (Hours per Year)	Receptor Type	Occupied Status
1	724,362	5,191,938	31:17	Home	Yes
2	728,996	5,191,250	4:20	Home	Yes
3	723,663	5,188,542	17:41	Home	Yes
4	720,993	5,186,693	0:00	Home	Yes
5	719,013	5,186,609	1:19	Home	Yes
6	723,940	5,185,782	0:00	Home	Yes
7	727,748	5,184,755	0:00	Home	Yes
8	728,120	5,187,230	0:00	Home	Yes
9	729,223	5,184,161	0:00	Home	Yes
10	729,204	5,187,627	0:00	Home	Yes
11	716,294	5,190,086	0:00	Home	Unknown
12	718,990	5,188,567	0:59	Home	Unknown
13	722,287	5,186,857	6:57	Home	Unknown
14	724,981	5,194,263	0:00	Home	Unknown
15	726,461	5,191,667	6:49	Home	Unknown
16	722,267	5,186,682	7:56	Home	No

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Sunflower Wind Project

Application for North Dakota Certificate of Site Compatibility

Figure 1

Receptor Locations Modeled with WindPro to Predict Expected Shadow Flicker Impacts

Morton and Stark Counties, ND

February 2014

- Project Area
- Occupied Residence
- Unoccupied Residence
- Residential Structure (Occupation Unknown)
- Other Nonresidential Structure

GE

- Turbine Location
- Alternate Turbine Location

Vestas

- Turbine Location
- Alternate Turbine Location

- County Boundary
- Interstate Highway

Canada

MN ND MT SD WY NE

1:45,000 WGS84 UTM Zone 13N

0 2 4 Miles

TETRA TECH

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Sunflower Wind Project

Application for North Dakota Certificate of Site Compatibility

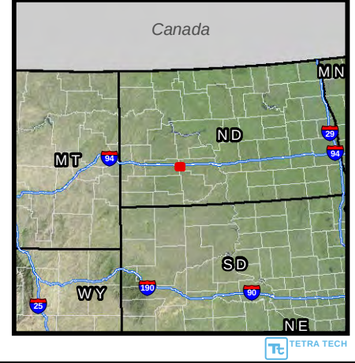
Figure 2A
WindPro Predicted Expected Shadow Flicker Impact Areas
Scenario A
(Vestas 2.0 V-110 Turbines)

Morton and Stark Counties, ND
February 2014

- Project Area
- Turbine Location
- Alternate Turbine Location
- Occupied Residence
- Unoccupied Residence
- Residential Structure (Occupation Unknown)
- Other Nonresidential Structure
- County Boundary
- Interstate Highway

Shadow Flicker Iso Line

- 0.015 hrs/yr
- 15 hrs/yr
- 30 hrs/yr
- 50 hrs/yr
- 100 hrs/yr
- 200 hrs/yr



1:45,000 WGS84 UTM Zone 13N

0 2 4 Miles

TETRA TECH

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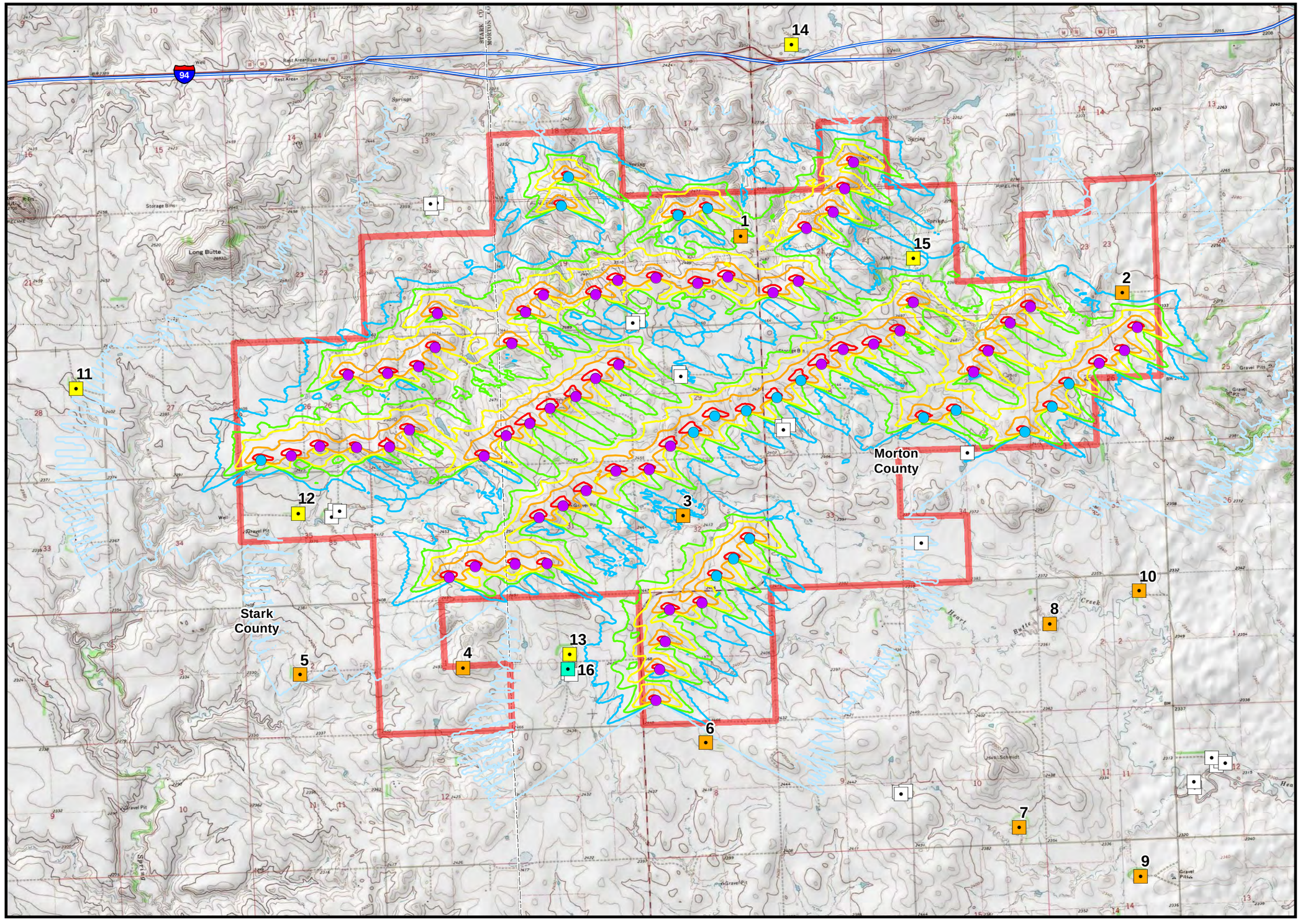
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Sunflower Wind Project

Application for North Dakota Certificate of Site Compatibility

Figure 2B
WindPro Predicted Expected Shadow Flicker Impact Areas
Scenario B
(GE 1.85-87 Turbines)

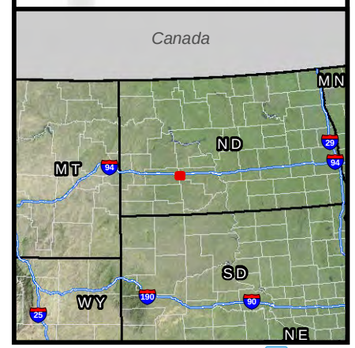
Morton and Stark Counties, ND
February 2014



- Project Area
- Turbine Location
- Alternate Turbine Location
- Occupied Residence
- Unoccupied Residence
- Residential Structure (Occupation Unknown)
- Other Nonresidential Structure
- County Boundary
- Interstate Highway

Shadow Flicker Iso Line

- 0.015 hrs/yr
- 15 hrs/yr
- 30 hrs/yr
- 50 hrs/yr
- 100 hrs/yr
- 200 hrs/yr



N

1:45,000 WGS84 UTM Zone 13N

0 2 4 Miles

TETRA TECH

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Appendix B Agency Correspondence

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APPENDIX B AGENCY CORRESPONDENCE

CONTENTS:

- Request for Comment Letters Sent
- Map Attachment to Request for Comment Letters
- Agency Comments and Correspondence

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Request for Comment Letters Sent

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TETRA TECH

February 10, 2014 TTEC –PTLD-2014-019

Central Stark & Western Soil Conservation District
Bonnie Twogood
District Manager
2948 4th Ave. West, Room C
Dickinson, ND 58601

RE: Application to the North Dakota Public Service Commission for Certificate of Site Compatibility for the Sunflower Wind Energy Project in Stark and MortonCounties, North Dakota
(Case No. PU-11-601)

Dear District Manager Twogood,

Tetra Tech has been contracted by Sunflower Wind Project, LLC to prepare an application for a Certificate of Site Compatibility, in accordance with Section 49-22-07 NDCC. The proposed Sunflower Wind Energy Project (Project) would be constructed on approximately 12,700 acres of leased private property. The north side of Project area boundary is located along I-94, and is approximately 3 miles south of Hebron, North Dakota. As currently planned, the Project would have a generating capacity of approximately 110 megawatts (MW) and would consist of up to 59 wind turbine generators as well as access roads, electrical collection systems and cabling, an operation and maintenance (O&M) building, a substation, and an interconnection yard where the Project will interconnect to the U.S. Department of Energy (DOE) Western Area Power Administration (Western)'s Dickinson-Mandan 230 kilovolt (kV) transmission line. The proposed Project area shown in the attached figure is the primary focus of our investigation.

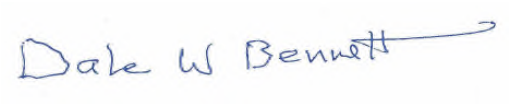
Per Section 69-06-01-05 of the North Dakota Public Service Commission (PSC)'s administrative rules, we are consulting the Central Stark & Western Soil Conservation District for assistance in identifying concerns or issues within the boundaries of the tracts listed below that would influence a decision regarding the use of the land, as well as applicable permits that may be required from your office. This information will be used to help guide Project development in a manner that identifies and avoids impacts to sensitive resources where practicable.

We have sent similar query letters to other federal and state agencies regarding this proposal. We would appreciate a response by March 10, 2014. Please contact me at Dale.Bennett@tetratech.com or (503) 221.8683 if you have any questions.

Tetra Tech, Inc.
1750 Harbor Way, Suite 400, Portland, OR 97201
Tel 503.221.8696 Fax 503.227.1287 www.tetratech.com

Respectfully submitted,

TETRA TECH, INC



Dale Bennett

Senior Project Manager

Cc: Casey Willis, Sunflower Wind, LLC
Tracey Dubuque, P.E., Tetra Tech

February 10, 2014 TTEC –PTLD-2014-019

Federal Aviation Administration
Laurie Suttmeier
District Manager Officer
Bismarck Airports District Office, BIS-ADO-600
2301 University Drive, Building 23B
Bismarck, ND 58504

RE: Application to the North Dakota Public Service Commission for Certificate of Site Compatibility for the Sunflower Wind Energy Project in Stark and MortonCounties, North Dakota
(Case No. PU-11-601)

Dear District Manager Officer Suttmeier,

Tetra Tech has been contracted by Sunflower Wind Project, LLC to prepare an application for a Certificate of Site Compatibility, in accordance with Section 49-22-07 NDCC. The proposed Sunflower Wind Energy Project (Project) would be constructed on approximately 12,700 acres of leased private property. The north side of Project area boundary is located along I-94, and is approximately 3 miles south of Hebron, North Dakota. As currently planned, the Project would have a generating capacity of approximately 110 megawatts (MW) and would consist of up to 59 wind turbine generators as well as access roads, electrical collection systems and cabling, an operation and maintenance (O&M) building, a substation, and an interconnection yard where the Project will interconnect to the U.S. Department of Energy (DOE) Western Area Power Administration (Western)'s Dickinson-Mandan 230 kilovolt (kV) transmission line. The proposed Project area shown in the attached figure is the primary focus of our investigation.

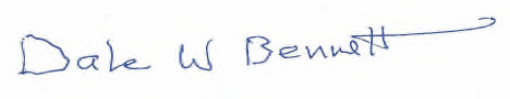
Per Section 69-06-01-05 of the North Dakota Public Service Commission (PSC)'s administrative rules, we are consulting the Federal Aviation Administration for assistance in identifying concerns or issues within the boundaries of the tracts listed below that would influence a decision regarding the use of the land, as well as applicable permits that may be required from your office. This information will be used to help guide Project development in a manner that identifies and avoids impacts to sensitive resources where practicable.

We have sent similar query letters to other federal and state agencies regarding this proposal. We would appreciate a response by March 10, 2014. Please contact me at Dale.Bennett@tetratech.com or (503) 221.8683 if you have any questions.

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Respectfully submitted,

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Dale Bennett

Senior Project Manager

Cc: Casey Willis, Sunflower Wind, LLC
Tracey Dubuque, P.E., Tetra Tech

TETRA TECH

February 10, 2014 TTEC –PTLD-2014-019

Morton County Highway Department
Michael Aubol
County Engineer
2916 37th St. NW
Mandan, ND 58554

RE: Application to the North Dakota Public Service Commission for Certificate of Site Compatibility for the Sunflower Wind Energy Project in Stark and MortonCounties, North Dakota
(Case No. PU-11-601)

Dear County Engineer Aubol,

Tetra Tech has been contracted by Sunflower Wind Project, LLC to prepare an application for a Certificate of Site Compatibility, in accordance with Section 49-22-07 NDCC. The proposed Sunflower Wind Energy Project (Project) would be constructed on approximately 12,700 acres of leased private property. The north side of Project area boundary is located along I-94, and is approximately 3 miles south of Hebron, North Dakota. As currently planned, the Project would have a generating capacity of approximately 110 megawatts (MW) and would consist of up to 59 wind turbine generators as well as access roads, electrical collection systems and cabling, an operation and maintenance (O&M) building, a substation, and an interconnection yard where the Project will interconnect to the U.S. Department of Energy (DOE) Western Area Power Administration (Western)'s Dickinson-Mandan 230 kilovolt (kV) transmission line. The proposed Project area shown in the attached figure is the primary focus of our investigation.

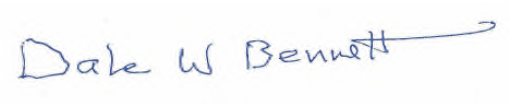
Per Section 69-06-01-05 of the North Dakota Public Service Commission (PSC)'s administrative rules, we are consulting the Morton County Highway Department for assistance in identifying concerns or issues within the boundaries of the tracts listed below that would influence a decision regarding the use of the land, as well as applicable permits that may be required from your office. This information will be used to help guide Project development in a manner that identifies and avoids impacts to sensitive resources where practicable.

We have sent similar query letters to other federal and state agencies regarding this proposal. We would appreciate a response by March 10, 2014. Please contact me at Dale.Bennett@tetratech.com or (503) 221.8683 if you have any questions.

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Respectfully submitted,

TETRA TECH, INC



Dale Bennett

Senior Project Manager

Cc: Casey Willis, Sunflower Wind, LLC
Tracey Dubuque, P.E., Tetra Tech

TETRA TECH

February 10, 2014 TTEC –PTLD-2014-019

Morton County Planning Commission
c/o Daniel Nairn
Director of Planning & Zoning
2916 37th St. NW
Mandan, ND 58554

RE: Application to the North Dakota Public Service Commission for Certificate of Site Compatibility for the Sunflower Wind Energy Project in Stark and MortonCounties, North Dakota
(Case No. PU-11-601)

Dear Director of Planning & Zoning Nairn,

Tetra Tech has been contracted by Sunflower Wind Project, LLC to prepare an application for a Certificate of Site Compatibility, in accordance with Section 49-22-07 NDCC. The proposed Sunflower Wind Energy Project (Project) would be constructed on approximately 12,700 acres of leased private property. The north side of Project area boundary is located along I-94, and is approximately 3 miles south of Hebron, North Dakota. As currently planned, the Project would have a generating capacity of approximately 110 megawatts (MW) and would consist of up to 59 wind turbine generators as well as access roads, electrical collection systems and cabling, an operation and maintenance (O&M) building, a substation, and an interconnection yard where the Project will interconnect to the U.S. Department of Energy (DOE) Western Area Power Administration (Western)'s Dickinson-Mandan 230 kilovolt (kV) transmission line. The proposed Project area shown in the attached figure is the primary focus of our investigation.

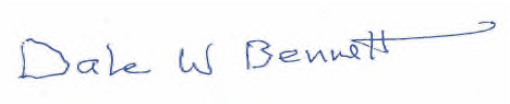
Per Section 69-06-01-05 of the North Dakota Public Service Commission (PSC)'s administrative rules, we are consulting the Morton County Planning Commission for assistance in identifying concerns or issues within the boundaries of the tracts listed below that would influence a decision regarding the use of the land, as well as applicable permits that may be required from your office. This information will be used to help guide Project development in a manner that identifies and avoids impacts to sensitive resources where practicable.

We have sent similar query letters to other federal and state agencies regarding this proposal. We would appreciate a response by March 10, 2014. Please contact me at Dale.Bennett@tetratech.com or (503) 221.8683 if you have any questions.

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Respectfully submitted,

TETRA TECH, INC



Dale Bennett

Senior Project Manager

Cc: Casey Willis, Sunflower Wind, LLC
Tracey Dubuque, P.E., Tetra Tech

TETRA TECH

February 10, 2014 TTEC –PTLD-2014-019

Morton County Soil Conservation District
Jim Hophauf
District Board Chair
3360 58th St.
Flasher, ND 58535

RE: Application to the North Dakota Public Service Commission for Certificate of Site Compatibility for the Sunflower Wind Energy Project in Stark and MortonCounties, North Dakota
(Case No. PU-11-601)

Dear District Board Chair Hophauf,

Tetra Tech has been contracted by Sunflower Wind Project, LLC to prepare an application for a Certificate of Site Compatibility, in accordance with Section 49-22-07 NDCC. The proposed Sunflower Wind Energy Project (Project) would be constructed on approximately 12,700 acres of leased private property. The north side of Project area boundary is located along I-94, and is approximately 3 miles south of Hebron, North Dakota. As currently planned, the Project would have a generating capacity of approximately 110 megawatts (MW) and would consist of up to 59 wind turbine generators as well as access roads, electrical collection systems and cabling, an operation and maintenance (O&M) building, a substation, and an interconnection yard where the Project will interconnect to the U.S. Department of Energy (DOE) Western Area Power Administration (Western)'s Dickinson-Mandan 230 kilovolt (kV) transmission line. The proposed Project area shown in the attached figure is the primary focus of our investigation.

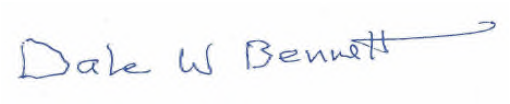
Per Section 69-06-01-05 of the North Dakota Public Service Commission (PSC)'s administrative rules, we are consulting the Morton County Soil Conservation District for assistance in identifying concerns or issues within the boundaries of the tracts listed below that would influence a decision regarding the use of the land, as well as applicable permits that may be required from your office. This information will be used to help guide Project development in a manner that identifies and avoids impacts to sensitive resources where practicable.

We have sent similar query letters to other federal and state agencies regarding this proposal. We would appreciate a response by March 10, 2014. Please contact me at Dale.Bennett@tetratech.com or (503) 221.8683 if you have any questions.

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Respectfully submitted,

TETRA TECH, INC



Dale Bennett

Senior Project Manager

Cc: Casey Willis, Sunflower Wind, LLC
Tracey Dubuque, P.E., Tetra Tech

TETRA TECH

February 10, 2014 TTEC –PTLD-2014-019

Natural Resources Conservation Service
Mary Podoll
State Conservationist
North Dakota State Office
220 East Rosser Ave, Federal Building, Rm 270
Bismarck, ND 58501

RE: Application to the North Dakota Public Service Commission for Certificate of Site Compatibility for the Sunflower Wind Energy Project in Stark and MortonCounties, North Dakota
(Case No. PU-11-601)

Dear State Conservationist Podoll,

Tetra Tech has been contracted by Sunflower Wind Project, LLC to prepare an application for a Certificate of Site Compatibility, in accordance with Section 49-22-07 NDCC. The proposed Sunflower Wind Energy Project (Project) would be constructed on approximately 12,700 acres of leased private property. The north side of Project area boundary is located along I-94, and is approximately 3 miles south of Hebron, North Dakota. As currently planned, the Project would have a generating capacity of approximately 110 megawatts (MW) and would consist of up to 59 wind turbine generators as well as access roads, electrical collection systems and cabling, an operation and maintenance (O&M) building, a substation, and an interconnection yard where the Project will interconnect to the U.S. Department of Energy (DOE) Western Area Power Administration (Western)'s Dickinson-Mandan 230 kilovolt (kV) transmission line. The proposed Project area shown in the attached figure is the primary focus of our investigation.

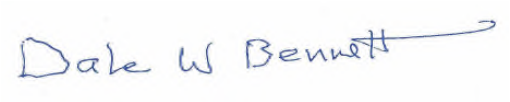
Per Section 69-06-01-05 of the North Dakota Public Service Commission (PSC)'s administrative rules, we are consulting the Natural Resources Conservation Service for assistance in identifying concerns or issues within the boundaries of the tracts listed below that would influence a decision regarding the use of the land, as well as applicable permits that may be required from your office. This information will be used to help guide Project development in a manner that identifies and avoids impacts to sensitive resources where practicable.

We have sent similar query letters to other federal and state agencies regarding this proposal. We would appreciate a response by March 10, 2014. Please contact me at Dale.Bennett@tetratech.com or (503) 221.8683 if you have any questions.

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1750 Harbor Way, Suite 400, Portland, OR 97201
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Respectfully submitted,

TETRA TECH, INC



Dale Bennett

Senior Project Manager

Cc: Casey Willis, Sunflower Wind, LLC
Tracey Dubuque, P.E., Tetra Tech

TETRA TECH

February 10, 2014 TTEC –PTLD-2014-019

North Dakota Aeronautics Commission
Kyle Wanner
Interim Director & Aviation Planner
PO Box 5020
Bismarck, ND 58502

RE: Application to the North Dakota Public Service Commission for Certificate of Site Compatibility for the Sunflower Wind Energy Project in Stark and MortonCounties, North Dakota
(Case No. PU-11-601)

Dear Interim Director & Aviation Planner Wanner,

Tetra Tech has been contracted by Sunflower Wind Project, LLC to prepare an application for a Certificate of Site Compatibility, in accordance with Section 49-22-07 NDCC. The proposed Sunflower Wind Energy Project (Project) would be constructed on approximately 12,700 acres of leased private property. The north side of Project area boundary is located along I-94, and is approximately 3 miles south of Hebron, North Dakota. As currently planned, the Project would have a generating capacity of approximately 110 megawatts (MW) and would consist of up to 59 wind turbine generators as well as access roads, electrical collection systems and cabling, an operation and maintenance (O&M) building, a substation, and an interconnection yard where the Project will interconnect to the U.S. Department of Energy (DOE) Western Area Power Administration (Western)'s Dickinson-Mandan 230 kilovolt (kV) transmission line. The proposed Project area shown in the attached figure is the primary focus of our investigation.

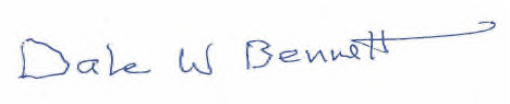
Per Section 69-06-01-05 of the North Dakota Public Service Commission (PSC)'s administrative rules, we are consulting the North Dakota Aeronautics Commission for assistance in identifying concerns or issues within the boundaries of the tracts listed below that would influence a decision regarding the use of the land, as well as applicable permits that may be required from your office. This information will be used to help guide Project development in a manner that identifies and avoids impacts to sensitive resources where practicable.

We have sent similar query letters to other federal and state agencies regarding this proposal. We would appreciate a response by March 10, 2014. Please contact me at Dale.Bennett@tetratech.com or (503) 221.8683 if you have any questions.

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Respectfully submitted,

TETRA TECH, INC



Dale Bennett

Senior Project Manager

Cc: Casey Willis, Sunflower Wind, LLC
Tracey Dubuque, P.E., Tetra Tech

TETRA TECH

February 10, 2014 TTEC –PTLD-2014-019

North Dakota Attorney General
Wayne Stenehjem
State Capitol
600 E. Boulevard Ave., Dept 125
Bismarck, ND 58505

RE: Application to the North Dakota Public Service Commission for Certificate of Site Compatibility for the Sunflower Wind Energy Project in Stark and MortonCounties, North Dakota
(Case No. PU-11-601)

Dear Stenehjem,

Tetra Tech has been contracted by Sunflower Wind Project, LLC to prepare an application for a Certificate of Site Compatibility, in accordance with Section 49-22-07 NDCC. The proposed Sunflower Wind Energy Project (Project) would be constructed on approximately 12,700 acres of leased private property. The north side of Project area boundary is located along I-94, and is approximately 3 miles south of Hebron, North Dakota. As currently planned, the Project would have a generating capacity of approximately 110 megawatts (MW) and would consist of up to 59 wind turbine generators as well as access roads, electrical collection systems and cabling, an operation and maintenance (O&M) building, a substation, and an interconnection yard where the Project will interconnect to the U.S. Department of Energy (DOE) Western Area Power Administration (Western)'s Dickinson-Mandan 230 kilovolt (kV) transmission line. The proposed Project area shown in the attached figure is the primary focus of our investigation.

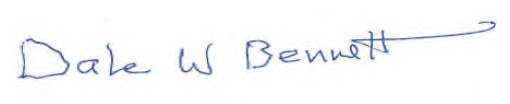
Per Section 69-06-01-05 of the North Dakota Public Service Commission (PSC)'s administrative rules, we are consulting the North Dakota Attorney General for assistance in identifying concerns or issues within the boundaries of the tracts listed below that would influence a decision regarding the use of the land, as well as applicable permits that may be required from your office. This information will be used to help guide Project development in a manner that identifies and avoids impacts to sensitive resources where practicable.

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TETRA TECH, INC



Dale Bennett

Senior Project Manager

Cc: Casey Willis, Sunflower Wind, LLC
Tracey Dubuque, P.E., Tetra Tech

TETRA TECH

February 10, 2014 TTEC –PTLD-2014-019

North Dakota Department of Agriculture
Doug Goehring
Agriculture Commissioner
600 East Boulevard Avenue, Dept 602
Bismarck, ND 58505

RE: Application to the North Dakota Public Service Commission for Certificate of Site Compatibility for the Sunflower Wind Energy Project in Stark and MortonCounties, North Dakota
(Case No. PU-11-601)

Dear Agriculture Commissioner Goehring,

Tetra Tech has been contracted by Sunflower Wind Project, LLC to prepare an application for a Certificate of Site Compatibility, in accordance with Section 49-22-07 NDCC. The proposed Sunflower Wind Energy Project (Project) would be constructed on approximately 12,700 acres of leased private property. The north side of Project area boundary is located along I-94, and is approximately 3 miles south of Hebron, North Dakota. As currently planned, the Project would have a generating capacity of approximately 110 megawatts (MW) and would consist of up to 59 wind turbine generators as well as access roads, electrical collection systems and cabling, an operation and maintenance (O&M) building, a substation, and an interconnection yard where the Project will interconnect to the U.S. Department of Energy (DOE) Western Area Power Administration (Western)'s Dickinson-Mandan 230 kilovolt (kV) transmission line. The proposed Project area shown in the attached figure is the primary focus of our investigation.

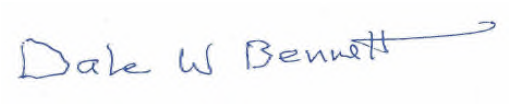
Per Section 69-06-01-05 of the North Dakota Public Service Commission (PSC)'s administrative rules, we are consulting the North Dakota Department of Agriculture for assistance in identifying concerns or issues within the boundaries of the tracts listed below that would influence a decision regarding the use of the land, as well as applicable permits that may be required from your office. This information will be used to help guide Project development in a manner that identifies and avoids impacts to sensitive resources where practicable.

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TETRA TECH

February 10, 2014 TTEC –PTLD-2014-019

North Dakota Department of Career and Technical Education
Wayne Kutzer
Director and Executive Officer
State Capitol, 15th Floor
600 E. Boulevard Ave., Dept 270
Bismarck, ND 58505

RE: Application to the North Dakota Public Service Commission for Certificate of Site Compatibility for the Sunflower Wind Energy Project in Stark and MortonCounties, North Dakota
(Case No. PU-11-601)

Dear Director and Executive Officer Kutzer,

Tetra Tech has been contracted by Sunflower Wind Project, LLC to prepare an application for a Certificate of Site Compatibility, in accordance with Section 49-22-07 NDCC. The proposed Sunflower Wind Energy Project (Project) would be constructed on approximately 12,700 acres of leased private property. The north side of Project area boundary is located along I-94, and is approximately 3 miles south of Hebron, North Dakota. As currently planned, the Project would have a generating capacity of approximately 110 megawatts (MW) and would consist of up to 59 wind turbine generators as well as access roads, electrical collection systems and cabling, an operation and maintenance (O&M) building, a substation, and an interconnection yard where the Project will interconnect to the U.S. Department of Energy (DOE) Western Area Power Administration (Western)'s Dickinson-Mandan 230 kilovolt (kV) transmission line. The proposed Project area shown in the attached figure is the primary focus of our investigation.

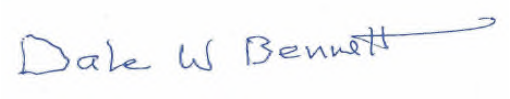
Per Section 69-06-01-05 of the North Dakota Public Service Commission (PSC)'s administrative rules, we are consulting the North Dakota Department of Career and Technical Education for assistance in identifying concerns or issues within the boundaries of the tracts listed below that would influence a decision regarding the use of the land, as well as applicable permits that may be required from your office. This information will be used to help guide Project development in a manner that identifies and avoids impacts to sensitive resources where practicable.

We have sent similar query letters to other federal and state agencies regarding this proposal. We would appreciate a response by March 10, 2014. Please contact me at Dale.Bennett@tetratech.com or (503) 221.8683 if you have any questions.

Tetra Tech, Inc.
1750 Harbor Way, Suite 400, Portland, OR 97201
Tel 503.221.8696 Fax 503.227.1287 www.tetratech.com

Respectfully submitted,

TETRA TECH, INC



Dale Bennett

Senior Project Manager

Cc: Casey Willis, Sunflower Wind, LLC
Tracey Dubuque, P.E., Tetra Tech

TETRA TECH

February 10, 2014 TTEC –PTLD-2014-019

North Dakota Department of Commerce
Al Anderson
Commissioner
1600 E. Century Ave.
Bismarck, ND 58503

RE: Application to the North Dakota Public Service Commission for Certificate of Site Compatibility for the Sunflower Wind Energy Project in Stark and MortonCounties, North Dakota
(Case No. PU-11-601)

Dear Commissioner Anderson,

Tetra Tech has been contracted by Sunflower Wind Project, LLC to prepare an application for a Certificate of Site Compatibility, in accordance with Section 49-22-07 NDCC. The proposed Sunflower Wind Energy Project (Project) would be constructed on approximately 12,700 acres of leased private property. The north side of Project area boundary is located along I-94, and is approximately 3 miles south of Hebron, North Dakota. As currently planned, the Project would have a generating capacity of approximately 110 megawatts (MW) and would consist of up to 59 wind turbine generators as well as access roads, electrical collection systems and cabling, an operation and maintenance (O&M) building, a substation, and an interconnection yard where the Project will interconnect to the U.S. Department of Energy (DOE) Western Area Power Administration (Western)'s Dickinson-Mandan 230 kilovolt (kV) transmission line. The proposed Project area shown in the attached figure is the primary focus of our investigation.

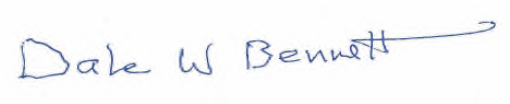
Per Section 69-06-01-05 of the North Dakota Public Service Commission (PSC)'s administrative rules, we are consulting the North Dakota Department of Commerce for assistance in identifying concerns or issues within the boundaries of the tracts listed below that would influence a decision regarding the use of the land, as well as applicable permits that may be required from your office. This information will be used to help guide Project development in a manner that identifies and avoids impacts to sensitive resources where practicable.

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Dale Bennett

Senior Project Manager

Cc: Casey Willis, Sunflower Wind, LLC
Tracey Dubuque, P.E., Tetra Tech

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February 10, 2014 TTEC –PTLD-2014-019

North Dakota Department of Health
Terry Dwelle
State Health Officer
Gold Seal Center
918 E. Divide Ave.
Bismarck, ND 58501

RE: Application to the North Dakota Public Service Commission for Certificate of Site Compatibility for the Sunflower Wind Energy Project in Stark and MortonCounties, North Dakota
(Case No. PU-11-601)

Dear State Health Officer Dwelle,

Tetra Tech has been contracted by Sunflower Wind Project, LLC to prepare an application for a Certificate of Site Compatibility, in accordance with Section 49-22-07 NDCC. The proposed Sunflower Wind Energy Project (Project) would be constructed on approximately 12,700 acres of leased private property. The north side of Project area boundary is located along I-94, and is approximately 3 miles south of Hebron, North Dakota. As currently planned, the Project would have a generating capacity of approximately 110 megawatts (MW) and would consist of up to 59 wind turbine generators as well as access roads, electrical collection systems and cabling, an operation and maintenance (O&M) building, a substation, and an interconnection yard where the Project will interconnect to the U.S. Department of Energy (DOE) Western Area Power Administration (Western)'s Dickinson-Mandan 230 kilovolt (kV) transmission line. The proposed Project area shown in the attached figure is the primary focus of our investigation.

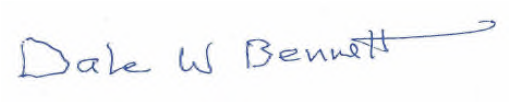
Per Section 69-06-01-05 of the North Dakota Public Service Commission (PSC)'s administrative rules, we are consulting the North Dakota Department of Health for assistance in identifying concerns or issues within the boundaries of the tracts listed below that would influence a decision regarding the use of the land, as well as applicable permits that may be required from your office. This information will be used to help guide Project development in a manner that identifies and avoids impacts to sensitive resources where practicable.

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Dale Bennett

Senior Project Manager

Cc: Casey Willis, Sunflower Wind, LLC
Tracey Dubuque, P.E., Tetra Tech

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February 10, 2014 TTEC –PTLD-2014-019

North Dakota Department of Human Services
Maggie Anderson
Executive Director
600 E. Boulevard Ave., Dept 325
Bismarck, ND 58505

RE: Application to the North Dakota Public Service Commission for Certificate of Site Compatibility for the Sunflower Wind Energy Project in Stark and MortonCounties, North Dakota
(Case No. PU-11-601)

Dear Executive Director Anderson,

Tetra Tech has been contracted by Sunflower Wind Project, LLC to prepare an application for a Certificate of Site Compatibility, in accordance with Section 49-22-07 NDCC. The proposed Sunflower Wind Energy Project (Project) would be constructed on approximately 12,700 acres of leased private property. The north side of Project area boundary is located along I-94, and is approximately 3 miles south of Hebron, North Dakota. As currently planned, the Project would have a generating capacity of approximately 110 megawatts (MW) and would consist of up to 59 wind turbine generators as well as access roads, electrical collection systems and cabling, an operation and maintenance (O&M) building, a substation, and an interconnection yard where the Project will interconnect to the U.S. Department of Energy (DOE) Western Area Power Administration (Western)'s Dickinson-Mandan 230 kilovolt (kV) transmission line. The proposed Project area shown in the attached figure is the primary focus of our investigation.

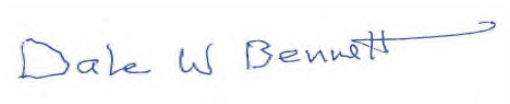
Per Section 69-06-01-05 of the North Dakota Public Service Commission (PSC)'s administrative rules, we are consulting the North Dakota Department of Human Services for assistance in identifying concerns or issues within the boundaries of the tracts listed below that would influence a decision regarding the use of the land, as well as applicable permits that may be required from your office. This information will be used to help guide Project development in a manner that identifies and avoids impacts to sensitive resources where practicable.

We have sent similar query letters to other federal and state agencies regarding this proposal. We would appreciate a response by March 10, 2014. Please contact me at Dale.Bennett@tetratech.com or (503) 221.8683 if you have any questions.

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Respectfully submitted,

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Dale Bennett

Senior Project Manager

Cc: Casey Willis, Sunflower Wind, LLC
Tracey Dubuque, P.E., Tetra Tech

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February 10, 2014 TTEC –PTLD-2014-019

North Dakota Department of Labor
Bonnie Storbakken
Commissioner of Labor
600 E. Boulevard Ave., Dept 406
Bismarck, ND 58505

RE: Application to the North Dakota Public Service Commission for Certificate of Site Compatibility for the Sunflower Wind Energy Project in Stark and MortonCounties, North Dakota
(Case No. PU-11-601)

Dear Commissioner of Labor Storbakken,

Tetra Tech has been contracted by Sunflower Wind Project, LLC to prepare an application for a Certificate of Site Compatibility, in accordance with Section 49-22-07 NDCC. The proposed Sunflower Wind Energy Project (Project) would be constructed on approximately 12,700 acres of leased private property. The north side of Project area boundary is located along I-94, and is approximately 3 miles south of Hebron, North Dakota. As currently planned, the Project would have a generating capacity of approximately 110 megawatts (MW) and would consist of up to 59 wind turbine generators as well as access roads, electrical collection systems and cabling, an operation and maintenance (O&M) building, a substation, and an interconnection yard where the Project will interconnect to the U.S. Department of Energy (DOE) Western Area Power Administration (Western)'s Dickinson-Mandan 230 kilovolt (kV) transmission line. The proposed Project area shown in the attached figure is the primary focus of our investigation.

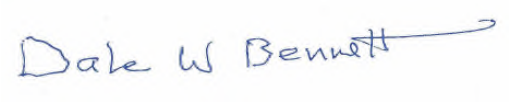
Per Section 69-06-01-05 of the North Dakota Public Service Commission (PSC)'s administrative rules, we are consulting the North Dakota Department of Labor for assistance in identifying concerns or issues within the boundaries of the tracts listed below that would influence a decision regarding the use of the land, as well as applicable permits that may be required from your office. This information will be used to help guide Project development in a manner that identifies and avoids impacts to sensitive resources where practicable.

We have sent similar query letters to other federal and state agencies regarding this proposal. We would appreciate a response by March 10, 2014. Please contact me at Dale.Bennett@tetratech.com or (503) 221.8683 if you have any questions.

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Respectfully submitted,

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Dale Bennett

Senior Project Manager

Cc: Casey Willis, Sunflower Wind, LLC
Tracey Dubuque, P.E., Tetra Tech

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February 10, 2014 TTEC –PTLD-2014-019

North Dakota Department of Transportation
Kevin Levi
District Engineer
Bismarck District
218 South Airport Road
Bismarck, ND 58504

RE: Application to the North Dakota Public Service Commission for Certificate of Site Compatibility for the Sunflower Wind Energy Project in Stark and MortonCounties, North Dakota
(Case No. PU-11-601)

Dear District Engineer Levi,

Tetra Tech has been contracted by Sunflower Wind Project, LLC to prepare an application for a Certificate of Site Compatibility, in accordance with Section 49-22-07 NDCC. The proposed Sunflower Wind Energy Project (Project) would be constructed on approximately 12,700 acres of leased private property. The north side of Project area boundary is located along I-94, and is approximately 3 miles south of Hebron, North Dakota. As currently planned, the Project would have a generating capacity of approximately 110 megawatts (MW) and would consist of up to 59 wind turbine generators as well as access roads, electrical collection systems and cabling, an operation and maintenance (O&M) building, a substation, and an interconnection yard where the Project will interconnect to the U.S. Department of Energy (DOE) Western Area Power Administration (Western)'s Dickinson-Mandan 230 kilovolt (kV) transmission line. The proposed Project area shown in the attached figure is the primary focus of our investigation.

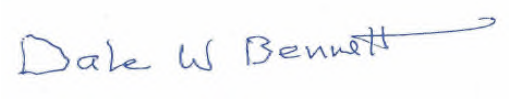
Per Section 69-06-01-05 of the North Dakota Public Service Commission (PSC)'s administrative rules, we are consulting the North Dakota Department of Transportation for assistance in identifying concerns or issues within the boundaries of the tracts listed below that would influence a decision regarding the use of the land, as well as applicable permits that may be required from your office. This information will be used to help guide Project development in a manner that identifies and avoids impacts to sensitive resources where practicable.

We have sent similar query letters to other federal and state agencies regarding this proposal. We would appreciate a response by March 10, 2014. Please contact me at Dale.Bennett@tetratech.com or (503) 221.8683 if you have any questions.

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TETRA TECH, INC



Dale Bennett

Senior Project Manager

Cc: Casey Willis, Sunflower Wind, LLC
Tracey Dubuque, P.E., Tetra Tech

February 10, 2014 TTEC –PTLD-2014-019

North Dakota Department of Transportation
Larry Gangl
District Engineer
Dickinson District
1700 Third Avenue West, Suite 101
Dickinson, ND 58601

RE: Application to the North Dakota Public Service Commission for Certificate of Site Compatibility for the Sunflower Wind Energy Project in Stark and MortonCounties, North Dakota
(Case No. PU-11-601)

Dear District Engineer Gangl,

Tetra Tech has been contracted by Sunflower Wind Project, LLC to prepare an application for a Certificate of Site Compatibility, in accordance with Section 49-22-07 NDCC. The proposed Sunflower Wind Energy Project (Project) would be constructed on approximately 12,700 acres of leased private property. The north side of Project area boundary is located along I-94, and is approximately 3 miles south of Hebron, North Dakota. As currently planned, the Project would have a generating capacity of approximately 110 megawatts (MW) and would consist of up to 59 wind turbine generators as well as access roads, electrical collection systems and cabling, an operation and maintenance (O&M) building, a substation, and an interconnection yard where the Project will interconnect to the U.S. Department of Energy (DOE) Western Area Power Administration (Western)'s Dickinson-Mandan 230 kilovolt (kV) transmission line. The proposed Project area shown in the attached figure is the primary focus of our investigation.

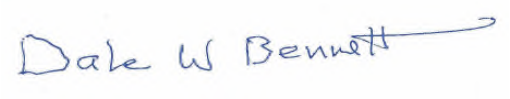
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Respectfully submitted,

TETRA TECH, INC



Dale Bennett

Senior Project Manager

Cc: Casey Willis, Sunflower Wind, LLC
Tracey Dubuque, P.E., Tetra Tech

TETRA TECH

February 10, 2014 TTEC –PTLD-2014-019

North Dakota Energy Infrastructure and Impact Office
Gerry Fisher
Assistant Director
PO Box 5523
Bismarck, ND 58506

RE: Application to the North Dakota Public Service Commission for Certificate of Site Compatibility for the Sunflower Wind Energy Project in Stark and MortonCounties, North Dakota
(Case No. PU-11-601)

Dear Assistant Director Fisher,

Tetra Tech has been contracted by Sunflower Wind Project, LLC to prepare an application for a Certificate of Site Compatibility, in accordance with Section 49-22-07 NDCC. The proposed Sunflower Wind Energy Project (Project) would be constructed on approximately 12,700 acres of leased private property. The north side of Project area boundary is located along I-94, and is approximately 3 miles south of Hebron, North Dakota. As currently planned, the Project would have a generating capacity of approximately 110 megawatts (MW) and would consist of up to 59 wind turbine generators as well as access roads, electrical collection systems and cabling, an operation and maintenance (O&M) building, a substation, and an interconnection yard where the Project will interconnect to the U.S. Department of Energy (DOE) Western Area Power Administration (Western)'s Dickinson-Mandan 230 kilovolt (kV) transmission line. The proposed Project area shown in the attached figure is the primary focus of our investigation.

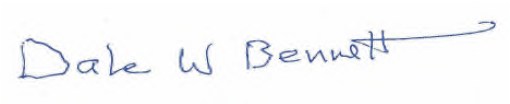
Per Section 69-06-01-05 of the North Dakota Public Service Commission (PSC)'s administrative rules, we are consulting the North Dakota Energy Infrastructure and Impact Office for assistance in identifying concerns or issues within the boundaries of the tracts listed below that would influence a decision regarding the use of the land, as well as applicable permits that may be required from your office. This information will be used to help guide Project development in a manner that identifies and avoids impacts to sensitive resources where practicable.

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Dale Bennett

Senior Project Manager

Cc: Casey Willis, Sunflower Wind, LLC
Tracey Dubuque, P.E., Tetra Tech

TETRA TECH

February 10, 2014 TTEC –PTLD-2014-019

North Dakota Game and Fish Department
Terry Steinwand
Director
100 N. Bismarck Expressway
Bismarck, ND 58501

RE: Application to the North Dakota Public Service Commission for Certificate of Site Compatibility for the Sunflower Wind Energy Project in Stark and MortonCounties, North Dakota
(Case No. PU-11-601)

Dear Director Steinwand,

Tetra Tech has been contracted by Sunflower Wind Project, LLC to prepare an application for a Certificate of Site Compatibility, in accordance with Section 49-22-07 NDCC. The proposed Sunflower Wind Energy Project (Project) would be constructed on approximately 12,700 acres of leased private property. The north side of Project area boundary is located along I-94, and is approximately 3 miles south of Hebron, North Dakota. As currently planned, the Project would have a generating capacity of approximately 110 megawatts (MW) and would consist of up to 59 wind turbine generators as well as access roads, electrical collection systems and cabling, an operation and maintenance (O&M) building, a substation, and an interconnection yard where the Project will interconnect to the U.S. Department of Energy (DOE) Western Area Power Administration (Western)'s Dickinson-Mandan 230 kilovolt (kV) transmission line. The proposed Project area shown in the attached figure is the primary focus of our investigation.

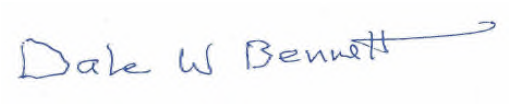
Per Section 69-06-01-05 of the North Dakota Public Service Commission (PSC)'s administrative rules, we are consulting the North Dakota Game and Fish Department for assistance in identifying concerns or issues within the boundaries of the tracts listed below that would influence a decision regarding the use of the land, as well as applicable permits that may be required from your office. This information will be used to help guide Project development in a manner that identifies and avoids impacts to sensitive resources where practicable.

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Dale Bennett

Senior Project Manager

Cc: Casey Willis, Sunflower Wind, LLC
Tracey Dubuque, P.E., Tetra Tech

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February 10, 2014 TTEC –PTLD-2014-019

North Dakota Geologic Survey
Edward Murphy
State Geologist
600 East Boulevard Avenue
Bismarck, ND 58505

RE: Application to the North Dakota Public Service Commission for Certificate of Site Compatibility for the Sunflower Wind Energy Project in Stark and MortonCounties, North Dakota
(Case No. PU-11-601)

Dear State Geologist Murphy,

Tetra Tech has been contracted by Sunflower Wind Project, LLC to prepare an application for a Certificate of Site Compatibility, in accordance with Section 49-22-07 NDCC. The proposed Sunflower Wind Energy Project (Project) would be constructed on approximately 12,700 acres of leased private property. The north side of Project area boundary is located along I-94, and is approximately 3 miles south of Hebron, North Dakota. As currently planned, the Project would have a generating capacity of approximately 110 megawatts (MW) and would consist of up to 59 wind turbine generators as well as access roads, electrical collection systems and cabling, an operation and maintenance (O&M) building, a substation, and an interconnection yard where the Project will interconnect to the U.S. Department of Energy (DOE) Western Area Power Administration (Western)'s Dickinson-Mandan 230 kilovolt (kV) transmission line. The proposed Project area shown in the attached figure is the primary focus of our investigation.

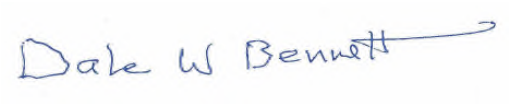
Per Section 69-06-01-05 of the North Dakota Public Service Commission (PSC)'s administrative rules, we are consulting the North Dakota Geologic Survey for assistance in identifying concerns or issues within the boundaries of the tracts listed below that would influence a decision regarding the use of the land, as well as applicable permits that may be required from your office. This information will be used to help guide Project development in a manner that identifies and avoids impacts to sensitive resources where practicable.

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Dale Bennett

Senior Project Manager

Cc: Casey Willis, Sunflower Wind, LLC
Tracey Dubuque, P.E., Tetra Tech

February 10, 2014 TTEC –PTLD-2014-019

North Dakota Indian Affairs Commission
Scott Davis
Executive Director
600 East Boulevard Avenue
1st Floor Judicial Wing, Rm 117
Bismarck, ND 58505

RE: Application to the North Dakota Public Service Commission for Certificate of Site Compatibility for the Sunflower Wind Energy Project in Stark and MortonCounties, North Dakota
(Case No. PU-11-601)

Dear Executive Director Davis,

Tetra Tech has been contracted by Sunflower Wind Project, LLC to prepare an application for a Certificate of Site Compatibility, in accordance with Section 49-22-07 NDCC. The proposed Sunflower Wind Energy Project (Project) would be constructed on approximately 12,700 acres of leased private property. The north side of Project area boundary is located along I-94, and is approximately 3 miles south of Hebron, North Dakota. As currently planned, the Project would have a generating capacity of approximately 110 megawatts (MW) and would consist of up to 59 wind turbine generators as well as access roads, electrical collection systems and cabling, an operation and maintenance (O&M) building, a substation, and an interconnection yard where the Project will interconnect to the U.S. Department of Energy (DOE) Western Area Power Administration (Western)'s Dickinson-Mandan 230 kilovolt (kV) transmission line. The proposed Project area shown in the attached figure is the primary focus of our investigation.

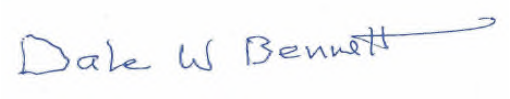
Per Section 69-06-01-05 of the North Dakota Public Service Commission (PSC)'s administrative rules, we are consulting the North Dakota Indian Affairs Commission for assistance in identifying concerns or issues within the boundaries of the tracts listed below that would influence a decision regarding the use of the land, as well as applicable permits that may be required from your office. This information will be used to help guide Project development in a manner that identifies and avoids impacts to sensitive resources where practicable.

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Dale Bennett

Senior Project Manager

Cc: Casey Willis, Sunflower Wind, LLC
Tracey Dubuque, P.E., Tetra Tech

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February 10, 2014 TTEC –PTLD-2014-019

North Dakota Industrial Commission, Renewable Energy Program
Karlene Fine
Industrial Commissioner
State Capitol, 14th Floor
600 E. Boulevard Ave., Dept 405
Bismarck, ND 58505

RE: Application to the North Dakota Public Service Commission for Certificate of Site Compatibility for the Sunflower Wind Energy Project in Stark and MortonCounties, North Dakota
(Case No. PU-11-601)

Dear Industrial Commissioner Fine,

Tetra Tech has been contracted by Sunflower Wind Project, LLC to prepare an application for a Certificate of Site Compatibility, in accordance with Section 49-22-07 NDCC. The proposed Sunflower Wind Energy Project (Project) would be constructed on approximately 12,700 acres of leased private property. The north side of Project area boundary is located along I-94, and is approximately 3 miles south of Hebron, North Dakota. As currently planned, the Project would have a generating capacity of approximately 110 megawatts (MW) and would consist of up to 59 wind turbine generators as well as access roads, electrical collection systems and cabling, an operation and maintenance (O&M) building, a substation, and an interconnection yard where the Project will interconnect to the U.S. Department of Energy (DOE) Western Area Power Administration (Western)'s Dickinson-Mandan 230 kilovolt (kV) transmission line. The proposed Project area shown in the attached figure is the primary focus of our investigation.

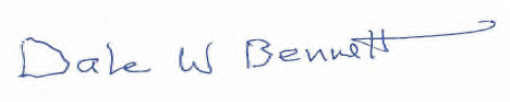
Per Section 69-06-01-05 of the North Dakota Public Service Commission (PSC)'s administrative rules, we are consulting the North Dakota Industrial Commission, Renewable Energy Program for assistance in identifying concerns or issues within the boundaries of the tracts listed below that would influence a decision regarding the use of the land, as well as applicable permits that may be required from your office. This information will be used to help guide Project development in a manner that identifies and avoids impacts to sensitive resources where practicable.

We have sent similar query letters to other federal and state agencies regarding this proposal. We would appreciate a response by March 10, 2014. Please contact me at Dale.Bennett@tetratech.com or (503) 221.8683 if you have any questions.

Tetra Tech, Inc.
1750 Harbor Way, Suite 400, Portland, OR 97201
Tel 503.221.8696 Fax 503.227.1287 www.tetratech.com

Respectfully submitted,

TETRA TECH, INC



Dale Bennett

Senior Project Manager

Cc: Casey Willis, Sunflower Wind, LLC
Tracey Dubuque, P.E., Tetra Tech

TETRA TECH

February 10, 2014 TTEC –PTLD-2014-019

North Dakota Office of Management & Budget
Pam Sharp
Director
600 E. Boulevard Ave., Dept 110
Bismarck, ND 58505

RE: Application to the North Dakota Public Service Commission for Certificate of Site Compatibility for the Sunflower Wind Energy Project in Stark and MortonCounties, North Dakota
(Case No. PU-11-601)

Dear Director Sharp,

Tetra Tech has been contracted by Sunflower Wind Project, LLC to prepare an application for a Certificate of Site Compatibility, in accordance with Section 49-22-07 NDCC. The proposed Sunflower Wind Energy Project (Project) would be constructed on approximately 12,700 acres of leased private property. The north side of Project area boundary is located along I-94, and is approximately 3 miles south of Hebron, North Dakota. As currently planned, the Project would have a generating capacity of approximately 110 megawatts (MW) and would consist of up to 59 wind turbine generators as well as access roads, electrical collection systems and cabling, an operation and maintenance (O&M) building, a substation, and an interconnection yard where the Project will interconnect to the U.S. Department of Energy (DOE) Western Area Power Administration (Western)'s Dickinson-Mandan 230 kilovolt (kV) transmission line. The proposed Project area shown in the attached figure is the primary focus of our investigation.

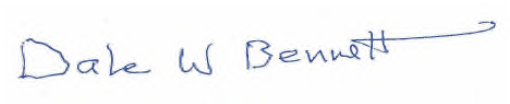
Per Section 69-06-01-05 of the North Dakota Public Service Commission (PSC)'s administrative rules, we are consulting the North Dakota Office of Management & Budget for assistance in identifying concerns or issues within the boundaries of the tracts listed below that would influence a decision regarding the use of the land, as well as applicable permits that may be required from your office. This information will be used to help guide Project development in a manner that identifies and avoids impacts to sensitive resources where practicable.

We have sent similar query letters to other federal and state agencies regarding this proposal. We would appreciate a response by March 10, 2014. Please contact me at Dale.Bennett@tetratech.com or (503) 221.8683 if you have any questions.

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Dale Bennett

Senior Project Manager

Cc: Casey Willis, Sunflower Wind, LLC
Tracey Dubuque, P.E., Tetra Tech

TETRA TECH

February 10, 2014 TTEC –PTLD-2014-019

North Dakota Parks and Recreation Department
Mark Zimmerman
Director
1600 E. Century Ave, Suite 3
Bismarck, ND 58503

RE: Application to the North Dakota Public Service Commission for Certificate of Site Compatibility for the Sunflower Wind Energy Project in Stark and MortonCounties, North Dakota
(Case No. PU-11-601)

Dear Director Zimmerman,

Tetra Tech has been contracted by Sunflower Wind Project, LLC to prepare an application for a Certificate of Site Compatibility, in accordance with Section 49-22-07 NDCC. The proposed Sunflower Wind Energy Project (Project) would be constructed on approximately 12,700 acres of leased private property. The north side of Project area boundary is located along I-94, and is approximately 3 miles south of Hebron, North Dakota. As currently planned, the Project would have a generating capacity of approximately 110 megawatts (MW) and would consist of up to 59 wind turbine generators as well as access roads, electrical collection systems and cabling, an operation and maintenance (O&M) building, a substation, and an interconnection yard where the Project will interconnect to the U.S. Department of Energy (DOE) Western Area Power Administration (Western)'s Dickinson-Mandan 230 kilovolt (kV) transmission line. The proposed Project area shown in the attached figure is the primary focus of our investigation.

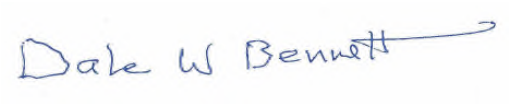
Per Section 69-06-01-05 of the North Dakota Public Service Commission (PSC)'s administrative rules, we are consulting the North Dakota Parks and Recreation Department for assistance in identifying concerns or issues within the boundaries of the tracts listed below that would influence a decision regarding the use of the land, as well as applicable permits that may be required from your office. This information will be used to help guide Project development in a manner that identifies and avoids impacts to sensitive resources where practicable.

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Dale Bennett

Senior Project Manager

Cc: Casey Willis, Sunflower Wind, LLC

Tracey Dubuque, P.E., Tetra Tech

TETRA TECH

February 10, 2014 TTEC –PTLD-2014-019

North Dakota Soild Conservation Committee
Scott Hochhalter
State Soil Specialist
NDSU Extension Service
2718 Gateway Ave., Ste 104
Bismarck, ND 58503

RE: Application to the North Dakota Public Service Commission for Certificate of Site Compatibility for the Sunflower Wind Energy Project in Stark and MortonCounties, North Dakota
(Case No. PU-11-601)

Dear State Soil Specialist Hochhalter,

Tetra Tech has been contracted by Sunflower Wind Project, LLC to prepare an application for a Certificate of Site Compatibility, in accordance with Section 49-22-07 NDCC. The proposed Sunflower Wind Energy Project (Project) would be constructed on approximately 12,700 acres of leased private property. The north side of Project area boundary is located along I-94, and is approximately 3 miles south of Hebron, North Dakota. As currently planned, the Project would have a generating capacity of approximately 110 megawatts (MW) and would consist of up to 59 wind turbine generators as well as access roads, electrical collection systems and cabling, an operation and maintenance (O&M) building, a substation, and an interconnection yard where the Project will interconnect to the U.S. Department of Energy (DOE) Western Area Power Administration (Western)'s Dickinson-Mandan 230 kilovolt (kV) transmission line. The proposed Project area shown in the attached figure is the primary focus of our investigation.

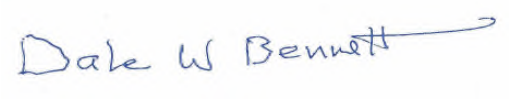
Per Section 69-06-01-05 of the North Dakota Public Service Commission (PSC)'s administrative rules, we are consulting the North Dakota Soild Conservation Committee for assistance in identifying concerns or issues within the boundaries of the tracts listed below that would influence a decision regarding the use of the land, as well as applicable permits that may be required from your office. This information will be used to help guide Project development in a manner that identifies and avoids impacts to sensitive resources where practicable.

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Respectfully submitted,

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Dale Bennett

Senior Project Manager

Cc: Casey Willis, Sunflower Wind, LLC
Tracey Dubuque, P.E., Tetra Tech

TETRA TECH

February 10, 2014 TTEC –PTLD-2014-019

North Dakota State Historic Preservation Office
Fern Swenson
Deputy State Historic Preservation Officer
612 East Boulevard Ave.
Bismarck, ND 58505

RE: Application to the North Dakota Public Service Commission for Certificate of Site Compatibility for the Sunflower Wind Energy Project in Stark and MortonCounties, North Dakota
(Case No. PU-11-601)

Dear Deputy State Historic Preservation Officer Swenson,

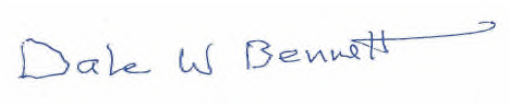
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Per Section 69-06-01-05 of the North Dakota Public Service Commission (PSC)'s administrative rules, we are consulting the North Dakota State Historic Preservation Office for assistance in identifying concerns or issues within the boundaries of the tracts listed below that would influence a decision regarding the use of the land, as well as applicable permits that may be required from your office. This information will be used to help guide Project development in a manner that identifies and avoids impacts to sensitive resources where practicable.

We have sent similar query letters to other federal and state agencies regarding this proposal. We would appreciate a response by March 10, 2014. Please contact me at Dale.Bennett@tetratech.com or (503) 221.8683 if you have any questions.

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Respectfully submitted,
TETRA TECH, INC



Dale Bennett
Senior Project Manager

Cc: Casey Willis, Sunflower Wind, LLC
Tracey Dubuque, P.E., Tetra Tech

February 10, 2014 TTEC –PTLD-2014-019

North Dakota State Land Department
Lance Gaebe
Land Commissioner
1707 North 9th Street
PO Box 5523
Bismarck, ND 58506

RE: Application to the North Dakota Public Service Commission for Certificate of Site Compatibility for the Sunflower Wind Energy Project in Stark and MortonCounties, North Dakota
(Case No. PU-11-601)

Dear Land Commissioner Gaebe,

Tetra Tech has been contracted by Sunflower Wind Project, LLC to prepare an application for a Certificate of Site Compatibility, in accordance with Section 49-22-07 NDCC. The proposed Sunflower Wind Energy Project (Project) would be constructed on approximately 12,700 acres of leased private property. The north side of Project area boundary is located along I-94, and is approximately 3 miles south of Hebron, North Dakota. As currently planned, the Project would have a generating capacity of approximately 110 megawatts (MW) and would consist of up to 59 wind turbine generators as well as access roads, electrical collection systems and cabling, an operation and maintenance (O&M) building, a substation, and an interconnection yard where the Project will interconnect to the U.S. Department of Energy (DOE) Western Area Power Administration (Western)'s Dickinson-Mandan 230 kilovolt (kV) transmission line. The proposed Project area shown in the attached figure is the primary focus of our investigation.

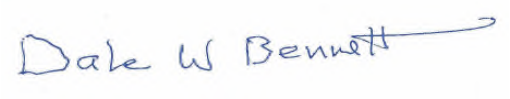
Per Section 69-06-01-05 of the North Dakota Public Service Commission (PSC)'s administrative rules, we are consulting the North Dakota State Land Department for assistance in identifying concerns or issues within the boundaries of the tracts listed below that would influence a decision regarding the use of the land, as well as applicable permits that may be required from your office. This information will be used to help guide Project development in a manner that identifies and avoids impacts to sensitive resources where practicable.

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Dale Bennett

Senior Project Manager

Cc: Casey Willis, Sunflower Wind, LLC
Tracey Dubuque, P.E., Tetra Tech

TETRA TECH

February 10, 2014 TTEC –PTLD-2014-019

North Dakota State Water Commission
Todd Sando
State Engineer
900 E. Boulevard Ave., Dept 770
Bismarck, ND 58505

RE: Application to the North Dakota Public Service Commission for Certificate of Site Compatibility for the Sunflower Wind Energy Project in Stark and MortonCounties, North Dakota
(Case No. PU-11-601)

Dear State Engineer Sando,

Tetra Tech has been contracted by Sunflower Wind Project, LLC to prepare an application for a Certificate of Site Compatibility, in accordance with Section 49-22-07 NDCC. The proposed Sunflower Wind Energy Project (Project) would be constructed on approximately 12,700 acres of leased private property. The north side of Project area boundary is located along I-94, and is approximately 3 miles south of Hebron, North Dakota. As currently planned, the Project would have a generating capacity of approximately 110 megawatts (MW) and would consist of up to 59 wind turbine generators as well as access roads, electrical collection systems and cabling, an operation and maintenance (O&M) building, a substation, and an interconnection yard where the Project will interconnect to the U.S. Department of Energy (DOE) Western Area Power Administration (Western)'s Dickinson-Mandan 230 kilovolt (kV) transmission line. The proposed Project area shown in the attached figure is the primary focus of our investigation.

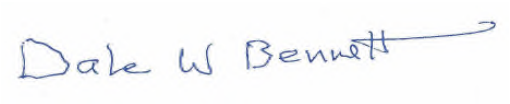
Per Section 69-06-01-05 of the North Dakota Public Service Commission (PSC)'s administrative rules, we are consulting the North Dakota State Water Commission for assistance in identifying concerns or issues within the boundaries of the tracts listed below that would influence a decision regarding the use of the land, as well as applicable permits that may be required from your office. This information will be used to help guide Project development in a manner that identifies and avoids impacts to sensitive resources where practicable.

We have sent similar query letters to other federal and state agencies regarding this proposal. We would appreciate a response by March 10, 2014. Please contact me at Dale.Bennett@tetratech.com or (503) 221.8683 if you have any questions.

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Respectfully submitted,

TETRA TECH, INC



Dale Bennett

Senior Project Manager

Cc: Casey Willis, Sunflower Wind, LLC
Tracey Dubuque, P.E., Tetra Tech

TETRA TECH

February 10, 2014 TTEC –PTLD-2014-019

Office of the Governor
Jack Dalrymple
Governor
600 East Boulevard Avenue
Bismarck, ND 58505

RE: Application to the North Dakota Public Service Commission for Certificate of Site Compatibility for the Sunflower Wind Energy Project in Stark and MortonCounties, North Dakota
(Case No. PU-11-601)

Dear Governor Dalrymple,

Tetra Tech has been contracted by Sunflower Wind Project, LLC to prepare an application for a Certificate of Site Compatibility, in accordance with Section 49-22-07 NDCC. The proposed Sunflower Wind Energy Project (Project) would be constructed on approximately 12,700 acres of leased private property. The north side of Project area boundary is located along I-94, and is approximately 3 miles south of Hebron, North Dakota. As currently planned, the Project would have a generating capacity of approximately 110 megawatts (MW) and would consist of up to 59 wind turbine generators as well as access roads, electrical collection systems and cabling, an operation and maintenance (O&M) building, a substation, and an interconnection yard where the Project will interconnect to the U.S. Department of Energy (DOE) Western Area Power Administration (Western)'s Dickinson-Mandan 230 kilovolt (kV) transmission line. The proposed Project area shown in the attached figure is the primary focus of our investigation.

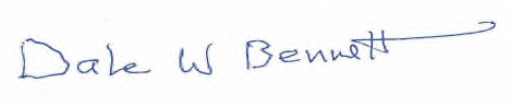
Per Section 69-06-01-05 of the North Dakota Public Service Commission (PSC)'s administrative rules, we are consulting the Office of the Governor for assistance in identifying concerns or issues within the boundaries of the tracts listed below that would influence a decision regarding the use of the land, as well as applicable permits that may be required from your office. This information will be used to help guide Project development in a manner that identifies and avoids impacts to sensitive resources where practicable.

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Respectfully submitted,

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Dale Bennett

Senior Project Manager

Cc: Casey Willis, Sunflower Wind, LLC
Tracey Dubuque, P.E., Tetra Tech

TETRA TECH

February 10, 2014 TTEC –PTLD-2014-019

Stark County Planning Commission
c/o Steven Josephson
Director of Planning
Stark County Courthouse
PO Box 130
Dickinson, ND 58601

RE: Application to the North Dakota Public Service Commission for Certificate of Site Compatibility for the Sunflower Wind Energy Project in Stark and MortonCounties, North Dakota
(Case No. PU-11-601)

Dear Director of Planning Josephson,

Tetra Tech has been contracted by Sunflower Wind Project, LLC to prepare an application for a Certificate of Site Compatibility, in accordance with Section 49-22-07 NDCC. The proposed Sunflower Wind Energy Project (Project) would be constructed on approximately 12,700 acres of leased private property. The north side of Project area boundary is located along I-94, and is approximately 3 miles south of Hebron, North Dakota. As currently planned, the Project would have a generating capacity of approximately 110 megawatts (MW) and would consist of up to 59 wind turbine generators as well as access roads, electrical collection systems and cabling, an operation and maintenance (O&M) building, a substation, and an interconnection yard where the Project will interconnect to the U.S. Department of Energy (DOE) Western Area Power Administration (Western)'s Dickinson-Mandan 230 kilovolt (kV) transmission line. The proposed Project area shown in the attached figure is the primary focus of our investigation.

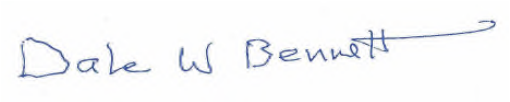
Per Section 69-06-01-05 of the North Dakota Public Service Commission (PSC)'s administrative rules, we are consulting the Stark County Planning Commission for assistance in identifying concerns or issues within the boundaries of the tracts listed below that would influence a decision regarding the use of the land, as well as applicable permits that may be required from your office. This information will be used to help guide Project development in a manner that identifies and avoids impacts to sensitive resources where practicable.

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Dale Bennett

Senior Project Manager

Cc: Casey Willis, Sunflower Wind, LLC
Tracey Dubuque, P.E., Tetra Tech

February 10, 2014 TTEC –PTLD-2014-019

Stark County Road Department
Al Heiser
Road Superintendent
Stark County Courthouse
PO Box 130
Dickinson, ND 58602

RE: Application to the North Dakota Public Service Commission for Certificate of Site Compatibility for the Sunflower Wind Energy Project in Stark and MortonCounties, North Dakota
(Case No. PU-11-601)

Dear Road Superintendent Heiser,

Tetra Tech has been contracted by Sunflower Wind Project, LLC to prepare an application for a Certificate of Site Compatibility, in accordance with Section 49-22-07 NDCC. The proposed Sunflower Wind Energy Project (Project) would be constructed on approximately 12,700 acres of leased private property. The north side of Project area boundary is located along I-94, and is approximately 3 miles south of Hebron, North Dakota. As currently planned, the Project would have a generating capacity of approximately 110 megawatts (MW) and would consist of up to 59 wind turbine generators as well as access roads, electrical collection systems and cabling, an operation and maintenance (O&M) building, a substation, and an interconnection yard where the Project will interconnect to the U.S. Department of Energy (DOE) Western Area Power Administration (Western)'s Dickinson-Mandan 230 kilovolt (kV) transmission line. The proposed Project area shown in the attached figure is the primary focus of our investigation.

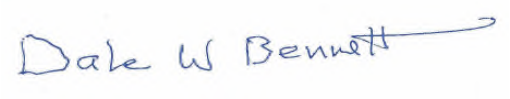
Per Section 69-06-01-05 of the North Dakota Public Service Commission (PSC)'s administrative rules, we are consulting the Stark County Road Department for assistance in identifying concerns or issues within the boundaries of the tracts listed below that would influence a decision regarding the use of the land, as well as applicable permits that may be required from your office. This information will be used to help guide Project development in a manner that identifies and avoids impacts to sensitive resources where practicable.

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Senior Project Manager

Cc: Casey Willis, Sunflower Wind, LLC
Tracey Dubuque, P.E., Tetra Tech

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February 10, 2014 TTEC –PTLD-2014-019

State Historic Society of North Dakota
Merlan Paaverud, Jr.
Director
State Historic Preservation Office
612 East Bouleavard Avenue
Bismarck, ND 58505

RE: Application to the North Dakota Public Service Commission for Certificate of Site Compatibility for the Sunflower Wind Energy Project in Stark and MortonCounties, North Dakota
(Case No. PU-11-601)

Dear Director Paaverud, Jr.,

Tetra Tech has been contracted by Sunflower Wind Project, LLC to prepare an application for a Certificate of Site Compatibility, in accordance with Section 49-22-07 NDCC. The proposed Sunflower Wind Energy Project (Project) would be constructed on approximately 12,700 acres of leased private property. The north side of Project area boundary is located along I-94, and is approximately 3 miles south of Hebron, North Dakota. As currently planned, the Project would have a generating capacity of approximately 110 megawatts (MW) and would consist of up to 59 wind turbine generators as well as access roads, electrical collection systems and cabling, an operation and maintenance (O&M) building, a substation, and an interconnection yard where the Project will interconnect to the U.S. Department of Energy (DOE) Western Area Power Administration (Western)'s Dickinson-Mandan 230 kilovolt (kV) transmission line. The proposed Project area shown in the attached figure is the primary focus of our investigation.

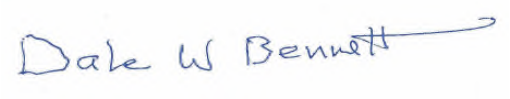
Per Section 69-06-01-05 of the North Dakota Public Service Commission (PSC)'s administrative rules, we are consulting the State Historic Society of North Dakota for assistance in identifying concerns or issues within the boundaries of the tracts listed below that would influence a decision regarding the use of the land, as well as applicable permits that may be required from your office. This information will be used to help guide Project development in a manner that identifies and avoids impacts to sensitive resources where practicable.

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Senior Project Manager

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Tracey Dubuque, P.E., Tetra Tech

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February 10, 2014 TTEC –PTLD-2014-019

U.S. Army Corps of Engineers, Omaha District
Daniel Cimarosti
Regulatory Program Manager
ND Regulatory Office
1513 South 12th Street
Bismarck, ND 58504

RE: Application to the North Dakota Public Service Commission for Certificate of Site Compatibility for the Sunflower Wind Energy Project in Stark and MortonCounties, North Dakota
(Case No. PU-11-601)

Dear Regulatory Program Manager Cimarosti,

Tetra Tech has been contracted by Sunflower Wind Project, LLC to prepare an application for a Certificate of Site Compatibility, in accordance with Section 49-22-07 NDCC. The proposed Sunflower Wind Energy Project (Project) would be constructed on approximately 12,700 acres of leased private property. The north side of Project area boundary is located along I-94, and is approximately 3 miles south of Hebron, North Dakota. As currently planned, the Project would have a generating capacity of approximately 110 megawatts (MW) and would consist of up to 59 wind turbine generators as well as access roads, electrical collection systems and cabling, an operation and maintenance (O&M) building, a substation, and an interconnection yard where the Project will interconnect to the U.S. Department of Energy (DOE) Western Area Power Administration (Western)'s Dickinson-Mandan 230 kilovolt (kV) transmission line. The proposed Project area shown in the attached figure is the primary focus of our investigation.

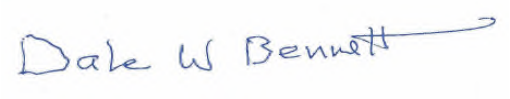
Per Section 69-06-01-05 of the North Dakota Public Service Commission (PSC)'s administrative rules, we are consulting the U.S. Army Corps of Engineers, Omaha District for assistance in identifying concerns or issues within the boundaries of the tracts listed below that would influence a decision regarding the use of the land, as well as applicable permits that may be required from your office. This information will be used to help guide Project development in a manner that identifies and avoids impacts to sensitive resources where practicable.

We have sent similar query letters to other federal and state agencies regarding this proposal. We would appreciate a response by March 10, 2014. Please contact me at Dale.Bennett@tetratech.com or (503) 221.8683 if you have any questions.

Tetra Tech, Inc.
1750 Harbor Way, Suite 400, Portland, OR 97201
Tel 503.221.8696 Fax 503.227.1287 www.tetratech.com

Respectfully submitted,

TETRA TECH, INC



Dale Bennett

Senior Project Manager

Cc: Casey Willis, Sunflower Wind, LLC
Tracey Dubuque, P.E., Tetra Tech

TETRA TECH

February 10, 2014 TTEC –PTLD-2014-019

U.S. Environmental Protection Agency, Region 8
Shaun McGrath
Regional Administrator
EPA Region 8 (8EPR-N)
1595 Wynkoop St.
Denver, CO 80202

RE: Application to the North Dakota Public Service Commission for Certificate of Site Compatibility for the Sunflower Wind Energy Project in Stark and MortonCounties, North Dakota
(Case No. PU-11-601)

Dear Regional Administrator McGrath,

Tetra Tech has been contracted by Sunflower Wind Project, LLC to prepare an application for a Certificate of Site Compatibility, in accordance with Section 49-22-07 NDCC. The proposed Sunflower Wind Energy Project (Project) would be constructed on approximately 12,700 acres of leased private property. The north side of Project area boundary is located along I-94, and is approximately 3 miles south of Hebron, North Dakota. As currently planned, the Project would have a generating capacity of approximately 110 megawatts (MW) and would consist of up to 59 wind turbine generators as well as access roads, electrical collection systems and cabling, an operation and maintenance (O&M) building, a substation, and an interconnection yard where the Project will interconnect to the U.S. Department of Energy (DOE) Western Area Power Administration (Western)'s Dickinson-Mandan 230 kilovolt (kV) transmission line. The proposed Project area shown in the attached figure is the primary focus of our investigation.

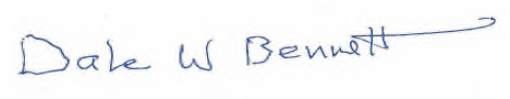
Per Section 69-06-01-05 of the North Dakota Public Service Commission (PSC)'s administrative rules, we are consulting the U.S. Environmental Protection Agency, Region 8 for assistance in identifying concerns or issues within the boundaries of the tracts listed below that would influence a decision regarding the use of the land, as well as applicable permits that may be required from your office. This information will be used to help guide Project development in a manner that identifies and avoids impacts to sensitive resources where practicable.

We have sent similar query letters to other federal and state agencies regarding this proposal. We would appreciate a response by March 10, 2014. Please contact me at Dale.Bennett@tetratech.com or (503) 221.8683 if you have any questions.

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1750 Harbor Way, Suite 400, Portland, OR 97201
Tel 503.221.8696 Fax 503.227.1287 www.tetratech.com

Respectfully submitted,

TETRA TECH, INC



Dale Bennett

Senior Project Manager

Cc: Casey Willis, Sunflower Wind, LLC
Tracey Dubuque, P.E., Tetra Tech

February 10, 2014 TTEC –PTLD-2014-019

U.S. Fish & Wildlife Service
Jeff Towner
Field Supervisor
North Dakota Field Office
3425 Miriam Avenue
Bismarck, ND 58501

RE: Application to the North Dakota Public Service Commission for Certificate of Site Compatibility for the Sunflower Wind Energy Project in Stark and MortonCounties, North Dakota
(Case No. PU-11-601)

Dear Field Supervisor Towner,

Tetra Tech has been contracted by Sunflower Wind Project, LLC to prepare an application for a Certificate of Site Compatibility, in accordance with Section 49-22-07 NDCC. The proposed Sunflower Wind Energy Project (Project) would be constructed on approximately 12,700 acres of leased private property. The north side of Project area boundary is located along I-94, and is approximately 3 miles south of Hebron, North Dakota. As currently planned, the Project would have a generating capacity of approximately 110 megawatts (MW) and would consist of up to 59 wind turbine generators as well as access roads, electrical collection systems and cabling, an operation and maintenance (O&M) building, a substation, and an interconnection yard where the Project will interconnect to the U.S. Department of Energy (DOE) Western Area Power Administration (Western)'s Dickinson-Mandan 230 kilovolt (kV) transmission line. The proposed Project area shown in the attached figure is the primary focus of our investigation.

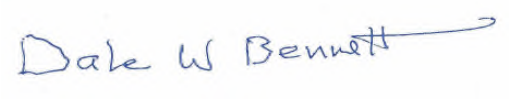
Per Section 69-06-01-05 of the North Dakota Public Service Commission (PSC)'s administrative rules, we are consulting the U.S. Fish & Wildlife Service for assistance in identifying concerns or issues within the boundaries of the tracts listed below that would influence a decision regarding the use of the land, as well as applicable permits that may be required from your office. This information will be used to help guide Project development in a manner that identifies and avoids impacts to sensitive resources where practicable.

We have sent similar query letters to other federal and state agencies regarding this proposal. We would appreciate a response by March 10, 2014. Please contact me at Dale.Bennett@tetratech.com or (503) 221.8683 if you have any questions.

Tetra Tech, Inc.
1750 Harbor Way, Suite 400, Portland, OR 97201
Tel 503.221.8696 Fax 503.227.1287 www.tetratech.com

Respectfully submitted,

TETRA TECH, INC



Dale Bennett

Senior Project Manager

Cc: Casey Willis, Sunflower Wind, LLC
Tracey Dubuque, P.E., Tetra Tech

TETRA TECH

February 20, 2014 TTEC –PTLD-2014-019

Chase Airstrip
Mr. Keith R. Chase
Owner
P.O. Box 48
Hebron, ND 58638

RE: Application to the North Dakota Public Service Commission for Certificate of Site Compatibility for the Sunflower Wind Energy Project in Stark and MortonCounties, North Dakota
(Case No. PU-11-601)

Dear District Manager Twogood,

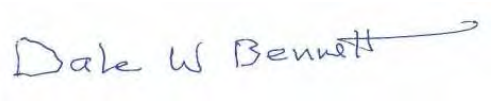
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Per Section 69-06-01-05 of the North Dakota Public Service Commission (PSC)'s administrative rules, we are consulting the Central Stark & Western Soil Conservation District for assistance in identifying concerns or issues within the boundaries of the tracts listed below that would influence a decision regarding the use of the land, as well as applicable permits that may be required from your office. This information will be used to help guide Project development in a manner that identifies and avoids impacts to sensitive resources where practicable.

We have sent similar query letters to other federal and state agencies regarding this proposal. We would appreciate a response by March 20, 2014. Please contact me at Dale.Bennett@tetratech.com or (503) 221.8683 if you have any questions.

Tetra Tech, Inc.
1750 Harbor Way, Suite 400, Portland, OR 97201
Tel 503.221.8696 Fax 503.227.1287 www.tetratech.com

Respectfully submitted,
TETRA TECH, INC



Dale Bennett
Senior Project Manager

Cc: Casey Willis, Sunflower Wind, LLC
Tracey Dubuque, P.E., Tetra Tech

February 20, 2014 TTEC –PTLD-2014-019

Glen Ullin Regional Airport
Mr. Gene Glasser
Manager
P.O. Box 306
Glen Ullin, ND 58631

RE: Application to the North Dakota Public Service Commission for Certificate of Site Compatibility for the Sunflower Wind Energy Project in Stark and MortonCounties, North Dakota
(Case No. PU-11-601)

Dear District Manager Officer Suttmeier,

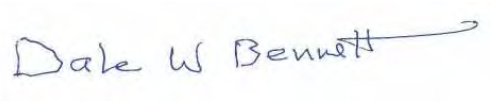
Tetra Tech has been contracted by Sunflower Wind Project, LLC to prepare an application for a Certificate of Site Compatibility, in accordance with Section 49-22-07 NDCC. The proposed Sunflower Wind Energy Project (Project) would be constructed on approximately 12,700 acres of leased private property. The north side of Project area boundary is located along I-94, and is approximately 3 miles south of Hebron, North Dakota. As currently planned, the Project would have a generating capacity of approximately 110 megawatts (MW) and would consist of up to 59 wind turbine generators as well as access roads, electrical collection systems and cabling, an operation and maintenance (O&M) building, a substation, and an interconnection yard where the Project will interconnect to the U.S. Department of Energy (DOE) Western Area Power Administration (Western)'s Dickinson-Mandan 230 kilovolt (kV) transmission line. The proposed Project area shown in the attached figure is the primary focus of our investigation.

Per Section 69-06-01-05 of the North Dakota Public Service Commission (PSC)'s administrative rules, we are consulting the Federal Aviation Administration for assistance in identifying concerns or issues within the boundaries of the tracts listed below that would influence a decision regarding the use of the land, as well as applicable permits that may be required from your office. This information will be used to help guide Project development in a manner that identifies and avoids impacts to sensitive resources where practicable.

We have sent similar query letters to other federal and state agencies regarding this proposal. We would appreciate a response by March 20, 2014. Please contact me at Dale.Bennett@tetratech.com or (503) 221.8683 if you have any questions.

Tetra Tech, Inc.
1750 Harbor Way, Suite 400, Portland, OR 97201
Tel 503.221.8696 Fax 503.227.1287 www.tetratech.com

Respectfully submitted,
TETRA TECH, INC

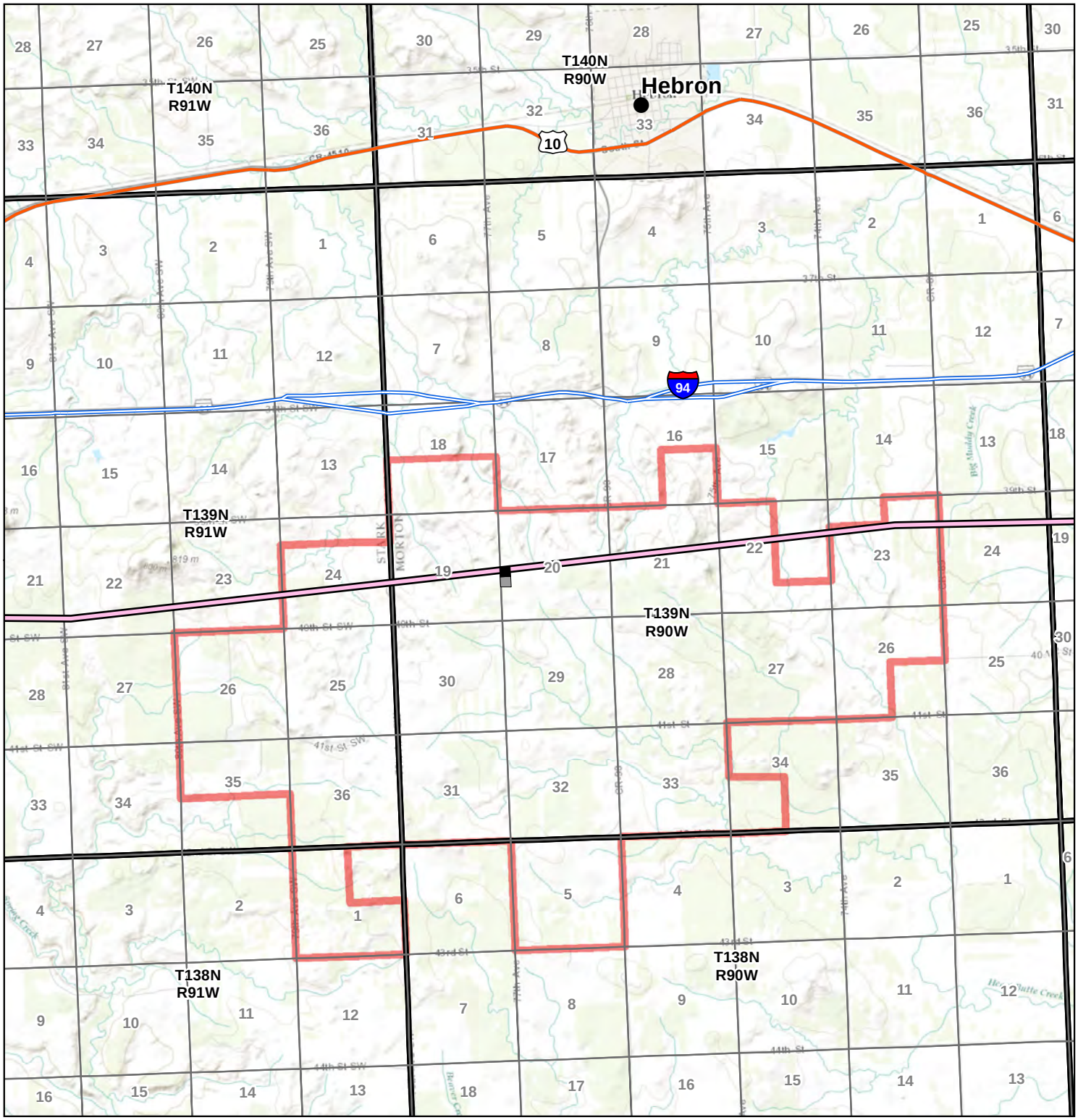


Dale Bennett
Senior Project Manager

Cc: Casey Willis, Sunflower Wind, LLC
Tracey Dubuque, P.E., Tetra Tech

Map Attachment to Request for Comment Letters

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1:80,000 WGS84 UTM Zone 13N

0 0.5 1 1.5 Miles

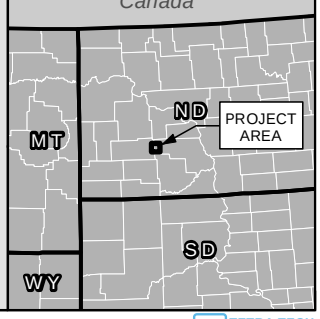
Sunflower Wind Project

Application for North Dakota Certificate of Site Compatibility

Project Location

Morton and Stark Counties, ND
February 2014

- Project Area
- Proposed Interconnection
- Proposed Substation
- Township/Range
- Section
- Existing Transmission Line
- County Boundary
- Interstate Highway
- Federal Highway



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Agency Comments and Correspondence

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DAvanzo, Jennifer

From: Wanner, Kyle C. <kcwanner@nd.gov>
Sent: Tuesday, February 18, 2014 2:47 PM
To: Bennett, Dale; DAvanzo, Jennifer
Subject: RE: Case No. PU-11-601

Follow Up Flag: Follow up
Flag Status: Flagged

Dale,

Thank-you for the information,

Could you please send the information on the wind farm to The Chase Airstrip and the Glen Ullin Municipal Airport to provide them an opportunity to comment as well? Providing them with the distance to the wind farm and updated project map would also be a good idea.

Thanks!

Kyle Wanner, Interim Director
North Dakota Aeronautics Commission
w (701) 328-9651
c (701) 425-5926
http://www.nd.gov/ndaero/

From: Bennett, Dale [mailto:Dale.Bennett@tetratech.com]
Sent: Tuesday, February 18, 2014 4:43 PM
To: Wanner, Kyle C.; DAvanzo, Jennifer
Subject: RE: Case No. PU-11-601

Kyle, Jennifer is in training today but here's the data you requested:

Airport Name	Type	Distance from the Project Area (miles)
Chase Airstrip	Private	4.4
Glen Ullin Regional	Public	5.75
Richardton	Public	10.7

Best - Dale

Dale Bennett | **Project Manager**
Direct: 503.721.7210 | Main: 503.221.8636 | Cell: 206.229.5161
Dale.Bennett@tetratech.com

Tetra Tech EC | **Sciences**
1750 SW Harbor Way | Portland, OR 97201 | www.tetratech.com

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From: Wanner, Kyle C. [mailto:kcwanner@nd.gov]
Sent: Tuesday, February 18, 2014 8:06 AM
To: DAvanzo, Jennifer
Cc: Bennett, Dale
Subject: RE: Case No. PU-11-601

Thank-you Jennifer,

This information is very helpful. Can you provide me with the straight line distance between the end of the project boundary and these three airports?:

- Glen Ullin Airport
- Richardton Airport
- Chase Airport

Thanks-

Kyle Wanner, Interim Director
North Dakota Aeronautics Commission
w (701) 328-9651
c (701) 425-5926
http://www.nd.gov/ndaero/

From: DAvanzo, Jennifer [mailto:Jennifer.Davanzo@tetratech.com]
Sent: Monday, February 17, 2014 9:29 PM
To: Wanner, Kyle C.
Cc: Bennett, Dale
Subject: FW: Case No. PU-11-601

To Mr. Wanner.

On behalf of Dale Bennett and Sunflower Wind Project LLC, thank you for a reponse to the Sunflower Wind Energy Project comment letter.

Please see the attached figure (Figure 1) per your request and let us know if you would like us to request comments from others.

Kind regards,
Jennifer D'Avanzo

Jennifer D'Avanzo, PWS | Senior Biologist, Project Manager
Direct: 503.727.8073| Main: 503.221.8636 |Fax 503.227.1287
jennifer.davanzo@tetratech.com

Tetra Tech | 1750 SW. Harbor Way, Suite 400 | Portland, OR 97201 | www.tetratech.com

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From: Wanner, Kyle C. [mailto:kcwanner@nd.gov]
Sent: Thursday, February 13, 2014 8:05 AM
To: Bennett, Dale
Subject: Case No. PU-11-601

Dale,

This e-mail is being sent in regards to the letter my office received regarding the Application to the North Dakota Public Service Commission for Certificate of Site Compatibility for the Sunflower Wind Energy Project in Stark and Morton Counties, North Dakota.

Can your company identify which public and private airports are in the vicinity of the project site and send me a map showing the project location in relation to the public/private airports?

From a brief look at the location, it appears that the Glen Ullin Airport is in the vicinity. A database of the private airports in North Dakota can be found at http://www.faa.gov/airports/airport_safety/airportdata_5010/

Depending on the location of the private and public airports, I may request that those individuals be allowed to comment on the proposal as well.

Thanks,

Kyle Wanner, Interim Director
North Dakota Aeronautics Commission
w (701) 328-9651
c (701) 425-5926
http://www.nd.gov/ndaero/

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Sunflower Wind Project
Application for North Dakota Certificate of Site Compatibility

Figure 1
Public and Private Airports

Morton and Stark Counties, ND
February 2014

FREDERICKS RANCH
WEYDAHL FIELD
FREI PRIVATE
BRECHT STRIP
SAKAKAWEA MEDICAL CENTER
GARRISON DAM RECREATIONAL AIRPARK
CIRCLE Z LANDING STRIP
UNDERWOOD
TURTLE LAKE MUNI
WESTERLIND
PHILBRICK PVT. AIRSTRIP
JOHNSON PRIVATE
WASHBURN MUNI
PETE'S PORT
SUNSET STRIP
SMITH STRIP
BEULAH
MERCER COUNTY RGNL
LORENTZEN
SODERQUIST
SPITZER
WOLBERG'S PRIVATE
JURGENS AIRSTRIP
RICHARDTON
CHASE AIRSTRIP
R J BOHN ARMORY
MEDCENTER ONE HOSPITAL MED-I-PORT
BRANDS
GLEN ULLIN RGNL
FITTERER'S STRIP
Z. P. FIELD
MANDAN MUNI
BISMARCK MUNI
DICKINSON - THEODORE ROOSEVELT RGNL

Killdeer, Dunn Center, Halliday, Dodge, Golden Valley, Zap, Beulah, Pick City, Riverdale, Coleharbor, Underwood, Turtle Lake, Mercer, Stanton, Washburn, Center, Wilton, Hebron, Taylor, Richardton, Gladstone, Dickinson, Glen Ullin, New Salem, Almont, Mandan, Lincoln

Little Missouri Bay State Park, Lake Ilo, Lake Tschida

MERCER, OLIVER, MORTON, STARK

Missouri River, Knife River, Crooked Creek, Deep Creek, Elm Creek, Otter Creek, Square Butte Creek, Coyote Creek, Haymarsh Creek, Sweetbrier Creek, Turtle Creek, Painted Woods Creek, Green River, Heart River, Antelope Creek, Government Creek, Big Muddy Creek, Heart Butte Creek, Crown Butte Creek, Little Heart River, Thirtymile Creek

1st St SW, 7th St SW, 15th St SW, 16th St SW, 19th St SW, 20th St SW, 21st St SW, 22nd St SW, 50th St SW, 52nd St, 53rd St, Newburg Rd, Hoover Rd, Bomber Club Rd, 53rd Ave SW, 57th Ave SW, 98th Ave SW, 100th

704 m, 711 m, 756 m, 664 m, 825 m, 839 m

1:480,000 WGS84 UTM Zone 13N

0 10 20 Miles

- Project Area
- County Boundary
- Existing Transmission Line (Over 230 kV)
- Railroad
- Interstate Highway
- Federal Highway
- State Highway
- Stream or River
- City/Town
- Public Airport
- Private Airport
- Public Heliport
- Private Heliport

Canada

MN, ND, MT, SD, WY, NE

P:\GIS_PROJECTS\Infinity_Wind_Power\Sunflower_NDPSC_CSC\MXDs\CSC\Infinity_SCSC_Fig_01_ProjectLocation_Airports_17i1l_20140217.mxd - Last Saved 2/17/2014

TETRA TECH

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DAvanzo, Jennifer

From: Bennett, Dale
Sent: Friday, February 14, 2014 9:00 AM
To: Daniel Nairn
Cc: Casey Willis (cwillis@infinitywind.com); DAvanzo, Jennifer
Subject: RE: Sunflower Wind Project

Thanks for your communication regarding the Sunflower Wind Project. Please go ahead and forward the decision of the Morton County Board of County Commissioners on Sunflower's application for a Special Use Permit when the decision is final as you propose.

Best regards

Dale Bennett | **Project Manager**
Direct: 503.721.7210 | Main: 503.221.8636 | Cell: 206.229.5161
Dale.Bennett@tetratech.com

Tetra Tech EC | **Sciences**
1750 SW Harbor Way | Portland, OR 97201 | www.tetratech.com

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Think Green - Not every email needs to be printed.

From: Daniel Nairn [mailto:Daniel.Nairn@mortonnd.org]
Sent: Friday, February 14, 2014 7:47 AM
To: Bennett, Dale
Subject: Sunflower Wind Project

Dale,

I received your letter requesting comment for the application to the Public Service Commission for the Sunflower Wind Project. An application for a Special Use Permit from Morton County has been filed for this project, and a public hearing will be held on February 27 with our Planning and Zoning Commission. The earliest the Board of County Commissioners could make a decision on the permit would be during their March 10 meeting.

After the Special Use Permit is reviewed by our board, I can send you a letter to communicate the decision. Obviously, I can't get this to you by the March 10 you've requested in the letter. If I sent you this letter by March 14, would that fit within your timeline?

Thanks,

Daniel Nairn, AICP
Director of Planning and Zoning
Morton County
2916 37th St. N.W. Mandan, ND 58554
701-667-3346

STATE HISTORICAL SOCIETY OF NORTH DAKOTA

Jack Dalrymple
Governor of North Dakota

North Dakota State Historical Board

Calvin Grinnell
New Town - President

A. Ruric Todd III
Jamestown - Vice President

Margaret Puetz
Bismarck- Secretary

Albert I. Berger
Grand Forks

Gereld Gerntholz
Valley City

Diane K. Larson
Bismarck

Chester E Nelson, Jr.
Bismarck

Sara Otte Coleman
Director
Tourism Division

Kelly Schmidt
State Treasurer

Alvin A. Jaeger
Secretary of State

Mark Zimmerman
Director
Parks and Recreation Department

Grant Levi
Director
Department of Transportation

Merlan E. Paaverud, Jr.
Director

Accredited by the American Alliance of Museums since 1986

February 13, 2014

Mr. Dale W. Bennett
Senior Project Manager
Tetra Tech
1750 Harbor Way, Suite 400
Portland, OR 97201

ND SHPO REF: 14-669 WAPA/PSC PU-13-847 Sunflower Wind Energy Project in Stark and Morton Counties, North Dakota

Dear Mr. Bennett,

We reviewed your very preliminary information on ND SHPO REF: 14-669 WAPA/PSC PU-13-847 Sunflower Wind Energy Project in Stark and Morton Counties, North Dakota. There is potential for unrecorded and recorded cultural resource properties in a variety of physiographic settings in the overall project area. As a federal undertaking, we encourage early agency consultation as part of the review process. Early consultation should also include tribal nations, North Dakota Indian Affairs, ND DOT regarding any Scenic Byways, and any managers or owners of properties maintained for recreational or scenic value.

We recommend a Class II (reconnaissance) survey by a permitted architectural historian for standing structures in the visual Area of Potential Effect (APE), and Class III survey of those found to be fifty years of age or older by a permitted architectural historian. Class III archeological (pedestrian) surveys will be warranted for all areas directly impacted by the project, **including crane paths**, access roads, staging areas, transmissions lines and turbine pads. We encourage you to invite tribal monitors to survey the APE. As part of the Class III Inventory, NDCRS site updates should be submitted on all sites resurveyed. If the project APE changes, we will request additional inventories, surveys and consultation.

Thank you for the opportunity to review this project to date. We look forward to further review of cultural resource surveys and site forms, and updates as the project siting occurs. If you have any questions please contact Paul Picha, Chief Archaeologist (701) 328-3574 or Susan Quinnell, Review and Compliance Coordinator at (701) 328-3576, e-mail squinnell@nd.gov

Sincerely,

Merlan E. Paaverud, Jr.
State Historic Preservation Officer (North Dakota) and
Director, State Historical Society of North Dakota

STATE HISTORICAL SOCIETY OF NORTH DAKOTA

RECEIVED
FEB 24 2014
By KL

Jack Dalrymple
Governor of North Dakota

North Dakota State Historical Board

Calvin Grinnell
New Town - President

A. Ruric Todd III
Jamestown - Vice President

Margaret Puetz
Bismarck- Secretary

Albert I. Berger
Grand Forks

Gereld Gerntholz
Valley City

Diane K. Larson
Bismarck

Chester E Nelson, Jr.
Bismarck

Sara Otte Coleman
Director
Tourism Division

Kelly Schmidt
State Treasurer

Alvin A. Jaeger
Secretary of State

Mark Zimmerman
Director
Parks and Recreation Department

Grant Levi
Director
Department of Transportation

Merlan E. Paaverud, Jr.
Director

Accredited by the American Alliance of Museums since 1986

February 18, 2014

Mr. Dale Bennett
Senior Project Manager
Tetra Tech
1750 Harbor Way, Suite 400
Portland, OR 97201

ND SHPO REF: 13-1244 WAPA /ND Public Service Commission (PSC Case No. PU-11-601) Infinity Wind Power's Sunflower Wind Project, Stark and Morton Counties, North Dakota

Dear Mr. Bennett,

We reviewed your preliminary information on ND SHPO REF: 13-1244 WAPA /ND Public Service Commission (PSC) Infinity Wind Power's Sunflower Wind Project Environmental Assessment (EA), Stark and Morton Counties, North Dakota. There is potential for unrecorded and recorded cultural resource properties in a variety of physiographic settings in the overall project area. We recommend a Class I (file search) cultural resource inventory followed by a Class II (reconnaissance) survey for standing structures in the visual Area of Potential Effect (APE). Class III (pedestrian) survey is also recommended of all the areas of direct impact including the turbine sites, power collections system, roads, and all other ground impacts. As part of the Class III Inventory, NDCRS site updates should be submitted on all sites resurveyed. Early consultation is also recommended with federal and tribal parties.

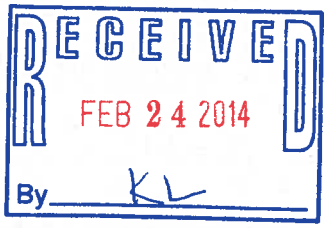
Thank you for the opportunity to review this project to date. We look forward to further review of cultural resource surveys and site forms. If you have any questions please contact Paul Picha, Chief Archaeologist (701) 328-3574 or Susan Quinnell, Review and Compliance Coordinator at (701) 328-3576, e-mail squinnell@nd.gov

Sincerely,

Merlan E. Paaverud, Jr.
State Historic Preservation Officer (North Dakota) and
Director, State Historical Society of North Dakota

USDA FSA United States Department of Agriculture Farm Service Agency
North Dakota State Office
1025 28th St South
Fargo, ND 58103-2372
Phone: (701) 239-5224
FAX: (701) 239-5696

February 20, 2014



Tetra Tech, Inc.
C/O Dale Bennett, Senior Project Manager
1750 Harbor Way, Suite 400
Portland, OR 97201

Dear Mr. Bennett,

This letter is in response to your February 10, 2014 letter concerning the environmental assessment associated with the Sunflower Wind Energy Conversion Project ("Project") in Stark and Morton Counties of North Dakota.

Based on the information in your February 10th letter, it is unknown if, at any time, the Project will be crossing land enrolled in the Conservation Reserve Program (CRP). Although the land enrolled in CRP is privately owned, FSA has administrative responsibilities to ensure the provisions of CRP are maintained throughout the contract period.

The land enrolled in CRP shall not have the cover disturbed during the Primary Nesting and Brood Rearing Season (PNS), which in North Dakota, is from April 15 through August 1. No activity is to take place on CRP during the PNS. However, there are exceptions to this provision. If disturbance of the existing cover is minimal, a waiver of this provision could be granted.

If the Project will need access to CRP during the PNS, a formal request to waive this provision must be submitted prior to any disturbance of CRP cover. Only the North Dakota State FSA Committee has the authority to grant a waiver of activity during the PNS. Therefore, if necessary, the request to disturb cover during the PNS shall be sent to the North Dakota State FSA Committee at the address provided on the letterhead of this letter. Such a request should include the proposed timeframe construction will occur, impact to the land enrolled in CRP and plans to restore CRP cover, if necessary.

If there are any questions, please contact this office.

Sincerely,

Aaron Krauter
State Executive Director

Cc: Stark FSA County Office
Morton FSA County Office
Honeyman, District Director
Moszer, District Director

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