New Frontier Wind Energy Project

Certification of Continuing Suitability Filing

November 2016

Prepared for: Meadowlark Wind I LLC, a wholly-owned subsidiary of

Capital Power

155 Federal St., Ste. 1200, Boston, MA 02110

Prepared by:

TETRA TECH

350 Indiana St., Ste. 500, Golden, CO 80401

November 21, 2016

Fredrikson & BYRON, P.A.

VIA FEDERAL EXPRESS

Mr. Darrell Nitschke
Executive Secretary
North Dakota Public Service Commission
600 E. Boulevard, Dept. 408
Bismarck, ND 58505-0480

RE: Meadowlark Wind I LLC's Application for a Certificate of Site Compatibility for the New Frontier Wind Energy Project in McHenry County, North Dakota Case No. PU-11-69

Dear Mr. Nitschke:

In accordance with Section 49-22-17 of the North Dakota Century Code, and Chapter 69-06-09 of the North Dakota Administrative Code, Meadowlark Wind I LLC submits an original and ten (10) copies of this letter and the following documents in connection with the above-referenced case:

1. Certification of Continuing Suitability, with accompanying:
   a. Exhibit 1 – Certification of Continuing Suitability Environmental Report; and
   b. Exhibit 2 – Certificate of Site Compatibility Chart.

Electronic copies of the above-referenced documents and this letter, as well as applicable geographic information system (GIS) data, are provided on the enclosed CDs.

If you have any questions, please let me know.

Sincerely,

MOLLIE M. SMITH

MMS/ms/60124127
Enclosures

cc: Williams R. Behling *(via e-mail, w/o encl.)*
Jena Tufts *(via e-mail, w/o encl.)*
Sarah McCall *(via e-mail, w/o encl.)*

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STATE OF NORTH DAKOTA

PUBLIC SERVICE COMMISSION

Meadowlark Wind I LLC **Case No. PU-11-69**
New Frontier Wind Energy Project – McHenry County
Siting Application

CERTIFICATION OF CONTINUING SUITABILITY

STATE OF MASSACHUSETTS)
) ss.
COUNTY OF SUFFOLK)

William R. Behling, being first duly sworn upon oath, states and alleges as follows:

1. I am the Business Development Manager for Capital Power Corporation ("Capital Power"), the parent company of Meadowlark Wind I LLC ("Meadowlark"). I am the Project Manager for Meadowlark's New Frontier Wind Energy Project ("Project"), which is the subject of the above-referenced matter. In my role as Project Manager, I am responsible for Project development, including permitting and environmental compliance.

2. I provide this Certification of Continuing Suitability ("Certification") on behalf of Meadowlark pursuant to N.D.C.C. § 49-22-17 and N.D.A.C. § 69-06-09-01, and I have the authority to bind Meadowlark with respect to the certifications made herein.

3. On April 25, 2012, the North Dakota Public Service Commission (the "Commission") issued Findings of Fact, Conclusions of Law and Order ("Order") granting Meadowlark Certificate of Site Compatibility No. 29 designating a site ("Designated Site") for the Project.

4. Meadowlark certifies that the Designated Site continues to meet the conditions upon which Certificate of Site Compatibility No. 29 was issued.

5. Attached as **Exhibit 1** is an Environmental Report prepared in support of, and relied upon in making, this Certification. The information in the Environmental Report is incorporated into this Certification as though set forth herein in its entirety.

6. Attached as **Exhibit 2** is a Certificate of Site Compatibility Chart, which confirms prior, or provides updated, information with respect to each of the Order provisions. The information in the Certificate of Site Compatibility Chart is incorporated into this Certification as though set forth herein in its entirety.

7. Meadowlark will comply with all requirements of the Commission's Order, including the Certification Relating to Order Provisions – Energy Conversion Facility Siting, and accompanying Tree and Shrub Mitigation Specifications.

8. Meadowlark respectfully requests that the Commission issue an order authorizing Meadowlark to begin construction of the Project as early as the Second Quarter of 2017, and no later than the Second Quarter of 2020.

FURTHER AFFIANT SAYETH NOT.

William R. Behling
Business Development Manager

Subscribed and sworn to before me
this 15th day of November, 2016.

Notary Public

JOANNA M. PERRY
Notary Public
COMMONWEALTH OF MASSACHUSETTS
My Commission Expires
May 13, 2022

Exhibit 1:
New Frontier Wind Energy Project
Certification of Continuing Suitability
Environmental Report

New Frontier Wind Energy Project

Certification of Continuing Suitability Environmental Report

November 2016

Prepared for: Meadowlark Wind I LLC, a wholly-owned subsidiary of

155 Federal St., Ste. 1200, Boston, MA 02110

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List of Acronyms and Abbreviations

Applicant	Meadowlark Wind I, LLC
BGEPA	Bald and Golden Eagle Protection Act
BOP EPC	Balance of Plant Engineering, Procurement, and Construction
Capital Power	Capital Power Corporation
CCS	Certification of Continuing Suitability
Commission	Public Service Commission
CRP	Conservation Reserve Program
CSC	Certificate of Site Compatibility
CUP	conditional use permit
dBA	decibels, A-scale
DNH	Determination of No Hazard to Air Navigation
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FCC	Federal Communications Commission
FSA	Farm Service Agency
GRE	Great River Energy
IPaC	Information for Planning Conservation
JD	Jurisdictional Determination
Meadowlark	Meadowlark I LLC
MISO	Midcontinent Independent Transmission System Operator
MW	megawatts
NDAC	North Dakota Administrative Code
NDCC	North Dakota Century Code
NDDOT	North Dakota Department of Transportation
NDGF	North Dakota Game and Fish
NDPRD	North Dakota Parks and Recreation Department
NLEB	Northern Long-eared bat

NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
NTIA	National Telecommunication Information Agency
NWP	nationwide permit
O&M	operations and maintenance
Project	New Frontier Wind Energy Project
PSC	Public Service Commission
PSC Order	Certificate of Site Compatibility Number 29
PTC	Production Tax Credit
RF	fixed station radio frequency
SHPO	State Historic Preservation Office
SWPPP	Stormwater Pollution Prevention Plan
SHSND	State Historical Society of North Dakota
Tetra Tech	Tetra Tech, Inc.
sq ft	square feet
USAF	U.S. Air Force
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
WNS	white-nose syndrome
WTG	wind turbine generator

1. Project Information

1.1 Introduction

On April 26, 2012, the North Dakota Public Service Commission (PSC or Commission) issued Certificate of Site Compatibility (CSC) Number 29 (PSC Order) to Meadowlark Wind I LLC (Meadowlark) for the New Frontier Wind Energy Project (Project) in McHenry County, North Dakota (see Case No. PU-11-69). In December 2014, Capital Power Investments LLC, a subsidiary of Capital Power Corporation (Capital Power), completed the acquisition of Element Power US, LLC, which included acquisition of Meadowlark, which owns the Project. Meadowlark, with the assistance of Capital Power, plans to complete the development and construction of the Project.

More than four years have elapsed since issuance of the CSC for the Project. Therefore, in accordance with North Dakota Century Code (NDCC) Section 49-22-17 and North Dakota Administrative Code (NDAC) Chapter 69-06-09, Meadowlark is submitting to the PSC a Certification of Continuing Suitability (CCS) for the Project. This Environmental Report was prepared in support of Meadowlark's CCS.

1.2 Project Description

The Project will have a nameplate (gross) generating capacity of up to 102 megawatts (MW). Meadowlark has entered into a generator interconnection agreement with Great River Energy (GRE) and the Midcontinent Independent Transmission System Operator (MISO) authorizing interconnection of up to 99 MW of the Project's output at GRE's McHenry Substation, located at Velva, North Dakota. Meadowlark is currently in the process of securing an off-taker for the Project.

With the exception of the updated information provided in the following sections, the Project's engineering and operational design, and planned construction, operation, maintenance, decommissioning, and restoration activities, have not changed since issuance of the CSC.

1.2.1 Turbine Models

The turbine models under consideration at the time the PSC Order was issued are either no longer available or are not the most up-to-date and efficient technology available. As a result, Meadowlark is currently considering the following turbine models: Acciona AW 125/3150; GE 2.5-116; Vestas V-100 2.0; Vestas V126 3.45. These turbine models are between 2.0 and 3.45 MW in size, and will have a hub height of between 80 and 90 meters and a rotor diameter of between 100 and 126 meters. Design details for each turbine model are provided in Table 1 below.

Table 1: Turbine Model Design Details

Turbine Type	Rotor Diameter	Hub Height	Generating Capacity	High Rotor Speed (RPM)
Acciona AW 125/3150	125 meters (410.1 feet)	87.5 meters (287.1 feet)	3.15 MW	14.7 (0.74 alternations per second)
GE 2.5-116	116 meters (380.5 feet)	90 meters (285.4 feet)	2.5 MW	13 (0.65 alternations per second)
Vestas V100-2.0	100 meter (328.1 feet)	80 meters (262.4 feet)	2.0 MW	15.2 (0.76 alternations per second)
Vestas V126-3.45	126 meters (413.3 feet)	87 meters (285.4 feet)	3.45 MW	12.8 (0.64 alternations per second)

1.2.2 Project Layout

Except as discussed below the Project layout has not changed from the layout presented at the time the CSC was issued. Since Meadowlark is no longer considering a turbine model under 2.0 MW, and Meadowlark has a generator interconnection agreement for up to 99 MW, Meadowlark plans to install no more than 49 turbines. As a result, Meadowlark has eliminated some of the approved turbine locations from further consideration. In addition, using the revised 49-turbine layout with the most conservative turbine model (i.e. the tallest turbine), Meadowlark determined that nine turbines needed to be shifted slightly to comply with applicable setbacks (see Table 2). The nine turbine shifts remain within the areas previously surveyed for cultural resources and wetlands.

Table 2: Wind Turbine Shifts to Comply with Current Setback Requirements

Turbine Number	Reason for Move	Distance Moved
WTG 6	Within Transmission Setback	106'-10" to the South-West
WTG 8	Within Overhead Distribution line setback	47'-7" to the South-West
WTG 26	Within Overhead Distribution line and Road Setback	22' to the East
WTG 32	Within Road Setback	55'-2" to the South-West
WTG 35	Within Road Setback	42'-3" to the South-West
WTG 39	Within Road Setback	43'-37" to the North-West
WTG 40	Within Road Setback	93'-6" to the South-West
WTG 47	Within Road Setback	53'-10" to the South-West
WTG 62	Within Road Setback	3'-2" to the North-East

WTG = wind turbine generator

The turbine locations that may be used for the Project are a subset of the locations previously approved by the PSC (see Hearing Exhibit No. 4), with the nine minor turbine shifts noted above, all 49 turbine locations are shown in Figure 1. As discussed further in Section 2, the current Project design meets all applicable siting and setback requirements.

The maximum estimated temporary disturbance (construction) and permanent disturbance (operation) impacts for the current Project design are shown in Revised Table 5.1-1. Revised Table 5.1-1 also includes the anticipated range of impacts as described in Hearing Exhibit No. 2 (see Revised Table 5.1-1 from the August 2011 CSC Application). As shown in Revised Table 5.1-1, the maximum temporary and permanent disturbance for the current Project design is within the anticipated range of impacts described in Hearing Exhibit No. 2.

Revised Table 5.1-1: Maximum Estimated Impacts for Project Facilities

Project Facilities	Temporary Disturbance (Construction)				Permanent Disturbance (Operation)		
	Impact Assumption (August 2011 CSC Application; Conservative)	Anticipated Range of Impacts (August 2011 CSC Application)	Impact Assumption (Current Design)	Anticipated Impacts (Current Design)	Impact Assumption (Conservative)	Anticipated Range of Impacts (August 2011 CSC Application)	Anticipated Impacts (Current Design)
Wind Turbines	1.6 acres (70,650 sq ft) per turbine	70 to 100 acres	1.9 acres (82,764 sq ft) per turbine	93.1 acres	0.08 acres (3,600 sq ft) per turbine	3.5 to 5 acres	3.9 acres
Access Roads	Assumes 40-foot-wide access road between turbines (crane walk)	111 acres	Assumes 49-foot-wide construction disturbance area for access road. Assumes 1,934 feet per turbine (crane walk).	106.6 acres	Assumes 18-foot-wide access road	50 acres	39.1 acres
Staging Areas	10 acres	10 acres	10 acres	10 acres	N/A	N/A	N/A
Collector Lines	Assumes a 24-foot-wide by 4-feet-deep construction trench	96 acres	Assumes a 24-foot-wide by 4-feet-deep construction trench. Assumes 2771.6 feet per turbine.	72.7 acres	N/A	N/A	N/A
Collector Substation	N/A	N/A	N/A	N/A	5 acres	5 acres	5 acres
O&M Facility	N/A	N/A	N/A	N/A	5 acres	5 acres	5 acres
Meteorological Tower	N/A	N/A	N/A	N/A	900 sq ft (0.02 acre)	.04 acres	.04 acres
TOTAL	N/A	287 to 317 acres	N/A	282.4 acres	N/A	64 to 65 acres	53.1 acres

CSC – Certificate of Site Compatibility; N/A – not applicable; sq ft – square feet; O&M – operations and maintenance

1.2.3 Project Schedule

Meadowlark plans to begin on-site construction of the Project as soon as the second quarter of 2017, with the Project operational by the end of 2017. However, the Project schedule is dependent on entering into a power purchase agreement or similar arrangement for the sale of the Project's output. Meadowlark will be taking steps by December 31, 2016 to qualify the Project for the production tax credit (PTC) and, under federal PTC regulations, has four years within which to construct the Project. Therefore, while on-site Project construction is anticipated to begin in the second quarter of 2017, it could begin as late as the spring of 2020.

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2. Compliance with NDAC Section 69-06-08-01

2.1 Compliance with Exclusion Areas

NDAC Section 69-06-08-01(1) identifies certain areas that must be excluded from consideration when siting an energy conversion facility. Table 3 below lists the exclusion areas in effect at the time the CSC was issued, notes the information discussed in Section 3.1 of the August 2011 CSC Application for each criterion, and provides any updates to the information for the Project.

Table 3: Exclusion Areas At Issuance of CSC

Exclusion Area	August 2011 CSC Application		Current Project
	Present within Project Area?	Description and Proposed Buffer	
Designated or registered national: 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.	No buffer is proposed.	No change.
Designated or registered state: 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.	No.	No buffer is proposed.	No change.
County parks and recreational areas; municipal parks; parks owned or administered by other governmental subdivisions; hardwood draws; and enrolled woodlands.	No.	No buffer is proposed.	No change.
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 Code of Federal Regulations 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, this exclusion does not apply.	Yes	The acreage to be removed from use for the life of the Project will have a negligible impact on agricultural productions. No buffer is proposed. Total prime farmland within Project Area is 113.6 acres (1.1 percent of the Project Area).	No change. The total prime farmland within the Project Area is 1,255.05 acres (11.07 percent of the Project Area). The total acres of prime farmland provided in the 2011 PSC Application appears to have been an error, as the total amount of prime farmland has not changed. The prime farmland acreage to be removed from use for the life of the Project is 2.65 acres, which remains less than 1 percent of the Project Area.
Irrigated land.	No.	No center pivot irrigation systems are present.	No change.

Table 3: Exclusion Areas At Issuance of CSC

Exclusion Area	August 2011 CSC Application		Current Project
	Present within Project Area?	Description and Proposed Buffer	
Areas critical to the life stages of threatened or endangered animal or plant species.	No.	No buffer is proposed.	No Project facilities in exclusion area. Although the Dakota skipper was not a protected species at the time the PSC Order was issued, it has since been listed (federally) as a threatened species. Meadowlark conducted surveys to identify potential Dakota skipper habitat in the Project site and identified small fragments of occupied Dakota skipper habitat. In coordination with the U.S. Fish and Wildlife Service, all Project facilities have been sited outside of these areas. See Section 3.8 for additional discussion.
Areas where animal or plant species that are unique or rare to this state would be irreversibly damaged.	No.	No buffer is proposed.	No Project facilities within exclusion area.

CSC – Certification of Continuing Suitability; PSC – Public Service Commission; PSC Order – Order issuing Certificate of Site Compatibility Number 29

Since issuance of the PSC Order, one exclusion area for energy conversion facilities was added to the PSC's rules (see NDAC Section 69-06-08-01(1)(h)). In addition, the PSC amended its rules to include exclusion areas specific to wind energy conversion facilities (see NDAC Section 69-06-08-01(2)). Table 4 below lists these additional exclusion areas and provides information regarding each criterion for the Project.

Table 4: Additional Exclusion Areas

Exclusion Area	Current Project
Areas within one thousand two hundred feet of the geographic center of an ICBM launch or launch control facility.	One ICBM launch control facility is located east of the Project boundary. As set forth in the PSC Order, no Project facilities will be located within 2,640 feet of the ICBM launch control facility; therefore, no turbines will be located in this exclusion area.
Areas less than one and one-tenth times the height of the turbine from interstate or state roadway right of way	As set forth in the PSC Order, no wind turbines will be located within this exclusion area.
Areas less than one and one-tenth times the height of the turbine plus 75 feet from the centerline of any county or maintained township roadway	As set forth in the PSC Order, no wind turbines will be located within this exclusion area.
Areas less than one and one-tenth times the height of the turbine from any railroad right of way	No wind turbines will be located within this exclusion area.
Areas less than one and one-tenth times the height of the turbine from a 115 kilovolt or higher transmission line	As set forth in the PSC Order, no wind turbines will be located within this exclusion area.

Table 4: Additional Exclusion Areas

Exclusion Area	Current Project
Areas less than one and one-tenth times the height of the turbine from the property line of a nonparticipating landowner, unless a variance is granted. A variance may be granted if an authorized representative or agent of the permittee and affected parties with associated wind rights file a written agreement expressing all parties' support for a variance to reduce the setback requirement in this subsection. A nonparticipating landowner is a landowner that has not signed a wind option or an easement agreement with the permittee of the wind energy conversion facility as defined in North Dakota Century Code chapter 17-04.	As set forth in the PSC Order, no wind turbines will be located within this exclusion area.

ICBM – intercontinental ballistic missile; PSC Order – Order issuing Certificate of Site Compatibility Number 29

As indicated in Tables 3 and 4, the Project meets the PSC's exclusion area criteria, including the criteria added since issuance of the CSC. Although prime farmland is present within the Project site, less than one percent of the prime farmland will be impacted by the Project; thus, the Project will continue to have a negligible impact on agricultural production (see Finding of Fact No. 18 of the PSC Order). In addition, while Dakota skipper habitat is present within the Project site, no facilities are sited within said habitat. Also, while certain exclusion areas identified in Table 4 are present within the Project site, those exclusion areas have been appropriately avoided by the Project. Figure 2 depicts the exclusion areas within the Project boundary, and shows the Project's compliance with the PSC's exclusion area criteria.

2.2 Compliance with Avoidance Areas

NDAC Section 69-06-08-01(3) identifies certain areas that must be avoided when siting an energy conversion facility unless the applicant shows that, under the circumstances, there is no reasonable alternative. Table 5 below lists the avoidance areas in effect at the time the CSC was issued, notes the information discussed in Section 3.2 of the August 2011 CSC Application for each criterion, and provides any updates to the information for the Project.

Table 5: Avoidance Areas At Issuance of CSC

Avoidance Area	August 2011 CSC Application		Current Project
	Present within Project Area?	Description and Proposed Buffer	
Historical resources which are not designated as exclusion areas.	Yes[1]	Meadowlark completed a literature search for cultural resources within the Project Area. Meadowlark will also complete field surveys for cultural resources during fall 2011.	Meadowlark completed cultural resource surveys in fall 2011. Three cultural resource sites were documented, and were unevaluated for the National Register of Historic Places. In a letter dated February 21, 2012 (late-filed Hearing Exhibit No. 9a), the State Historical Society of North Dakota, (SHSND) concurred with a "No Significant Sites" determination, provided the unevaluated sites are avoided. The Project layout avoids the three unevaluated cultural resource sites identified in 2011. A Class I site file search and literature review was conducted for the Project in July, 2016 (see Appendix E). No new inventories have been conducted and no new cultural resources have been identified within the Research area since the Class III cultural resources inventory in 2011.

Table 5: Avoidance Areas At Issuance of CSC

Avoidance Area	August 2011 CSC Application		Current Project
	Present within Project Area?	Description and Proposed Buffer	
			A Class III survey of buildings and structures (including cemeteries over 50 years old) was conducted in the visual Area of Potential Effect for the Project. None of the properties or their individual features are recommended as potentially eligible for listing on the NRHP (see Appendix F). A Class III archeological survey of additional direct impacts that were not previously surveyed (i.e. wider turning radii for construction and one collection line shift to comply with USAF cable setbacks) was conducted. The pedestrian surveys identified one previously unidentified archaeological site. The site is recommended as not eligible for listing on the NRHP (see Appendix G).All 2016 cultural resources survey reports will be submitted to the SHPO for concurrence. SHPO concurrence letters will be provided to the PSC upon receipt. See discussion in Section 3.4.
Areas within the city limits of a city or the boundaries of a military installation.	No.	The Minot Air Force Base's Missile Launch Facility is east of the Project Area. Meadowlark is coordinating with the Minot Air Force Base and will adhere to the setbacks determined by the USAF.	Meadowlark has been coordinating with the Minot Air Force Base and has redesigned one collection line to comply with setbacks. See discussion in Section 4.11.
Areas within known floodplains as defined by the geographical boundaries of the hundred-year flood.	No.	Floodplains have not been mapped by the Federal Emergency Management Agency in the Project Area. Per the North Dakota State Water Commission, no identified floodplains exist within the Project Area). Meadowlark will avoid impacts to surface water to the extent practicable.	No change.
Areas that are geologically unstable.	No.	No buffer is proposed.	Correspondence with the North Dakota Geological Survey indicated that there is a landslide potential in the southern portion of the Project Area (see agency consultation in Section 4.11). No Project facilities are located within landslide areas (see Figure 2).
Woodlands and wetlands.	Yes	Wetlands will be avoided to the extent practicable. If impacts are unavoidable, appropriate permits will be obtained. Woodland impacts will be minimal because the extent of woodlands (residential groves and agricultural windbreaks) is limited. No buffers are proposed.	A Jurisdictional Determination by the U.S. Army Corps of Engineers (based on the 2011 Wetland Delineation report) confirmed only one jurisdictional wetland would be impacted by the Project. Impacts to this wetland will be temporary. See discussion in Section 3.6.

Table 5: Avoidance Areas At Issuance of CSC

Avoidance Area	August 2011 CSC Application		Current Project
	Present within Project Area?	Description and Proposed Buffer	
Areas of recreational significance which are not designated as exclusion areas.	No	No buffer is proposed.	No change.

1 Known important historical resources will be avoided during development of the Project layout. Meadowlark will complete field surveys to locate any previously unidentified historical resources that may occur in the Project Area. Any important historical resources identified during these surveys will also be avoided during development of the final Project layout.

NRHP – National Register of Historic Places; PSC – Public Service Commission; SHPO – State Historic Preservation Office; USAF – U.S. Air Force

Since issuance of the PSC Order, the PSC amended its rules to include an avoidance area specific to wind energy conversion facilities (see NDAC Section 69-06-08-01(4)). Table 6 below lists the additional avoidance area and provides relevant information for the Project.

Table 6: Additional Avoidance Area

Avoidance Area	Current Project
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 50 dBA. The sound level avoidance area criteria may be waived in writing by the owner of the occupied residence or the community building.	A screening-level acoustic analysis was completed to evaluate the expected sound levels resulting from the Project wind turbines and substation. The results of the acoustic assessment show that, with the exception of five participating landowner residences, the Project will comply with the PSC's 50 dBA limit within 100 feet of all inhabited residences. Meadowlark has obtained written waivers of the sound level avoidance area criteria from the five participating landowners. See discussion in Section 3.3.

dBA – decibels, A-scale; PSC – Public Service Commission

As indicated in Tables 5 and 6, the Project meets the PSC's avoidance area criteria, including the criterion added since issuance of the CSC. Although cultural resources are present within the Project site, the Project continues to avoid impacts to these sites (see Finding of Fact Nos. 22 and 23 of the PSC Order). In addition, while shelterbelts are present, the turbine locations avoid these areas and less than one acre of treed area will be impacted by the Project (see Finding of Fact No. 24). Wetlands are also present within the Project site, but the layout continues to avoid wetlands to the extent practicable and impacts will only be temporary (see Finding of Fact No. 25). While residences are present in and around the Project Area, the Project will comply with the PSC's sound level avoidance area criteria, either by meeting the 50 decibels, A-scale (dBA) requirement or obtaining the applicable written waiver. With the exception of cultural resource sites and the sound avoidance areas, Figure 2 depicts the avoidance areas within the Project boundary, and shows the Project's compliance with the PSC's avoidance area criteria.

2.3 Compliance with Selection Criteria

Per NDAC Section 69-06-08-01(5), "A site may be approved in an area only when it is demonstrated to the commission by the applicant that any significant adverse effects resulting from the location, construction, and operation of the facility in that area as they relate to the following, will be at an acceptable minimum, or that those effects will be managed and maintained at an acceptable minimum." Table 7 below lists the PSC's selection criteria, notes the information discussed in Section 3.3 of the August 2011 CSC Application for each criterion, and provides any updates to the information for the Project.

Table 7: Selection Criteria

Selection Criteria	Potential Adverse Effects	
	August 2011 CSC Application	Current Project
The impact upon agriculture:		
Agricultural production.	A final layout has not been determined for the Project, so exact impacts to agricultural production areas are not known at this time. Permanent Project facilities will remove land from crop production or rangeland, but the amount of land removed is not anticipated to be significant. Table 5.1-1 estimates temporary and permanent Project impacts based on a preliminary layout. Depending upon the turbine type selected, 52 to 69 acres of land may be permanently disturbed for the Project.	The current design has eliminated some turbine locations; as a result, the current Project design may disturb up to 53.1 acres of land during the life of the Project.
Family farms and ranches.	No turbines will be placed within 1,400 feet of occupied residences. The potential adverse effects to family farms are land area lost to Project facilities and aesthetic impacts. Wind lease payments will provide a supplemental source of income in excess of normal farming operations.	No change.
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 owner, where impacts are expected, has expressed concerns related to economically suitable irrigation on their land.	No change.
Surface drainage patterns and ground water flow patterns.	No adverse effects are anticipated.	No change.
The agricultural quality of the cropland.	No impacts to the agricultural quality of cropland are anticipated. If compaction of soils occurs during construction or drain tiles are damaged, Meadowlark will work with the landowners to alleviate the compaction and/or repair the drain tiles.	No change.
The impact upon the availability and adequacy of:		
Law enforcement.	No adverse effects are anticipated.	No change.
School systems and education programs.	No adverse effects are anticipated.	No change.
Governmental services and facilities.	No adverse effects are anticipated.	No change.
General and mental health care facilities.	No adverse effects are anticipated.	No change.
Recreational programs and facilities.	No adverse effects are anticipated.	No change.

Table 7: Selection Criteria

Selection Criteria	Potential Adverse Effects	
	August 2011 CSC Application	Current Project
Transportation facilities and networks.	During construction, there will likely be an increase in vehicle trips per day. During operation no adverse effects to transportation facilities or networks are anticipated. Meadowlark intends to enter into a Road Agreement with McHenry County and/or Townships if applicable.	Meadowlark has executed Road Use and Maintenance Agreements with Brown Township and Bjornson Township for the Project.
Retail service facilities.	No adverse effects are anticipated. During construction, with the influx of people involved in the Project, there may be a positive impact on retail services.	No change.
Utility services.	No adverse effects are anticipated.	No change. Updated studies regarding potential impacts to public services and existing infrastructure are addressed in Section 3.2 of this Environmental Report.
The impact upon:		
Local institutions.	No adverse effects are anticipated.	No change.
Noise-sensitive land uses.	No adverse effects are anticipated. Noise-sensitive receptors are occupied residences of landowners who are parties to easement agreements with Meadowlark. Turbines will be setback at least 1,400 feet from occupied residences.	No change. Updated acoustic analysis is discussed in Section 3.4 of this Environmental Report.
Rural residences and businesses.	No adverse effects are anticipated. Turbines will be setback at least 1,400 feet from occupied residences.	No change.
Aquifers.	No adverse effects are anticipated.	No change.
Human health and safety.	With implementation of the mitigative measures discussed in Section 7.5.3, no adverse effects to human health and safety are anticipated.	No change.
Animal health and safety.	No adverse effects to livestock are anticipated from the Project. There is a potential for avian and bat collisions with the turbines for the Project and displacement, injury, or mortality for other wildlife species. Mitigative measures as discussed in Sections 7.15.3 and 7.16.3 will minimize the potential for these impacts. Meadowlark is coordinating with the U.S. Fish and Wildlife Service and North Dakota Game and Fish Department regarding appropriate mitigation measures to protect animal health and safety.	No change. Updated wildlife studies are discussed in Sections 3.7 and 3.8 of this Environmental Report.
Plant life.	A final layout has not been determined for the Project, so exact impacts to plant life are not known at this time. Table 5.1-1 estimates temporary and permanent Project impacts based on a preliminary layout.	The current design has eliminated some turbine locations; as a result, the current Project design may disturb up to 53.1 acres of land during the life of the Project.
Temporary and permanent housing.	Temporary housing will be utilized during construction. It is likely employees during Project operation will live near the Project and create a positive effect on the housing market by renting or purchasing available housing. No adverse effects are anticipated.	No change.

Table 7: Selection Criteria

Selection Criteria	Potential Adverse Effects	
	August 2011 CSC Application	Current Project
Temporary and permanent skilled and unskilled labor.	No adverse effects to temporary and permanent skilled and unskilled labor are anticipated. Project construction and operations should yield a benefit to the labor community, both short- and long-term.	No change.
Cumulative impact:		
The cumulative effects of the location of the facility in relation to existing and planned facilities and other industrial development.	No significant adverse cumulative effects due to the location of the Project in relation to existing or planned facilities and other industrial development are anticipated.	No change.

CSC – Certificate of Site Compatibility

As set forth in Table 7 above, any significant adverse effects resulting from the location, construction, and operation of the Project as they relate to the selection criteria continue to be at an acceptable minimum or be managed and maintained at an acceptable minimum (see Finding of Fact No. 20 of the PSC Order).

2.4 Compliance with Policy Criteria

In accordance with NDAC Section 69-06-08-01(6), "The commission may give preference to an applicant that will maximize benefits that result from the adoption of the following policies and practices, and in a proper case may require the adoption of such policies and practices. The commission may also give preference to an applicant that will maximize interstate benefits." Table 8 below lists the PSC's policy criteria, notes the information discussed in Section 3.4 of the August 2011 CSC Application for each criterion, and provides any updates to the information for the Project.

Table 8: Policy Criteria

Policy Criteria	Suitable Policy or Practice of Applicant	
	August 2011 CSC Application	Current Project
Recycling of the conversion byproducts and effluents.	Not applicable.	No change.
Energy conservation through location, process, and design.	Meadowlark will develop a site layout that optimizes wind resources while minimizing the impact on land resources and any sensitive areas. A doubling of the wind speed will increase the available energy by a factor of eight times. Depending on the technology chosen, the factor could range from 8-12 times at low wind speeds. Meadowlark will minimize the amount of underground collection lines to the extent practicable to reduce energy line losses between the generation point and the Project Substation.	No change.
Training and utilization of available labor in this state for the general and specialized skills required.	Meadowlark will use local labor to the extent practicable.	No change.
Use of a primary energy source or raw material located within the state.	The energy generated at the site will utilize the wind resources in the state of North Dakota.	No change.
Not relocating residents.	No residents will be relocated as a result of the Project.	No change.
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. Meadowlark is coordinating with U.S. Fish and Wildlife Service on appropriate mitigation measures.	No change.

Table 8: Policy Criteria

Policy Criteria	Suitable Policy or Practice of Applicant	
	August 2011 CSC Application	Current Project
Economies of construction and operation.	Meadowlark will use local labor to the extent practicable. Meadowlark intends to use the same construction crew to construct both the generator lead line and Project. Meadowlark also intends to use the same operations and maintenance crew to oversee the generator lead line and the Project.	No change.
Secondary uses of appropriate associated facilities for recreation and the enhancement of wildlife.	None are proposed; the Project will be constructed on private lands owned by third parties.	No change.
Use of citizen coordinating committees.	Meadowlark has and will continue to work with landowners in the development of the Project; thus, a citizen coordinating committee is not necessary.	No change.
A commitment of a portion of the energy produced for use in this state.	The Project will interconnect with the electrical transmission system at the McHenry Substation. The Project's output may be sold to offtakers potentially in North Dakota, which would serve load in North Dakota.	No change.
Labor relations.	The Project will have an employment policy consistent with industry practices. Labor relations are not anticipated to be an issue and will be handled by experienced contractors. Oversight of contractors will be provided by Meadowlark during construction and operation of the Project.	No change.
Retail service facilities.	No adverse effects are anticipated. During construction, with the influx of people involved in the Project, there may be a positive impact on retail services.	No change.
The coordination of facilities.	Existing facilities and facility corridors were considered in the location of the Project.	No change.
Monitoring of impacts.	Meadowlark and the construction contractor will employ Best Management Practices during construction and will conduct monitoring as directed by permitting authorities and regulatory approvals required for the Project.	No change.

CSC – Certificate of Site Compatibility

As set forth in Table 8 above, Meadowlark continues to demonstrate its commitment to maximize the benefits of the Project as far as possible to meet the PSC's policy criteria (see Finding of Fact No. 21 of the PSC Order).

2.5 Compliance with Setbacks

Table 9 below outlines the Project setbacks identified in the PSC Order, the PSC's current setbacks (set forth in NDAC Section 69-06-08-01), and the current McHenry County setbacks. Although the current PSC setback requirements were not in affect at the time the CSC was issued, the Project will comply with all of the setback requirements set forth in Table 9, regardless of which turbine model is selected. Where PSC and County setback requirements differ, Meadowlark has applied the more stringent setback. Except for the sound avoidance area setback, all Project setbacks are depicted on Figure 2.

Table 9: Setback Distances for Wind Turbines

Setback Type	Distance
PSC Order Setback Requirements	
Project Boundary/Adjacent property not under lease	1.1 x blade tip height
Occupied Residence	1,400 feet
Missile Facility (Building)	2,640 feet[1]
Missile Cabling	100 feet
Improved Township and County Roads	1.1 x blade tip height
State and Federal Highways	1.1 x blade tip height
Overhead Transmission and Distribution Lines	1.1 x blade tip height
Current PSC Setback Requirements	
Interstate and state road rights-of-way	1.1 x turbine height
Centerline of county or maintained township roadways	1.1 x turbine height, plus 75 feet
Railroad rights-of-way	1.1 x turbine height
115 kilovolt or higher transmission lines	1.1 x turbine height
Property line of non-participating landowners	1.1 x turbine height[2]
Inhabited residence or community building	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 50 dBA (see Section 3.2.4 of this Environmental Report). The sound level avoidance area criteria may be waived in writing by the owner of the occupied residence or the community building.
ICBM launch or launch control facility	1,200 feet
Current McHenry County Setback Requirements	
Occupied dwellings (non-participating landowners)	1,300 feet[3]
Occupied dwellings (participating landowners)	500 feet[3]
Interstate or state roadway rights-of-way	1.1 x turbine tip height
Improved county or township roadway	1.1 x turbine tip height
Centerline of unimproved county or township road	150 feet
Railroad right-of-way or overhead transmission line	1.1 x turbine tip height

1. See Finding of Fact No. 28 in PSC Order and Section 7.3.2 of August 2011 PSC CCS application.
2. A variance may be granted if an authorized representative or agent of the permittee and affected parties with associated wind rights file a written agreement expressing all parties' support for a variance to reduce the setback requirement.
3. The setback distance may be reduced by written agreement with the property owner.

CCS – Certification of Continuing Suitability; dBA – decibels, A-scale; ICBM – intercontinental ballistic missile; PSC – Public Service Commission; PSC Order – Order issuing Certificate of Site Compatibility Number 29

Table 10 below identifies the occupied residences in or near the Project site, the status of the residence (participating or non-participating), the distance from the residence to the nearest turbine, and the closest turbine to each residence (see also Figure 3). As shown in Table 10, the Project complies with the PSC and County setbacks from occupied residences. Note that, with the exception of the nine minor turbine shifts, the 49 turbine locations evaluated are the same locations as were evaluated in the August 2011 PSC CCS application; however, a different geographic coordinate system was used for the current analysis than was used in 2011. As a result, the distances from receptors to turbines shown in Table 10

may be slightly different than were shown in Hearing Exhibit No. 4. A discussion of compliance with the sound avoidance area setback requirement is provided in Section 3.3.

Table 10: Setback Distances from Residences

Residence	Status	Distance to Turbine (feet)	Closest Turbine
3	Participating	1,423	T-24
12	Participating	1,431	T-08*
44	Participating	1,441	T-47*
2	Participating	1,473	T-33
1	Participating	1,711	T-32*
13	Participating	1,888	T-08*
7	Participating	2,004	T-06*
14	Participating	2,011	T-16
4	Participating	2,206	T-50
11	Non-participating	2,469	T-01
5	Participating	2,500	T-16
42	Non-participating	2,539	T-01
21	Non-participating	2,599	T-34
8	Non-participating	2,745	T-19
6	Participating	2,785	T-46
9	Participating	2,929	T-01
10	Non-participating	2,945	T-01
15	Non-participating	2,964	T-46
43	Non-participating	3,108	T-01
31	Non-participating	3,193	T-43
35	Participating	3,396	T-01
24	Non-participating	3,587	T-34
29	Non-participating	4,084	T-30
40	Non-participating	4,146	T-30
22	Non-participating	4,252	T-46
18	Non-participating	4,526	T-64
28	Non-participating	4,926	T-30
23	Non-participating	5,053	T-21
25	Non-participating	5,178	T-34
27	Non-participating	5,428	T-30
26	Non-participating	5,432	T-34
32	Non-participating	5,585	T-29
30	Non-participating	5,873	T-34
47	Non-participating	6,651	T-44
38	Non-participating	6,953	T-30

Table 10: Setback Distances from Residences

Residence	Status	Distance to Turbine (feet)	Closest Turbine
16	Non-participating	7,055	T-01
39	Non-participating	7,241	T-30
17	Non-participating	7,354	T-46
37	Non-participating	8,300	T-43
36	Non-participating	8,778	T-64
41	Non-participating	10,593	T-29
33	Non-participating	11,166	T-01
34	Non-participating	12,179	T-01
45	Non-participating	12,194	T-42
46	Non-participating	13,246	T-42
19	Non-participating	14,328	T-17
20	Non-participating	15,742	T-17

* minor shift to turbine to comply with setback

3. Updated Environmental Analysis

A detailed environmental analysis was conducted for the Project as part of the August 2011 CSC Application. For several resources, the original analysis presented in the August 2011 CSC Application has not substantially changed for the current Project (as described in Section 1 of this Environmental Report). For other resources, Meadowlark conducted additional studies and analyses to confirm that the Project site continues to meet the conditions upon which the CSC was issued. Table 11 below identifies each section of the environmental analysis provided in the August 2011 CSC Application and, where applicable, indicates where updates to the analysis are provided in this Environmental Report.

Table 11: Updates to Environmental Analysis Sections

August 2011 CSC Application Environmental Analysis Section	Current Project
Section 7.1 Description of Environmental Setting	No update needed.
Section 7.2 Demographics	No update needed.
Section 7.3 Land Use and Managed Lands	See Section 3.1 of Environmental Report for updates.
Section 7.4 Public Services and Existing Infrastructure	See Section 3.2 of Environmental Report for updates.
Section 7.5 Human Health and Safety	No update needed.
Section 7.6 Sound and Noise	See Section 3.3 of Environmental Report for updates.
Section 7.7 Cultural and Archaeological Resources	See Section 3.4 of Environmental Report for updates.
Section 7.8 Recreational Resources	No update needed.
Section 7.9 Visual Resources	See Section 3.5 of Environmental Report for updates.
Section 7.10 Effects on Land-Based Economies	No update needed.
Section 7.11 Soils, Geology, and Groundwater	No update needed.
Section 7.12 Surface Water and Floodplains	No update needed.
Section 7.13 Wetlands	See Section 3.6 of Environmental Report for updates.
Section 7.14 Vegetation	No update needed.
Section 7.15 Wildlife	See Section 3.7 of Environmental Report for updates.
Section 7.16 Rare and Unique Natural Resources	See Section 3.8 of Environmental Report for updates.

A summary of potential impacts and mitigation measures for the resources in Table 11 are discussed in Table 7.17-1 of the August 2011 CSC Application. Updated information, including the results of any additional studies and analyses, as well as discussions of agency consultation and mitigation, as applicable, are provided in the following sections. Copies of study reports referenced are included in Appendices A through K.

3.1 Land Use and Managed Lands

There have been no changes in land ownership or management within or adjacent to the Project Area including no new development, or new state or federal interests. The McHenry County Comprehensive Plan 2015-2035 has no existing or future land uses in the southwestern corner of the county and no identified future growth nodes. The Project may cross Conservation Reserve Program (CRP) lands managed by the U.S. Department of Agriculture Farm Service Agency (FSA). According to data received

from NRCS there are CRP lands within the Project Area. Meadowlark will work with the FSA and individual landowners of the identified CRP land. See additional discussion in Section 4.11 of this report.

3.2 Public Services and Existing Infrastructure

Based on available data, no significant changes to the existing infrastructure were identified in the Project Area.

Meadowlark updated its microwave beam path and Federal Communications Commission (FCC) assessment, as well as its aviation/airspace assessment, and confirmed that the Project will not negatively impact those resources. The assessment results are discussed further below.

3.2.1 Microwave Beam Path/FCC Assessment

An engineering study and report was prepared on September 6, 2016 to describe the analysis and determination of the locations of federally-licensed (FCC) microwave and fixed station radio frequency (RF) facilities that may be adversely impacted as a result of the construction of the Project (see Appendix A).

Microwave Interference

Using industry standard procedures and FCC databases, a search was conducted to determine the presence of any existing microwave paths crossing the Project Area, land mobile and other RF facilities within or adjacent to the identified area and broadcast signals receivable in the area. Within two miles of the Project Area, the study identified one licensed land mobile station from the FCC database, which is located within the Project Area. The proposed turbine that is closest to the land mobile station (Turbine 6) is 600 meters from the station site. Since Turbine 6 is not within the near-field zone, interference to microwave paths is not expected. The near-field zone of a transmission is the distance within which metal structures such as wind turbines may cause undesirable electromagnetic coupling with the transmitting antenna. No adverse impact is expected to be caused to the transmissions of land mobile stations known to be in the area.

TV Broadcast Facilities

Regarding potential impacts to over-the-air broadcast TV reception, television stations in the Minot area are predicted to reach the Project Area with a satisfactory over-the-air signal. It is anticipated that there are approximately 46 households within an area likely to be affected (approximately 65 square miles). It is conservatively estimated that 35 percent, or 16, of the households receive TV programming primarily by satellite dish or cable. This leaves an estimated 30 households relying on transmitted off-the-air TV signals. The study concluded that any disruptions to over-the-air TV broadcast signals, if they occur, can be resolved satisfactorily through mitigation such as making minor upgrades to antennas or satellite subscriptions.

AM Facilities

Regarding potential impacts to transmitted signals of AM broadcast stations, a search of the FCC's database revealed no AM facilities within the required notification distance of three kilometers from the Project boundary. Occasionally, depending upon ground conditions, local AM receivers may experience

slight signal changes due to local effects, but such anomalies are not recognized by the FCC or the standards of good engineering practice as having an unduly adverse effect.

Cell Phone Reception
There are no known cellular phone towers registered with the FCC that are less than 1.5 kilometers from any part of the Project Area. Therefore, the proposed wind project should not disrupt cell phone service in the area.

Department of Defense Radar Concerns
The Department of Defense and the Department of Homeland Security Long Range Radar Joint Program Office has adopted a "pre-screening tool" to evaluate the impact of wind turbines on air defense long-range radar. This tool was applied to the Project Area, and it returned a result of "no anticipated impact to Air Defense and Homeland Security radars". However, a definitive determination is obtained only after formal study by the Department of Defense, which is triggered by the Federal Aviation Administration (FAA) 7460-1 notification process. Meadowlark filed 49 forms 7460-1 with FAA on November 16, 2016.

NEXRAD
Operation of RF frequencies for federal government use is managed by the National Telecommunication Information Agency (NTIA), which is part of the U.S. Department of Commerce. The technical specifications for most government facilities are unavailable to the public. On August 29, 2016, a notification of the Project was sent to the NTIA. On November 1, 2016, the NTIA submitted a response stating that the U.S. Department of Commerce and the Department of Energy Western Area Power Administration identified concerns regarding potential impacts to radar systems from the Project.

A pre-screening tool has been developed to evaluate the potential impact of obstructions to the NEXRAD Weather Surveillance Doppler Radar Stations. This tool was applied to the Project Area, and it returned a result of "some impacts possible" to weather radar operations. Meadowlark is in contact with the U.S. Department of Commerce and the Department of Energy Western Area Power Administration to confirm that the Project will not interfere with radar systems.

The updated Microwave Beam Path/FCC Assessment Report for the Project is included in Appendix A.

3.2.2 Aviation/Airspace Assessment

On September 6, 2016 Aviation Systems, Inc. evaluated the feasibility of the Project from an aviation and airspace point of view (see Appendix B). The analytical findings are listed below:

- The Project would not impact Low Altitude Enroute Airways or Minimum Vectoring Altitudes.
- Impact is unlikely to Joint Use Long Range Radar. Further Radar study is not necessary.
- Minimum impact is expected to NEXRAD weather radar. Further weather radar impact study is not necessary.
- The Project is outside any Military Operations Areas or Restricted Areas. However, there is a Military Training Route (IR-678) that overlies the Project with floors as low as 450 feet above ground level. According to FAA Order JO 7400.2K, a proposed structure's location on a Military Training Route is not a basis for determining it to be a Hazard to Air Navigation. However, the FAA submits proposed

projects to the Department of Defense Siting Clearinghouse for review and the military may, in some cases, object to the Project's impacts on their operations and mission sustainability. In such situations, attempts are made to find a middle ground between the military's need to protect their airspace assets and the proponent's interests in the Project. This step, if at all necessary, would be taken if and when the Project is submitted to the FAA for review, with detailed turbine locations and heights. On November 16, 2016, Meadowlark filed 49 forms 7460-1 with the FAA. Meadowlark had previously obtained a Determination of No Hazard to Air Navigation (DNH) from the FAA for each of the original 66 turbine locations at 495 feet. Meadowlark is coordinating directly with the U.S. Air Force (USAF) (see Section 4.11). The FAA will consult with the USAF regarding the military training route during the DNH review process.

- Within Sector A, which reaches the "Target Height", and notwithstanding any potential military objections, 499 feet above ground level turbines should be approved anywhere in the Sector (the total height of all turbines being considered is less than 495 feet).

The updated Aviation/Airspace Report for the Project is included in Appendix B.

3.3 Sound and Noise

At the time the CSC was issued, the PSC did not have a specific requirement in its rules with respect to sound. However, prior to the public hearing, Meadowlark conducted an acoustic modeling analysis for each of the turbine models under consideration with conservative assumptions (e.g., full rotational speed; flat terrain; all turbine locations, including alternates) for the Project (Hearing Exhibit No. 11 – Acoustic Assessment Report, dated December 2, 2011). Based on the analysis, the expected operational sound levels at nearby residences ranged from less than 32.6 dBA to 48.5 dBA, with the highest expected sound level for a non-participating residence at 42.1 dBA (see Finding of Fact No. 32).

Since issuance of the CSC, the PSC adopted NDAC Section 69-06-08-01(4), which states: "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 50 dBA. The sound level avoidance area criteria may be waived in writing by the owner of the occupied residence or the community building."

Using the current Project layout, which consists of only 49 potential turbine locations, and the current turbine models under consideration, Meadowlark prepared an updated acoustic modeling analysis for the Project (see Appendix C). Operational turbines were evaluated at 49 potential locations and four different wind turbines models were evaluated. For each turbine, acoustic analyses for three different modeling scenarios was performed. Scenarios included wind turbine operation at cut-in wind speed, as well as maximum rotational wind speed under both moderate downwind and anomalous meteorological conditions. The overall objective of this study was to determine the feasibility of the Project to operate in compliance with the PSC's 50 dBA noise limit applicable within 100 feet of an occupied residence or community building.

The results of the acoustic assessment show that the Project will comply with the PSC's sound level avoidance area criteria at all receptors, except for five participating landowner residences, which may experience sound levels above the applicable noise limit under certain circumstances. Meadowlark has

obtained written waivers of the sound level avoidance area criteria from those landowners, and copies are provided in Appendix D.

3.4 Cultural and Archaeological Resources

At the time the CSC was issued, Meadowlark had completed a Class I literature search, a Class II historic structure survey, and a Class III cultural resource inventory for the Project. No historic structures were identified as eligible for listing on the National Register of Historic Places (NRHP), and three cultural resource sites were identified that remained unevaluated for NRHP-listing eligibility (see Hearing Exhibit No. 9, late-filed Hearing Exhibit No. 9a and Finding of Fact No. 22 of the PSC Order). The State Historical Society of North Dakota (SHSND), SHPO concurred with a "No Significant Sites" affected determination, so long as the three unevaluated cultural resources were avoided (see late-filed Exhibit 9a and Finding of Fact No. 23 of the PSC Order). At the time the CSC was issued, the Project's layout avoided the three unevaluated cultural resources (see Finding of Fact No. 22 of the PSC Order).

Meadowlark contacted the SHPO in August 2016 to re-introduce the Project. The SHPO reviewed the previous Class III archeological survey and responded to Meadowlark with a series of recommendations for the Project. These recommendations included a Class I file search, a Class III pedestrian survey for standing buildings and structures, and a Class III archeological survey of additional direct impacts that were not previously surveyed (i.e. wider turning radii for construction and one collection line shift to comply with USAF cable setbacks). At the time the CSC was issued, the SHSND required a Class II windshield inventory for standing structures in the visual area of potential effect (APE); currently the SHSND requires a Class III pedestrian survey for historic properties within a two mile buffer of the Project. SHPO correspondence can be found in Appendix N.

Since Project layout changes are within the prior survey corridors, the previous cultural and archeological resource studies are still valid for the Project. Meadowlark's environmental consultant, Tetra Tech, Inc. (Tetra Tech), conducted a Class I site file search and literature review for the Project through the SHPO on July 20, 2016 (see Appendix E). The site file search covered a one-mile-buffer around the Project Area, referred to as the "Research area." Tetra Tech verified that no new inventories have been conducted and no new cultural resources have been identified within the Research area since the Project's 2011 Class III cultural resources inventory (Harty and Asbury 2011).

In accordance with the SHPO's recommendations, Tetra Tech conducted a Class III survey by a permitted architectural historian of buildings and structures (including cemeteries over 50 years old) in the visual APE. Tetra Tech assessed 71 resources within the visual APE. Twenty-one of these properties appear to have no buildings more than 50 years old, so they are not considered historic. Six properties contained at least one feature that retains sufficient significance and integrity to be formally recorded on SHSND architectural site forms. None of the properties or their individual features are recommended as potentially eligible for listing on the NRHP (see Appendix F).

Additionally, Tetra Tech conducted a Class III cultural resources inventory of 43 additional locations (181.74 total acres) that would allow for 42 larger turning radii and one relocation of a collection line in support of the construction of the Project. The 42 radii are located at proposed and existing intersections where a larger turning radius is necessary to transport the Project's heavy equipment and materials. The

one collection line survey area measures 975 feet long by 100 feet long. This survey was conducted in accordance with SHPO's recommendations to survey additional direct impacts that were not previously surveyed (see Appendix G). The pedestrian surveys identified one previously unidentified archaeological site, consisting of a concrete foundation. The site is recommended as not eligible for listing on the NRHP.

All 2016 cultural resources survey reports will be submitted to the SHPO for concurrence. SHPO concurrence letters will be provided to the PSC upon receipt.

All Project facilities have been surveyed for cultural resources. If any changes are made to the layout outside of previously surveyed areas, these changes will be surveyed for cultural resources. The Project avoids the three identified unevaluated cultural resource sites present within the Project Area. Therefore, with respect to cultural and archaeological resources, the Project continues to meet the conditions upon which the CSC was issued (see Finding of Fact Nos. 22 and 23 of the PSC Order).

3.5 Visual Resources

With respect to the Project's potential visual impacts to the quality of the site, the analysis has not changed from what is provided in Section 7.9 of the August 2011 CSC Application, except the number of proposed turbines has been reduced, which would reduce the number of potential turbines on the site.

Shadow flicker impacts are not regulated in applicable county, 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 conversion facility. However, prior to the public hearing, Meadowlark conducted a shadow flicker analysis to determine estimated shadow flicker levels at residences in and near the Project Area (Hearing Exhibit No. 12 – Shadow Flicker Analysis Report, dated December 2, 2011). Based on the analysis, three residences owned by participating landowners were identified as potentially having shadow flicker levels of over 30 hours per year. Meadowlark had communicated the information to the affected landowners, and no concerns were raised (see Finding of Fact No. 33 of the PSC Order).

Using the current Project layout, which consists of only 49 potential turbine locations, and the current turbine models under consideration, Meadowlark has prepared an updated shadow flicker analysis for the Project (see Appendix H).

The shadow flicker analysis concluded that there are a total of 47 residential structures identified within and near the Project Area as occupied or potentially occupied residences considered potential shadow-flicker receptors for the purpose of the analysis. A receptor in the model is defined as a one meter squared area (approximate size of a typical window), 3.28 feet (one meter) above ground level. Approximate eye level is set at 4.94 feet (1.5 meters).

Because the Project is using a minimum turbine siting setback requirement of 1,400 feet to occupied residences, the most sensitive receptors are generally not located in the high potential shadow flicker impact zones. There are five occupied receptors (Receptors 2, 3, 5, 12, and 44) with potential shadow flicker impacts greater than 30 hours per year. All of these residences are owned by landowners that are participating in the Project. Receptors 2, 3, 5, and 12 from the current study correspond to the worst-case receptors in the 2011 shadow flicker study (Receptors M, H, and O with anticipated impacts greater than

30 hours and Receptor K with anticipated impacts just below 30 hours). Receptor 44 is a structure that was not in existence in 2011, therefore this receptor was not analyzed in the 2011 shadow flicker analysis.

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 within acceptable ranges for avoiding nuisance conditions. There are five occupied receptors with potential shadow flicker impacts greater than 30 hours per year; however, all of these residences are owned by landowners that are participating in the Project. Meadowlark has communicated this information to the landowners, and the landowners have executed written acknowledgments, copies of which are provided in Appendix D. In the event that flicker mitigation is necessary, Meadowlark will work with individual landowners to address issues, and the mitigation measures employed may include adding vegetative screening or installing curtains or blinds on the windows facing the turbine casting shadows.

3.6 Wetlands

In February 2012, an approved jurisdictional determination (JD) for the Project, based on the 2011 Wetland Delineation Report, was completed and provided to Meadowlark by the U.S. Army Corps of Engineers (USACE). Per the 2011 Wetland Delineation Report and approved JD, one wetland was determined jurisdictional, and the Project would have approximately 0.085 acres of impacts to this jurisdictional wetland. The JD from the USACE states that it will be valid for a period of five years from the date of the letter (February 24, 2012), therefore the JD is still valid for the Project. Meadowlark contacted the USACE and confirmed that the JD is still valid for the Project (see Section 4.11 of this Environmental Report).

The only changes to the Project layout have been to eliminate turbine locations and the associated facilities for those locations (i.e., access roads and collection/communication lines), and Meadowlark made minor shifts to nine turbines to comply with current setback requirements (see Section 2.5). The current Project layout would have temporary impacts of 0.085 acres to one jurisdictional wetland; this is the same impact as discussed in the 2011 Wetland Delineation Report and covered under the approved JD for the Project. Since permanent impacts from the Project to jurisdictional wetlands will be below 1/10th of an acre, preconstruction notification under nationwide permits (NWP) 12 and 14 is not required for the Project. In addition to avoidance and compliance with applicable permits, Meadowlark plans to employ the following mitigative measures set forth in the August 2011 CSC Application to minimize impacts to wetlands: following requirements of the National Pollutant Discharge Elimination System (NPDES) and stormwater pollution prevention plan (SWPPP) during construction, following the *Construction and Environmental Disturbance Requirements* as provided by the North Dakota Department of Health, and using Best Management Practices during construction and operation of the Project to protect topsoil and adjacent wetland resources and to minimize soil erosion. Therefore, with respect to wetlands, the Project continues to meet the conditions upon which the CSC was issued (see Finding of Fact Nos. 25 and 34 of the PSC Order).

3.7 Wildlife

Since the issuance of the CSC, Meadowlark has conducted additional wildlife studies and analyses for the Project, which are discussed in the following sections. Based on the additional studies and analyses conducted, with respect to wildlife, the Project site continues to meet the conditions upon which the CSC was issued.

3.7.1 Avian Surveys

Wind energy provides a clean, renewable energy source; however, birds have been identified as a species group potentially impacted by wind energy development from collisions with structures (e.g. power lines and wind turbine blades) and displacement due to the presence of the associated structures (Erickson et al. 2014, Loss et al. 2015, Manville 2016). As a result, pre-construction avian surveys are often initiated to better understand any potential impact to local and migratory species of birds. The point-count surveys, initiated on March 30, 2016, are ongoing and scheduled to continue through mid-November 2016; however, interim results are discussed below.

Bi-weekly surveys (every other week) were performed at the Project from March 30 through August 2, 2016, which included spring and summer migration and breeding seasons, for a total of ten survey rounds. Avian use surveys were conducted at nine point-count locations (fixed 800-meter radius) distributed throughout the Project Area for 20-minutes at each point-count location. A total of 10,139 birds from 119 identified species and 10 individuals from unidentified hawk species were observed during avian use surveys. The species with the highest overall mean use were the red-winged blackbird, horned lark, Franklin's gull and mallard (35.68, 18.17, 9.47 and 5.23 birds per 20 minutes, respectively) and have the highest likelihood for potential turbine collisions. Overall raptor use at the Project was moderate (1.26 birds per 20 minutes) during the 2016 avian use surveys. The red-tailed hawk had the highest mean use overall for raptors (0.62 birds per 20 minutes) which is relatively low use of the Project and a low potential for turbine collisions. No federally listed threatened or endangered species were detected during the 2016 point-count surveys.

The species with overall highest mean use, the red-winged blackbird, horned lark, Franklin's gull and mallard, are unlikely to suffer population impacts if mortality to individuals is caused by Project infrastructure, as the species populations in North Dakota are large and widely distributed (PIFSC 2013, Sauer et al. 2014). For raptor species, while fatalities of red-tailed hawks have occurred at wind facilities, fatalities of red-tailed hawks at the Project are expected to be uncommon based on the relatively low rate of use. Furthermore, any fatalities at the Project are not expected to have population-level impacts because North Dakota red-tailed hawk populations are large and relatively stable (PIFSC 2013, Sauer et al. 2014).

Currently, the results of the avian surveys indicate an overall low impact to residential and migratory bird species identified within the Project Area. An interim memo of results of avian surveys conducted at the Project between March 30, 2016 and August 2, 2016 is included as Appendix I.

3.7.2 Eagle Surveys

Under authority of the federal Bald and Golden Eagle Protection Act (BGEPA; 16 United States Code 668–668d), bald eagles (*Haliaeetus leucocephalus*) and golden eagles (*Aquila chrysaetos*) are afforded additional legal protection. U.S. Fish and Wildlife Service (USFWS) promulgated regulations in 2009 that provided for a permitting framework for incidental take associated with otherwise lawful activities, including wind energy, under the existing BGEPA (50 Code of Federal Regulation 22.26). Applications for incidental take permits under BGEPA are being considered by USFWS for bald eagles throughout the contiguous United States. Incidental take permits for golden eagles are available only to projects located west of the 100th meridian (USFWS 2013a). The Draft Eagle Conservation Plan Guidance, that outlines the recommended steps for permit applicants, was released by USFWS in February 2011 (USFWS 2011), with revised technical appendices released in August 2012 (USFWS 2012b). USFWS released Eagle Conservation Plan Guidance, Module 1 – Land-based Wind Energy: Version 2 (USFWS 2013a) in April 2013.

Bald eagles may occur in North Dakota as breeders, winter residents, migrants, or year-round residents. The nesting period in North Dakota begins in January with nest building or maintenance and ends when the young fledge, typically in July (Johnson 2010). Golden eagles are common in North America west of the 100th meridian, and small populations are also present in the eastern portions of Canada and the United States (Kochert et al. 2002). Both year-round and migratory golden eagles occur in North Dakota (NDGF 2016). Golden eagles in the western United States are most commonly associated with open and semi-open habitats such as shrublands, grasslands, woodland-brushlands, and coniferous forests as well as in farmland and riparian habitats (Kochert et al. 2002). Golden eagles in North Dakota nest mainly west of the Missouri River (Johnson 2015) and egg-laying occurs from late March to early May (Stewart 1975, DeLong 2004). Both species of eagles may occur within the Project Area during the non-breeding season and both have the potential to nest within the Project Area during their North Dakota breeding seasons.

As discussed further below, Meadowlark conducted updated raptor nest surveys and eagle use surveys for the Project. No eagle nests were found within the Project Area, and eagle use survey results showed low use of the Project Area by eagles.

3.7.2.1 Raptor Nest Surveys

Raptor nest surveys were conducted aerially on March 14-15, 2016, with ground-based follow up occurring continuously between mid-April and June 2016. Eight raptor nests were observed within the Raptor Survey Area (Project Area and a two-mile buffer of the Project boundary). Raptor nests detected within the Raptor Survey Area included four Occupied Active great-horned owl nests (two are within the Project boundary), three Occupied Active red-tailed hawk nests (all three are within the Project boundary), and one unoccupied stick nest (not within the Project boundary).

Eagle nest surveys were conducted for a ten mile area around the Project boundary. Two new occupied and one historical unoccupied bald eagle nest were identified outside of the Project Area and Raptor Survey Area. No eagle nests were located within the Project Area. One of the occupied nests was adjacent to a historical unoccupied nest (location of the historical nest was provided by North Dakota

Game and Fish [NDGF]); both of these nests are located just beyond the 10-mile buffer of the Project Area. The other occupied bald eagle nest is about eight miles to the northwest of the Project Area. While no eagle nests were identified in the raptor nest study conducted in 2011, the survey area only extended two miles from the Project Area. A copy of the raptor nest survey report is included in the interim memo of results of avian surveys as Appendix I.

3.7.2.2 Eagle Use Surveys

Eagle use surveys were conducted biweekly from March 30, 2016 through August 2, 2016, which capture the spring and most of the summer seasons (March 16 – June 15 and June 16 – August 15, respectively). The summer season extends until August 15; results for the full summer season will be presented in the final report. Nine eagle survey points were established in March 2016 within the Project Area to provide spatial coverage of approximately 30 percent of a one-kilometer buffer around the proposed turbine locations (dated March 22, 2016), consistent with recommendations in the Eagle Conservation Plan Guidance, Module 1 – Land-based Wind Energy: Version 2 (USFWS 2013a). Surveys included 60 minutes of eagle use surveys conducted concurrently with 20 minutes of general avian surveys during the first 20 minutes of each eagle survey (total of one hour of survey time at each point-count location). The total eagle survey time at the Project Area was 90 hours.

One adult and one immature bald eagle and no golden eagles were observed during 90 hours of monitoring during eagle use surveys. Both bald eagle observations occurred separately on March 31, 2016. A total of three eagle exposure minutes were recorded for these two observations and accounted for the total number of eagle exposure minutes recorded during 10 rounds of surveys. Overall mean use, calculated as the total number of eagles observed divided by the total number of observation hours, was 0.02 eagles per hour. Results of the survey show a low use of the Project Area by eagles. Three bald eagles and one golden eagle were observed prior to, or during, the eagle use surveys but outside of the 800-meter radius survey area. These sightings occurred between March 29 – April 14, 2016 and are considered “incidental” and not included in the eagle exposure minutes calculation. An interim memo of results of eagle use surveys conducted at the Project between March 16, 2016 and August 15, 2016, along with details of the incidental sightings, is included as Appendix J.

3.7.3 Bat Acoustical Monitoring Surveys

Capital Power contracted Tetra Tech to perform acoustic monitoring surveys for bat species in the Project Area from spring through the fall of 2016 in order to capture activity associated with spring migration, summer residency, and fall migration periods. An interim memo of results of bat acoustic monitoring conducted at the Project between April 13, 2016 and July 17, 2016 is included as Appendix K.

The objective of acoustic monitoring is to assess bat occurrence and use of the Project Area by local and migratory bat species. Tetra Tech used Wildlife Acoustic Song Meter SM3BAT Monitoring Systems (bat detectors) for the duration of the acoustic monitoring survey. Each bat detector station consisted of the acoustic detector, powered by a 20-watt solar panel and a 12-volt battery, encased in a waterproof housing. The SM3-U1 microphone was elevated to approximately 1.5 meters to avoid vegetation and attached to the recording unit by a high-quality, low-loss three-meter microphone cable. Each bat detector was manually checked by trained technicians approximately twice per month during the survey period.

Tetra Tech deployed four ground-based bat detectors within the Project Area on April 13, 2016. Sampling sites were located within representative habitats within the Project Area, in areas with potential for high bat activity and diversity, and in areas available for access under existing lease agreements.

During the spring and early summer survey period, 350 detector-nights were monitored over 96 calendar nights between April 13 and July 17. Based on the preliminary, interim analysis, five bat species were confirmed within the Project Area. Little brown bat is considered the most common and widespread bat in North Dakota (Johnson and Isakson 2014) and accounted for 83 percent of bat passes recorded. Migratory tree bats (eastern red bat, hoary bat, and silver-haired bat) accounted for the remaining 17 percent. Less than one percent belonged to big brown bat. No northern long-eared bat (NLEB; *Myotis septentrionalis*) passes were recorded (see Section 3.8.2.7 for further discussion of NLEB). Continued monitoring through late summer and fall allows for a complete annual assessment of temporal use by resident and migratory bat species within the Project Area during the seasons when bats are most active.

Despite a lack of empirical studies directly correlating pre-construction bat activity to post-construction bat fatality, bat acoustic monitoring provides baseline information on species present and the seasonal timing of activity. This information can provide useful insight for potential mitigation measures and facilitate the development of a successful wildlife conservation strategy.

3.7.4 Dakota Skipper Butterfly Occupancy Survey

The Dakota skipper (*Hesperia dacotae*) is a butterfly species federally protected as threatened under the Endangered Species Act, and its current range is now limited to scattered remnants of high quality native prairie in Minnesota, North Dakota, South Dakota, and southern Manitoba and Saskatchewan (USFWS 2015a). See Section 3.8.2.8 for further discussion of the Dakota skipper.

Meadowlark conducted a number of studies of the Project Area using qualified scientists to determine the likelihood of occurrence of Dakota skipper, including a desktop habitat analysis, ground-truthing survey of the Project Area, and a Dakota skipper occupancy survey (i.e., flight surveys) in accordance with protocol being recommended by the USFWS.

Tetra Tech coordinated implementation of Dakota skipper habitat assessments and flight surveys for the Project with the Bismarck office of the USFWS. The habitat assessments evaluated grassland habitat within the Project Area and identified areas that exhibit vegetative characteristics consistent with the presence of Dakota skippers. The habitat assessment included a subjective measure of the relative abundance of key indicator plant species (forbs and graminoids) used by the Dakota skipper. Following the habitat assessment, three grassland sites within the Project Area were chosen for flight surveys as they exhibited habitat characteristics suitable for the presence of Dakota skipper. Flight surveys to determine the presence of Dakota skippers were conducted within these three grassland sites following protocol in the *Dakota Skipper Guidance for Interagency Cooperation under Section 7 (a)(2) of the Endangered Species Act Version 1.0 USFWS, Regions 3 and 6*, February 2015. Dakota skippers were observed within one of the grassland sites surveyed during the 2016 surveys. Four Dakota skippers were observed within this site during the flight surveys. Additional details are provided within the New Frontier Dakota Skipper Occupancy Survey Report (see Appendix L).

Meadowlark has participated in several discussions with the USFWS regarding the Dakota skipper butterfly survey protocol and results (see Section 4.11 of this Environmental Report). In consultation with the USFWS, Meadowlark removed a turbine location, and associated access road and collector/ communications system components, in order to avoid Dakota skipper habitat. As a result, no impacts to the Dakota skipper are anticipated from construction and operation of the Project.

3.8 Rare and Unique Natural Resources Analysis

The NDGF maintains a list of Species of Conservation Priority but these species are not afforded any formal protection by the state of North Dakota and there are no state permitting requirements for them. Only species protected by the Endangered Species Act (ESA) are considered threatened or endangered in North Dakota. In 2015, the NDGF released an updated North Dakota State Wildlife Action Plan (Dyke et al. 2015) to replace the state's 2005 Comprehensive Wildlife Conservation Strategy. Twenty species were added to the list of Species of Conservation Priority and five were removed. Of the 20 species added, the following bird species may occur within the Project Area: lesser scaup (*Aythya affinis*), *rufa* red knot, American kestrel (*Falco sparverius*), and western meadowlark (*Sturnella neglecta*). In addition, the following added bat species may occur within the Project Area: Townsend's big-eared bat (*Corynorhinus townsendii*), big brown bat (*Eptesicus fuscus*), little brown bat (*Myotis lucifugus*), and northern long-eared bat (Dyke et al. 2015). Removed from the list of Species of Conservation Priority were two bird species that may occur within the Project Area: redhead (*Aythya americana*) and sedge wren (*Cistothorus platensis*; Dyke et al. 2015). North Dakota's Wildlife Action Plan focuses on species that are considered Species of Conservation Priority. They are categorized into three levels according to their conservation need:

- Level I: A species having a high level of conservation priority because of declining status either in North Dakota or across their range; or a high rate of occurrence in North Dakota constituting the core of the species' breeding range, but are at-risk range wide, and non-State Wildlife Grants funding is not readily available to them.
- Level II: Species having a moderate level of conservation priority; or a high level of conservation priority, but a substantial amount of non-State Wildlife Grant funding is available to them.
- Level III: North Dakota's species having a moderate level of conservation priority, but are believed to be peripheral or do not breed in North Dakota.

The following species were observed in the Project Area and are considered avian Species of Conservation Priority (Section 3.8.1) as detailed in the current North Dakota State Wildlife Action Plan.

3.8.1 Species of Conservation Priority

The following Species of Conservation Priority were observed during the avian surveys at the Project Area: Level I – American bittern, Swainson's hawk, ferruginous hawk, marbled godwit, Franklin's gull, black tern, lark bunting, chestnut-collared longspur; Level II – American white pelican, northern pintail, canvasback, lesser scaup, northern harrier, bald eagle (see Eagle Surveys above), American kestrel, sharp-tailed grouse (see grouse lek surveys below), American avocet, willet, upland sandpiper, short-eared owl, loggerhead shrike, dickcissel, bobolink, western and meadowlark. The majority of these species had under 35 individuals observed during the avian surveys which is a low mean use of 0.39

birds per 20 minutes or less for each species. As a result, fatalities, should they occur, are expected to be low and not impact these species' population. The exception being the larger numbers of Franklin's gull (852 individuals, 9.47 birds per 20 minutes), American white pelican (94 individuals, 1.04 birds per 20 minutes), lesser scaup (103 individuals, 1.14 birds per 20 minutes), and western meadowlark (62 individuals, 0.69 birds per 20 minutes). According to publicly available data, there have been no reported fatalities of Franklin's gulls or American white pelican, and only one lesser scaup fatality, at a wind farm. As a result, any fatalities, should they occur, are expected to be low. More than one fatality of Western meadowlark has been reported at wind farms from publicly available data. However, the population of western meadowlark is abundant over much of the western Unites States and Canada (PIFSC 2013, Sauer et al. 2014) and any fatalities, should they occur, are not expected to have any impacts to the population.

3.8.1.1 Grouse Lek Surveys

One of the more impacted species due to land development is grouse-like bird species native to the prairie regions of the United States and Canada (Manville 2016). One such species that occurs in North Dakota is the sharp-tailed grouse, which is a Level II Species of Conservation Priority and managed as a gamebird species by the NDGF. While not formally protected under any state law, NDGF has asked for any energy development project to include a detailed lek (areas where sharp-tailed grouse gather annually for mating) survey of the area to be developed.

Ground lek surveys were conducted in 2016 at 108 accessible survey points along public access roads in suitable habitat within one mile of the Project Area. Two rounds of surveys were conducted on six days from mid-April through mid-May 2016 to coincide with the prairie grouse breeding season. Two sharp-tailed grouse leks were detected within the Project Area and one-mile buffer. The location of Historic Lek H-MCW18, approximately 1 mile from the nearest proposed turbine location, was provided by NDGF and was confirmed active during this survey. Lek 1, approximately two miles from the nearest turbine location, was detected during the first round of surveys only. The number of displaying males ranged from two-12 (average across both leks = 7). No other grouse species were detected during surveys.

Sharp-tailed grouse often exhibit strong site fidelity (Connelly et al. 1998) and use traditional leks year after year. Based on the presence of the leks and availability of grassland habitat, there is the potential for Project-related impacts such as displacement of sharp-tailed grouse. However, per discussions with the NDGF, NDGF is not making lek buffer recommendations at this time. Meadowlark will take into account survey information when preparing its Wildlife Conservation Strategy (previously called Avian and Bat Protection Plan) for the Project.

3.8.2 Threatened and Endangered Species

Since issuance of the CSC, the USFWS has made public the Information for Planning Conservation (IPaC), which is an online planning tool designed to streamline the USFWS environmental review process. The IPaC provides the initial scoping process to determine if any threatened or endangered species, critical habitat, or other natural resources may be impacted by project development. Results of the IPaC assessment for the Project are available in Appendix M.

Since issuance of the CSC, three species that may occur within the Project Area were listed for protection under the ESA: rufa red knot (*Calidris canutus rufa*; threatened), northern long-eared bat (threatened), and Dakota skipper (threatened). One species, Sprague's pipit (*Anthus spragueii*), was removed from ESA-listing as a candidate species in April 2016.

ESA-listed species that may occur in the current Project Area are discussed in the sections that follow. For those species protected under the ESA at the time the CSC was issued, the analysis has not changed. For the additional ESA-listed species, the Project is not anticipated to impact those species.

3.8.2.1 Whooping Crane

The potential exists for whooping cranes (*Grus americana*) to fly through the area during migration. Whooping cranes generally migrate at 1,000-6,000 foot altitudes, well above turbine height (Stehn 2007), and thus 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 area. To date, no whooping cranes have been reported as being killed or injured by wind turbines (Loss et al. 2015, Manville 2016).

Western Ecosystems Technologies, Inc. completed desktop review and analysis of potential whooping crane habitat resources and compared these resources to areas outside of the Project Area to the north, south, east, and west (WEST 2011) (see Appendix C to the 2011 CSC Application). A focus of the analysis was to determine whether the Project Area contained the only suitable whooping crane stopover habitat in the area, or if areas outside of the Project Area also contained suitable whooping crane stopover habitat. The analysis showed that roosting and foraging habitats are plentiful outside of, as well as in, the Project Area; therefore, the Project Area does not contain the only suitable whooping crane stopover habitat in the area. Since the 2011 whooping crane habitat assessment, the overall whooping crane migration corridor has not changed and the Project Area has not changed. Therefore, results of the 2011 habitat analysis should still be applicable to the current Project Area. Meadowlark will use this information as part of the Wildlife Conservation Strategy (previously called Avian and Bat Protection Plan) that will be prepared for the Project.

3.8.2.2 Interior Least Tern

The interior population of the least tern was listed as endangered species in 1985 (USFWS 1985a). The species nests on barren sandbars on the Missouri River and feeds on small fish in the river (USFWS 1990b). In North Dakota, the interior least tern is primarily found on sandbars on the Missouri River between the Garrison Dam and Lake Oahe, in reservoirs, and on the Missouri and Yellowstone Rivers upstream of Lake Sakakawea (USFWS 1990b).

There are no preferred habitats within the Project Area and no least terns were observed during any biological surveys. It is possible, but unlikely, that least terns may fly through the Project Area during migration.

3.8.2.3 Pallid Sturgeon

The pallid sturgeon historically occupied the Mississippi and Missouri rivers and their major tributaries (USFWS 1990a). 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.

The pallid sturgeon is listed by USFWS as occurring in McHenry County however, there is no suitable habitat in the Project Area. As a result, the species is unlikely to occur in the Project Area.

3.8.2.4 Gray Wolf

The gray wolf was listed as endangered in 1974 (USFWS 2014b, USFWS 2014c). Gray wolves previously inhabited a large portion of the United States in a variety of habitats including tundra, forests, grasslands, and deserts. The gray wolf is extirpated from the lower 48 states with the exception of Minnesota, Wisconsin, Michigan, Montana, Idaho, and Washington (USFWS 2013c, WAPA and USFWS 2015). However, there have been documented occurrences of gray wolves in North Dakota during the 1990's (USFWS 2013c). The presence of wolves in most of North Dakota will likely remain sporadic and consist of occasional dispersing animals from Minnesota and Manitoba (USFWS 2013c).

The Project Area lacks forested areas known to support wolf pack establishment and persistence (USFWS 2012b). Furthermore, there are no known breeding populations in North Dakota (NDGF 2015). Therefore, this species is unlikely to occur within the Project Area and has a low likelihood of passing through the Project Area.

3.8.2.5 Piping Plover

The Great Plains population of the piping plover was listed as a threatened species in 1985 (USFWS 1985b). The plover nests in 23 counties in North Dakota, primarily in alkali wetlands in the Missouri Coteau Ecoregion with some habitat occurring on the Missouri River. Critical habitat for the piping plover was listed on September 11, 2002 (USFWS 2002), and includes the entire length of the Missouri River in North Dakota.

No piping plover designated critical habitat is present within the Project site, and no piping plovers were observed during any biological surveys. It is possible, but unlikely, that piping plovers may fly through the Project Area during migration.

3.8.2.6 Rufa Red Knot

The USFWS listed the rufa subspecies of red knot as threatened on December 11, 2014. The red knot is a medium sized shorebird that is found in the western hemisphere and is noted for its long-distance migrations of up to 9,320 miles between circumpolar breeding habitats and marine wintering habitats in southern latitudes of South America. Most of the known migration routes for the rufa subspecies are along coastal regions of Canada and the U.S. However, an interior migratory route was identified to and from the Arctic passing through Saskatchewan and Alberta, Canada through the Great Plains states to non-breeding areas mostly in Texas and Louisiana along coastal areas of the Gulf of Mexico (Skagen et al. 1999). Population sizes for knots are in decline around the world, especially *C. c. rufa*, which declined

from about 82,000 individuals in the 1980s to fewer than 30,000 in 2010 (Baker et al. 2013). Threats to the rufa red knot include the loss of habitat in both breeding and non-breeding areas; disruption of natural predator cycles on the breeding grounds; reduced prey availability at stopover areas and throughout the nonbreeding range; and increasing frequency and severity of asynchronies ("mismatches") in the timing of the birds' annual migratory cycle relative to favorable food and weather conditions (USFWS 2014d). To date, no red knot fatalities have been reported at a wind farm with publicly available data.

There is no preferred stopover habitat for red knots and the species was not detected within the Project Area during any of the onsite surveys. It is possible, but unlikely, that red knots may encounter the turbines within the Project Area during migration.

3.8.2.7 Northern Long-eared Bat

The NLEB was listed as threatened with an interim 4(d) rule effective May 4, 2015 (USFWS 2015c). A final 4(d) rule became effective on February 16, 2016. The final 4(d) rule limits the prohibition of incidental take to areas affected by white-nose syndrome (WNS) and an additional 150-mile buffer around this area (WNS Zone). Within the WNS Zone, incidental take is prohibited if it occurs within a hibernaculum, results from tree removal within 0.25 miles of a hibernaculum entrance, or results from tree removal within 150 feet of a known maternity roost tree. Incidental take is not prohibited outside of the WNS Zone and fatalities caused by collisions with wind turbines are explicitly excluded from the prohibition on incidental take, regardless of proximity to the WNS Zone. North Dakota, and the Project Area specifically, fall outside of the area where incidental take is prohibited as currently mapped by the USFWS (See Appendix K).

NLEB have been found from Maine to North Carolina on the Atlantic Coast, westward to eastern Oklahoma and north through the Dakotas, reaching into eastern Montana and Wyoming (USFWS 2013b). The northern long-eared bat is considered common only in discrete portions of its western range, including the Black Hills of South Dakota (USFWS 2013b). NLEB roost in trees during the spring, summer, and fall (USFWS 2013b). The species prefers large, contiguous tracks of upland forested habitat during the summer residency period. Suitable natural roosting habitats in the Project Area are limited to individual trees, wind breaks and woodlots (WEST 2011). NLEB do not undertake long-distance seasonal migrations between summer and winter ranges, but do perform shorter distance movements between summer roosts and winter hibernacula. These seasonal movements are generally between 35 miles and 55 miles, but may be substantially longer in some areas, perhaps as great as 168 miles (USFWS 2013b). Information on habitat use during migration is limited, but individuals in transit are likely to use foraging habitats at least part of the time. NLEB spend winter hibernating in caves and mines.

NLEB has a low likelihood to occur in the Project Area during the summer residency period (approximately May 15–August 15) because of the lack of suitable habitat (large contiguous forest) and due to the species being uncommon in the far western extent of its range, which includes the Project Area. Bat acoustical surveys conducted from April 13 to July 17 recorded 607 bat passes auto-classified as NLEB, for which 101 met quality standards and were manually reviewed. None were determined to be NLEB during manual review. No hibernacula have been documented within North Dakota (USFWS 2013b).

3.8.2.8 Dakota Skipper Butterfly

The Dakota skipper is a butterfly species federally protected as threatened under the Endangered Species Act. It is an obligate user of undisturbed high-quality native prairie. Although its historic range once consisted of vast, unbroken native prairie in the north-central U.S. and south-central Canada, its current range is now limited to scattered remnants of high quality native prairie in Minnesota, North Dakota, South Dakota, and southern Manitoba and Saskatchewan (USFWS 2015a). The Dakota skipper population has declined due to sensitivity to disturbances, such as grazing and fire, and the loss of native prairie habitat. Preferred habitat includes prairie dominated by little bluestem grass (*Schizachyrium scoparium*) and needlegrasses (e.g., *Hesperostipa spartea*), with the presence of wood lily (*Lilium philadelphicum*), bluebell bellflower (*Campanula rotundifolia*), purple coneflower (*Echinacea angustifolia*), upright prairie coneflower (*Ratibida columnifera*), common gaillardia (*Gaillardia aristata*), and/or Mountain deathcamas (smooth camas; *Zigadenus elegans*) (USFWS 2014a). Designated critical habitat for the Dakota skipper is located within McHenry County; however, no designated critical habitat occurs within the Project Area (USFWS 2015b). The closest designated critical habitat to the Project Area is approximately 25 miles to the northeast.

As discussed in Section 3.7.4, Meadowlark conducted a number of studies of the Project Area using qualified scientists to determine the likelihood of occurrence of Dakota skipper. Based on the study results, and consultation with the USFWS, Meadowlark removed one turbine location and its associated facilities in order to avoid Dakota skipper habitat. As a result, no impacts to the Dakota skipper are anticipated from construction or operation of the Project.

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4. Compliance with NDCC Section 49-22-09 Factors

As discussed below, based on analysis of the factors in NDCC Section 49-22-09, the Project site continues to meet the conditions upon which the CSC was issued.

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

Section 7 of the August 2011 CSC Application (see summary in Section 7.17) and this Environmental Report discuss the research and investigations relating to the potential effects of the Project on public health and welfare, natural resources, and the environment, as well as the proposed mitigation measures to avoid or minimize effects.

4.2 Technologies to Minimize Adverse Environmental Effects

As indicated in Section 10.2 of the August 2011 CSC Application, Meadowlark will utilize the most recent technologies to minimize impacts to the environment.

4.3 Potential for Beneficial Uses of Waste Energy

This factor is not applicable to the Project.

4.4 Unavoidable Adverse Environmental Effects

The unavoidable adverse environmental effects remain the same as set forth in Section 10.4 of the August 2011 CSC Application. See also Section 1.2 for an updated discussion of the maximum estimated temporary and permanent impacts for Project facilities.

4.5 Alternatives to the Proposed Site

No alternatives to the Project's designated site were proposed during the public hearing.

4.6 Irreversible and Irretrievable Commitment of Natural Resources

The irreversible and irretrievable commitments of natural resources remain the same as set forth in Section 10.6 of the August 2011 CSC Application.

4.7 Direct and Indirect Economic Impacts

As discussed in Section 10.7 of the August 2011 CSC Application, Project impacts will be minimal, since the landowners receive easement payments and the area around turbines can continue to be used for agricultural purposes. The Project will continue to provide short-term and long-term economic benefits to McHenry County and the state, including additional tax revenue, wages, and income from Project-related expenditures.

4.8 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. As discussed further in Section 4.11, Meadowlark has consulted with state agencies and McHenry County, and on October 4, 2016 obtained a conditional use permit (CUP) from McHenry County for the Project. To date, no issues related to existing development plans have been raised.

4.9 Effect of Site on Cultural Resources

As discussed in Section 3.4, Meadowlark has conducted cultural resource field surveys for the Project, and the Project layout avoids the three unevaluated cultural resources previously identified. All 2016 cultural resources survey reports will be submitted to the SHPO for concurrence. SHPO concurrence letters will be provided to the PSC upon receipt. Therefore, no impacts to cultural resources are anticipated.

4.10 Effect of Site on Biological Resources

The potential effect on biological resources remains the same as set forth in Section 10.10 of the August 2011 CSC Application. With respect to wildlife, Meadowlark plans to implement the mitigation measures outlined in Section 7.15.3 of the August 2011 CSC Application to avoid or minimize impacts, which include the following:

- Meadowlark will coordinate with USFWS and NDGF regarding wildlife and habitat impacts from the Project (see Section 4.11 for an update regarding agency consultation).
- Meadowlark will prepare and implement a Project-specific Wildlife Conservation Strategy (the Wildlife Conservation Strategy replaces the avian and bat protection plan referenced in the August 2011 CSC Application).
- Meadowlark will conduct post-construction bird and bat mortality monitoring.
- Meadowlark plans to place the electrical collection system from the turbines to the Project substation underground, if site conditions are favorable.
- Meadowlark will follow the applicable practices suggested by the Avian Powerline Interaction Committee (APLIC 2006).
- Meadowlark will avoid or minimize disturbance of individual wetlands or drainage systems to the extent possible.
- Meadowlark will protect existing trees and shrubs where practicable. If impacts are unavoidable, Meadowlark will replace existing trees and shrubs at a 2:1 ratio and will monitor plantings for three years, in accordance with the PSC's tree and shrub mitigation specifications.
- Meadowlark will maintain appropriate water and soil conservation practices during construction and operation of the Project to protect topsoil and adjacent resources and to minimize soil erosion.
- Meadowlark will revegetate disturbed non-cropland areas with a native seed mix recommended by Natural Resources Conservation Service.
- Meadowlark will establish and enforce reasonable driving speed limits on Project access roads to minimize potential for road killed wildlife or livestock that could attract foraging raptors.

In addition, Meadowlark plans to implement the following mitigation measures:

- Use the minimum number of aviation hazard lights acceptable to the FAA to avoid attracting migrating birds and bats to the turbines.
- Install motion-activated lighting or down-shielded lighting on other Project facilities that require lighting at night to avoid the potential to draw birds and bats toward the facility.
- Per conversation with the USFWS, Meadowlark selected a different turbine of the original 66 turbine locations to be included in the proposed 49 turbine layout to avoid all direct disturbances to suitable Dakota skipper habitat. This was deemed acceptable to the USFWS for mitigation of direct effects. Within 100 meters of occupied Dakota skipper habitat, Meadowlark will minimize traffic on Project access roads during the mobile flight period (June 18 through July 14), add magnesium chloride for dust abatement during construction, and treat roads to manage weeds. With respect to wetlands, Meadowlark plans to employ the mitigative measures set forth in the August 2011 CSC Application to minimize impacts to wetlands. These include avoidance of impacts to wetlands to the extent possible, obtaining appropriate permits from the USACE and the State of North Dakota, following requirements of the NPDES and SWPPP during construction, following the *Construction and Environmental Disturbance Requirements* as provided by the North Dakota Department of Health, and using Best Management Practices during construction and operation of the Project to protect topsoil and adjacent wetland resources and to minimize soil erosion.

4.11 Agency Comments

Since the issuance of the CSC, Meadowlark has continued to consult with state and federal agencies regarding the Project. Meadowlark sent out agency consultation letters in 2016 to all agencies that had previously commented on the Project. A summary of agency coordination since the issuance of the CSC is provided below and formal correspondence is included in Appendix N.

U.S. Fish and Wildlife Service Coordination

Capital Power, on behalf of Meadowlark, held conference calls and meetings with Kevin Shelley, Acting North Dakota Supervisor, of the USFWS, in September 2015 and January, April, July, and September 2016 to discuss the Project. The purpose of the initial discussions in September 2015 and January 2016 was to determine if additional Tier 3 studies should be conducted at the site in order to conclude the analysis of the site and move it forward into construction. Additionally, a biological resources site characterization memorandum was prepared for the Project and submitted to USFWS in October 2015. This memorandum was discussed with the USFWS during the January 2016 meeting. Subsequent to this discussion, Meadowlark's environmental consultant began conducting avian and bat studies at the Project (see Section 3.7.1, 3.7.2, and 3.7.3 of this report for description of avian and bat studies).

In April 2016, Meadowlark and USFWS discussed results of a desktop native prairie habitat assessment and plans for a field visit to ground-truth for native prairie, as well as a focused Dakota skipper occupancy survey. Kevin Shelley provided Meadowlark with a list of qualified surveyors for Dakota skipper. Subsequent to this conversation, Meadowlark retained a qualified surveyor, Scott Krych of HDR, to conduct Dakota skipper occupancy surveys at the Project during the skipper's flight stage in the Project

Area (June 28 – July 7; see Section 3.7.4 of this report for description of Dakota skipper butterfly occupancy survey).

The conversations with USFWS in July and September 2016 were primarily to discuss the results of the Dakota skipper occupancy surveys. Preliminary results of the avian and bat studies were also discussed, and Meadowlark provided updates regarding permitting and the schedule for construction of the Project. Meadowlark proposed mitigation to remove Project infrastructure from the Dakota skipper occupied habitat as identified during field surveys. Figures were provided to the USFWS showing the proposed Project infrastructure before and after the proposed mitigation. The modification was deemed acceptable to the USFWS for mitigation of direct effects. Kevin Shelley also recommended certain measures to avoid indirect effects, such as minimizing traffic on Project roads in the vicinity of habitat during the flight period, using magnesium chloride and water for dust abatement near habitat, and treatment of adjacent Project roads near habitat to manage weeds. Meadowlark plans to minimize traffic on Project access roads within 100 meters of occupied Dakota skipper habitat during the mobile flight period (June 28 through July 7), add magnesium chloride for dust abatement during construction, and treat roads to manage weeds.

In 2016, Tetra Tech conducted avian surveys (including eagles), as well as bat acoustical monitoring. Sections 3.7.1, 3.7.2, and 3.7.3 of this report discuss the preliminary results of these studies. Memoranda of preliminary results of these studies were provided to the USFWS, and were discussed with the USFWS on September 8, 2016 (see Appendices F, G, and H). Kevin Shelley requested that Meadowlark compare the current data with the previous work done on migratory birds to determine the current risk scenario to avian species. Kevin Shelley also requested a comparative analysis of impacts to native prairie from Project infrastructure from the original layout (66 turbines) versus the proposed layout (49 turbines). In addition, Kevin Shelley asked if there are any prairie dog towns within the Project Area and suggested obtaining prairie dog town data from NDGF to determine potential for eagle use of the Project. Memoranda were submitted to the USFWS to address these requests (see Appendices O and P), which are discussed below:

Tetra Tech prepared a memorandum that includes a comparison of the results of the Fall 2011 and the Spring and Summer 2016 avian surveys (Appendix O). Comparing the results from the 2011 and 2016 surveys is difficult because they occurred during different seasons of the year and had some differences in methodology. Nonetheless, there are no obvious patterns that would indicate a significant change in land use or habitat condition, and avian use indicates a low probability that the Project will significantly impact avian resources.

Also included in Appendix O is a comparison of total acres of native prairie and grasslands potentially impacted by the 66 turbine layout proposed in 2011 versus the 49 turbine layout currently proposed. Very little of the Project Area consists of good quality native prairie habitat. The majority of the grassland areas observed in the Project Area either lack native grasses and forbs, have a high cover of non-native grasses, and/or are being encroached by woody species such as silverberry and green ash. Overall, 75.3 acres of native prairie and grassland would be impacted under the currently proposed 49-turbine Project layout. However, only 17.8 acres of impacts (15.5 acres of temporary and 2.3 acres of permanent impacts) would occur in good quality prairie habitat. The 66-turbine Project layout proposed in 2011 would have impacted 87.0 acres of native prairie and grassland. This included 26 acres of impacts (22.8 acres

of temporary and 3.2 acres of permanent impacts) to good quality prairie habitat. The reduction in turbine numbers along with the re-siting of WTG 20 and the underground collection system near WTG 21 and WTG 22 to avoid Dakota Skipper habitat has reduced the Project's overall impact on native prairie by 13% and its permanent impact by 28%. These reductions will benefit grassland birds and other wildlife in the area.

Regarding prairie dog towns, in order to help determine if the presence of prairie dogs might serve as an attractant to eagles and other raptors, and better understand the potential risks and impacts to wildlife that may use the Project Area, Tetra Tech requested the location of any prairie dog town within two miles of the Project Area from NDGF. NDGF responded that there are no known prairie dog towns in or within two miles of the Project Area. This reduces the potential for eagles and other raptors to use the Project Area while foraging. See Appendix P for additional information.

North Dakota Game and Fish Department Coordination
In March 2016, Meadowlark and their environmental consultant, Tetra Tech, completed a data sharing agreement with the NDGF and obtained GIS shapefiles from the NDGF of bald and golden eagle nests, and sharp-tailed grouse lek locations within 10 miles of the Project.

In July 2016, Aaron Robinson, Upland Game Management Supervisor of the NDGF, spoke with Meadowlark's environmental consultant regarding buffers for sharp-tailed grouse leks. Aaron Robinson stated that the NDGF is not setting sharp-tailed grouse buffer recommendations at this time but instead have decided that more research is needed.

State Historical Society of North Dakota Coordination
In a letter dated September 2, 2016, the SHSND provided comments to Meadowlark regarding the Project. The SHSND reviewed the previous Class III archeological survey and recommended the following be conducted for the Project:

- Conduct a current Class I file search to determine any additional recorded cultural resources in the previously surveyed area.
- Conduct a Class III architectural survey for standing buildings and structures within a two-mile radius of turbines.
- Conduct a Class III archaeological survey for direct impacts not previously surveyed (i.e. expanded turning radii).

In accordance with the recommendations from SHSND, Meadowlark's environmental consultant has prepared an updated Class I file search. A Class III architectural survey was conducted by a permitted architectural historian. A Class III archaeological survey for direct impacts not previously surveyed was conducted for the Project. Results of these surveys are discussed in Section 3.4 of this report. At the time the CSC was issued, the SHSND required a Class II windshield inventory for standing structures in the visual APE; currently the SHSND requires a Class III pedestrian survey for historic properties within a two mile buffer of the Project.

All 2016 cultural resources survey reports will be submitted to the SHPO for concurrence. SHPO concurrence letters will be provided to the PSC upon receipt.

U.S. Air Force Coordination

Meadowlark reopened communications with the USAF in April 2016 regarding the Project. On August 25, 2016, the USAF provided regulations for crossing buried cable and stated that one collector line was within 45 feet of underground missile cables. This collector line was rerouted to be at least 100 feet from missile cables, to comply with the USAF's setback. The USAF is forwarding Meadowlark's request to the community planner and will contact Meadowlark after all internal agencies have reviewed the Project. Meadowlark will provide the PSC with additional coordination with USAF upon receipt.

U.S. Army Corps of Engineers Coordination

Capital Power, on behalf of Meadowlark, and their environmental consultant spoke with the USACE about the current JD for the Project. The USACE confirmed that the JD is valid until February 24, 2017. The USACE verified that Meadowlark would not need to prepare a Pre-Construction Notification under the current requirements for a NWP 12 because the impact for jurisdictional wetland D4-3b would be less than 1/10th of an acre under the current Project layout, and no additional impacts to jurisdictional wetlands are anticipated. Meadowlark has submitted a request to the USACE to re-verify the JD for an additional five years.

National Telecommunications and Information Administration Coordination

On August 29, 2016, the NTIA was provided data of the Project boundary and turbines to review the Project. On November 1, 2016, the NTIA submitted a response stating that the U.S. Department of Commerce and the Department of Energy Western Area Power Administration identified concerns regarding potential impacts to radar systems from the Project. Meadowlark is in contact with the U.S. Department of Commerce and the Department of Energy Western Area Power Administration to confirm that the Project will not interfere with radar systems.

North Dakota Department of Health Coordination

In a letter dated September 6, 2016, the North Dakota Department of Health provided comments regarding the Project. The North Dakota Department of Health stated that environmental impacts from the proposed construction will be minor and can be controlled by proper construction methods. The North Dakota Department of Health provided the following comments:

- Minimize fugitive dust emissions.
- Minimize adverse effects on a water body.
- Projects disturbing one or more acres are required to have a permit to discharge storm water runoff.
- Minimize noise levels by ensuring that construction activities are not conducted during early morning or late evening hours and that construction equipment is equipped with a recommended muffler.

The North Dakota Department of Health provided construction and environmental disturbance requirements for soils, surface waters, and fill material. Meadowlark will adhere to the construction and environmental disturbance requirements, and will minimize fugitive dust emissions, adverse effects to

water bodies, and noise levels as requested. Meadowlark will obtain a permit to discharge storm water runoff.

U.S. Department of Agriculture Farm Service Agency Coordination

In a letter dated September 8, 2016, the U.S. Department of Agriculture FSA provided comments regarding the Project. The FSA stated that land enrolled in CRP shall not have cover disturbed during the primary nesting and brood rearing season, April 15 through August 1, with exceptions if the existing cover is minimal. The FSA stated that if disturbance of the existing cover is minimal, a waiver of this provision could be granted. Meadowlark obtained CRP data for the Project Area from the FSA, and will either avoid disturbance to CRP land during the primary nesting and brood rearing season or will obtain a waiver from the FSA if necessary.

U.S. Department of Agriculture Natural Resources Conservation Service Coordination

In a letter dated September 19, 2016, the U.S. Department of Agriculture Natural Resources Conservation Service stated that the Project may remove farmland from production; therefore may be subject to the Farmland Protection Policy Act. The agency requested that Meadowlark complete the form NRCS-CPA-106 for all areas of the Project which could remove agricultural lands from production. Meadowlark will complete the form as requested after the turbine model is determined. The Natural Resources Conservation Service also provided guidelines for the installation of permanent structures where wetlands occur. The Farmland Protection Policy Act only applies to federal activities, therefore would not apply to the Project.

North Dakota Geological Survey Coordination

In an email dated September 8, 2016, the North Dakota Geological Survey provided comments regarding the Project. The North Dakota Geological Survey provided a graphic which depicts a landslide area mapped in the southern portion of the Project Area. No Project facilities are located within landslide areas (see Figure 2). See additional discussion in Section 2.2 of this report.

North Dakota Department of Transportation Coordination

In a letter dated September 13, 2016, the North Dakota Department of Transportation (NDDOT) provided comments regarding the Project. The NDDOT stated that the Project should have no adverse effect to NDDOT highways. Highways 41 and 53 have a seven ton seasonal restriction, and NDDOT reserves the right to change the seasonal restrictions or impose restrictions outside the typical spring thaw season. It will be necessary to make requests regarding load and access points to the NDDOT. If any work needs to be done on highway right-of-way, appropriate permits and risk management documents will need to be obtained from NDDOT. Meadowlark will coordinate with the NDDOT regarding seasonal restrictions on state highways and load and access points. Meadowlark will obtain all appropriate permits and risk management documents from NDDOT, as applicable.

North Dakota Parks and Recreation Department Coordination

In a letter dated September 15, 2016, the North Dakota Parks and Recreation Department (NDPRD) provided comments regarding the Project. NDPRD determined that the Project will not affect NDPRD-managed state park lands or Land and Water Conservation Fund lands. The North Dakota Natural Heritage biological conservation database was reviewed to determine if any plant or animal species of

concern or other significant ecological communities are known to occur within a one-mile radius of the Project Area. There are several documented plant, animal, and significant ecological community occurrences in the database within or adjacent to the Project Area. One plant species and six ecological communities of concern were identified within approximately one mile of the Project Area. The plant (Chamomile grapefern) does not occur within the Project Area boundary. Three of the communities (sedge marsh, mixed grass prairie, emergent marsh) are outside of the Project Area, therefore there would be no impact on those communities. Three of the ecological communities occur within the Project Area, including: brackish wet meadow, permanent open water, and wet prairie. No Project facilities will be constructed in permanent open water. A prairie desktop and field evaluation were conducted for the Project Area and Meadowlark will avoid native prairie, brackish wet meadow, and wet prairie communities to the extent possible (see additional discussion in Section 3.7.4).

The NDPRD suggests that all efforts be made to avoid impacts to wildlife species and their habitats. In an effort to avoid or minimize impacts to wildlife the NDPRD encourages proper evaluation of all potential wind energy sites. To identify and assess adverse impacts to wildlife the NDPRD suggests pre- and post-construction avian and bat monitoring studies be conducted. Meadowlark has conducted pre-construction avian and bat monitoring studies (see Sections 3.7.1, 3.7.2, and 3.7.3) and will conduct post-construction bird and bat mortality monitoring for the Project (see Section 4.10). Meadowlark will prepare a Project-specific Wildlife Conservation Strategy for the Project to avoid, minimize, and mitigate potential impacts to wildlife.

The NDPRD recommends that the Project be accomplished with minimal impacts and that all efforts be made to ensure that critical habitats not be disturbed in the Project Area to help secure rare species conservation in North Dakota. Regarding reclamation efforts, the NDPRD recommends that any impacted areas be revegetated with species native to the Project Area. Meadowlark has sited the Project to minimize impacts to critical habitats (see Section 3.8.2.8) and has committed to mitigation measures as described in Section 4.10.

McHenry County Coordination

Meadowlark has been coordinating with McHenry County regarding the local permitting requirements for the Project. In April 2016, Meadowlark met with the County to re-introduce the Project. In August and September 2016, Meadowlark and their environmental consultant had discussions with the County regarding CUP requirements for the Project. The Project CUP application was submitted to McHenry County on September 6, 2016 and was unanimously approved by the McHenry County Commissioners on October 4, 2016. Additionally, the transmission line CUP application was submitted to McHenry County October 14, 2016 and was unanimously approved by the McHenry County Commissioners on November 1, 2016.

5. Permits

Table 12 below provides updated information regarding permits required for the Project. The list is the same as was provided in Table 9.0-1 of the August 2011 CSC Application, with updated information regarding the status of each permit.

Table 12: List of Permits

Agency	Approval	Description	Status
FAA	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.	Determination of No Hazard letters received December 2011 for 495 feet. Determinations of No Hazard letters received June 2012 for updated layout for 495 feet. Updated microwave beam path, FCC assessment, and aviation/airspace assessment confirm Project will not negatively impact those resources. Meadowlark filed 49 Forms 7460-1 with the FAA on November 1, 2016.
USACE	Section 404 Permit	Required for the discharge of dredged or fill material into waters of U.S. Minimal levels of fill may be covered under existing NWPs.	Received JD from USACE in February 2012. Current design is within the thresholds of NWPs 12 and 14 (below 1/10th of an acre).
USFWS	Compatibility Analysis, Right-of-Way Permit, and Special Use Permit	If constructing in a wetland within a wetland easement, compatibility analysis is required. A right-of-way permit may be required for permanent disturbance in wetland easements and a Special Use Permit is required for temporary disturbance in wetland easements.	Meadowlark will avoid impacts to wetland basins within wetland easements.
U.S. Environmental Protection Agency	Spill Prevention Control and Countermeasure Plan	Would be required if any facility associated with the Project (O&M or Substation) has a tank holding more than 1,320 gallons of oil on site.	Will develop prior to construction.
North Dakota Public Service Commission	Certificate of Site Compatibility	For facilities with greater than 0.5 MW nameplate capacity.	CSC Certificate issued April 25, 2012. More than four years have elapsed since issuance of the CSC for the Project. Therefore, in accordance with NDCC Section 49-22-17 and NDAC Chapter 69-06-09, Meadowlark is submitting a CCS for the Project.
NDDOH	Section 401 Certification	Verify that project construction would comply with state water quality standards. A 401 Water Quality Certification will be required if a Section 404 permit is required.	Proposed design is within the impact thresholds allowed by NWPs 12 and 14 (below 1/10th of an acre), so an individual Section 401 Certification is not required for the Project.
	NPDES General Permit (Construction)	For stormwater discharges from construction activities that involve disturbing more than 1 acre.	The Project will submit an Application/Notice of Intent to North Dakota Department of Health and SWPPP prior to construction.
	Septic Tank and Drainfield Permit	Required for installation of septic system at O&M facility.	Must meet construction standards for construction of water well for the O&M building. The Project will obtain applicable septic, drainfield, water use, and well permits prior to construction from state and/or County authorities.

Table 12: List of Permits

Agency	Approval	Description	Status
North Dakota Department of Transportation	Road Approach/Access Permit	Required to provide driveway access to state owned right-of-way.	Meadowlark will coordinate with NDDOT for any impacts to state highways. Meadowlark will obtain all appropriate permits and risk management documents from NDDOT, as applicable.
	Utility Permit / Risk Management Documents	Required to install utilities within state owned right-of-way.	Meadowlark will obtain all appropriate permits from NDDOT for installation of utilities within state owned right-of-way.
North Dakota Highway Patrol	Overheight/Overweight Permit	Required to transport oversize loads on state maintained roads.	Will prepare and submit permit application prior to construction.
SHPO	Review and Coordination	Field reviews for archaeological resources will be required by the SHPO.	Cultural Resource Class I, II, and III surveys were conducted at the time the CSC was issued. Two response letters from SHPO (2011.08.17 RE: Recommendations; 2012.02.21 RE: Reports). A Class I site file search and literature review for the Project through the SHPO was conducted on July 20, 2016. The Project avoids three identified unevaluated cultural resource sites present within the Project Area. Architectural history survey with a two-mile buffer is complete. Cultural Resource survey of turning radius improvements and minor collector line shifts complete. All 2016 cultural resources survey reports will be submitted to the SHPO for concurrence. SHPO concurrence letters will be provided to the PSC upon receipt.
North Dakota State Water Commission	Temporary Water Permit	Required for temporary use of surface water or groundwater.	If applicable, the Project will prepare and submit a permit application prior to construction.
McHenry County	CUP and Public Hearing	Required for the Project's facilities.	Meadowlark obtained the Project CUP on October 4, 2016. Meadowlark obtained the CUP for the transmission line on November 1, 2016.
	Building Permit	Required for the Project's O&M building.	The Project will prepare and submit a permit application(s) prior to construction.

CSC – Certificate of Site Compatibility; CUP – conditional use permit; FAA – Federal Aviation Administration; FCC – Federal Communications Commission; JD – Jurisdictional Determination; MW – megawatt; NDAC – North Dakota Administrative Code; NDCC – North Dakota Century Code; NDOT – North Dakota Department of Transportation; NWP – nationwide permit; O&M – operations and maintenance; PSC – Public Service Commission; SHPO – State Historic Preservation Office; SWPPP – Stormwater Pollution Prevention Plan; USACE – U.S. Army Corps of Engineers; USAF – U.S. Air Force; USFWS – U.S. Fish and Wildlife Service

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Figures

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NEW FRONTIER WIND ENERGY PROJECT

Figure 1. Project Layout

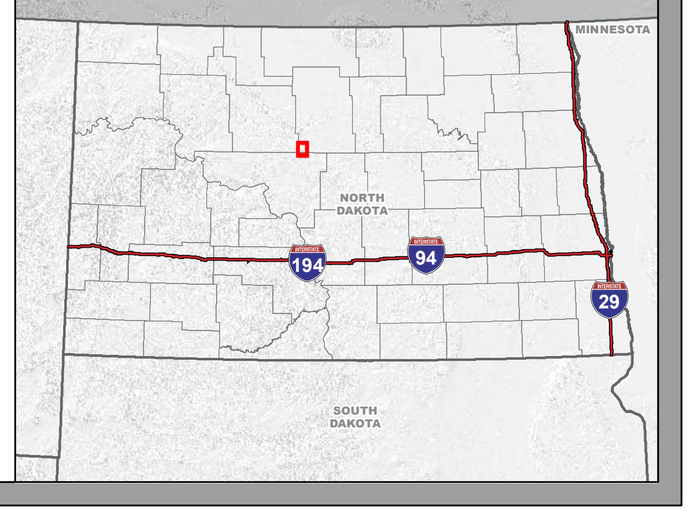
- Project Area
- Turbine
- Met Tower
- Access Road
- Collector Line
- O & M Building
- Substation

0 0.25 0.5 Miles

Scale is 1:18,000 when printed at 22x34"

TETRA TECH

Vicinity Map



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NEW FRONTIER WIND ENERGY PROJECT

Figure 2. Environmental and Siting Considerations

0 0.25 0.5 Miles

Scale is 1:18,000 when printed at 22x34"

Entity and Associated Setback

- Intercontinental Ballistic Missile (ICBM) launch site or Launch Control Facility (2,640 ft)
- Non Participants (1.1 x blade tip height)
- Residence (1,400 ft)
- Transmission Line (1.1 x blade tip height)
- Overhead Distribution Lines (1.1 x blade tip height)
- Rail Road Right-of-Way (1.1 x blade tip height)
- Roads (1.1 x blade tip height)

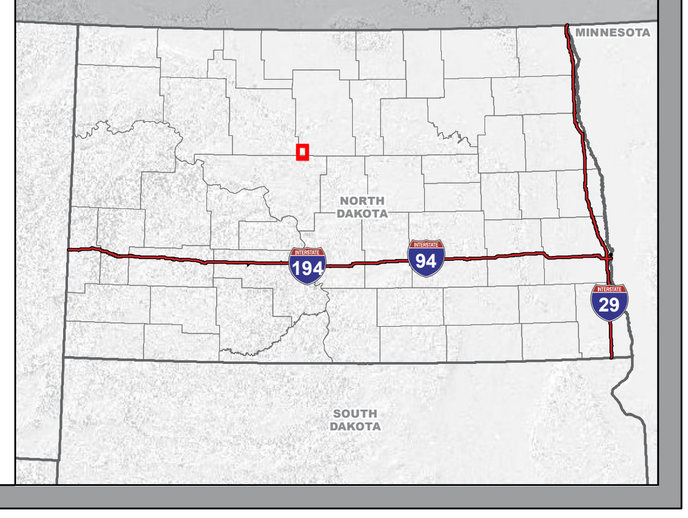
Landslide Data - ND Geological Survey

- Landslides

- Project Area
- Turbine
- Met Tower
- Access Road
- Collector Line
- O & M Building
- Substation
- Setback Area

TETRA TECH

Vicinity Map



P:\5563_New_Frontier_Wind\GIS\Layouts\EnvironmentalAndSitingConsiderations.mxd Source: BTS, ESRI, NREL, FCC, DOD, and Ventyx Last Modified: 11/14/2016

NEW FRONTIER WIND ENERGY PROJECT

Figure 3. Distance from Residences to Turbine Locations

0 0.25 0.5 Miles

Scale is 1:30,000 when printed at 22x34"

Project Area

Turbine

Occupied Structures

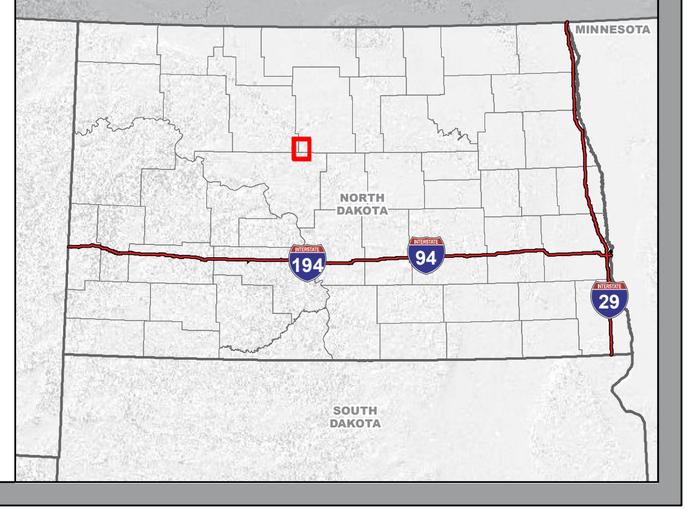
Participant

Non-Participant

TETRA TECH

P:\5563_New_Frontier_Wind\GIS\Layouts\PSC_Application\Residence_to_Turbine_Distances.mxd Source: BTS, ESRI, NREL, FCC, DOD, and Ventyx Last Modified: 11/14/2016

Vicinity Map



Appendix A:
Microwave Beam Path/FCC Assessment Report

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ENGINEERING REPORT
CONCERNING THE EFFECTS UPON
FCC LICENSED RF FACILITIES
DUE TO CONSTRUCTION OF
NEW FRONTIER WIND ENERGY PROJECT
In
McHENRY COUNTY, NORTH DAKOTA

Prepared for
Capital Power Corporation
155 Federal Street, Suite 1200
Boston, MA 02110

September 6, 2016

By: B. Benjamin Evans
Evans Engineering Solutions
(262) 518-0178 Phone
www.evansengsolutions.com

ENGINEERING REPORT
CONCERNING THE EFFECTS UPON
FCC LICENSED RF FACILITIES
DUE TO CONSTRUCTION OF THE
NEW FRONTIER WIND ENERGY PROJECT
In
McHENRY COUNTY, NORTH DAKOTA

I. INTRODUCTION

On April 26, 2012, the North Dakota Public Service Commission issued Certificate of Site Compatibility Number 29 to Meadowlark Wind I, LLC for the New Frontier Wind Energy Project (Project) in McHenry County, North Dakota. In December 2014, Capital Power Investments LLC, a subsidiary of Capital Power Corporation (Capital Power), completed the acquisition of Element Power US, LLC, which included Meadowlark Wind I, LLC and the Project.

This engineering report describes the results of a study and analysis to determine the locations of federally-licensed (FCC) microwave and fixed station radio frequency (RF) facilities that may be adversely impacted as a result of the construction of the New Frontier Wind Energy Project in McHenry County, North Dakota. This document describes impact zones and any necessary mitigation procedures, along with recommendations concerning individual wind turbine siting. All illustrations, calculations and conclusions contained in this document are based on FCC database records[1].

Frequently, wind turbines located on land parcels near RF facilities can cause more than one mode of RF impact, and may require an iterative procedure to minimize adverse effects. This procedure is necessary in order to ensure that disruption of RF facilities either does not occur or, in the alternative, that mitigation procedures will be effective. The purpose of this study is to facilitate the siting of turbines to avoid such unacceptable impact.

The New Frontier wind project as currently planned involves the construction of about 49 wind turbines just north of the community of Ruso, in the southwest corner of McHenry County,

[1] The databases used in creating the attached tables and maps are generally accurate, but anomalies have been known to occur. Generally, for wind turbine siting, an on-site verification survey is often suggested as part of the due diligence process.

North Dakota. The wind turbines proposed to be erected will have a maximum blade tip height of 150 meters AGL.

Using industry standard procedures and FCC databases, a search was conducted to determine the presence of any existing microwave paths crossing the subject property, land mobile and other RF facilities within or adjacent to the identified area and broadcast signals receivable in the area. A specific turbine layout has been submitted for analysis. Accordingly, this report will address the potential conflicts that may be caused by the proposed turbines.

The following tabulation and analysis consists of four sections:

1. Microwave point-to-point path analysis[2]
2. Land mobile, public safety and other communications tower sites
3. Broadcast AM, FM and TV
4. Cellular, Radar, and NTIA Notification

The attached figures were generated based upon the operating parameters of the FCC-licensed stations as contained in the FCC station database, with corrections of the antenna locations as needed.

The following analysis examines the pertinent FCC licensed services in the area for impact. This analysis assumes that all licensed services have been designed and constructed according to FCC requirements and good engineering practice. If this is not the case, the impacted facility must share responsibility with the wind project developer for the costs of any mitigation measures[3].

Each of the RF analyses is described separately in the sections that follow.

[2] Only point-to point microwave facilities were considered (for instance, a study of earth station facilities is not included).

[3] For instance, some microwave paths may have insufficient ground clearances as they are presently configured.

II. ANALYSIS OF MICROWAVE LINKS

An extensive analysis was undertaken to determine the likely effect of the new wind turbine farm upon the existing microwave paths, consisting of a Fresnel x/y/z axis study. The microwave paths have been overlaid on Google Earth™ maps, and the images of the microwave paths and the proposed turbines are also available in a KMZ file.

Important Note: Microwave path studies are based upon third party and FCC databases that normally exhibit a high degree of accuracy and reliability. Although Evans performs due diligence to ensure that all existing microwave facilities are represented, we cannot be responsible for errors in FCC databases that may lead to incomplete results. However, should such situations occur, Evans would perform an engineering analysis to determine how the additional facilities can be accommodated or, if wind turbine structures are already built, determine a method to re-direct an impacted beam path.

For this microwave study, *Worst Case Fresnel Zones* (WCFZ) were calculated for each microwave path. The mid-point of a microwave path is the location where the widest (or worst case) Fresnel zone occurs. Possible geographic coordinate errors must be added to the Fresnel zone clearance numbers[4]. The radius *R* of the Worst Case Fresnel Zone, in meters, is calculated for each path using the following formula:

$$R \cong 8.65\sqrt{\frac{D}{F_{GHz}}}$$

where D is the microwave path length in kilometers and F_{GHz} is the frequency in gigahertz.

In general, the WCFZ is defined by the cylindrical area whose axis is the direct line between the microwave link endpoints and whose radius is *R* as calculated above. This is the zone where the siting of obstructions should be avoided. Evans Engineering Solutions has identified just one licensed microwave link from the FCC database that is within 2 miles of the project area. This microwave link is listed in Table 1 and mapped in Figure 1.

Call Sign 1	Call Sign 2	Site 1 Name	Site 2 Name	Freq. (MHz)	WCFZ (m)	Licensee
WPYP792	WPYP793	Ruso	South Prairie	6345.49/6093.45	22.0	Prairie Public Broadcasting, Inc.

Table 1 – Active Microwave Links in and near New Frontier Project Area

[4] Many microwave facilities were built before accurate methods were available to establish exact geographic coordinates (such as GPS). It is not unusual for database errors of up to 4 or 5 seconds to occur, which can affect the positioning of critical turbines located near Fresnel paths.

As can be seen in Figure 1, the microwave path listed in Table 1 is far outside the wind project area. Thus, no constraints on turbine siting within the project area are imposed by any FCC-licensed microwave paths.

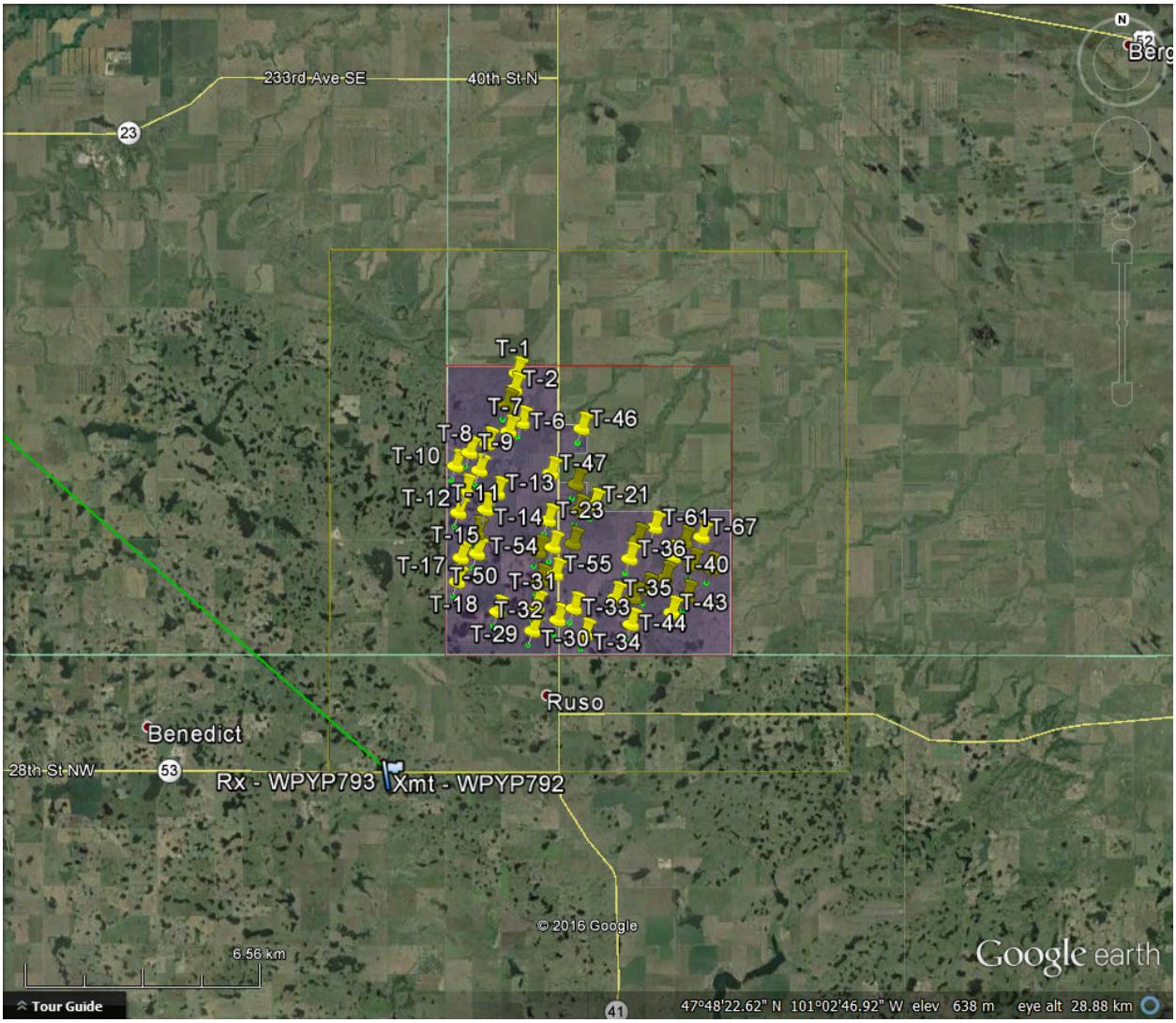

Figure 1 – Licensed Microwave Paths in or near New Frontier Project Area

III. ANALYSIS OF FIXED RADIO FACILITIES

3.1 Land Mobile & Public Safety Facilities

A search of the FCC's land mobile/public safety radio database revealed only one land mobile transmitter station that falls within the search area (about two miles beyond the project area boundaries). This land mobile station, which is inside the project area, is listed in Table 2 and mapped in Figures 2 and 3. The specifications on the land mobile station, with call sign of WQOZ940, can be found in the associated land mobile (LM) spreadsheet file.

Multi-directional transmitting facilities, including land mobile stations, that are within 400 meters of a turbine site customarily should be further evaluated for the possibility of transmitter interference caused by wind turbines. It appears that the planned turbine that is closest to WQOZ940 (Turbine 6) is 600 meters from the station site. The locations of WQOZ940 and Turbine 6 (also nearby Turbines 3 and 7) are shown in Figure 3. The calculated outer edge of the near-field zone of the transmissions of WQOZ940, which is the distance within which metal structures such as wind turbines may cause undesirable electromagnetic coupling with the transmitting antenna, is shown in a circular blue shaded area around the WQOZ940 transmitter site. Since Turbine 6 is not within this near-field zone, interference to transmissions is not expected.

The reader is referred to the provided KMZ file for more magnification and closer inspection.

Based on the current project layout, and assuming that the land mobile stations in and near the project area are actually located at their licensed locations, or located farther away from turbines, no adverse impact is expected to be caused to the transmissions of land mobile stations that are known to be in the area. If any of the turbines are to be re-sited, it is recommended that no turbine be closer than 240 meters from the WQOZ940 site.

Call Sign	Latitude (NAD-83)	Longitude (NAD-83)	Ant. Ht. (m AGL)	Freq. (MHz)	Licensee
WQOZ940	47.899444	-100.938333	12.4	452.8	Anderson, Armann

Table 2 – Land Mobiles Stations within 2 Miles of Project Area

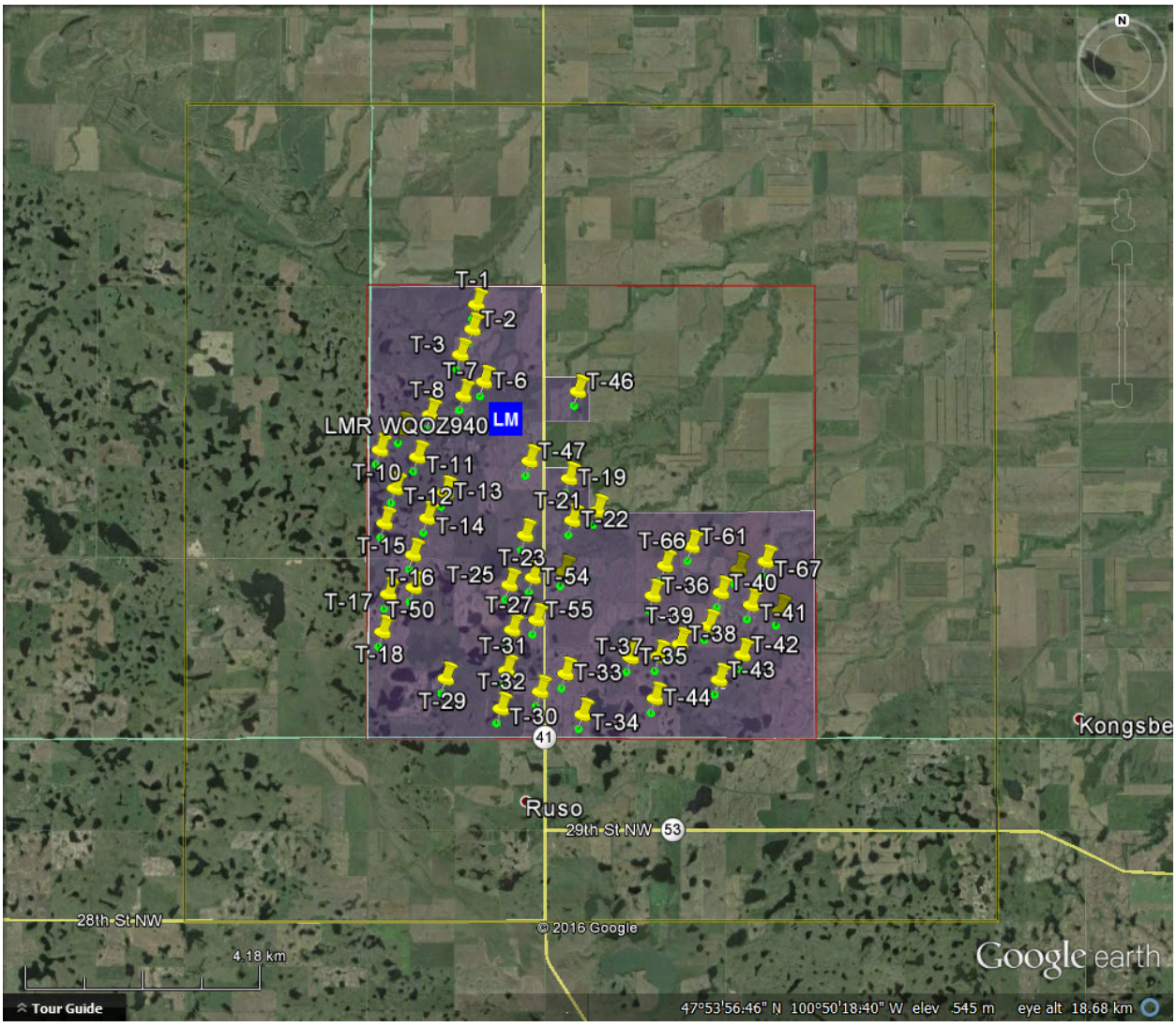

Figure 2 – Land Mobile Stations in or near New Frontier Project Area

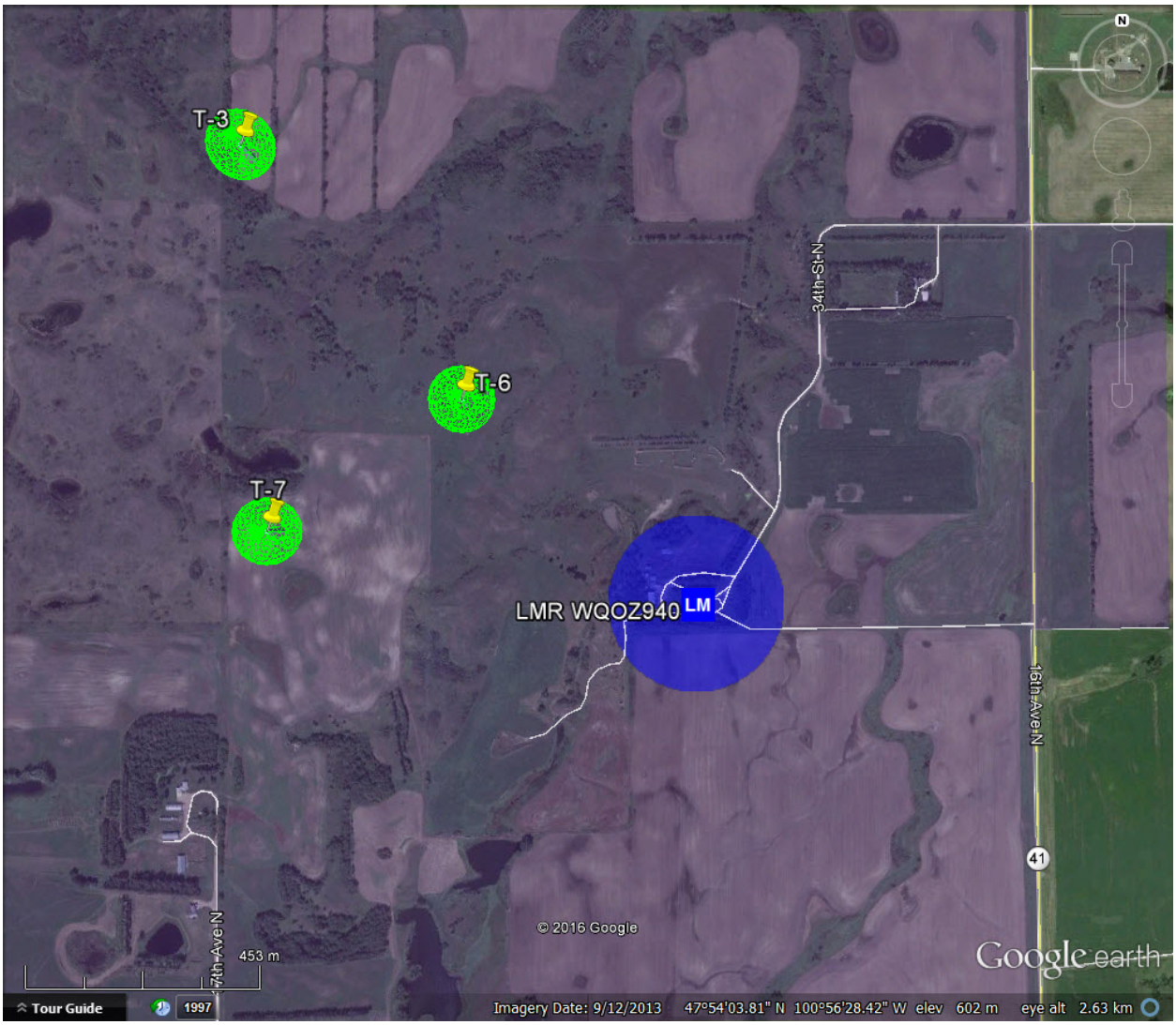

Figure 3 – Close-Up of New Frontier Turbines near Land Mobile Station WQOZ940

3.2 Other Communications Sites

Searches through the FCC registered antenna structures database and the FCC transmitter databases reveal communications towers located within 30 kilometers of the center of the proposed project area, which are listed in Table 3 and mapped in Figure 4. Many of these structures appear to be cellular base station towers. It is suggested that these sites be investigated for microwave operations that are not in the FCC database, including unlicensed microwave facilities.

FCC Registr. #	Owner	Location	Latitude	Longitude	Height AGL (m)
1038365	Souris River Telecom. Cooperative	South Prairie, ND	48-01-34.0N	101-18-59.0W	150.0
1039842	Basin Electric Power Cooperative	Benedict, ND	47-55-19.0N	101-04-48.0W	54.0
1039991	North Dakota, State of	Butte, ND	47-49-12.0N	100-45-33.0W	70.1
1050837	Gray Television Group, Inc.	Max, ND	47-55-26.0N	101-17-40.0W	67.7
1054870	CCATT LLC	Garrison, ND	47-52-22.7N	101-17-42.5W	121.0
1059679	Northwest Dakota Cellular of North Dakota, LP	Garrison, ND	47-48-40.0N	101-14-48.2W	92.4
1208372	Soo System Radio Comm. Corp.	Max, ND	47-48-51.0N	101-18-50.5W	52.0
1208387	Soo System Radio Comm. Corp.	Balfour, ND	47-58-05.0N	100-36-00.5W	51.8
1232160	SRT Communications, Inc.	Velva, ND	48-03-06.1N	100-56-02.1W	36.6
1232172	SRT Communications, Inc.	Minot, ND	48-01-34.0N	101-18-58.6W	150.9
1234918	SRT Communications, Inc.	Butte, ND	47-49-11.0N	100-45-39.0W	54.9
1241902	SRT Communications, Inc.	Karlsruhe, ND	48-03-57.0N	100-36-59.0W	91.4
1250108	SRT Communications, Inc.	Benedict, ND	47-52-12.8N	101-00-54.4W	103.6
1250760	SRT Communications, Inc.	Max, ND	47-49-37.5N	101-17-19.9W	103.6
1250933	CCATT LLC	Velva, ND	48-02-50.9N	100-55-01.5W	91.4
1253430	Western Area Power Administration	Kongsberg, ND	47-48-49.0N	100-45-58.0W	67.0
1260087	SRT Communications, Inc.	Sawyer, ND	48-04-58.5N	101-02-26.8W	103.6
1279817	Minot AFB	Balfour, ND	47-42-51.1N	101-00-36.4W	91.4
1279837	Minot AFB	Benedict, ND	47-42-51.1N	101-00-36.4W	91.4
1292119	North Central RSA 2 of North Dakota, LP	Velva, ND	48-04-01.7N	100-55-47.3W	86.5
1293873*	Municipal Communications, LLC	Ruso, ND	47-50-06.7N	100-51-40.8W	123.1
Not Registr.	Basin Electric Power Cooperative	Voltaire, ND	48-01-24.0N	100-53-01.5W	9.1
Not Registr.	Prairie Public Broadcasting, Inc.	Ruso, ND	47-49-07.0N	100-59-26.5W	60.7
Not Registr.	Basin Electric Power Cooperative	Max, ND	47-56-02.9N	101-14-50.7W	38.1
Not Registr.	Verendrye Electric Cooperative, Inc.	South Prairie, ND	48-00-15.0N	101-17-46.6W	55.0
Not Registr.	Verendrye Electric Cooperative, Inc.	Velva, ND	48-03-00.0N	100-55-53.5W	64.0
Not Registr.	BNSF Railway Co.	Simcoe, ND	48-07-24.4N	100-51-24.3W	46.0
Not Registr.	Soo Systems Radio Comm. Corp.	Kongsberg, ND	47-51-07.9N	100-48-01.1W	53.3
Not Registr.	Basin Electric Power Cooperative	Butte, ND	47-49-02.0N	100-45-32.2W	60.6

The listed coordinates for the above structures are from documents filed with the FCC and have not been verified by this consultant. Green-shaded records indicate towers containing microwave or land mobile facilities documented in Sections I & II of this report.

* This tower is not verified to have been constructed as of the date of this report.

Table 3 – Communications Towers within 30 KM of Project Area

As mentioned previously, multi-directional transmitting facilities within 400 meters of a planned turbine customarily should be further evaluated for the possibility of turbine-related transmitter interference. The New Frontier project is not expected to cause any turbine-related signal transmission problems to multi-directional transmitting facilities located at any of the tower sites listed in Table 3 and shown in Figure 4 below, since the closest tower is 1.5 kilometers from the nearest project boundary (ASRN 1293873).

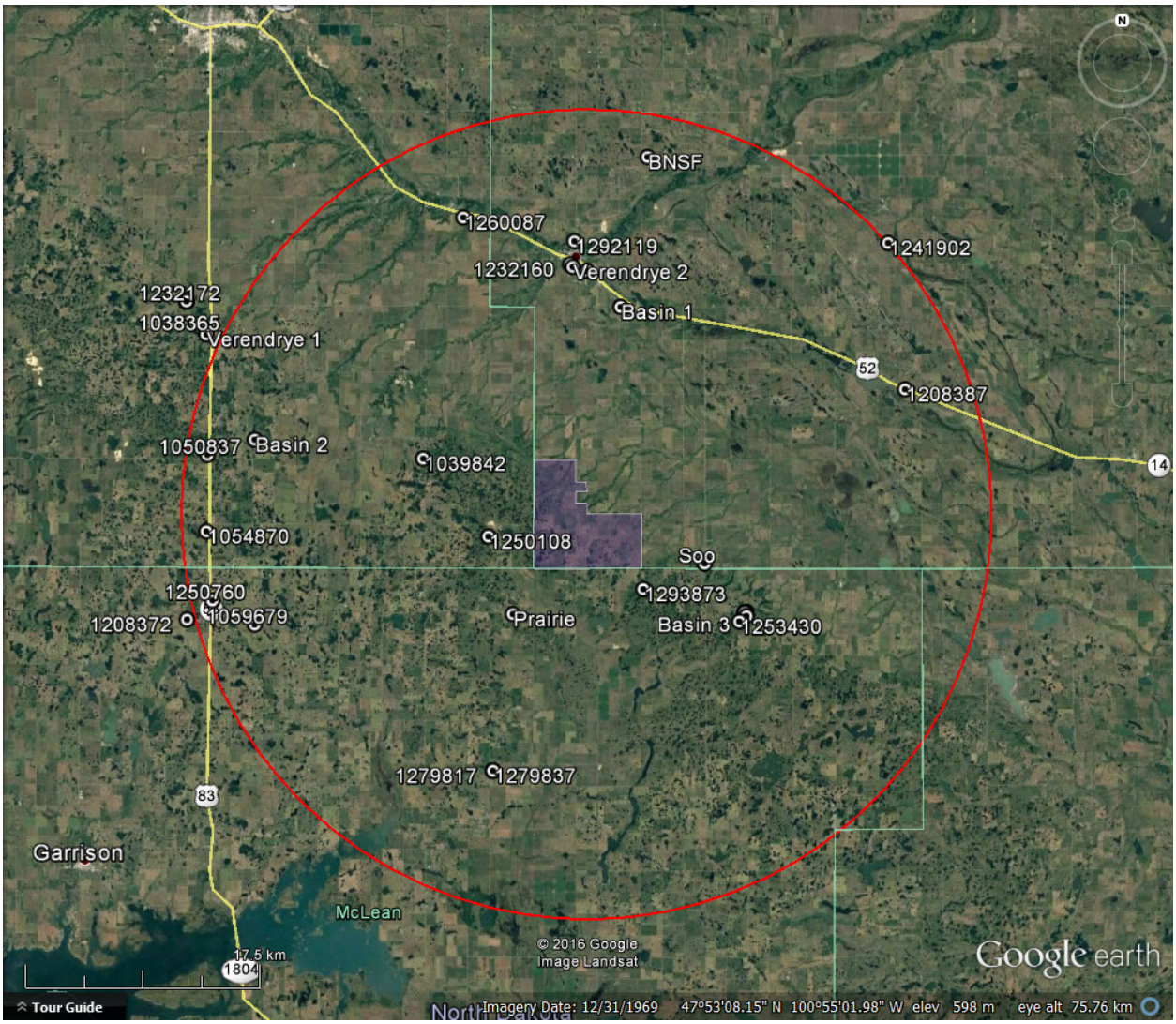

Figure 4 – FCC-Documented Antenna Structures within 30 KM of Center of Project Area

IV. ANALYSIS OF BROADCAST FACILITIES

4.1 TV Broadcast Facilities

The rotating blades of a wind turbine have the potential to disrupt over-the-air broadcast TV reception within a few miles of the turbine, especially when the direct path from the viewer's residence is obstructed by terrain. Interference is caused when signals reflected by the blades arrive at the viewer's TV antenna along with the direct signal. This is known as "multipath interference." However, as turbine manufacturers have replaced all-metal blades with blades constructed of mostly nonmetallic materials[5], this effect has been reduced. Also, the new generation of HDTV receivers is better equipped to deal with minor multipath interference (which is manifested by "pixilating" or "freezing" of the digital picture) than analog TV sets, as special circuitry is employed to suppress the reflected signal. Occasionally, however, multipath interference from one or more turbines can cause video failure in HDTV receivers, especially if the receiver location is in a valley or other place of low elevation.

There is some possibility of signal disruption for residences that have to point their outdoor antennas through the turbine area, or that utilize "rabbit ear" antennas and/or older HDTV receivers. Most of this effect should be dissipated for locations three or more miles from a turbine, but some residual problems could be noted for HDTV receivers that are located below the grade level at the turbine base. Usually, a rule of thumb is that approximately 10% of the receiver locations are affected to some extent within three miles of a large turbine when the turbine is between the TV station and the receiver. The usual effect is intermittent "pixilation" or freezing of the digital TV picture. This estimate is based upon Evans Engineering's experience with similar wind energy projects.

McHenry County is in the Minot/Bismarck/Dickinson/Williston Designated Market Area (DMA) as defined by Nielsen Media Research; however, only stations in the Minot area are predicted to reach the wind project area with a satisfactory over-the-air signal. The TV stations that have been determined to place a predicted FCC primary off-the-air service signal over at least a portion of the project area are listed in Table 4. The TV stations' service area boundaries are mapped in Figure 5.

[5] Modern turbine blades are usually constructed from glass-reinforced plastic (GRP), although they usually contain some metal for strengthening, balance and grounding.

Call Sign	Type of Service	Network Affiliate	Virtual Channel	Actual Channel	City of License	Power (KW)	Ant. Height (m HAAT)	Dist. (km)	Direction
KMOT	Conventional	NBC/Fox	10	10	Minot, ND	7.69	207	47.4	NW
KXMC-TV	Conventional	CBS	13	13	Minot, ND	16.1	334	36.6	NW
KMCY	Conventional	ABC	14	14	Minot, ND	40	217	39.6	NW
KNDM	Conventional	Heroes & Icons	24	24	Minot, ND	50	239	42.9	NW
KSRE	Conventional	PBS	6	40	Minot, ND	146	249	39.8	NW

Table 4 - TV Stations Serving Project Area

If the New Frontier wind project should cause disruptions to over-the-air TV viewing, methods to resolve them are available, and are as follows:

1. Relocation of the household antenna to receive a better signal
2. Installation of a better outside antenna, or one with a higher gain
3. Installation of satellite or cable TV

According to this engineer's calculations, there are approximately 46 households within an area likely to be affected (approximately 65 square miles). It is conservatively estimated that 35%, or 16, of the households receive TV programming primarily by satellite dish or cable. This leaves an estimated 30 households relying on transmitted off-the-air TV signals. Based on the 10% criteria described previously, up to three TV receiving locations may be affected in the worst-case. Mitigation costs would be approximately $200 per location for an upgraded outdoor antenna, or $400 per year per location for a satellite or cable subscription.

It is the opinion of this consultant that any disruptions to over-the-air TV broadcast signals, if they occur, can be resolved satisfactorily.

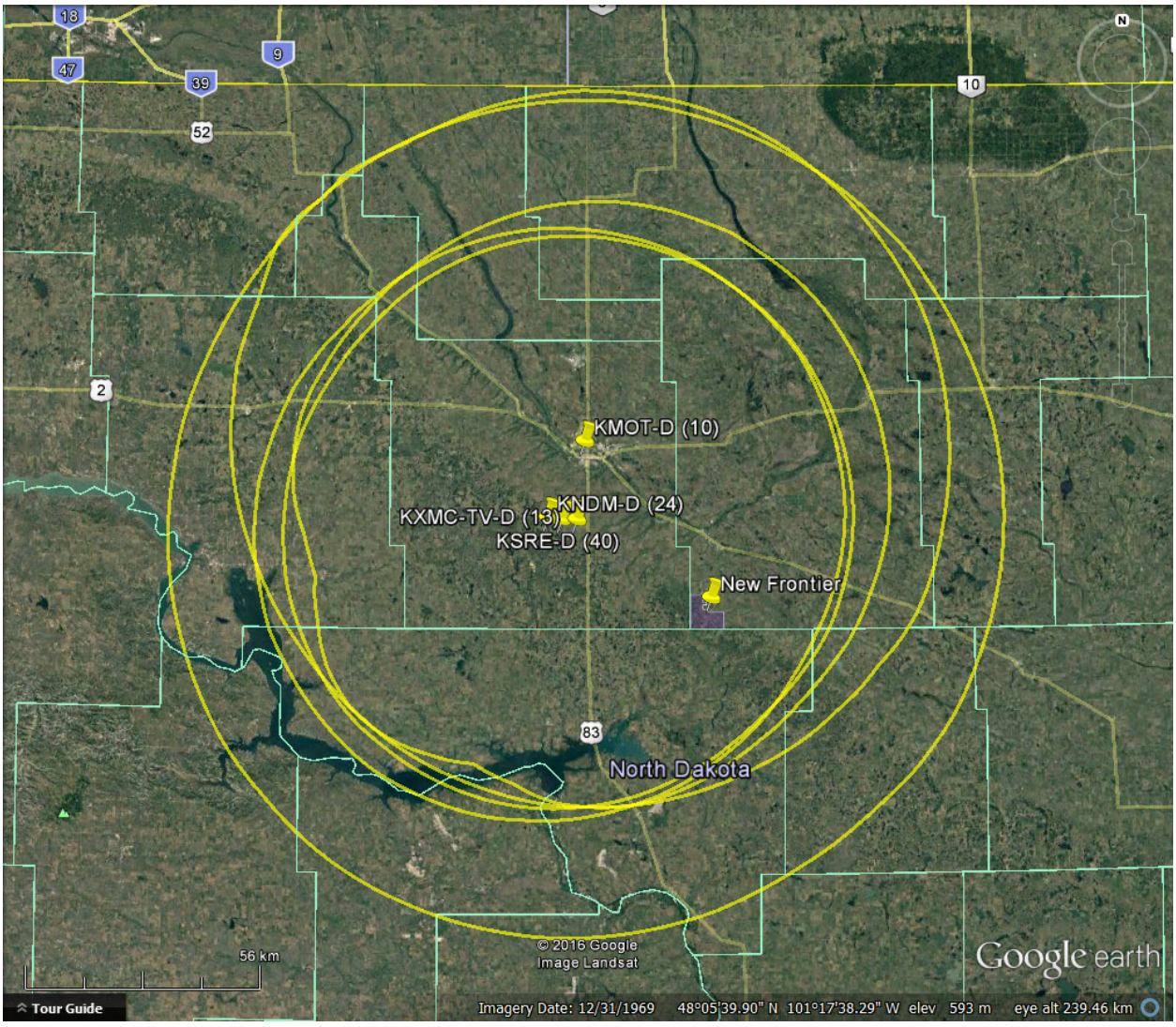

Figure 5 – Predicted Over-the-Air Television Coverage into New Frontier Project Area

4.2 FM Facilities

The full-service FM stations that place a predicted primary signal over at least part of the project area are listed in the following Table 5. The FM stations' service area boundaries are mapped in Figure 6.

Call Sign	Format	Freq. (MHz)	City of License	Power (KW)	Ant. Height (m HAAT)	Dist. (km)	Direction
KMPR	Classical/News	88.9	Minot, ND	50	283	39.8	NW
KIZZ	CHR	93.7	Minot, ND	100	169	42.9	NW
KTZU	Classic Rock	94.9	Velva, ND	100	156	36.5	NW
KYYX	Country	97.1	Minot, ND	100	300	36.6	NW
KMXA-FM	AC	99.9	Minot, ND	100	142	56.6	NW
KNDL	Contemporary Christian	100.7	Berthold, ND	52	208	42.9	NW
KWGO	Country	102.9	Burlington, ND	100	156	36.5	NW
KZPR	Active Rock	105.3	Minot, ND	100	169	42.9	NW
KHRT-FM	Contemporary Christian	106.9	Minot, ND	50	105	42.0	NW

AC = "Adult Contemporary"; CHR = "Contemporary Hits Radio"

Table 5 – FM Stations Serving Project Area

Because of the "capture effect" supported by the "discriminator" in FM receivers, significant disruptions to the above facilities are not expected. Although the received signal may vary with the blade rotation at some receive locations in the immediate area, good quality FM receive radios will most likely factor out such time-varying signals. In those relatively few cases where significant impact is caused, home FM radios could be connected to the rooftop TV receive antennas to pull in a stronger direct signal.

4.3 AM Facilities

Large metallic structures such as wind turbines can adversely affect the transmitted signals of AM broadcast stations up to three kilometers away. A search of the FCC's database revealed no AM facilities within the required notification distance of three kilometers from the wind project boundaries. There should therefore be no reasonable expectations of disruptions in transmitted radiations on the AM band due to the presence of the turbines. Occasionally, depending upon ground conditions, local AM receivers may experience slight signal changes due to local effects, but such anomalies are not recognized by the FCC or the standards of good engineering practice as having an unduly adverse effect.

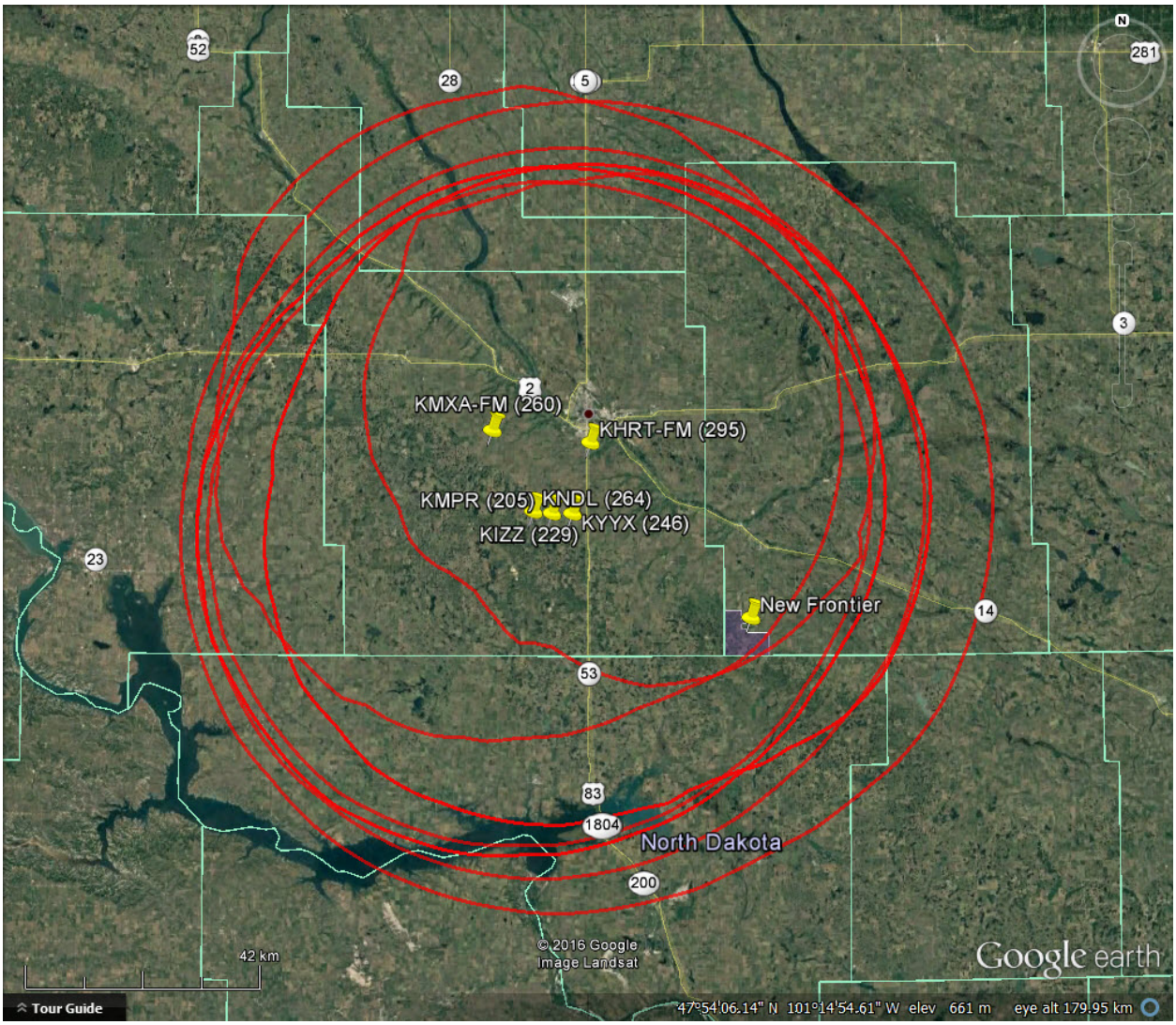

Figure 6 – Predicted FM Radio Coverage into New Frontier Project Area

V. CELLULAR, RADAR , AND NTIA NOTIFICATION

5.1 Cell Phone Reception

There is no credible evidence known by this writer to suggest that cell phone reception has been a problem in and around wind turbines. Since cell phone service is mobile by design, operation of mobile devices in the area should theoretically not be significantly affected. In addition, cellular antennas employ diversity and multiple receivers to compensate for any disruptions at any one location.

Multidirectional signals emitted from any cellular tower that is not in the immediate area of the wind project (within 400 meters of any turbine site) would not be expected to be adversely affected by wind turbines. As stated in Section 3.2, there are no known towers registered with the FCC that are less than 1.5 kilometers from any part of the project area.[6] Therefore, the proposed wind project should not disrupt cell phone service in the area.

5.2 DoD Radar Concerns

The Department of Defense (DoD) and the Department of Homeland Security *Long Range Radar Joint Program Office* "JPO" has adopted a "pre-screening tool" to evaluate the impact of wind turbines on air defense long-range radar. This tool was applied to the New Frontier project area, and it returned a result of "no anticipated impact to Air Defense and Homeland Security radars" (see Figure 7). However, a definitive determination is obtained only after formal study by the DoD, which is triggered by the FAA 7460-1 notification process.

[6] However, it is suggested that an on-site inspection be performed to confirm that there are no undocumented microwave links on the cellular towers which might be blocked by planned turbines.

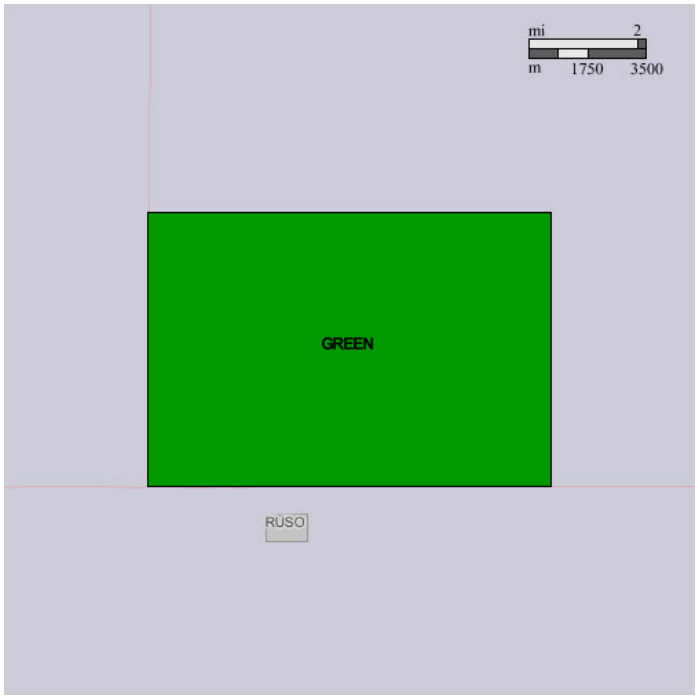

Figure 7 – DoD Long-Range Radar Screening

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

5.3 NEXRAD

A pre-screening tool has been developed to evaluate the potential impact of obstructions to the NEXRAD Weather Surveillance Doppler Radar Stations. This tool was applied to the New Frontier project area, and it returned a result, shown in Figure 8, of "some impacts possible" to weather radar operations. However, a definitive determination is obtained only after the NTIA review process.

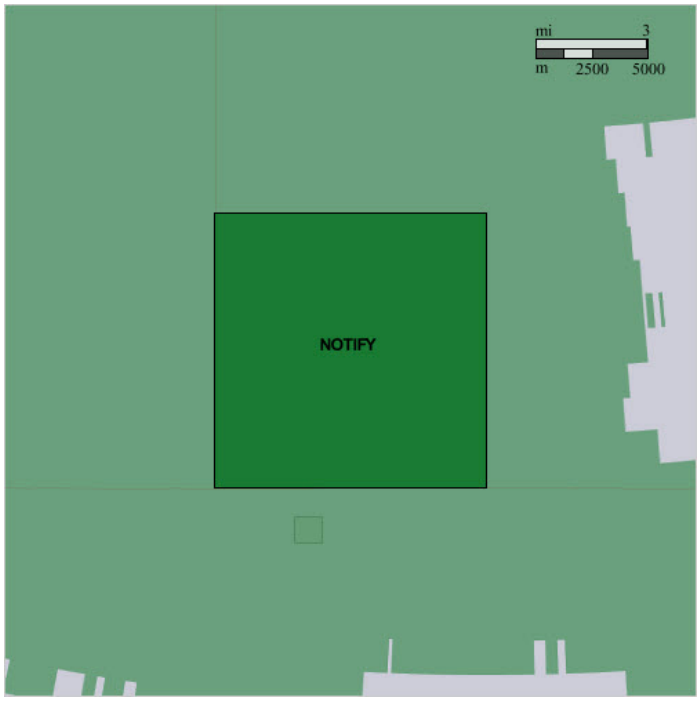

Figure 8 – NEXRAD Weather Radar Screening

- **Dk Green: Notification Zone.** Some impacts possible. Consultation with NOAA is optional, but NOAA would still like to know about the project.

5.4 NTIA NOTIFICATION

Operation of RF frequencies for federal government use is managed by the National Telecommunication Information Agency (NTIA), which is part of the U.S. Department of Commerce. The technical specifications for most government facilities are unavailable to the public. In order to avoid the derailment of the wind energy project due to late objections from a government agency, the NTIA should be notified of the proposed project during pre-construction planning. The NTIA has set in place a review process, wherein the Interdepartmental Radio Advisory Committee (IRAC), consisting of representatives from various government agencies, reviews new proposals for wind turbine projects for impact on government frequencies. In almost all cases, no adverse impact is found, and IRAC usually issues a determination in about 60 days.

On August 29, 2016, this office sent a notification of the New Frontier wind project to the NTIA, and a determination is expected around the end of October 2016.

VI. CONCLUSIONS AND RECOMMENDATIONS

1. There are no FCC-licensed microwave paths that cross or come close to the wind project area; therefore, turbine siting is not constrained by licensed microwave paths.

2. If an excessive amount of time goes by before the turbines are to be constructed (six months or more), it is recommended that the microwave study be updated in case new paths have been added to the FCC's database.

3. No land mobile transmitting stations are expected to be adversely affected, assuming that their transmitters are located exactly as per their FCC licenses.

4. Over-the-air TV interference due to operating wind turbines is unlikely to occur, but if it does occur, effective mitigation methods to resolve the interference are available, with satellite or cable service installation providing the worst-case solution. No radio broadcast facilities are likely to be affected.

5. It is suggested that an on-site inspection of the New Frontier wind project area and its environs be done to: 1) determine the existence of undocumented microwave antennas on the known communications towers listed in Table 3 of this report, and 2) determine the existence of any undocumented communications towers and antennas not found in the analyses described in this report.

Respectfully Submitted,

B. Benjamin Evans
RF Impact Consultant

September 6, 2016

Appendix B:
Aviation/Airspace Report

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AVIATION SYSTEMS INC.
Aviation Consultants

September 6, 2016

Bill Behling
Business Development Manager
Capital Power Corporation
155 Federal Street, Suite 1200
Boston, MA 02110

Re: New Frontier Wind Energy Project, 16-N-0952.001

Dear Mr. Behling:

As requested, Aviation Systems, Inc. (ASI), has evaluated the feasibility of the New Frontier Wind Energy Project, (hereinafter referred to as the "Project"), from an aviation and airspace point of view. We reviewed the Project against Federal aviation and airspace criteria set forth in:

- Federal Aviation Regulation (FAR) Part 77 (14 CFR 77), the *Safe, Efficient Use and Preservation of the Navigable Airspace;*
- FAA Order 8260.3B, the *United States Standard for Terminal Instrument Procedures* (referred to as TERPs);
- FAA Order JO 7400.2K, the *Procedures for Handling Airspace Matters* and;
- FAA Order 7610.4, *Special Military Operations.*

The criteria in these documents comprise the factors the Federal Aviation Administration (FAA) will use in evaluating the aeronautical compatibility and regulatory compliance of the Project when it is submitted for their official regulatory review under FAR Part 77 as specified in Title 49 U.S. Code Section 44718.

Basic Project Information

- Our task was to determine the feasibility of wind turbines up to 499 feet above ground level (AGL) proposed in an approximate area of 18.92 sq. Nautical Miles (NM) in McHenry County, North Dakota. Please see the attached map depicting the Project boundaries and surrounding area.
- Terrain within the Project area varies from 1,846 feet above mean sea level (AMSL) to 2,175 feet AMSL. With a proposed structure height of 499 feet AGL, the highest point of the Project could theoretically be 2,674 feet AMSL. A 50-foot

buffer is added for terrain variations and to establish the "Target Height"[1] of 2,724 feet AMSL.

- The nearest public-use airport subject to the Federal regulatory criteria above is Turtle Lake Municipal Airport (FAA Identifier: 91N) located 22.48 NM north of the project centerpoint. 91N is a Visual Flight Rules (VFR) airport with one turf runway (08/26), one based aircraft and approximately 804 annual operations. The project would not impact the airport operations.

Analytical Findings

- The Project would not impact Low Altitude Enroute Airways or Minimum Vectoring Altitudes (MVA).

- Impact is unlikely to Joint Use Long Range Radar (Ref: Green on DoD Screening tool). Further radar study is not necessary.

- Minimal impact is expected to NEXRAD weather radar (Ref: Green on DoD Screening Tool). Further weather radar impact study is not necessary.

- The Project is outside any Military Operations Areas (MOA) or Restricted Areas. However, there is a Military Training Route (MTR) IR-678 that overlies the project with floors as low as 450 feet AGL (Ref: broken blue line on map depicts the centerline). According to FAA Order JO 7400.2K, a proposed structure's location on an MTR is not a basis for determining it to be a Hazard to Air Navigation. However, the FAA submits proposed projects to the DoD Siting Clearinghouse for review and the military may, in some cases, object to the project's impact on their operations and mission sustainability. In such situations, attempts are made to find a middle ground between the military's need to protect their airspace assets and the proponent's interest in the project. This step, if at all necessary, would be taken if and when the project is submitted to the FAA for review, with detailed turbine locations and heights.

Conclusion

- Within Sector A, which reaches the "Target Height", and notwithstanding any potential military objections, 499 feet AGL turbines should be approved anywhere in the Sector.

The "Target Height" is not an official FAA vertical limitation but, rather, an in-house artificial convention used to limit the analysis to only relevant and material factors which might influence building heights and FAA approvability. In simple terms, if you do not exceed the "Target Height" your structures should have no FAA FAR Part 77 operational airspace issues.

As a cautionary note, the FAA makes changes to the National Aviation System every day. New approaches are published, departure procedures are changed, new runways are planned, MVAs are modified, etc. Consequently, it is possible for the study findings to become obsolete in a relatively short time. We recommend the study findings be reviewed for currency before filing sites within the study area. Studies older than 12 months should automatically be re-visited, and their findings confirmed.

Furthermore, study findings are intended as a planning tool in conjunction with the resolution of other pertinent issues. Actual construction activities are not advisable until DNHs are issued for any structures that require filing.

Sincerely,

Gary M. Allen, Esq., Ph.D.
President and General Counsel
Attachments: As stated

Appendix C:
Acoustic Modeling Analysis

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Acoustic Assessment

New Frontier Wind Energy Project

November 2016

Prepared for

Capital Power

Prepared by

TETRA TECH

160 Federal Street
Boston, MA 02110
617-443-7500

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TABLES

APPENDIX A

FIGURES

ACRONYMS AND ABBREVIATIONS

AGL	above ground level
CadnaA	Computer-Aided Noise Abatement Program
Capital Power	Capital Power Corporation
dB	decibel
dBA	A-weighted decibel
dBL	unweighted decibel
ft	feet
GE	General Electric
Hz	Hertz
IEC	International Electrotechnical Commission
ISO	International Organization for Standardization
ISO 9613-2	ISO Standard: Attenuation of Sound during Propagation Outdoors
kHz	kilohertz
L_{eq}	equivalent sound level
L_{max}	maximum sound level
L_p	sound pressure level
L_w	sound power level
m	meters
m/s	meters per second
mph	miles per hour
MVA	megavolt ampere
MW	megawatt
NEMA	National Electrical Manufacturers Association
NSR	Noise Sensitive Receptor
Project	New Frontier Wind Energy Project
PSC	Public Service Commission
pW	picowatt
Tetra Tech	Tetra Tech, Inc.
µPa	microPascal
USGS	United States Geological Survey
UTM	Universal Transverse Mercator
W	watt

EXECUTIVE SUMMARY

Tetra Tech, Inc. (Tetra Tech) has completed an acoustic assessment for the proposed New Frontier Wind Energy Project (Project) under development in McHenry County, North Dakota. A screening-level analysis was completed to evaluate the expected sound levels resulting from the Project wind turbines and substation. Operational turbines were evaluated at the 49 potential locations from the November 8, 2016 Project layout, and four different wind turbines models were evaluated. For each turbine, acoustic analyses for three different modeling scenarios was performed. Scenarios included wind turbine operation at cut-in wind speed, as well as maximum rotational wind speed under both moderate downwind and anomalous meteorological conditions. The overall objective of this study was to determine the feasibility of the Project to operate in compliance with the North Dakota Public Service Commission (PSC) 50 dBA noise limit applicable within 100 feet of an occupied residence or community building.

Wind turbine sound source data was obtained from each turbine manufacturer. General Electric (GE) provided the noise specification for the GE 2.5-116 (GE 2016). Vestas supplied the noise specification for both the Vestas V100-2.0 (Vestas 2016) and the Vestas V126-3.45 (Vestas 2016). Acciona provided the noise specification for the Acciona AW125/3150 (Acciona 2015). Substation noise impacts were based on a projected 111 megavolt ampere (MVA) transformer. It is expected that the wind turbines and substation equipment installed will have similar sound profiles to what was used in the acoustic modeling analysis; however, it is possible that the final warranty sound power levels may vary slightly.

Sound propagation modeling was conducted using the Computer-Aided Noise Abatement (CadnaA) program (version 4.6.155), a comprehensive 3-dimensional acoustic modeling computer simulation software, with calculations made in accordance with the International Organization for Standardization (ISO) standard 9613-2 “Attenuation of Sound during Propagation Outdoors”. This acoustic modeling software is widely used by acoustical engineers due to its adaptability to evaluate complex acoustic scenarios. Several modeling assumptions inherent in the ISO 9613-2 calculation methodology, or selected as conditional inputs by the user, were implemented in the CadnaA model to ensure conservative results.

The results of the acoustic assessment show that the Project will comply with the North Dakota PSC 50 dBA limit at all non-participating receptors. It is expected that received sound levels at noise-sensitive receptors will be consistent with sound generated at similar wind energy projects successfully sited throughout the state of North Dakota employing the same or similar criteria. However, while the Project has demonstrated compliance with the requirements, the Project may result in periodically audible sound within adjacent areas under certain operational and meteorological conditions.

1.0 INTRODUCTION

On April 26, 2012, the North Dakota Public Service Commission (PSC or Commission) issued Certificate of Site Compatibility (CSC) Number 29 (PSC Order) to Meadowlark Wind I, LLC (Meadowlark or Applicant) for the New Frontier Wind Energy Project (Project) in McHenry County, North Dakota (Figure 1). In December 2014, Capital Power Investments LLC, a subsidiary of Capital Power Corporation (Capital Power), completed the acquisition of Element Power US, LLC (Element Power), which included Meadowlark and the Project.

Capital Power proposes to construct and operate the New Frontier Wind Energy Project in McHenry County, North Dakota. The Project is expected to have an up to nominal 100.8 Megawatt (MW) power output capacity using 49 wind turbine locations, which were previously permitted by the North Dakota Public Service Commission (PSC). For the Project site layout, Capital Power is considering the use of four different wind turbine models: (1) Acciona AW125/3150; (2) GE 2.5-116; (3) Vestas V100-2.0; and (4) Vestas V126-3.45. The proposed Project infrastructure also includes collection lines and a substation. The substation transformer is rated at 111 megavolt ampere (MVA) and located along State Highway 41 north of State Highway 53.

This acoustic assessment included modeling analyses to predict future sound levels when the wind turbines are operational. Three different modeling scenarios were considered, one with wind turbines operating at cut-in wind speed and two others at maximum rotational wind speed, under moderate downwind and anomalous meteorological conditions. Operational sounds levels resulting from the Project were analyzed at existing noise-sensitive receptors (e.g., residential structures) and compliance was assessed relative to the PSC noise limit.

1.1 Study Area

The Project Study Area encompasses approximately 11,352 acres (17 square miles) within McHenry County. County and township (section line) roads characterize the existing roadway infrastructure in and around the Study Area. The Study Area is accessed via State Highway 41, State Highway 53, and other local two-lane paved and gravel county roads. The land within the Study Area is primarily agricultural with scattered farmstead residences. The turbines will be located on privately-owned land in southwestern McHenry County. This region of North Dakota has topography that can be described as level to rolling plains with isolated sandstone buttes or badlands formations to the west of the Study Area. Gentle slopes characterize most of the Study Area and local relief ranges from less than 1,712 to over 2,196 feet. There are also a number of waterbodies throughout the Study Area. Current land use within the Study Area is primarily agricultural, supporting both crops and livestock grazing. Potential noise sensitive receptor locations within the Study Area and in the vicinity of proposed turbine locations were included in the acoustic analysis. Noise sensitive receptor (NSR) 15 was identified as a military use facility. Figure 1 (Appendix A) presents the proposed wind turbine locations, as well as the noise sensitive receptor locations.

1.2 Existing Acoustic Environment

McHenry County would generally be considered a rural agricultural area. Existing ambient sound levels are expected to be relatively low, although sound levels would be higher near roadways such as State Highway 41 and State Highway 53. Other human activity such as agricultural operations would seasonally contribute to sound levels in the area associated with crop harvests. Background sound levels are expected to vary both spatially and temporally depending on natural sounds and proximity to area sound sources such as roadways. Typically, background sound levels are quieter during the night than during the daytime, except during periods when evening and nighttime insect noise may contribute to the soundscape, predominantly in the warmer seasons.

1.3 Acoustic Terminology

Airborne sound is described as the rapid fluctuation or oscillation of air pressure above and below atmospheric pressure, creating a sound wave. Sound is characterized by properties of the sound waves, which are frequency, wavelength, period, amplitude, and velocity. Noise is defined as unwanted sound. A sound source is defined by a sound power level (L_W), which is independent of any external factors. The acoustic sound power is the rate at which acoustical energy is radiated outward and is expressed in units of watts (W). Sound energy travels in the form of a wave, a rapid fluctuation or oscillation of air pressure above and below atmospheric pressure. A sound pressure level (L_P) is a measure of this fluctuation and can be directly determined with a microphone or calculated from information about the source sound power level and the surrounding environment through predictive acoustic modeling. While the sound power of a source is strictly a function of the total amount of acoustic energy being radiated by the source, the sound pressure levels produced by a source are a function of the distance from the source and the effective radiating area or physical size of the source. In general, the magnitude of a source's sound power level is always considerably higher than the observed sound pressure level near a source due to the fact that the acoustic energy is being radiated in various directions.

Sound levels are presented on a logarithmic scale to account for the large pressure response range of the human ear, and are expressed in units of decibels (dB). A dB is defined as the ratio between a measured value and a reference value usually corresponding to the lower threshold of human hearing defined as 20 micropascals (µPa). Conversely, sound power is commonly referenced to 1 picowatt (pW), which is one trillionth of a watt. Broadband sound includes sound energy summed across the frequency spectrum. In addition to broadband sound pressure levels, analysis of the various frequency components of the sound spectrum is often completed to determine tonal characteristics. The unit of frequency is Hertz (Hz), which corresponds to the rate in cycles per second that sound pressure waves are generated. Typically, a sound frequency analysis examines 11 octave bands (or 33 1/3 octave) ranging from 20 Hz (low) to 20,000 Hz (high). This range encompasses the entire human audible frequency range. Since the human ear does not perceive every frequency with equal loudness, spectrally varying sounds are often adjusted with a weighting filter. The A-weighted filter is applied to compensate for the frequency response of the human auditory system. Sound exposure in acoustic assessments is commonly measured and calculated as A-weighted dB (dBA). Unweighted sound levels are referred to as

linear. Linear dB are used to determine a sound's tonality and to engineer solutions to reduce or control noise as techniques are different for low and high frequency noise. Sound levels that are linear in this report are presented as dBL.

Sound can be measured, modeled, and presented in various formats, with the most common metric being the equivalent sound level (L_{eq}). The equivalent sound level has been shown to provide both an effective and uniform method for comparing time-varying sound levels and is widely used in acoustic assessments in the State of North Dakota. Estimates of noise sources and outdoor acoustic environments, and the comparison of relative loudness are presented in Table 1. Table 2 provides additional reference information on acoustic terminology.

Table 1. Sound Pressure Levels (L_P) and Relative Loudness of Typical Noise Sources and Soundscapes

Noise Source or Activity	Sound Level (dBA)	Subjective Impression	Relative Loudness (perception of different sound levels)
Jet aircraft takeoff from carrier (50 ft)	140	Threshold of pain	64 times as loud
50-hp siren (100 ft)	130		32 times as loud
Loud rock concert near stage or Jet takeoff (200 ft)	120	Uncomfortably loud	16 times as loud
Float plane takeoff (100 ft)	110		8 times as loud
Jet takeoff (2,000 ft)	100	Very loud	4 times as loud
Heavy truck or motorcycle (25 ft)	90		2 times as loud
Garbage disposal, food blender (2 ft), or Pneumatic drill	80	Loud	Reference loudness
Vacuum cleaner (10 ft)	70	Moderate	1/2 as loud
Passenger car at 65 mph (25 ft)	65		
Large store air-conditioning unit (20 ft)	60		1/4 as loud
Light auto traffic (100 ft)	50	Quiet	1/8 as loud
Quiet rural residential area with no activity	45		
Bedroom or quiet living room or Bird calls	40	Faint	1/16 as loud
Typical wilderness area	35		
Quiet library, soft whisper (15 ft)	30	Very quiet	1/32 as loud
Wilderness with no wind or animal activity	25	Extremely quiet	
High-quality recording studio	20		1/64 as loud
Acoustic test chamber	10	Just audible	
	0	Threshold of hearing	
Adapted from: Beranek 1988; EPA 1971			

Table 2. Acoustic Terms and Definitions

Term	Definition
Noise	Typically defined as unwanted sound. This word adds the subjective response of humans to the physical phenomenon of sound. It is commonly used when negative effects on people are known to occur.
Sound Pressure Level (L_P)	Pressure fluctuations in a medium. Sound pressure is measured in decibels referenced to 20 microPascals, the approximate threshold of human perception to sound at 1,000 Hz.
Sound Power Level (L_W)	The total acoustic power of a noise source measured in decibels referenced to picowatts (one trillionth of a watt). Noise specifications are provided by equipment manufacturers as sound power as it is independent of the environment in which it is located. A sound level meter does not directly measure sound power.
A-Weighted Decibel (dBA)	Environmental sound is typically composed of acoustic energy across all frequencies. To compensate for the auditory frequency response of the human ear, an A-weighting filter is commonly used for describing environmental sound levels. Sound levels that are A-weighted are presented as dBA in this report.
Unweighted Decibels (dBL)	Unweighted sound levels are referred to as linear. Linear decibels are used to determine a sound's tonality and to engineer solutions to reduce or control noise as techniques are different for low and high frequency noise. Sound levels that are linear are presented as dBL in this report
Propagation and Attenuation	Propagation is the decrease in amplitude of an acoustic signal due to geometric spreading losses with increased distance from the source. Additional sound attenuation factors include air absorption, terrain effects, sound interaction with the ground, diffraction of sound around objects and topographical features, foliage, and meteorological conditions including wind velocity, temperature, humidity, and atmospheric conditions.
Octave Bands	The audible range of humans spans from 20 to 20,000 Hz and is typically divided into center frequencies ranging from 31 to 8,000 Hz for noise modeling evaluations.
Broadband Sound	Noise which covers a wide range of frequencies within the audible spectrum, i.e., 200 to 2,000 Hz.
Masking	Interference in the perception of one sound by the presence of another sound. At elevated wind speeds, leaf rustle and noise made by the wind itself can mask wind turbine sound levels, which remain relatively constant.
Frequency (Hz)	The rate of oscillation of a sound, measured in units of Hz or kilohertz (kHz). One hundred Hz is a rate of one hundred times (or cycles) per second. The frequency of a sound is the property perceived as pitch: a low-frequency sound (such as a bass note) oscillates at a relatively slow rate, and a high-frequency sound (such as a treble note) oscillates at a relatively high rate. For comparative purposes, the lowest note on a full range piano is approximately 32 Hz and middle C is 261 Hz.

Note: Compiled by Tetra Tech from multiple technical and engineering resources.

2.0 NOISE REGULATIONS AND GUIDELINES

A review was conducted of noise regulations applicable to the Project at the federal, state, county, and local levels. There are no federal, county or local environmental noise requirements specific to this Project. At the state level, the PSC has established regulations applicable to wind energy facilities.

2.1 State of North Dakota Public Service Commission Noise Regulations

North Dakota adopted noise regulations for wind energy facilities under the PSC Chapter 69-06-08-01(4) as follows:

> *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. The sound level avoidance area criteria may be waived in writing by the owner of the occupied residence or the community building.*

Sound levels resulting from the Project within 100 feet of all identified receptors located in the vicinity of the Project were assessed against the 50 dBA limit to determine whether compliance was achieved. The PSC noise limit is absolute and independent of the existing acoustic environment; therefore, a baseline sound survey is not required to assess conformity.

3.0 ACOUSTIC MODELING METHODOLOGY AND RESULTS

Sound generated by an operating wind turbine is comprised of both aerodynamic and mechanical sound with the dominant sound component from modern utility scale wind turbines being largely aerodynamic. Aerodynamic sound refers to the sound produced from air flow and the interaction with the wind turbine tower structure and moving rotor blades. Mechanical sound is generated at the gearbox, generator, and cooling fan, and is radiated from the surfaces of the nacelle and machinery enclosure and by openings in the nacelle casing. Due to the improved design of wind turbine mechanical components and the use of improved noise damping materials within the nacelle, including elastomeric elements supporting the generator and gearbox, mechanical noise emissions have been minimized. Sound reduction elements designed as a part of the wind turbines include impact noise insulation of the gearbox and generator, sound reduced gearbox, sound reduced nacelle, and rotor blades designed to minimize noise generation.

Wind energy facilities, in comparison to other energy-related facilities, are somewhat unique in that the sound generated by each individual wind turbine will increase as the wind speed across the site increases. Wind turbine sound is negligible when the rotor is at rest, increases as the rotor tip speed increases, and is generally constant once rated power output and maximum rotational speed are achieved. Wind turbine maximum sound power will generally be reached at wind speeds between 7 meters per second [m/s] and 11 m/s, depending on the candidate turbine selected. It is important to recognize as wind speeds increase, the background ambient sound level will generally increase as well, resulting in acoustic masking effects; however, this trend is also affected by local contributing sound sources. The net result is that during periods of elevated wind speeds when higher wind turbine sound emissions occur, the sound produced from a wind turbine operating at maximum rotational speed may be largely or fully masked due to wind generated sound in foliage or vegetation. In practical terms, this means a nearby receptor would tend to hear leaves or vegetation rustling rather than wind turbine noise. This relationship is expected to further minimize the potential for any adverse noise effects of the Project. Conversely, these acoustic masking effects may be limited during periods of unusually high wind shear or at receiver locations that are sheltered from the prevailing wind direction.

3.1 Acoustic Modeling Software and Calculation Methods

The operational acoustic assessment was performed using the proposed November 8, 2016 layout with 49 potential wind turbine locations. Four potential wind turbine models were evaluated in this analysis:

- **Acciona AW125/3150**: Wind turbine that has a rotor diameter 410 ft (125 m) and a hub height of 287 ft (87.5 m).
- **GE 2.5-116**: Wind turbine that has a rotor diameter of 381 ft (116 m) and a hub height of 295 ft (90 m);
- **Vestas V100-2.0:** Wind turbine that has a rotor diameter of 328 ft (100 m) of and a hub height of 262 ft (80 m); and

- **Vestas V126-3.45** Wind turbine that has a rotor diameter of 413 ft (126 m) and a hub height of 285 ft (87 m).

The acoustic modeling analysis was conducted using the most recent version of DataKustic GmbH's computer-aided noise abatement program or CadnaA (v 4.6.155). CadnaA is a comprehensive 3-dimensional acoustic software model that conforms to the International Organization for Standardization (ISO) standard ISO 9613-2 "Attenuation of Sound during Propagation Outdoors." The engineering methods specified in this standard consist of full (1/1) 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 both sources and receptors, seasonal foliage effects, and meteorological conditions. Topographical information was imported into the acoustic model using the official United States Geological Survey (USGS) digital elevation dataset to accurately represent terrain in three dimensions. Terrain conditions, vegetation type, ground cover, and the density and height of foliage can also influence the absorption that takes place when sound waves travel over land. The ISO 9613-2 standard accounts for ground absorption rates by assigning a numerical coefficient of G=0 for acoustically hard, reflective surfaces and G=1 for absorptive surfaces and soft ground. If the ground is hard-packed dirt, typically found in industrial complexes, pavement, bare rock or for sound traveling over water, the absorption coefficient is defined as G=0 to account for reduced sound attenuation and higher reflectivity. In contrast, ground covered in vegetation, including suburban lawns, livestock and agricultural fields (both fallow with bare soil and planted with crops), will be acoustically absorptive and aid in sound attenuation (i.e., G=1.0). A mixed (semi-reflective) ground factor of G=0.5 was used in the Project acoustic modeling analysis. In addition to geometrical divergence, attenuation factors include topographical features, terrain coverage, and/or other natural or anthropogenic obstacles that can affect sound attenuation and result in acoustical screening. To be conservative, sound attenuation through foliage and diffraction around and over existing anthropogenic structures such as buildings was not included in the model.

Sound attenuation by the atmosphere is not strongly dependent on temperature and humidity; however, the temperature of 10^{o}Celsius (50^{o}Fahrenheit) and 70 percent relative humidity parameters were selected as reasonably representative of conditions favorable to sound propagation. Atmospheric absorption depends on temperature and humidity and is most important at higher frequencies. Over short distances, the effects of atmospheric absorption are minimal. The ISO 9613-2 standard calculates attenuation for meteorological conditions favorable to propagation, i.e., downwind sound propagation or what might occur typically during a moderate atmospheric ground level inversion. Though a physical impracticality, the ISO 9613-2 standard simulates omnidirectional downwind propagation. For receivers located between discrete wind turbine locations or wind turbine groupings, the acoustic model may result in over-prediction. In addition, the acoustic modeling algorithms essentially assume laminar atmospheric conditions, in which neighboring layers of air do not mix. This conservative assumption does not take into consideration turbulent eddies and micrometeorological variations that may form when winds change speed or direction, which can interfere with the sound wave propagation path and increase attenuation effects.

Conversely, there may be meteorological conditions from time to time that will aid in the long-range propagation of sound. These anomalous meteorological conditions may include well-developed moderate ground-based temperature inversions and low level jets. While the North Dakota PSC does not specifically require or suggest that these meteorological conditions be explicitly addressed in modeling assessments, ISO 9613-2 includes a methodology to account for effects produced under these conditions and so they were addressed to ensure a conservative assessment.

3.2 Acoustic Modeling Input Parameters

In order to assist project developers and acoustical engineers, wind turbine manufacturers report wind turbine sound power data at integer wind speeds referenced to the effective hub height, ranging from cut-in to full rated power per International Electrotechnical Commission (IEC) standard IEC 61400-11:2006 Wind Turbine Generator Systems—Part 11: Acoustic Noise Measurement Techniques. This accepted IEC standard was developed to ensure consistent and comparable sound emission data of utility-scale wind turbines between manufacturers. Tables 3 and 4 present a summary of sound power data for the candidate wind turbine models during normal operations correlated to 10 meter height integer wind speeds 10 meter above ground level (AGL).

The specification for the wind turbines includes an expected warranty confidence interval, or k-factor which was added to the nominal sound power level in the acoustic model. As indicated in the manufacturer sound specification, the Acciona AW125/3150 has a k-factor of 1 dB while the other wind turbines has a k-factor of 2 dB applied. This confidence interval incorporates the uncertainty in independent sound power level measurements conducted, the applied probability level and standard deviation for test measurement reproducibility, and product variability.

Table 3. Wind Turbine Broadband Sound Power Levels (dBA) Correlated with Wind Speed

Wind Speed (m/s)	Hub Height (m)	WTG Sound Power Level at Reference Wind Speed (dBA)								
		3	4	5	6	7	8	9	10	11
Acciona AW125/3150	87.5	-	-	-	107.3	108.4	108.4	108.4	108.4	-
GE 2.5-116	90.0	-	94.5	95.4	98.3	101.7	104.7	106.5	107.0	107.0
Vestas V100-2.0	80.0	93.7	94.0	95.0	98.6	100.7	103.3	104.9	105.0	105.0
Vestas V126-3.45	87.0	92.5	92.6	94.3	97.8	101.4	104.7	107.7	109.8	110.1

Note: "—"Indicates data unavailable for associated wind speed. Sources: Acciona 2016; GE Energy 2016; and Vestas 2016.

Wind turbines can be somewhat directional, radiating more sound in some directions than others. The IEC test measurement protocol requires that sound measurements are made for the maximum downwind directional location when reporting apparent sound power levels. Thus, it is assumed that WTG directivity and sound generating efficiencies are inherently incorporated in the sound source data and used in acoustic model development. A summary of sound power data by octave band center frequency for both wind turbines operating at maximum rotation are presented in Table 4 (1/1 octave band frequency data provided with stated intended use limited for informational purposes only).

Table 4. Wind Turbine Broadband Sound Power Level by Octave Band Frequency

Frequency (Hz)	K-Factor	Octave Band Sound Power Level (dBA)									Broadband (dBA)
		31.5	63	125	250	500	1000	2000	4000	8000	
Acciona AW125/3150	1.0	77.4	85.3	94.7	101.2	103.8	103.3	98.2	87.6	81.3	108.4
GE 2.5-116	2.0	76.1	88.8	96.2	99.7	102.2	101.5	96.6	86.7	66.6	107.0
Vestas V100-2.0	2.0	76.7	85.0	89.8	91.0	95.4	100.3	100.6	94.8	76.5	105.0
Vestas V126-3.45	2.0	79.5	90.0	96.5	100.1	102.2	105.4	104.4	98.3	84.6	110.1

Note: "—"Indicates data unavailable for associated wind speed. Sources: Acciona 2016; GE Energy 2016; and Vestas 2016.

3.3 Acoustic Modeling Results

Acoustic modeling was completed for wind turbine cut-in and maximum rotational operating conditions, thereby describing resultant sound pressure levels over the entire operational range of the Project. In addition, sound energy contribution from the Project substation was included in the acoustic modeling analysis. When calculating received sound levels, it was assumed that the Project substation and all wind turbines were operating concurrently at the given operating condition. Sound contour plots displaying Project operational sound levels in color-coded isopleths are provided in Figures 2 through 13, in Appendix A. For each of the four turbine models, three figures are presented. The first figure shows received sound levels when all wind turbines are operating at cut-in wind speed. The second figure shows received sound levels when all wind turbines are operating at maximum rotational wind speed under moderate downwind propagation conditions. The third figure shows received sound levels conditions when all wind turbines are operating at maximum rotational wind speed under anomalous meteorological conditions.

Table 5 presents the results of the Project acoustic modeling analysis and includes the ID, Universal Transverse Mercator (UTM) coordinates, receptor status and the received sound levels at each receptor. Received sound levels are rounded to the nearest whole decimal for consistency with the State of North Dakota noise limit absolute value of 50 dBA. In addition, a 100-foot buffer was included around the receptors, corresponding to the point of compliance identified in the PSC 50 dBA noise limit.

The acoustic modeling results shown in Tables 5 demonstrate that received sound levels are below the PSC 50 dBA noise limit at all non-participating receptors.

Table 5. Acoustic Modeling Results Summary*

		UTM Coordinates (meters)		Acciona AW1253150			GE 2.5-116			Vestas V100-2.0			Vestas V126-3.45		
NSR ID	NSR Status	Easting	Northing	Cut-in	Maximum Rotational	Anomalous Meteorological	Cut-in	Maximum Rotational	Anomalous Meteorological	Cut-in	Maximum Rotational	Anomalous Meteorological	Cut-in	Maximum Rotational	Anomalous Meteorological
1	Participant	355605	5301329	48	49	49	35	47	48	33	44	44	33	**50**	**51**
2	Participant	355661	5302441	50	**51**	**51**	38	**51**	**51**	35	47	47	35	**53**	**53**
3	Participant	355702	5304238	**51**	**52**	**52**	39	**52**	**52**	37	48	48	37	**54**	**54**
4	Participant	354027	5303759	45	46	47	33	46	47	31	42	42	30	48	48
5	Participant	354097	5304134	45	46	47	33	46	47	31	42	42	30	48	48
6	Participant	355606	5307543	42	43	44	31	43	44	28	39	39	27	45	46
7	Participant	355126	5306945	45	46	46	33	46	46	31	42	42	30	48	48
8	Non-participant	356588	5306315	41	42	43	30	42	43	27	38	38	27	44	45
9	Participant	355290	5309265	39	40	41	28	40	41	25	36	36	25	42	43
10	Non-participant	355229	5309343	39	40	41	28	40	41	25	36	36	24	42	43
11	Non-participant	354397	5309449	41	42	42	29	41	42	26	38	38	26	44	44
12	Participant	354123	5306615	49	**50**	**51**	38	50	**50**	35	46	46	35	**52**	**52**
13	Participant	354129	5306370	46	47	48	35	47	48	32	44	44	32	49	50
14	Participant	352764	5304471	45	46	46	33	46	46	31	42	42	30	48	48
15	Military Facility	356024	5307978	40	41	42	29	41	42	26	37	37	25	43	44
16	Non-participant	355935	5310392	32	33	35	21	33	35	17	28	28	17	34	36
17	Non-participant	357493	5309065	32	33	36	22	34	36	17	29	29	17	35	37
18	Non-participant	360751	5304944	36	37	39	25	38	39	22	33	33	21	39	41
19	Non-participant	348671	5304722	23	24	26	12	25	27	7	18	18	7	25	28
20	Non-participant	348189	5304543	21	22	25	11	23	26	5	17	17	6	24	26
21	Non-participant	355635	5300982	43	44	45	32	44	45	29	40	40	28	46	47
22	Non-participant	355940	5308365	39	40	41	27	40	41	24	35	35	24	41	43
23	Non-participant	357655	5306178	39	40	42	27	40	42	24	35	35	24	41	43
24	Non-participant	355731	5300486	40	41	43	29	41	43	25	37	37	25	43	44
25	Non-participant	355619	5299997	36	37	39	25	37	39	21	32	32	21	39	40
26	Non-participant	355445	5300002	36	37	39	25	38	39	21	33	33	21	39	41
27	Non-participant	355401	5300005	36	37	39	25	38	39	21	33	33	21	39	41
28	Non-participant	355289	5300130	37	38	40	25	38	40	22	33	33	22	39	41
29	Non-participant	355309	5300409	38	39	40	26	39	40	23	34	34	23	40	42
30	Non-participant	355799	5299704	35	36	38	24	36	38	20	31	31	20	37	39
31	Non-participant	358962	5301030	40	41	42	28	41	42	25	36	36	25	42	43
32	Non-participant	353241	5300543	35	37	38	24	37	39	20	32	32	20	38	40
33	Non-participant	355840	5311882	27	28	30	16	29	31	12	23	23	12	30	32
34	Non-participant	357661	5310795	28	29	31	17	30	32	13	24	24	13	31	33
35	Participant	355462	5309266	38	39	41	27	39	41	24	35	35	23	41	42
36	Non-participant	360761	5306287	32	33	35	21	34	36	17	28	28	17	35	37
37	Non-participant	358898	5299451	33	34	36	22	34	37	18	29	29	18	35	37
38	Non-participant	354692	5299450	34	35	37	23	35	37	18	30	30	18	36	38
39	Non-participant	355368	5299420	34	35	37	23	36	38	19	30	30	19	37	39
40	Non-participant	355104	5300327	38	39	41	27	39	41	23	35	35	23	41	42
41	Non-participant	352663	5299129	30	31	34	19	32	34	15	27	27	15	33	35
42	Non-participant	354311	5309444	40	41	42	29	41	42	26	37	37	26	43	44
43	Non-participant	355272	5309370	39	40	41	27	40	41	24	36	36	24	41	42
44	Participant	355890	5305977	48	50	50	37	49	50	34	46	46	34	**52**	**52**
45	Non-participant	361733	5299729	28	29	32	18	30	33	14	25	25	13	31	34
46	Non-participant	362418	5300028	27	28	31	17	29	32	13	24	24	13	30	33
47	Non-participant	357737	5299654	34	35	38	23	36	38	19	30	30	19	37	39

*Tabulated sound levels are rounded values. Please note that sound levels greater than 50 dBA, and exceedances of the ND PSC noise criteria, are identified in red.

3.4 Substation Noise

Substations have switching, protection and control equipment, and typically one or more transformers, which generate the sound generally described as a low humming. There are three main sound sources associated with a transformer: core noise, load noise and noise generated by the operation of the cooling equipment. The core vibrational noise is the principal noise source and does not vary significantly with electrical load. Transformers are designed and catalogued by MVA ratings. Just as horsepower ratings designate the power capacity of an electric motor, a transformer's MVA rating indicates its maximum power output capacity. The National Electrical Manufacturers Association (NEMA) published NEMA Standards TR1-1993 (R2000), which establish the maximum noise level allowed for transformers, voltage regulators, and shunt reactors based on the equipment's method of cooling its dielectric fluid (air-cooled vs. oil-cooled) and the electric power rating.

Transformer noise is generated and will attenuate with distance at different rates depending on the transformer dimensions, voltage rating, and design. The noise produced by substation transformers is primarily caused by the load current in the transformer's conducting coils (or windings) and consequently the main frequency of this sound is twice the supply frequency. The characteristic humming sound consists of tonal components generated at harmonics of 120 Hz. Most of the acoustical energy resides in the fundamental tone (120 Hz) and the first 3 or 4 harmonics (240, 360, 480, 600 Hz). In addition to core vibration noise, transformer cooling fans may generate broadband noise, limited to periods when high heat loads require additional cooling capacity. The resulting audible sound is a combination of core noise and the broadband fan noise. Circuit-breaker operations may also cause audible noise, particularly the operation of air-blast breakers which is characterized as an impulsive sound event of very short duration. This is expected to occur only a few times throughout the year, and was therefore not considered in this analysis.

The proposed substation would be located along State Highway 41 approximately 10,000 feet (3,000 meters) north of State Highway 53, with the closest residence approximately 500 feet (150 meters) to the southwest. The transformer at this substation location was modeled using the latest version of CadnaA implementing ISO 9613-2. Table 6 presents the transformer sound source data by octave band center frequency calculated based on the estimated transformer NEMA and MVA ratings using standardized engineering guidelines.

Table 6. Transformer Sound Power Level

	Octave Band Sound Power Level (dB)									Broadband (dBA)
Frequency (Hz)	31.5	63	125	250	500	1000	2000	4000	8000	
111 MVA Transformer	54.0	73.3	85.4	87.9	93.3	90.6	86.8	81.5	72.4	97.0

Transformers the size of the one proposed for the Project can present a noise concern if the separation distance is less than a few hundred feet between the transformer and noise-sensitive receptors. The proposed transformer location is approximately 500 feet (150 meters) from the nearest noise sensitive receptor and poses little concern from a noise perspective. Nevertheless,

transformer noise may be periodically audible at nearby receptors on occasions when background sound levels are very low.

3.5 Construction Noise

The development of the Project will involve construction to establish access roads, excavate and form wind turbine foundations, prepare the site for crane-lifting and assemble and commission the wind turbines. Work on large-scale wind projects such as the Project is generally divided into four phases consisting of the following:

1. *Site Clearing*: The initial site mobilization phase includes the establishment of temporary site offices, workshops, stores, and other on-site facilities. Installation of erosion and sedimentation control measures will be completed as well as the preparation of initial haulage routes.

2. *Grading*: This phase would begin with the grading and formation of access roads and preparation of laydown areas. Excavation for the concrete turbine foundations would also be completed.

3. *Foundation Work*: Construction of the reinforced concrete turbine foundations would take place in addition to installation of the internal transmission network.

4. *WTG Installation*: Delivery of the turbine components would occur followed by their installation and commissioning.

Work on these construction activities is expected to overlap. It is likely that the wind turbines will be erected in small groupings. Each grouping may undergo periodic testing and commissioning prior to commencement of full commercial operation. Other construction activities include those for the supporting infrastructure such as the substation, operations and maintenance building, and the overhead transmission line.

The construction of the Project 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 7.

Table 7. 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
Concrete Batch Plant	83	51

Source: FHWA 2006; Bolt et al. 1977

Sounds generated by construction activities are typically exempt from state and local noise oversight provided that they occur within weekday, daytime periods as may be specified under local zoning or legal codes. All reasonable efforts will be made to minimize the impact of noise resulting from construction activities. As the design of the Project progresses and construction scheduling is finalized, the construction engineer normally notifies the community, via public notice or alternative method, of the expected Project construction commencement and duration to help minimize the effects of construction noise. In addition, the location of stationary equipment and the siting of construction laydown areas will be carefully selected to be as far removed from existing noise-sensitive receptors as is practical. Candidate construction noise mitigation measures include scheduling louder construction activities during daytime hours and equipping internal combustion engines with appropriate sized muffler systems to minimize noise excessive emissions.

Construction activity will generate traffic having potential noise effects, such as trucks travelling to and from the site on public roads. At the early stage of the construction phase, equipment and materials will be delivered to the site, such as hydraulic excavators and associated spreading and compacting equipment needed to form access roads and foundation platforms for each turbine. Once the access roads are constructed, equipment for lifting the towers and turbine components will arrive. Traffic noise is categorized into two categories: (1) the noise that will occur during the initial temporary traffic movements related to turbine delivery, haulage of components and remaining construction; and (2) maintenance and ongoing traffic from staff and contractors, which is expected to be minor.

4.0 CONCLUSIONS

Project operational sound has been calculated and compared to the 50 dBA North Dakota PSC noise limit. Acoustic modeling analysis per ISO 9613-2 and inclusive of a number of conservative assumptions demonstrates the Project will not generate exceedances of the PSC noise limit at any non-participating receptor under all three modeling scenarios; wind turbine operation at cut-in wind speed and at maximum rotational wind speed under both moderate downwind and anomalous meteorological conditions.

It is expected that received sound levels at noise-sensitive receptors will be consistent with sound generated at similar wind energy projects successfully sited throughout the state of North Dakota employing the same or similar criteria. However, while the Project has demonstrated compliance with the requirements, the Project may result in periodically audible sound within adjacent areas under certain operational and meteorological conditions.

5.0 TECHNICAL REFERENCES

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V100-2.0 MW Third octave noise emission. Vestas Wind Systems A/S. 2016.

V126-3.45 MW Loq Torque (LTq) Third octave noise emission. Vestas Wind Systems A/S 2016.

APPENDIX A

Figures

NEW FRONTIER WIND ENERGY PROJECT

Figure 1: Project Layout

- Wind Turbine
- Participant Receptor
- Non-Participant Receptor
- Substation

0 0.25 0.5 Miles

Scale is 1:18,000 when printed at 22x34"

TETRA TECH

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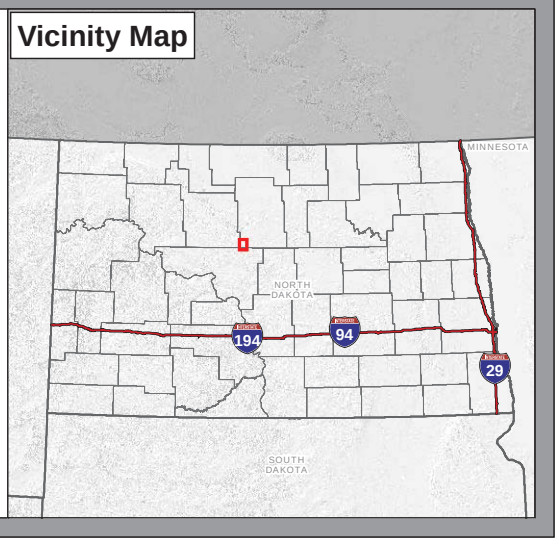
Vicinity Map



NEW FRONTIER WIND ENERGY PROJECT

Figure 2 – Acciona AW125/3150: Received Sound Levels Wind Turbines at Cut-In Wind Speed

- Acciona AW125/3150 Wind Turbine
- Participant Receptor
- Non-Participant Receptor
- Substation

Sound Level Contour Ranges (dBA)

- 35 - 40 dBA
- 40 - 45 dBA
- 45 - 50 dBA
- > 50 dBA

0 0.5 1 Miles

Scale is 1:24,000 when printed at 22x34"

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Vicinity Map

NEW FRONTIER WIND ENERGY PROJECT

Figure 3 – Acciona AW125/3150: Received Sound Levels Wind Turbines at Maximum Rotational Wind Speed

- Acciona AW125/3150 Wind Turbine
- Participant Receptor
- Non-Participant Receptor
- Substation

Sound Level Contour Ranges (dBA)

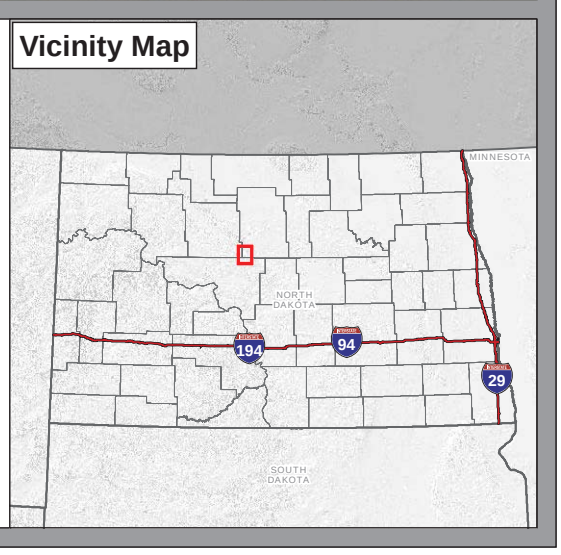
- 35 - 40 dBA
- 40 - 45 dBA
- 45 - 50 dBA
- > 50 dBA

0 0.5 1 Miles

Scale is 1:32,000 when printed at 22x34"

TETRA TECH

Vicinity Map



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NEW FRONTIER WIND ENERGY PROJECT

Figure 4 – Acciona AW125/3150: Received Sound Levels Wind Turbines at Maximum Rotational Wind Speed Anomalous Meteorological Conditions

0 0.5 1 Miles

Scale is 1:32,000 when printed at 22x34"

- Acciona AW125/3150 Wind Turbine
- Participant Receptor
- Non-Participant Receptor
- Substation

Sound Level Contour Ranges (dBA)

- 35 - 40 dBA
- 40 - 45 dBA
- 45 - 50 dBA
- > 50 dBA

TETRA TECH

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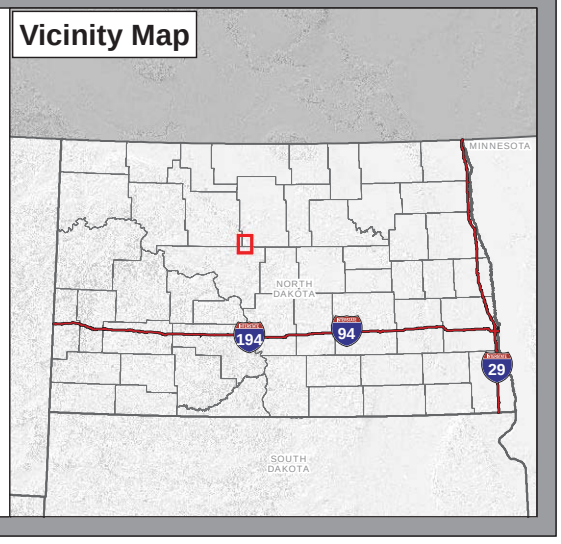

NEW FRONTIER WIND ENERGY PROJECT

Figure 5 – GE 2.5-116: Received Sound Levels
Wind Turbines at Cut-In Wind Speed

0 0.25 0.5 Miles

Scale is 1:18,000 when printed at 22x34"

- GE 2.5-116 Wind Turbine
- Participant Receptor
- Non-Participant Receptor
- Substation

Sound Level Contour Ranges (dBA)

- 35 - 40 dBA
- 40 - 45 dBA
- 45 - 50 dBA
- > 50 dBA

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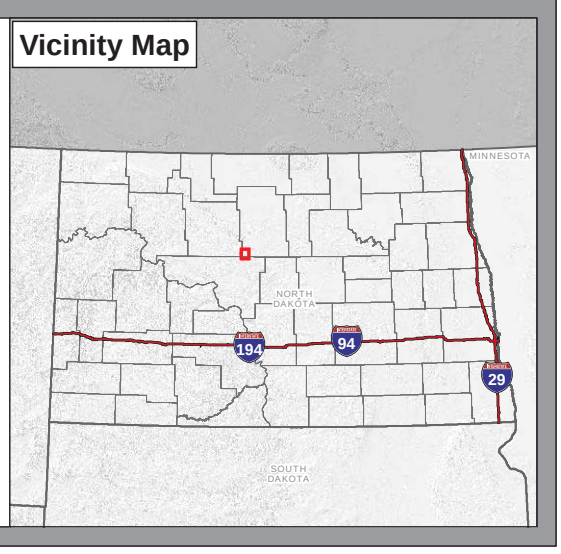


NEW FRONTIER WIND ENERGY PROJECT

Figure 6 – GE 2.5-116: Received Sound Levels
Wind Turbines at Maximum Rotational Wind Speed

0 0.25 0.5 Miles

Scale is 1:24,000 when printed at 22x34"

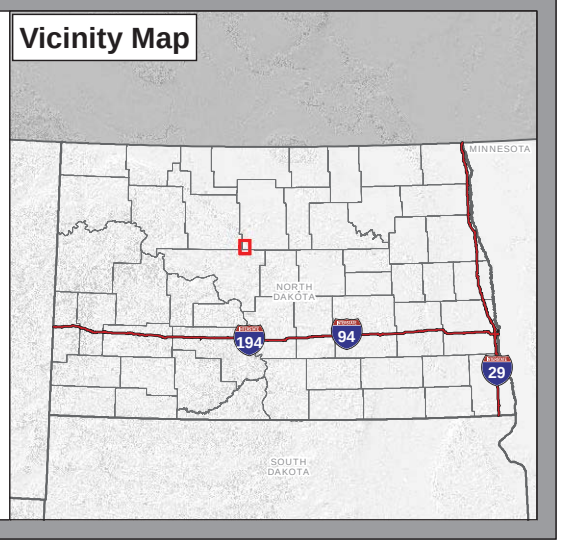
- GE 2.5-116 Wind Turbine
- Participant Receptor
- Non-Participant Receptor
- Substation

Sound Level Contour Ranges (dBA)

- 35 - 40 dBA
- 40 - 45 dBA
- 45 - 50 dBA
- > 50 dBA

TETRA TECH

Vicinity Map



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NEW FRONTIER WIND ENERGY PROJECT

Figure 7 – GE 2.5-116: Received Sound Levels
Wind Turbines at Maximum Rotational Wind Speed
Anomalous Meteorological Conditions

0 0.5 1 Miles

Scale is 1:28,000 when printed at 22x34"

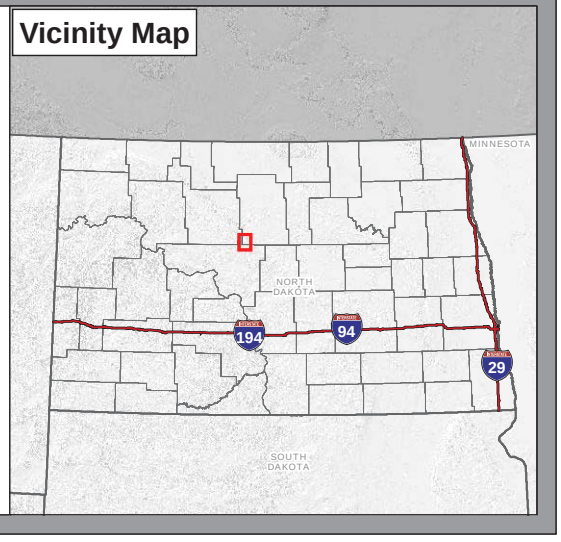
- GE 2.5-116 Wind Turbine
- Participant Receptor
- Non-Participant Receptor
- Substation

Sound Level Contour Ranges (dBA)

- 35 - 40 dBA
- 40 - 45 dBA
- 45 - 50 dBA
- > 50 dBA

TETRA TECH

Vicinity Map



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NEW FRONTIER WIND ENERGY PROJECT

Figure 8 – Vestas V100-2.0: Received Sound Levels
Wind Turbines at Cut-In Wind Speed

0 0.25 0.5 Miles

Scale is 1:18,000 when printed at 22x34"

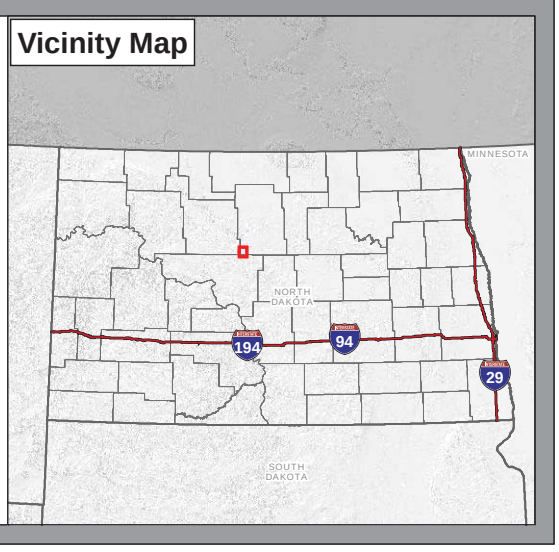
- Vestas V100-2.0 Wind Turbine
- Participant Receptor
- Non-Participant Receptor
- Substation

Sound Level Contour Ranges (dBA)

- 35 - 40 dBA
- 40 - 45 dBA
- 45 - 50 dBA
- > 50 dBA

TETRA TECH

Vicinity Map



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NEW FRONTIER WIND ENERGY PROJECT

Figure 9 – Vestas V100-2.0: Received Sound Levels
Wind Turbines at Maximum Rotational Wind Speed

0 0.25 0.5 Miles

Scale is 1:24,000 when printed at 22x34"

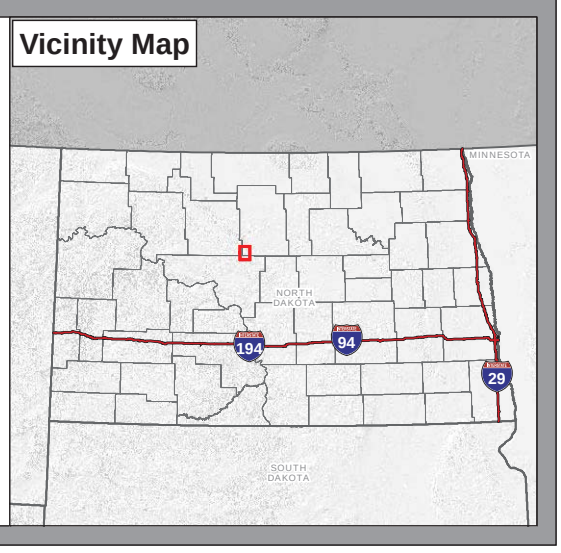
- Vestas V100-2.0 Wind Turbine
- Participant Receptor
- Non-Participant Receptor
- Substation

Sound Level Contour Ranges (dBA)

- 35 - 40 dBA
- 40 - 45 dBA
- 45 - 50 dBA
- > 50 dBA

TETRA TECH

Vicinity Map



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NEW FRONTIER WIND ENERGY PROJECT

Figure 10 – Vestas V100-2.0: Received Sound Levels Wind Turbines at Maximum Rotational Wind Speed, Anomalous Meteorological Conditions

- Vestas V100-2.0 Wind Turbine
- Participant Receptor
- Non-Participant Receptor
- Substation

Sound Level Contour Ranges (dBA)

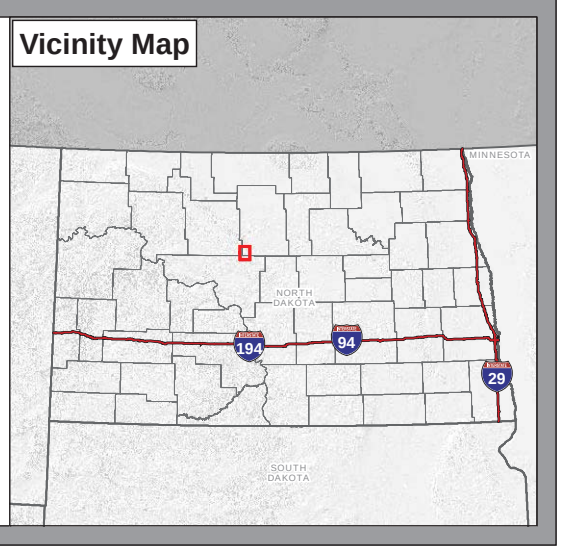
- 35 - 40 dBA
- 40 - 45 dBA
- 45 - 50 dBA
- > 50 dBA

0 0.25 0.5 Miles

Scale is 1:24,000 when printed at 22x34"

TETRA TECH

Vicinity Map



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NEW FRONTIER WIND ENERGY PROJECT

Figure 11 – Vestas V126-3.45: Received Sound Levels Wind Turbines at Cut-In Wind Speed

- Vestas V126-3.45 Wind Turbine
- Participant Receptor
- Non-Participant Receptor
- Substation

Sound Level Contour Ranges (dBA)

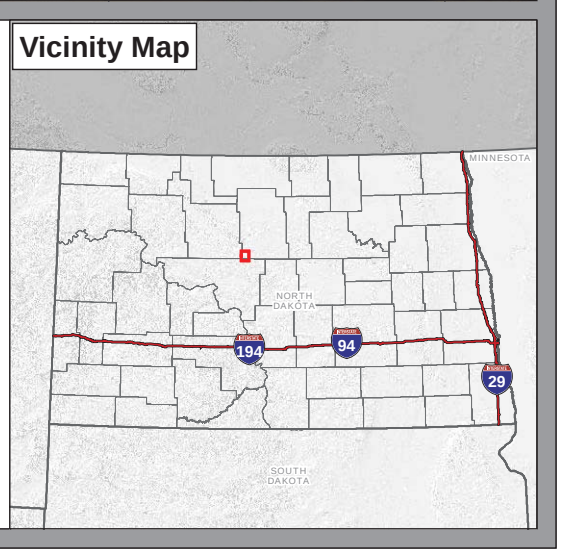
- 35 - 40 dBA
- 40 - 45 dBA
- 45 - 50 dBA
- > 50 dBA

0 0.25 0.5 Miles

Scale is 1:18,000 when printed at 22x34"

TETRA TECH

Vicinity Map



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NEW FRONTIER WIND ENERGY PROJECT

Figure 12 – Vestas V126-3.45: Received Sound Levels Wind Turbines at Maximum Rotational Wind Speed

- Vestas V126-3.45 Wind Turbine
- Participant Receptor
- Non-Participant Receptor
- Substation

Sound Level Contour Ranges (dBA)

- 35 - 40 dBA
- 40 - 45 dBA
- 45 - 50 dBA
- > 50 dBA

0 0.5 1 Miles

Scale is 1:32,000 when printed at 22x34"

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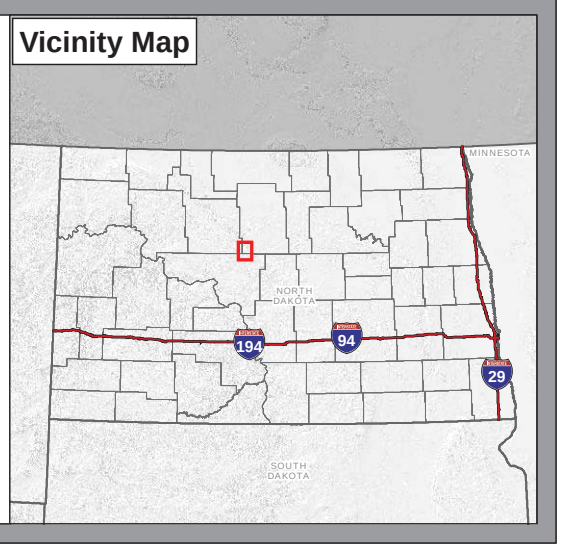
Vicinity Map



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NEW FRONTIER WIND ENERGY PROJECT

Figure 13 – Vestas V126-3.45: Received Sound Levels Wind Turbines at Maximum Rotational Wind Speed Anomalous Meteorological Conditions

0 0.5 1 Miles

Scale is 1:32,000 when printed at 22x34"

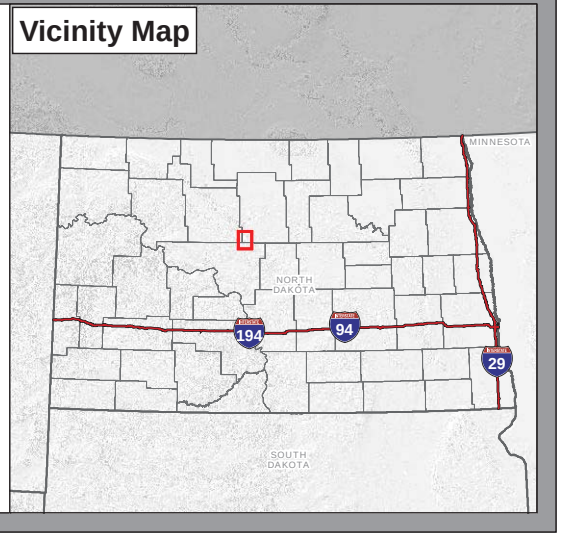
- Vestas V126-3.45 Wind Turbine
- Participant Receptor
- Non-Participant Receptor
- Substation

Sound Level Contour Ranges (dBA)

- 35 - 40 dBA
- 40 - 45 dBA
- 45 - 50 dBA
- > 50 dBA

TETRA TECH

Vicinity Map



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Appendix D:
Participating Landowner Waivers for Acoustic and Shadow Flicker Exceedances

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SHADOW FLICKER ACKNOWLEDGMENT

Meadowlark Wind I LLC intends to construct the New Frontier Wind Energy Project ("Project") to be located in McHenry County, North Dakota. A portion of the Project may be located on or near your property, described as follows:

All that real property located in McHenry County, North Dakota more fully described as follows:

The Southeast Quarter (SE1/4) of Section Nineteen (19), and the Northwest Quarter of the Northwest Quarter (NW1/4 NW1/4) of Section Twenty Nine (29) and the North Half of Northeast Quarter (N1/2 NE1/4) of Section Thirty (30), in Township One Hundred Fifty One North (151) and Range Eighty (80) West of the Fifth Principle Meridian, McHenry County, North Dakota according to the Original U.S. Government Survey thereof (the "Premises").

(the "Property").

The Project is a wind energy conversion facility, and consists of wind turbines and other associated components. 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. Shadow flicker impacts are not regulated in applicable state or federal law. However, developers in North Dakota often set a goal of 30 hours per year or less for shadow flicker impacts at inhabited residences. Operation of the Project may result in shadow flicker impacts that are at or exceed 30 hours per year at an inhabited residence located on your Property.

By signing this waiver, you, as the owner of the inhabited residence on the Property, acknowledge and confirm that: (1) you understand operation of the Project may result in shadow flicker levels that are at or exceed 30 hours per year at your residence; and (2) you have no objection to the construction and operation of the Project.

Dated this 9th day of Nov, 2016.

Fred O Baluski

Fredrick W. Baluski, Jr.

Evonne Baluski

Evonne Baluski

SHADOW FLICKER ACKNOWLEDGMENT

Meadowlark Wind I LLC intends to construct the New Frontier Wind Energy Project ("Project") to be located in McHenry County, North Dakota. A portion of the Project may be located on or near your property, described as follows:

All that real property located in McHenry County, North Dakota more fully described as follows:

TOWNSHIP 151 NORTH, RANGE 80 WEST, MCHENRY COUNTY, NORTH DAKOTA

PARCEL 1:

Section 27: SW ¼
Section 28: SE ¼

PARCEL 2:

Section 29: SW ¼ NE ¼
Section 31: SE ¼ NE ¼ AND NE ¼ SE ¼
Section 32: W ½ NE ¼ AND S ½ NW ¼ AND SW ¼

PARCEL 3:

Section 32: E ½ NE ¼

(the "Property").

The Project is a wind energy conversion facility, and consists of wind turbines and other associated components. 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. Shadow flicker impacts are not regulated in applicable state or federal law. However, developers in North Dakota often set a goal of 30 hours per year or less for shadow flicker impacts at inhabited residences. Operation of the Project may result in shadow flicker impacts that are at or exceed 30 hours per year at an inhabited residence located on your Property.

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Dated this 16 day of Nov., 2016.

Marvin Berg

Marvin Berg

Lorraine Berg

Lorraine Berg

SHADOW FLICKER ACKNOWLEDGMENT

Meadowlark Wind I LLC intends to construct the New Frontier Wind Energy Project ("Project") to be located in McHenry County, North Dakota. A portion of the Project may be located on or near your property, described as follows:

PARCEL 1:

THE SOUTHWEST QUARTER OF THE NORTHWEST QUARTER, THE NORTHWEST QUARTER OF THE SOUTHWEST QUARTER, THE SOUTH HALF OF THE SOUTHWEST QUARTER AND THE SOUTHEAST QUARTER, ALL IN SECTION 17, TOWNSHIP 151 NORTH, RANGE 80 WEST OF THE 5TH PRINCIPAL MERIDIAN, MCHENRY COUNTY, NORTH DAKOTA.

PIN: 01-0000-00079-000 and 01-0000-00080-000

PARCEL 2:

THE EAST HALF OF THE SOUTHWEST QUARTER AND LOTS 3 AND 4, SOUTHEAST QUARTER, ALSO KNOWN AS THE SOUTH HALF OF SECTION 18, TOWNSHIP 151 NORTH, RANGE 80 WEST OF THE 5TH PRINCIPAL MERIDIAN, MCHENRY COUNTY, NORTH DAKOTA.

PIN: 01-0000-00083-000 and 01-0000-00084-000

PARCEL 3:

THE NORTHWEST QUARTER AND THE NORTH HALF OF THE NORTHEAST

QUARTER, ALL IN SECTION 20, TOWNSHIP 151 NORTH, RANGE 80 WEST OF THE 5TH PRINCIPAL MERIDIAN, MCHENRY COUNTY, NORTH DAKOTA.

PIN: 01-0000-00091-000 and 01-0000-00089-000

(the "Property").

The Project is a wind energy conversion facility, and consists of wind turbines and other associated components. 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. Shadow flicker impacts are not regulated in applicable state or federal law. However, developers in North Dakota often set a goal of 30 hours per year or less for shadow flicker impacts at inhabited residences. Operation of the Project may result in shadow flicker impacts that are at or exceed 30 hours per year at an inhabited residence located on your Property.

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Dated this 11 day of Nov, 2016.

Curtis E. Nelson

Diana L. Nelson

Erick L. Nelson

Amy L. Nelson

SHADOW FLICKER ACKNOWLEDGMENT

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All that real property located in McHenry County, North Dakota more fully described as follows:

Parcel 1:

TOWNSHIP 151 NORTH, RANGE 80 WEST, MCHENRY COUNTY, NORTH DAKOTA
SECTION 29: SE ¼ NE ¼ LESS R/W

Parcel 2:

OUTLOT 1 OF THE NE¼ NW¼ AND N½ NE¼, SECTION 29, TOWNSHIP 151 N, RANGE 80 W DESCRIBED AS FOLLOWS: A TRACT OF LAND LYING IN THE NE¼ NW¼ AND THE N½ NE¼ OF SECTION 29, TOWNSHIP 151 N, AND RANGE 80 W OF THE 5TH PRINCIPAL MERIDIAN, COUNTY OF MCHENRY, STATE OF NORTH DAKOTA, AND MORE PARTICULARLY DESCRIBED AS FOLLOWS: BEGINNING AT A POINT ON THE NORTH LINE OF SECTION 29, SAID POINT BEING N89° 47' 38" W A DISTANCE OF 100.00 FEET FROM THE NORTHEAST CORNER OF SAID SECTION 29; THENCE BEARING N89° 47' 38" W ALONG THE NORTH LINE OF SECTION 29 A DISTANCE OF 3890.94 FEET; THENCE BEARING S00° 02' 42" W A DISTANCE OF 1328.09 FEET TO A POINT ON THE NORTH QUARTER QUARTER LINE; THENCE BEARING S89° 52' 00" E ALONG SAID QUARTER QUARTER LINE A DISTANCE OF 3899.84 FEET TO A POINT ON THE WEST RIGHT-OF-WAY LINE OF NORTH DAKOTA STATE HIGHWAY NO. 41; THENCE BEARING N00° 02' 23" W ALONG SAID STATE RIGHT-OF-WAY A DISTANCE OF 1323.15 FEET TO THE POINT OF BEGINNING. THE ABOVE DESCRIBED TRACT OF LAND CONTAINS 118.54 ACRES MORE OR LESS.

(the "Property").

The Project is a wind energy conversion facility, and consists of wind turbines and other associated components. 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. Shadow flicker impacts are not regulated in applicable state or federal law. However, developers in North Dakota often set a goal of 30 hours per year or less for shadow flicker impacts at inhabited residences. Operation of the Project may result in shadow flicker impacts that are at or exceed 30 hours per year at an inhabited residence located on your Property.

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Dated this 9 day of Nov, 2016.

Joseph B. Saville

Penny Saville

Penny L. Saville

SHADOW FLICKER ACKNOWLEDGMENT

Meadowlark Wind I LLC intends to construct the New Frontier Wind Energy Project ("Project") to be located in McHenry County, North Dakota. A portion of the Project may be located on or near your property, described as follows:

Northwest Quarter (NW ¼) of Section 21, Township 151 North, Range 80 West of the 5th Principal Meridian, McHenry County, North Dakota.

Save and Except the Following:

A tract of land conveyed to the State of North Dakota, for the use of the State Highway Department in a Warranty Deed, dated February 3, 1961, recorded March 7, 1961, Book 162 of Deeds at page 94, Official Public Records, McHenry County, North Dakota.

(the "Property").

The Project is a wind energy conversion facility, and consists of wind turbines and other associated components. 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. Shadow flicker impacts are not regulated in applicable state or federal law. However, developers in North Dakota often set a goal of 30 hours per year or less for shadow flicker impacts at inhabited residences. Operation of the Project may result in shadow flicker impacts that are at or exceed 30 hours per year at an inhabited residence located on your Property.

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Dated this 9th day of November, 2016.

Neil J. Schmidt

Dallas Schmidt

SOUND LEVEL WAIVER

Meadowlark Wind I LLC intends to construct the New Frontier Wind Energy Project ("Project") to be located in McHenry County, North Dakota. A portion of the Project may be located on or near your property, described as follows:

Parcel 1:

THE EAST HALF OF THE SOUTHEAST QUARTER (E½ SE¼) OF SECTION TWENTY-FOUR (24), AND THE NORTHEAST QUARTER (NE¼) AND SOUTHEAST QUARTER (SE¼) OF SECTION TWENTY-FIVE (25), IN TOWNSHIP ONE HUNDRED FIFTY ONE (151) NORTH AND RANGE EIGHTY ONE (81) WEST OF THE FIFTH PRINCIPAL MERIDIAN, WARD COUNTY, NORTH DAKOTA.

Parcel 2:

TOWNSHIP 151 N., RANGE 80 W. SECTION 30: LOTS 1, 2, 3, 4, E½ NW¼ AND E½ SW¼, COUNTY OF MCHENRY, STATE OF NORTH DAKOTA.

Parcel 3:

TOWNSHIP 151 N., RANGE 80 W. SECTION 19: LOTS 1, 2, 3, 4, E½ NW¼ AND E½ SW¼, COUNTY OF MCHENRY, STATE OF NORTH DAKOTA.

(the "Property").

The Project is a wind energy conversion facility under North Dakota law. Under N.D. Admin. Code § 69-06-08-01(4) (2016), areas where operation of a wind energy facility will result in sound levels that exceed 50 dBA within one hundred feet of an inhabited residence are an "avoidance area" and shall not be part of a wind energy conversion facility site, unless the owner of the residence signs a waiver of the sound avoidance area requirement. Operation of the Project may result in sound levels that exceed 50 dBA within one hundred feet of an inhabited residence located on your Property.

By signing this waiver, you, as the owner of the inhabited residence on the Property, acknowledge and confirm that: (1) you understand operation of the Project may result in sound levels that exceed 50 dBA within one hundred feet of your residence; (2) you have no objection to the construction and operation of the Project; and (3) you waive the sound level avoidance area criteria in N.D. Admin. Code § 69-06-08-01(4).

Dated this 9th day of November, 2016.

Wade Baluski Personal Rep. of Gladys Baluski

Wade Baluski, Personal Representative of Gladys V. Baluski

SOUND LEVEL WAIVER

Meadowlark Wind I LLC intends to construct the New Frontier Wind Energy Project ("Project") to be located in McHenry County, North Dakota. A portion of the Project may be located on or near your property, described as follows:

All that real property located in McHenry County, North Dakota more fully described as follows:

TOWNSHIP 151 NORTH, RANGE 80 WEST, MCHENRY COUNTY, NORTH DAKOTA

PARCEL 1:

Section 27: SW ¼
Section 28: SE ¼

PARCEL 2:

Section 29: SW ¼ NE ¼
Section 31: SE ¼ NE ¼ AND NE ¼ SE ¼
Section 32: W ½ NE ¼ AND S ½ NW ¼ AND SW ¼

PARCEL 3:

Section 32: E ½ NE ¼

(the "Property").

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Dated this 10 day of Nov., 2016.

Marvin Berg

Lorraine Berg

SOUND LEVEL WAIVER

Meadowlark Wind I LLC intends to construct the New Frontier Wind Energy Project ("Project") to be located in McHenry County, North Dakota. A portion of the Project may be located on or near your property, described as follows:

All that real property located in McHenry County, North Dakota more fully described as follows:

The Southeast Quarter (SE1/4) of Section Thirty-two (32), in Township One Hundred Fifty One (151) North and Range Eighty (80) West of the Fifth Principal Meridian, McHenry County, North Dakota according to the Original U.S. Government Survey thereof, (Lessor property, hereinafter "Premises").

(the "Property").

The Project is a wind energy conversion facility under North Dakota law. Under N.D. Admin. Code § 69-06-08-01(4) (2016), areas where operation of a wind energy facility will result in sound levels that exceed 50 dBA within one hundred feet of an inhabited residence are an "avoidance area" and shall not be part of a wind energy conversion facility site, unless the owner of the residence signs a waiver of the sound avoidance area requirement. Operation of the Project may result in sound levels that exceed 50 dBA within one hundred feet of an inhabited residence located on your Property.

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Dated this 11 day of Nov, 2016.

Dwight Howe

Dwight Howe

Sharon Howe

Sharon Howe

SOUND LEVEL WAIVER

Meadowlark Wind I LLC intends to construct the New Frontier Wind Energy Project ("Project") to be located in McHenry County, North Dakota. A portion of the Project may be located on or near your property, described as follows:

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THE SOUTHWEST QUARTER OF THE NORTHWEST QUARTER, THE NORTHWEST QUARTER OF THE SOUTHWEST QUARTER, THE SOUTH HALF OF THE SOUTHWEST QUARTER AND THE SOUTHEAST QUARTER, ALL IN SECTION 17, TOWNSHIP 151 NORTH, RANGE 80 WEST OF THE 5TH PRINCIPAL MERIDIAN, MCHENRY COUNTY, NORTH DAKOTA.

PIN: 01-0000-00079-000 and 01-0000-00080-000

PARCEL 2:

THE EAST HALF OF THE SOUTHWEST QUARTER AND LOTS 3 AND 4, SOUTHEAST QUARTER, ALSO KNOWN AS THE SOUTH HALF OF SECTION 18, TOWNSHIP 151 NORTH, RANGE 80 WEST OF THE 5TH PRINCIPAL MERIDIAN, MCHENRY COUNTY, NORTH DAKOTA.

PIN: 01-0000-00083-000 and 01-0000-00084-000

PARCEL 3:

THE NORTHWEST QUARTER AND THE NORTH HALF OF THE NORTHEAST

QUARTER, ALL IN SECTION 20, TOWNSHIP 151 NORTH, RANGE 80 WEST OF THE 5TH PRINCIPAL MERIDIAN, MCHENRY COUNTY, NORTH DAKOTA.

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Dated this 11 day of Nov., 2016.

Curtis Nelson

Diana Nelson

Erick L. Nelson

Amy L. Nelson

SOUND LEVEL WAIVER

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Parcel 1:

TOWNSHIP 151 NORTH, RANGE 80 WEST, MCHENRY COUNTY, NORTH DAKOTA

SECTION 29: SE ¼ NE ¼ LESS R/W

Parcel 2:

OUTLOT 1 OF THE NE¼ NW¼ AND N½ NE¼, SECTION 29, TOWNSHIP 151 N, RANGE 80 W DESCRIBED AS FOLLOWS: A TRACT OF LAND LYING IN THE NE¼ NW¼ AND THE N½ NE¼ OF SECTION 29, TOWNSHIP 151 N, AND RANGE 80 W OF THE 5TH PRINCIPAL MERIDIAN, COUNTY OF MCHENRY, STATE OF NORTH DAKOTA, AND MORE PARTICULARLY DESCRIBED AS FOLLOWS: BEGINNING AT A POINT ON THE NORTH LINE OF SECTION 29, SAID POINT BEING N89° 47' 38" W A DISTANCE OF 100.00 FEET FROM THE NORTHEAST CORNER OF SAID SECTION 29; THENCE BEARING N89° 47' 38" W ALONG THE NORTH LINE OF SECTION 29 A DISTANCE OF 3890.94 FEET; THENCE BEARING S00° 02' 42" W A DISTANCE OF 1328.09 FEET TO A POINT ON THE NORTH QUARTER QUARTER LINE; THENCE BEARING S89° 52' 00" E ALONG SAID QUARTER QUARTER LINE A DISTANCE OF 3899.84 FEET TO A POINT ON THE WEST RIGHT-OF-WAY LINE OF NORTH DAKOTA STATE HIGHWAY NO. 41; THENCE BEARING N00° 02' 23" W ALONG SAID STATE RIGHT-OF-WAY A DISTANCE OF 1323.15 FEET TO THE POINT OF BEGINNING. THE ABOVE DESCRIBED TRACT OF LAND CONTAINS 118.54 ACRES MORE OR LESS.

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Dated this 9 day of Nov, 2016.

Joseph B. Saville

Penny L. Saville

SOUND LEVEL WAIVER

Meadowlark Wind I LLC intends to construct the New Frontier Wind Energy Project ("Project") to be located in McHenry County, North Dakota. A portion of the Project may be located on or near your property, described as follows:

Northwest Quarter (NW ¼) of Section 21, Township 151 North, Range 80 West of the 5th Principal Meridian, McHenry County, North Dakota.

Save and Except the Following:

A tract of land conveyed to the State of North Dakota, for the use of the State Highway Department in a Warranty Deed, dated February 3, 1961, recorded March 7, 1961, Book 162 of Deeds at page 94, Official Public Records, McHenry County, North Dakota.

(the "Property").

The Project is a wind energy conversion facility under North Dakota law. Under N.D. Admin. Code § 69-06-08-01(4) (2016), areas where operation of a wind energy facility will result in sound levels that exceed 50 dBA within one hundred feet of an inhabited residence are an "avoidance area" and shall not be part of a wind energy conversion facility site, unless the owner of the residence signs a waiver of the sound avoidance area requirement. Operation of the Project may result in sound levels that exceed 50 dBA within one hundred feet of an inhabited residence located on your Property.

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Dated this 9th day of November, 2016.

Neil J. Schmidt

Dallas Schmidt

SHADOW FLICKER ACKNOWLEDGMENT

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(the "Property").

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Dated this 18 day of November, 2016.

Neil J. Schmidt

Dallas Schmidt

SOUND LEVEL WAIVER

Meadowlark Wind I LLC intends to construct the New Frontier Wind Energy Project ("Project") to be located in McHenry County, North Dakota. A portion of the Project may be located on or near your property, described as follows:

Northwest Quarter (NW ¼) of Section 21, Township 151 North, Range 80 West of the 5th Principal Meridian, McHenry County, North Dakota.

Save and Except the Following:

A tract of land conveyed to the State of North Dakota, for the use of the State Highway Department in a Warranty Deed, dated February 3, 1961, recorded March 7, 1961, Book 162 of Deeds at page 94, Official Public Records, McHenry County, North Dakota.

(the "Property").

The Project is a wind energy conversion facility under North Dakota law. Under N.D. Admin. Code § 69-06-08-01(4) (2016), areas where operation of a wind energy facility will result in sound levels that exceed 50 dBA within one hundred feet of an inhabited residence are an "avoidance area" and shall not be part of a wind energy conversion facility site, unless the owner of the residence signs a waiver of the sound avoidance area requirement. Operation of the Project may result in sound levels that exceed 50 dBA within one hundred feet of an inhabited residence located on your Property.

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Dated this 16 day of November, 2016.

Neil J. Schmidt

Dallas Schmidt

Appendix E:
Class I Cultural Resource Site File Search and Literature Review for the New Frontier Wind Energy Project, McHenry County, North Dakota

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TETRA TECH

August 1, 2016

Bill Behling, Business Development Manager, Commercial Services
Capital Power Corporation
155 Federal Street, Suite 1200
Boston, MA 02110
Sent via Email: wbehling@capitalpower.com

Re: Class I Cultural Resource Site File Search and Literature Review for the New Frontier Wind Energy Project, McHenry County, North Dakota

Mr. Behling,

The purpose of this letter is to describe the results of a Class I Cultural Resource Site File Search and Literature Review for the New Frontier Wind Energy Project (Project), McHenry County, North Dakota. The results of this review include previously recorded sites and previously conducted surveys for the New Frontier Wind Energy Project and associated 15-mile, 115-kV transmission line.

For the purposes of this review, the term "Project area" refers to the area encompassing the turbine locations, access roads, collection lines, laydown yard, substation, and associated transmission line (Figure 1). The site file search covered a 1-mile-buffer around the Project area and this area is referred to as the "Research area."

The Research area is located within the Velva (1991), Voltaire Lake (1991), Blacktail Coulee (1981), Kongsberg NE (1991), Kongsberg (1981), and Ruso (1981) quadrangles. The legal locations of the Project Research area are listed in Table 1.

Table 1. Legal Locations of the New Frontier Wind Energy Project Class I Research Area.

Township	Range	Section(s)
153 North	80 West	36
153 North	79 West	31
152 North	80 West	2, 3, 10, 11, 14, 15, 22, 23, 25-27, 34-36
151 North	80 West	1, 2, 4-36
151 North	81 West	1, 12, 13, 24, 25, 36
150 North	81 West	1
150 North	80 West	1-6

Tetra Tech, Inc. (Tetra Tech) conducted a Class I site file search and literature review through the State Historical Society of North Dakota (SHSND) State Historic Preservation Office on July 20, 2016. The SHSND files include records of all archaeological and historical investigations that have been conducted and all cultural resources (prehistoric and historic archaeological sites, site leads, and Isolated Finds) that have been previously recorded within the Research area (Figure 1). Additionally, the Class I research included a review of the National Park Service's online data base for properties listed on the National Register of Historic Places (NRHP). Tetra Tech also reviewed historic North Dakota General Land Office (GLO) records to determine whether vestiges of trails, transportation routes, homesteads, or other historic resources may be present in the Research area.

Within the Research area, 16 prior investigations (Table 2) have been undertaken and 37 cultural resources have been previously recorded (Tables 3 and 4). The previous investigations consisted of road and highway improvements, industrial and commercial development, abandoned mine lands, fiber optic, cell tower, wind energy development, gas pipeline, and water pipeline projects.

Of the 37 cultural resources located within the Research area, 32 consists of archaeological resources (Table 3) (prehistoric, historic, and multicomponent) and five are architectural resources (Table 4). The archaeological resources include one Isolated Finds (prehistoric lithic flake) and 31 sites or site leads (25 prehistoric and 6 historic). The 25 prehistoric archaeological sites consist of three cairn(s), and 22 lithic scatters. The historic archeological sites and site leads consist of two mines, a post office, a stone wall, a dump, and a railroad segment.

The five architectural resources are all sites and consist of a church, a stone homestead, farmstead, a livestock structure, and a collapsed barn.

Of the 32 archaeological resources, one is assessed as Eligible, three are assessed as Not Eligible, and 28 have not been evaluated for inclusion into the NRHP. The five architectural resources have not been evaluated for inclusion into the NRHP.

For the resources assessed as Not Eligible, no further management is required. Sites that have not been evaluated for inclusion into the NRHP should be treated as eligible sites and avoided during ground disturbing activities. The sites assessed as Eligible should also be avoided during ground disturbing activities.

A review of the 1884, 1889, 1892, and 1895 North Dakota GLO Original Survey Plats identified 35 potential historic resources once located within the Research area. The potential resources consist of five historic structures, six historic road segments, and 24 historic trail segments (Table 5). The potential resources have not been recorded or assessed for eligibility for inclusion into the NRHP and should be avoided. A map of the locations of the previously recorded resources and potential resources are provided in Figure 1.

Table 2:
Site File Search Data: Previously Conducted Archaeological Investigations within the New Frontier Wind Energy Project Class I Research Area.

Manuscript Number	Author(s)	Title	Year
9507	Amy Belier	Archer Daniels Midland Facility Expansion; A Class III Cultural Resource Inventory	2005
7309	Thomas K. Larson	Results of a Class II and Class III Cultural Resource Inventory for NDDOT Project Area NH-4-052(031)112 McHenry County, ND	1998
0136	F. Schneider	Preliminary Field Reconnaissance and Literature Search of Cultural Resources in the Burlington Dam Project; Preliminary Cultural Resource Investigation of the Upper Souris River Basin, North Dakota.	1977
0306	Woolworth Research Associates	A Report on an Archeological and Historical Reconnaissance Survey of the Great Lakes Gas Transmission Company Pipeline Route in North Dakota and Minnesota.	1978
1007	Michael Gregg	Class III Intensive Inventory for all Cultural Resource at a Proposed Industrial Park Development, Town of Velva, McHenry County, North Dakota.	1980
3000	Bruce Rippeteau	A Cultural Resource Survey for Wold Engineering, CAP-2542(81) , Survey of County Road Improvement, McHenry County, North Dakota; Dickinson Bureau of Land Management District Office.	1981
3024	Richard A. Fox, Jr.	Class III Intensive Inventory for all Cultural Resources at a Proposed Industrial Park Sewage Lagoon Town of Velva, McHenry County, North Dakota.	1980
3249	Michael L. Gregg	Consolidation Coal Company's Velva Mine, Ward County, North Dakota: Class III Intensive Inventory for all Cultural Resources in Noncontiguous Parcels Totaling	1984

Manuscript Number	Author(s)	Title	Year
		ca. 150 Acres.	
9946	Damita Hiemstra	Velva Sunflower Road: A Class III Cultural Resource Survey for Road Improvements Along State Route 97 South of Velva in McHenry County, North Dakota.	2006
10035	Damita Hiemstra and Andrea Kulevsky	Northern Prairie Rural Waterline: A Class II and Class III Cultural Resource Inventory in McHenry County, North Dakota.	2007
10046	David W. Kluth	A Cultural Resource Inventory of Three Proposed Fiber Duct Installations in North Central North Dakota.	2007
12995	Jennifer L. Harty and Sophia L. Asbury; Jennifer L. Harty and Jennifer N. Macy	New Frontier Wind Project: A Class III Cultural Resource Investigation in McHenry County, North Dakota. And Addendum	2011, 2012
13859	Damita Engel	North Central Rural Water Consortium Anamoose/Benedict Area Segment B: A Class II and Class III Cultural Resource Inventory of a Proposed Waterline in McHenry, McLean and Ward Counties, North Dakota.	2010
14964	John F. Hoffecker	Class III Cultural Resources Inventory ND006 Ruso 29th Street NW, Ruso McLean County, North Dakota Section 1, T 150 N R 80 W.	2014
15254	John G. Hodgson	Results of a Class I and Class III Archaeological and Cultural Resources Investigation: Proposed ND006 Ruso 404' Cellular Telecommunications Tower Location, Section 1, Township 150 North, Range 80 West, McLean County, North Dakota.	2014
15503	Amie Meade, Caitlin Carlson, and William Bluemle	SRT Communications' Butte Exchange: A Class II and Class III Cultural Resource Inventory in McHenry, McLean, and Sheridan Counties, North Dakota.	2014

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Table 3:
Site File Search Data: Previously Recorded Archaeological Resources within the New Frontier Wind Energy Project Class I Research Area.

Site Number	Record Type	Time Period	Site Type	NRHP Eligibility
32MH188	Archeological	Historical	Canadian Pacific/Soo Line Railroad	Eligible
32MH406	Archeological	Historical	Dump	Not Eligible
32MH407	Archeological	Historical	Stone Wall	Not Eligible
32MH408	Archeological	Prehistoric	Cairn	Unevaluated
32MH409	Archeological	Prehistoric	Cairns	Unevaluated
32MH410	Archeological	Prehistoric	Cairn	Unevaluated
32MHX058	Archeological	Prehistoric	Lithic Scatter	Unevaluated
32MHX059	Archeological	Prehistoric	Lithic Scatter	Unevaluated
32MHX060	Archeological	Prehistoric	Lithic Scatter	Unevaluated
32MHX061	Archeological	Prehistoric	Lithic Scatter	Unevaluated
32MHX062	Archeological	Prehistoric	Lithic Scatter	Unevaluated
32MHX063	Archeological	Prehistoric	Lithic Scatter	Unevaluated
32MHX064	Archeological	Prehistoric	Lithic Scatter	Unevaluated
32MHX065	Archeological	Prehistoric	Lithic Scatter	Unevaluated
32MHX066	Archeological	Prehistoric	Lithic Scatter	Unevaluated
32MHX067	Archeological	Prehistoric	Lithic Scatter	Unevaluated
32MHX068	Archeological	Prehistoric	Lithic Scatter	Unevaluated
32MHX069	Archeological	Prehistoric	Lithic Scatter	Unevaluated
32MHX070	Archeological	Prehistoric	Lithic Scatter	Unevaluated
32MHX071	Archeological	Prehistoric	Lithic Scatter	Unevaluated
32MHX072	Archeological	Prehistoric	Lithic Scatter	Unevaluated

Site Number	Record Type	Time Period	Site Type	NRHP Eligibility
32MHX073	Archeological	Prehistoric	Lithic Scatter	Unevaluated
32MHX085	Archeological	Prehistoric	Lithic Scatter	Unevaluated
32MHX086	Archeological	Prehistoric	Lithic Scatter	Unevaluated
32MHX087	Archeological	Prehistoric	Lithic Scatter	Unevaluated
32MHX128	Archeological	Prehistoric	Lithic Scatter	Unevaluated
32MHX129	Archeological	Prehistoric	Lithic Scatter	Unevaluated
32MHX130	Archeological	Prehistoric	Lithic Scatter	Unevaluated
32MHX255	Archeological	Prehistoric	Lithic Scatter	Unevaluated
32WDX047	Archeological	Historical	Grelland Post Office	Unevaluated
32WDX588	Archeological	Historical	Truax-Traer Mine	Unevaluated
32WDX589	Archeological	Historical	Quist Mine	Unevaluated

Table 4:
Site File Search Data: Previously Recorded Architectural Resources within the New Frontier Wind Energy Project Class I Research Area.

Site Number	Record Type	Site Type	Site Type or Name	NRHP Eligibility
32MH402	Architectural	Historical	Stone Homestead	Unevaluated
32MH403	Architectural	Historical	Farmstead	Unevaluated
32MH404	Architectural	Historical	Livestock Structure	Unevaluated
32MH405	Architectural	Historical	Collapsed Barn	Unevaluated
32ML945	Architectural	Historical	First Lutheran Church of Ruso	Unevaluated

Table 5:
Site File Search Data: Potential Historic Resources noted on GLO Plats within the New Frontier Wind Energy Project Class I Research Area.

Potential Resource	Plat Date	Township and Range	Section
Structure	1889	T152N R80W	2 N½, NW
Structure	1889	T152N R80W	2 NW, NE
Structure	1889	T152N R80W	14 NW, NW
Structure	1892	T151N R80W	5 SE, SW
Structure	1892	T151N R80W	16 SW, SE
East to West Trending Road Segment	1892	T151N R80W	16, 17
East to West Trending Road Segment	1896	T151N R81W	1
North to South Trending Road Segment	1889	T152N R80W	2, 11, 14, 15, 22, 27, 28, 33, 34
North to South Trending Road Segment	1892	T151N R80W	4, 9, 16, 20, 21, 29, 32
North to South Trending Road Segment	1892	T150N R80W	5, 8
Northwest to Southeast Trending Road Segment	1892	T151N R80W	21, 22
East to West Trending Trail Segment	1889	T152N R80W	9-11
East to West Trending Trail Segment	1889	T152N R80W	13, 14, 22-24
North to South Trending Trail Segment	1889	T152N R80W	14, 23
North to South Trending Trail Segment	1889	T152N R80W	22, 34
East to West Trending Trail Segment	1889	T152N R80W	27, 28
North to South Trending Trail Segment	1889	T152N R80W	23, 26, 27, 34, 35
East to West Trending Trail Segment	1889	T152N R80W	26, 27
East to West Trending Trail Segment	1889	T152N R80W	34-36
East to West Trending Trail Segment	1889	T152N R80W	36
East to West Trending Trail Segment	1889	T152N R80W	25-36

Potential Resource	Plat Date	Township and Range	Section
East to West Trending Trail Segment	1889	T152N R80W	11-12
L-shaped Trail Segment	1892	T151N R80W	4-6
Northeast to Southwest Trending Road Segment	1892	T151N R80W	5, 7, 8
North to South Trending Trail Segment	1892	T151N R80W	8, 17
North to South Trending Trail Segment	1892	T151N R80W	8, 17
East to West Trending Trail Segment	1892	T151N R80W	3, 4
Northeast to Southwest Trending Road Segment	1892	T151N R80W	1-3, 9, 10, 16
Northeast to Southwest Trending Road Segment	1892	T151N R80W	1, 2, 10, 11, 15, 16, 20, 21
Northeast to Southwest Trending Road Segment	1892	T151N R80W	25-36
North to South Trending Trail Segment	1892	T151N R80W	15, 16, 21, 28
East to West Trending Trail Segment	1892	T151N R80W	15, 16
Northeast to Southwest Trending Road Segment	1892	T151N R80W	13, 14, 22, 23, 27
East to West Trending Trail Segment	1892	T151N R80W	23, 24
North to South Trending Trail Segment	1892	T151N R80W	2, 11, 14, 15, 22

Tetra Tech recommends a Class III intensive level pedestrian survey of the Project facilities and transmission line segments be conducted for areas that have not been previously surveyed once a final Project layout has been produced. Previously recorded and potential resources will be recorded if they fall within the Project's area of potential effect.

In the event that an unanticipated discovery of a significant archaeological resource occurs, construction work within a 150-foot-wide buffer (45 meters either side) of the discovery should cease until a professional Archaeologist can record the site and evaluate the resource's significance. Once the site has been recorded, and if the site is recommended as "not eligible" for inclusion into the NRHP, work on that area may resume pending the concurrence of the SHSND. If the site is assessed as "eligible" for inclusion into the NRHP, a mitigation plan may be proposed with SHSND's guidance. All work in the area of the resource should remain halted until the SHSND feels the appropriate data collection is completed.

If human remains are inadvertently discovered during construction activities, all work in the vicinity of the find should cease and the local law enforcement office and the SHSND should be notified immediately (NDCC 23-06-27).

If you have any additional questions, please feel free to contact me.

Sincerely,

Stephen Anderson M.A., R.P.A.
Principal Archaeologist
Main: (303) 980-3601
Cell: (720) 256-6843
Stephen.anderson@tetratech.com

CC: Jena Tufts, Capital Power Corporation
Sarah McCall, Tetra Tech, Inc.

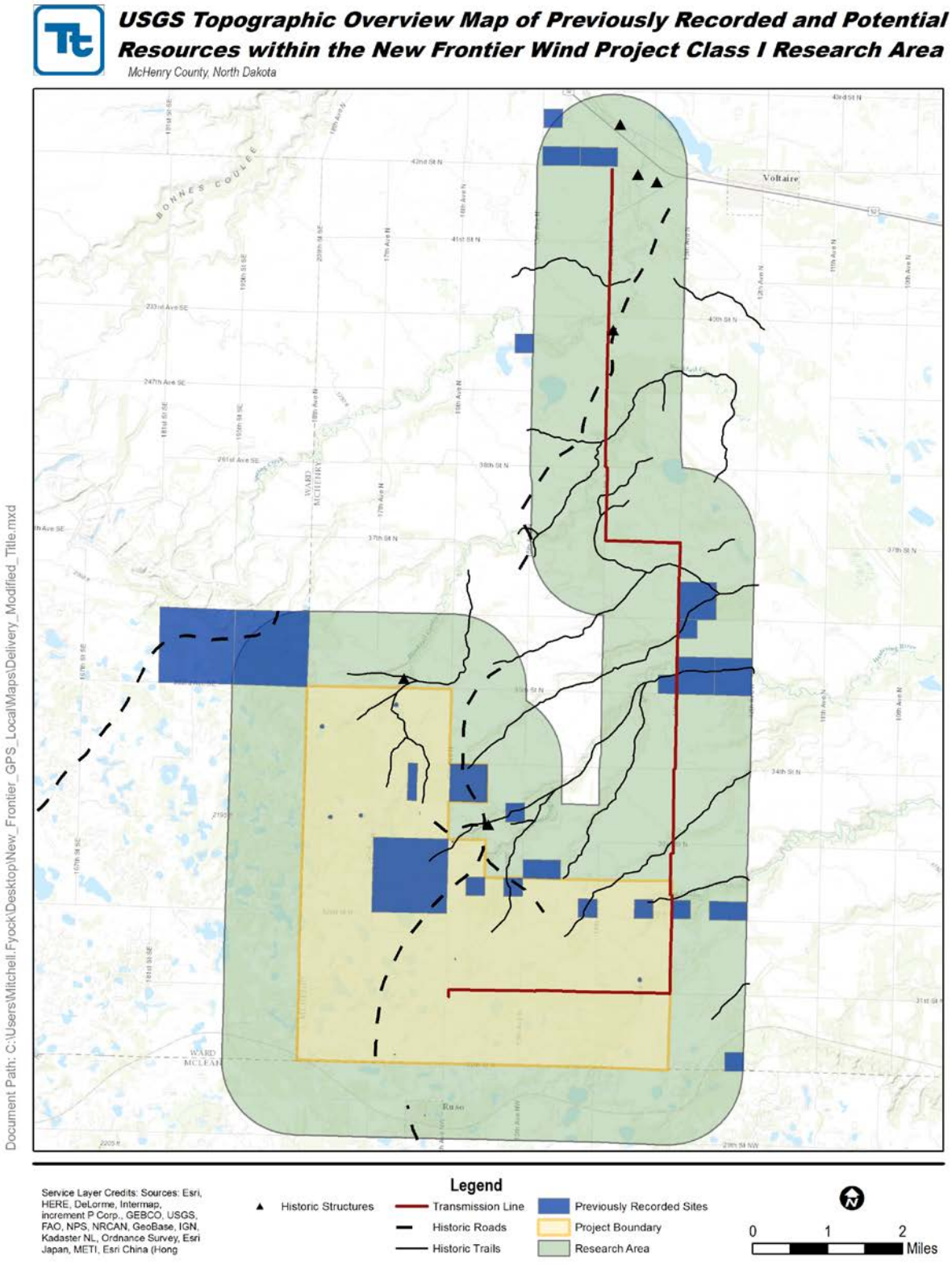

Figure 1: USGS Topographic Overview Map of Previously Recorded and Potential Resources within the New Frontier Wind Energy Project Class I Research Area.

Appendix F:
Preliminary Findings – Historic Architecture Survey, New Frontier Wind Energy Project

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TETRA TECH

TO: Bill Behling, Business Development Manager, Capital Power

Jena Tufts, Sr. Advisor, HSE Project Services, Capital Power

FROM: James Sexton, Ph.D., Tetra Tech, Inc.

DATE: November 1, 2016

SUBJECT: Preliminary Findings – Historic Architecture Survey, New Frontier Wind Energy Project

Project Description

On April 26, 2012, the North Dakota Public Service Commission (PSC or Commission) issued Certificate of Site Compatibility (CSC) Number 29 (PSC Order) to Meadowlark Wind I LLC (Meadowlark) for the New Frontier Wind Energy Project (Project) in McHenry County, North Dakota (see Case No. PU-11-69). In December 2014, Capital Power Investments LLC, a subsidiary of Capital Power Corporation (Capital Power), completed the acquisition of Element Power US, LLC, which included acquisition of Meadowlark, which owns the Project. Meadowlark, with the assistance of Capital Power Corporation, plans to complete development of the Project.

The Project will have a nameplate (gross) generating capacity of up to 102 megawatt (MW). Meadowlark has entered into a generator interconnection agreement with Great River Energy and the Midcontinent Independent Transmission System Operator authorizing interconnection of up to 99 MW of the Project's output at Great River Energy's McHenry Substation, located at Velva, North Dakota. Meadowlark is currently in the process of securing an off-taker for the Project.

Methods

On September 2, 2016, Capital Power received a letter from the State Historical Society of North Dakota (SHSND) as a response to the request to review the previous archaeological survey conducted for the Project as part of the original PSC CSC. The SHSND reviewed the previous studies conducted for the Project and recommended conducting a Class III survey by a permitted architectural historian of buildings and structures (including cemeteries over 50 years old) in the visual Area of Potential Effect (APE). Capital Power contracted Tetra Tech, Inc. (Tetra Tech) to conduct this historic architecture survey as recommended by the SHSND. The SHSND defined the APE as an area within a 2-mile radius of individual turbine locations. Tetra Tech's permitted architectural historian conducted a field visit the week of October 3-7, 2016. The architectural historian drove all public roads within the APE. Significant features were photographed using a Digital Single-Lens-Reflex camera outfitted with a hotshoe geotagger to record locational data about the photographs. Additional information about building type, materials, and conditions was recorded. Much of the work was undertaken from the public

right-of-way. Where Tetra Tech was able to obtain explicit permission to enter properties, elements were examined more closely.

Preliminary Findings

Tetra Tech assessed 73 resources within the visual APE. Two properties were military installations associated with Minot Air Force base. Tetra Tech was not given permission to photograph or investigate these properties, which appear to be a silo and barracks, in the field. Desktop research suggests that these installations are related to the Minuteman III missile program. As the Minuteman III missiles did not become operational until 1970, these installations do not meet the 50 year age requirement for listing in the National Register of Historic Places (NRHP). While the Minot AFB Minuteman III program might qualify under Criterion Consideration G for properties that have achieved significance within the last fifty years, as it was the first Minuteman installation to become active, it is unlikely that a single silo or barracks would qualify for listing in the NRHP on its own. Twenty-one of the other properties appear to have no buildings more than 50 years old, so they are not considered historic. Forty-four of the properties contained at least one historic building. However, these properties and their buildings individually, lacked sufficient significance or integrity to be formally documented. Six properties contained at least one feature that retains sufficient significance and integrity to be formally recorded on SHSND architectural site forms. None of the properties or their individual features will be recommended as potentially eligible to the National Register of Historic Places.

Appendix G:
Cultural Resources Addendum Report for the New Frontier Wind Energy Project, McHenry County, North Dakota

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Cultural Resources Addendum Report for the New Frontier Wind Energy Project

McHenry County, North Dakota

Prepared for:
Capital Power Corporation
155 Federal Street, Suite 1200
Boston, MA 02110

Prepared by:
Tetra Tech, Inc.
350 Indiana Street, Suite 500
Golden, Colorado 80401

Authors:
Stephen R. Anderson, MA, RPA and Deborah Huntley, PhD, RPA

November 2016

EXECUTIVE SUMMARY

In November of 2011, Kadrmas, Lee & Jackson completed a report detailing the results of the initial Class III inventory for the New Frontier Wind Energy Project (the Project). An addendum report was submitted in January 2012 to discuss changes to the facility layout including additional routes designed to avoid cultural resources and to provide for more appropriate access to six additional wind turbines. In October 2016, Tetra Tech was contracted to survey 43 additional locations (181.74 total acres) that would allow for 42 larger turning radii and one relocation of a collection line in support of the construction of New Frontier Wind Energy Project in McHenry County, North Dakota. Of the 42 radii; one measures 765 feet long by 400 feet wide, one measures 1,125 feet long by 400 feet wide, one measures 770 feet long by 400 feet wide, one measures 670 feet long by 400 feet wide, one measures 640 feet long by 400 feet wide, one measures 655 feet long by 400 feet wide, one measures 740 feet long by 400 feet wide, and each of the 35 remaining radii areas measure 400 feet by 400 feet and are located at proposed and existing intersections where a larger turning radius is necessary to transport the Project's heavy equipment and materials. The one collection line survey area measures 975 feet long by 100 feet long.

Since the Project is located on privately owned land and is privately funded, Section 106 is not required. However, the Project is subject to cultural resource surveys based on the North Dakota Public Service Commission permitting process.

This survey report documents the results of an intensive level pedestrian survey of the 43 additional locations within the Project. The survey was conducted on October 4 and 5 and November 13, 2016 as part of the Public Service Commission permitting requirements and recommendations of the State Historic Society of North Dakota. An updated cultural resource desktop study (records search) was completed in July 2016 (Anderson 2016) of the Project Research area. The records search included a review of previously conducted surveys, previously recorded archaeological, architectural sites and site leads, and review of historic maps.

This research indicated that there were previously recorded cultural resources within the Project Research area. Several potential resources were indicated in the Project area from Bureau of Land Management General Land Office plats and consist of several historic roads and two historic structures. In addition to the roads and structures, several sites and site leads fell into the Research area. The pedestrian survey conducted for this Project recorded one newly identified archaeological site. The site consists of a concrete foundation and is shown as Town Hall on the Blacktail Coulee 1981 quadrangle map. The site is in complete ruin and is recommended as not eligible for inclusion into the National Register of Historic Places. The Project is unlikely to have an adverse effect on this historic archaeological property.

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ABBREVIATIONS AND ACRONYMS

A.D.	Anno Domini
APE	area of potential effect
BLM	Bureau of Land Management
B.P.	before present
Capital Power	Capital Power Corporation
CFR	Code of Federal Regulations
CSC	Certificate of Site Compatibility
Element Power	Element Power US, LLC
GLO	General Land Office
IF	Isolated Find
KRF	Knife River flint
Meadowlark	Meadowlark Wind I, LLC
NDAC	North Dakota Administrative Code
NDCC	North Dakota Century Code
NHPA	National Historic Preservation Act
NRHP	National Register of Historic Places
Project	New Frontier Wind Energy Project
PSC	Public Service Commission
PSC Order	Certificate of Site Compatibility Number 29
SHPO	State Historic Preservation Office
SHSND	State Historic Society of North Dakota
Tetra Tech	Tetra Tech, Inc.

1.0 INTRODUCTION

On April 26, 2012, the North Dakota Public Service Commission (PSC) issued Certificate of Site Compatibility (CSC) Number 29 (PSC Order) to Meadowlark Wind I, LLC (Meadowlark) for the New Frontier Wind Energy Project (Project) in McHenry County, North Dakota. In December 2014, Capital Power Investments LLC, a subsidiary of Capital Power Corporation (Capital Power), completed the acquisition of Element Power US, LLC (Element Power), which included Meadowlark and the Project. Capital Power proposes to construct and operate the Project, which could produce up to 99 megawatts and is located in McHenry County, North Dakota approximately one mile north of the Town of Ruso. In compliance with the North Dakota PSC requirements for the identification of historic properties, Capital Power contracted Tetra Tech, Inc. (Tetra Tech) to conduct a supplemental Class III Cultural Resource Inventory for 42 recently designed turning radii and one collection line location within the proposed Project.

1.1 OBJECTIVES OF THE CULTURAL RESOURCES SURVEY AND REPORT

The purpose of this cultural resources survey report is to review the proposed Project in sufficient detail and determine the extent that the Project may affect historic properties within or near the area of potential effect (APE; see Section 1.4). The goals of the pedestrian survey and report are to:

- Identify and describe archaeological and historic built environment resources within the APE;
- Provide a cultural context for the APE;
- Identify any adverse effects that may occur as a result of the proposed Project; and
- Develop recommendations to mitigate the possible significant impacts on cultural resources.

1.2 PROJECT BACKGROUND

In November of 2011, Kadrmas, Lee & Jackson completed a report detailing the results of the initial Class III inventory for the Project. An addendum report was submitted in January 2012 to discuss changes to the facility layout including additional routes designed to avoid cultural resources and to provide for more appropriate access to six additional wind turbines. In October and November 2016, Tetra Tech was contracted to survey 43 additional locations (181.74 total acres) that would allow for 42 larger turning radii and one relocation of a collection line in support of the construction of New Frontier Wind Energy Project in McHenry County, North Dakota. Of the 42 radii; one measures 765 feet long by 400 feet wide, one measures 1,125 feet long by 400 feet wide, one measures 770 feet long by 400 feet wide, one measures 670 feet long by 400 feet wide, one measures 640 feet long by 400 feet wide, one measures 655 feet long by 400 feet wide, one measures 740 feet long by 400 feet wide, and each of the remaining 35 radii areas measure 400 feet by 400 feet and are located at proposed and existing intersections where a larger turning radius is necessary to transport the Project's heavy equipment and materials. The one collection line survey area measures 975 feet long by 100 feet long.

Since the Project is located on privately owned land and is privately funded, Section 106 is not required. However, the Project is subject to cultural resource surveys based on the North Dakota PSC permitting process.

This survey report documents the results of an intensive level pedestrian survey of the Project that was conducted on October 4 and 5 and November 13, 2016 as part of the PSC permitting process and

recommendations of the State Historic Society of North Dakota (SHSND). An updated cultural resource desktop study (records search) was completed in July 2016 (Anderson 2016) of the Project Research area. The records search included review of previously conducted surveys, previously recorded archaeological, architectural sites and site leads, and review of historic maps.

This research indicated that there were previously recorded cultural resources within the Project Research area. Several potential resources were indicated in the Project area from Bureau of Land Management (BLM) General Land Office (GLO) plats and consist of several historic roads and two historic structures. In addition to the roads and structures, several sites and site leads fell into the Research area. The pedestrian survey conducted for this Project recorded one newly identified archaeological site (Table ES-1). The site consists of a concrete foundation and is shown as Town Hall on the Blacktail Coulee 1981 quadrangle map. The site is in complete ruin and is recommended as not eligible for inclusion into the National Register of Historic Places (NRHP). The Project is unlikely to have an adverse effect on this historic archaeological property.

Table 1-1. Legal Locations of the New Frontier Wind Energy Project Turning Radii Survey Areas.

Township	Range	Section(s)
151 North	80 West	4, 5, 8, 9, 16-23, 25-30, 32-36
150 North	80 West	2-5

1.3 REGULATORY CONTEXT

The Project is currently proposed on private land and no federal or state funding is required. However, the Project is subject to review under the PSC guidelines. This report serves as a record that PSC guidelines were followed to assess the potential effects of the Project on cultural resources. As such, National Historic Preservation Act (NHPA) Section 106 is utilized as a guideline to assess those impacts. In addition, any finds of Native American human remains, even on private lands, would be required to comply with the Native American Graves Protection and Repatriation Act and the North Dakota Century Code (NDCC; 23-06-27) and accompanying administrative rules (North Dakota Administrative Code [NDAC] 40-02-03) which protects human remains in unmarked graves on private lands.

1.3.1 National Historic Preservation Act, Section 106

The principal federal law addressing cultural resources is the NHPA of 1966, as amended (16 United States Code, Section 470), and its implementing regulations (36 Code of Federal Regulations [CFR], Part 800), that primarily address compliance with Section 106 of the NHPA. Section 106 of the NHPA (16 United States Code §40 et seq.) requires federal agencies to take into account the effects of their proposed actions on properties eligible for inclusion in the NRHP. The regulations describe the process for identifying and evaluating historic properties, for assessing the effects of federal actions on historic properties, and for consulting with interested parties, including the State Historic Preservation Office (SHPO) and Indian tribes, to develop measures that would avoid, reduce, or minimize adverse effects. The term “historic properties” refers to cultural resources that are listed on, or meet specific criteria of eligibility for listing on, the NRHP (See Section 6.1).

Section 106 of the NHPA describes the procedures for identifying and evaluating eligible properties, for assessing the effects of federal actions on eligible properties, and for consulting to avoid, reduce, or minimize adverse effects. Eligible properties need not be formally listed on the NRHP. As part of the Section 106 process, federal agencies are required to consult with the SHPO. Section 106 does not require the preservation of historic properties, but it ensures that the decisions of federal agencies concerning the treatment of these places result from meaningful considerations of cultural and historic values and of the options available to protect the properties. If a project is an undertaking, as defined by 36 CFR 800.3, it is subject to Section 106 and consideration under other federal requirements.

1.3.2 Native American Graves Protection and Repatriation Act

Requirements for responding to discoveries of Native American human remains and associated funerary objects on federal land are addressed under Native American Graves Protection and Repatriation Act (Public Law 101-601) and its implementing regulations found at Title 43 CFR Part 10. Native American Graves Protection and Repatriation Act requires federal agencies and institutions that receive federal funding to return Native American cultural items and human remains to their respective peoples. Cultural items include funerary objects, sacred objects, and objects of cultural patrimony. On public lands federal agencies typically comply with the law and regulations by determining lineal descendants and culturally affiliated Indian tribes and by carrying out appropriate treatment and disposition of the discovered remains, including transfer of custody.

1.3.3 The NDCC 23-06-27 and Accompanying Administrative Rules NDAC 40-02-03

NDCC 23-06-27 - This law provides for protection of any human burial sites, human remains, and burial goods on both state and privately owned land.

NDAC 40-02-03 - This law provides protection of prehistoric and historic human burial sites, human remains, and burial goods in unmarked graves on both state and privately owned land. In essence, it is illegal knowingly to disturb, buy, sell, or barter human skeletal remains or associated items from unmarked graves. Also, these items may not be displayed for profit or in any commercial enterprise. People who encounter or discover unmarked graves and their contents should stop any further disturbance activities and report the find to an appropriate law enforcement officer in the county where the remains are found as well as the SHSND. Violators of this law may be guilty of a class C felony. All efforts will be made to establish the tribal affiliation of remains from unmarked graves and to see that these remains are reburied in a timely, appropriate fashion.

1.4 DEFINITION OF AREA OF POTENTIAL EFFECT AND SURVEY AREA

The APE is based on the 43 additional locations (181.74 total acres) that would allow for 42 larger turning radii and one relocation of a collection line in support of the construction of New Frontier Wind Energy Project in McHenry County, North Dakota. Of the 42 radii; one measures 765 feet long by 400 feet wide, one measures 1,125 feet long by 400 feet wide, one measures 770 feet long by 400 feet wide, one measures 670 feet long by 400 feet wide, one measures 640 feet long by 400 feet wide, one measures 655 feet long by 400 feet wide, one measures 740 feet long by 400 feet wide, and each of the 35 remaining radii areas measure 400 feet by 400 feet and are located at proposed and existing intersections where a larger turning radius is necessary to transport the Project's heavy equipment

and materials. The one collection line survey area measures 975 feet long by 100 feet long (see Figures 1-1 and 1-2).

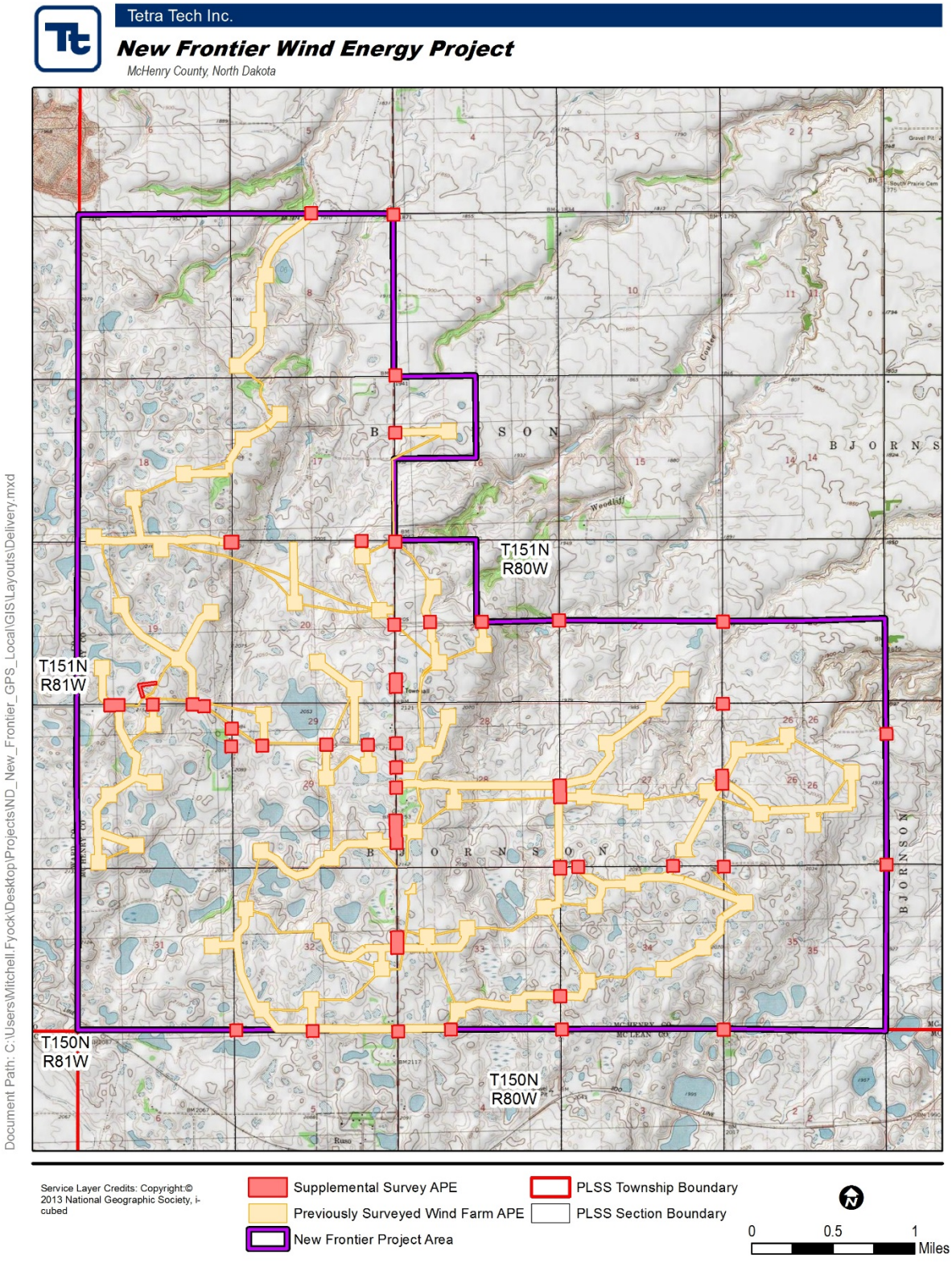

Figure 1-1. Project Overview Map– Topographic Map

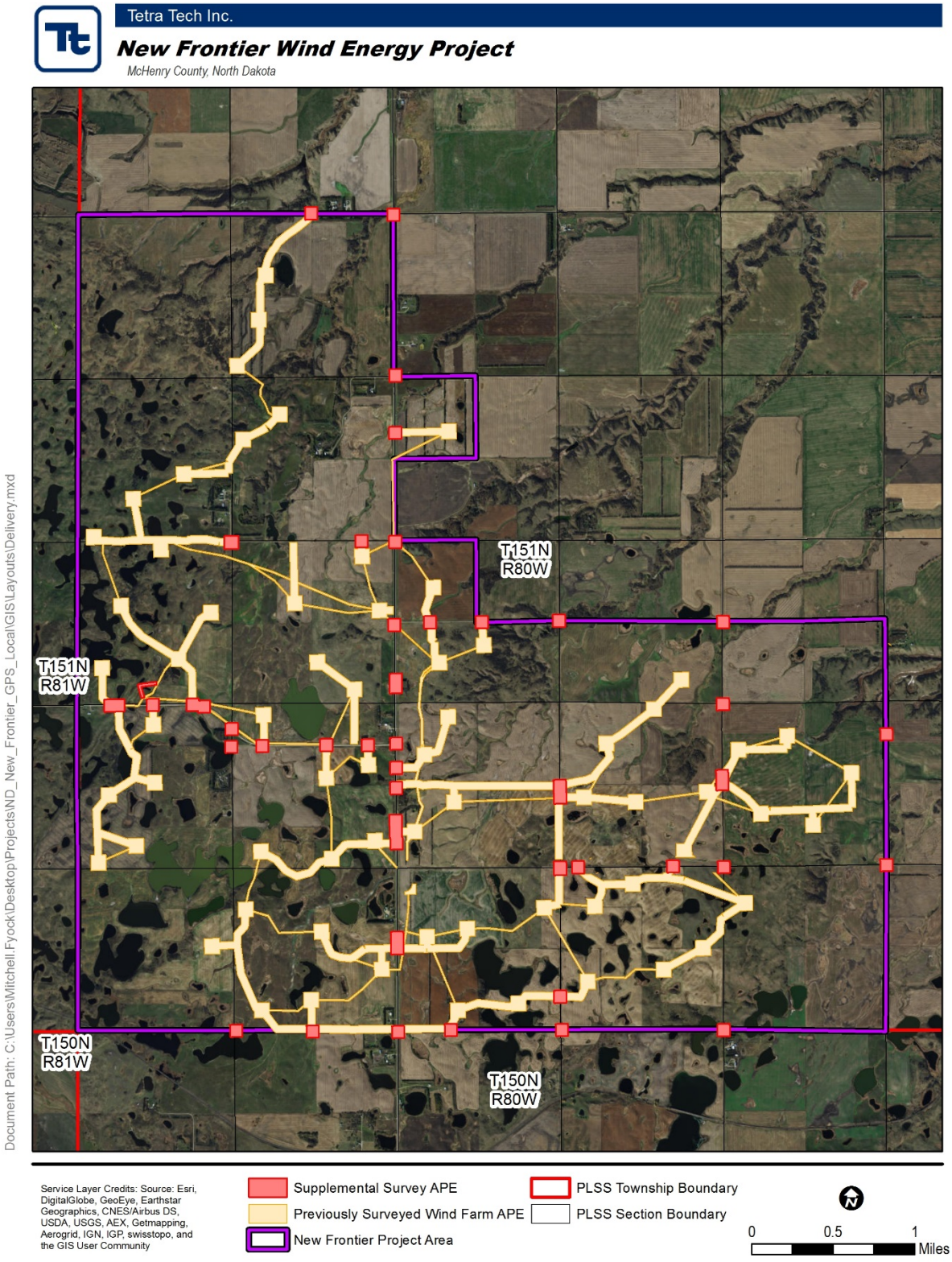

Figure 1-2. Project Overview Map – Aerial Imagery Map

2.0 ENVIRONMENTAL BACKGROUND

A brief overview of environmental conditions (past and present) within the Project area is necessary to provide a foundation for understanding past human subsistence and settlement patterns in the region. Understanding how environmental variables (i.e., availability of food, water, fuel, and tool materials) affected past decision-making processes can lead to a greater awareness of a region's cultural resources. Below we summarize the broader regional environment and provide a description of specific environmental conditions in the New Frontier Wind Energy Project area.

2.1 PHYSIOGRAPHY AND TOPOGRAPHY

The Project area is located at the intersection of two major physiographic provinces. Much of McHenry County is within the Glaciated Plains or Drift Prairie of the Central Lowlands physiographic province (Bluemle 2000). The Drift Prairie is a rolling plain covered with glacial deposits, or drift, with low relief and abundant potholes. The northwest portion of McHenry County is within the flat, gently sloping Souris Lake Plain, which was created by sedimentation of the floor of glacial Lake Souris (Bluemle 2000). In the southwestern most corner of McHenry County, where the Project area is located, is about 30 square miles of terrain that is on the Missouri Coteau (DesLauriers 1990). The Missouri Coteau is a subcontinental divide within the Great Plains physiographic province, rising in elevation above the Central Lowlands. The Missouri Coteau is hilly, with knob-and-kettle terrain shaped by millennia of glacial processes (Picha et al. 2008). Elevation in this area ranges from 1,600 to 2,150 feet (485 to 655 meters) above mean sea level.

2.2 HYDROLOGY

The Missouri Coteau has well developed drainage networks that drain west towards the Missouri River (Bluemle 2000). East of the Missouri Coteau, however, the landscape is poorly drained with stream systems that are not well developed. The Project area is within the Souris River drainage system. The Souris is a glacial meltwater channel that originates in Saskatchewan, forms a loop into North Dakota just north of the Project area, and eventually flows back northward into Canada (Bluemle 2000). Poor drainage characterizes the Project area. Spring Coulee, a minor drainage located at the Project area's northeast corner, eventually meets the Wintering River to the east. Numerous potholes, sloughs and depressions in the area hold rainfall and snowmelt, which would have attracted both game and prehistoric hunter-gatherer groups (Picha et al. 2008).

2.3 GEOLOGY AND SOILS

During the Pleistocene Epoch (1 million to about 10,000 years ago [B.P.]), glaciers repeatedly advanced and retreated over much of North Dakota. In the Project area, Coleharbor Group glacial deposits occur. These include unsorted clays, silt, sand, and pebbles (Bluemle 2000). Soils in the Project area are deep, and today are suitable for cultivation and grazing (DesLauriers 1990).

Those soils present in the APE that formed in alluvial or colluvial settings (e.g., depositional settings) are the most likely to contain buried paleosols and surfaces and thusly have a higher potential to contain intact or stratified archaeological deposits. Although some soils in the Project area were formed in depositional settings, the Project area is mainly located on upland settings. The occurrence of intermittent drainages so close to their sources reduces the potential that these soils will contain deeply buried archaeological materials, in contrast to landforms adjacent to larger permanent drainages.

Archaeological sites may also be present in non-alluvial settings such as on upland tables and buttes. At such locations, artifacts would be buried through natural soil formation, which is a relatively slow process compared to a more dynamic setting such as a floodplain. In the uplands, artifacts would be encountered shallow to the surface either within the organic horizon or in the horizon immediately below. Unlike the depositional setting, there will likely not be deeply buried sites due to the shallow nature of the bedrock in the area.

2.4 CLIMATE

Much of what is known about the postglacial climate and associated vegetation regimes of North Dakota has been derived by examining pollen in sediment layers from post-glacial sloughs in Stutsman County in east-central North Dakota (Bluemle 2000). Within North Dakota, the last glacial advance never reached the southwestern corner of the state where the Project area is located. Prior to the retreat of glaciers in North Dakota approximately 16,000 years ago, the Project area likely resembled tundra. The cool moist climate that followed the end of the Wisconsinan period of the Pleistocene epoch (12,000 to 10,000 B.P.) allowed for the growth of spruce dominated boreal forests in North Dakota, roughly correlating the arrival of the first people in the area (Bluemle 2000).

Between 10,500 and 8,500 years ago, climatic trends began to shift towards a warmer and drier environment which initially allowed for the spread of hardwood forest throughout North Dakota (Bluemle 2000). The Des Lacs-Souris basin was forested during this time, initially by spruce forest and later by deciduous forest (Picha et al. 2008). However, the warming, drying trend that fostered the development of the deciduous forest on the plains eventually led to their demise as prairies soon began to dominate the upland areas and deciduous forest became confined to areas along the water's edge. These warmer and drier conditions throughout the Midwest led to the development of tall-grass and short-grass prairie ecosystems on the Great Plains and in North Dakota. Prior to 9,000 B.P., no broad area of prairie vegetation existed in the Midwest (Benchley et al. 1997).

From 8,500 to 4,000 B.P., drier and warmer conditions persisted throughout the northern Great Plains in what is generally called the Altithermal. These conditions allowed drought-tolerant grasslands similar to those found in Wyoming and eastern Montana to spread across North Dakota, outcompeting forest plains margins (Kay 1998). A shift in the Pacific Westerlies during this period likely helped to bring about milder winters, windier springs, and warm, windy summers with sudden and irregular abrupt episodes of warm, moist conditions. Such unstable climatic conditions reduced water levels in deeper lakes and totally eliminated water in shallower lakes and basins, but more importantly, it altered middle Holocene landscapes by providing the catalyst to spur massive sediment erosion and deposition. In the Des Lacs-Souris basin vegetation cover was reduced and the land became prone to erosion (Picha et al. 2008). Climactic variation during the Altithermal would have likely led to the deflation and erosion of many older archaeological sites (11,500-4,000 B.P.) on upland landforms through erosion, and the deep burial of such sites on lowland landforms through sedimentation.

Between 4,000 and 3,000 B.P., the climate of the Northern Plains became cooler and wetter and by 3,000 B.P. the climate was similar to modern times. This climatic shift allowed for more stabilized vegetation regimes which in turn led to the stabilization of the landscape of the plains. During the past 4,000 years, landforms have changed very little compared to early periods and it is likely that the oldest intact cultural deposits on upland landforms may correspond with the beginning of this

relative stability. The overall trend during the past 2,000 to 4,000 years has been towards long-term cooling interspersed with a warming period known as the Neo-Atlantic episode between 1,000 and 1,200 B.P. (Kay 1998). The last major cooling event is known as the Little Ice Age and lasted from approximately A.D. 1550 to 1850 and is well documented in Europe and to a lesser extent in North America (Bryson and Murray 1977). These warming and cooling episodes impacted local flora and fauna, which in turn influenced human use of the Des Lacs-Souris basin (Picha et al. 2008).

Contemporary climatic trends for west-central North Dakota include a continental-type climate subject to frequent surges of continental polar air during the winter (DesLauriers 1990, Picha et al. 2008). Seasonal extremes in temperature fluctuation are quite common, with summers being generally very hot when warm air pushes northward from the Gulf of Mexico and the southwestern United States and winters being long and very cold. In winter the average temperature for McHenry County is 10 degrees Fahrenheit, and average summer temperature is 67 degrees Fahrenheit. Total annual precipitation is about 13 inches, with the majority of precipitation occurring in spring and summer (DesLauriers 1990). Despite seasonal temperature fluctuations, prehistoric hunter-gatherers probably lived in the area on a year-round basis. Families overwintered in sheltered valley bottoms close to water and fuel wood, subsisting on stored food (Picha et al. 2008).

2.5 ECOLOGICAL RESOURCES

As the regional climate shifted during the late Pleistocene and throughout the Holocene, so did the faunal and floral resources available for human exploitation. At the end of the last ice age, early inhabitants may have encountered mammoth, mastodon, stag-moose, caribou, shrub oxen, musk oxen, giant bison, short-faced bear, giant beaver, and ground sloth. Most of these animals became extinct at the end of the Wisconsinan period, while others such as caribou and musk oxen progressively moved north out of North Dakota and into present-day Canada.

As conditions became warmer and drier during the middle Holocene, bison became the dominant species on the plains. The role of bison as a central source of subsistence for prehistoric and historic Native American peoples on the Northern Plains has been well documented and spans nearly the entire period of human habitation in the region, beginning as far back as 10,000 years ago and continuing into the nineteenth century of the current era. As climatic conditions became cooler and moister around 4,000 year ago, other animal species such as moose, elk, grizzly and black bears, pronghorn, white-tailed and mule deer, gray wolf, mountain lions, coyote, fox, beaver, jackrabbits, and cottontail rabbits began to expand across the Northern Plains, finding niches in the many diverse habitats. These species were all present at the time of early human occupation of the area and are still found in the state with the exception of the grizzly bear and gray wolf. Other animal resources available to prehistoric and historic peoples would have included waterfowl, fish, turtles, and mussels found in the Missouri River and its tributaries.

Prior to agricultural development, vegetation within the Project area was part of the Temperate North American Grasslands Biome (Odum 1971). The following information is drawn from Picha et al. (2008). In the past, mixed prairie grasses were dominant and included needle grasses (Stipa sp.), slender wheat grass (Agropyron trachycaulum), needle and thread (Stipa comata), and grama grasses (Bouteloua sp.). Scattered stands of bur oak (Quercus sp.) and bluestem (Andropogon sp.) grasses could be found at valley heads and coulees draining to the Souris River. Bur oak acorns would

have been available as a food resource. Communities of cottonwood (Populus sp.), willow (Salix sp.) and elm (Ulmus sp.), as well as chokecherries (Prunus sp.), juneberry (Amelanchier alnifolia), buffaloberry (Sheperdia argentia), and wild rose (Rosa sp.), occurred along drainages. Locally available grassland fauna prior to agricultural development likely included elk (Cervus canadensis), mule deer (Odecoileus hemionus), white-tailed deer (Odecoileus virginianus), pronghorn (Antilocapra americana), and bison (Bison bison). Coyote (Canis latrans), red fox (Vulpes vulpes), long-tailed weasel (Mustela frevata), and grizzly bear (Ursus horribiles) may have been found in or near the Project area. Rivers, streams, potholes, and marshes would have been home to fish, amphibians and waterfowl species in addition to beaver (Castor canadensis), muskrat (Ondatra zibethicus), and mink (Mustela vison).

Farming and ranching are the main economic enterprises in McHenry County today (DesLauriers 1990), and the Project area reflects this. Most of the Project area has been plowed, with scattered small rises and knobs standing fallow and serving as collection points for field clearing piles. Local fauna today consist mainly of mule and white-tailed deer, pronghorn, and domestic cattle.

The local environment also provided raw materials needed during prehistoric times. Glacial outwash gravel deposits on the Missouri Coteau contain granite cobbles that could be used for construction and as a heat source for food preparation (i.e., stone boiling and baking) (Picha et al. 2008). Preferred materials for chipped stone tools were Swan River chert, Knife River flint (KRF), and Tongue River Silicates, all of which occur in surface-exposed glacial sediments. Oil and gas are important economic resources in more recent times (Bluemle 1988).

3.0 CULTURAL BACKGROUND

This section provides a brief summary of cultural traditions and known cultural resources with the region. Similar to Section 2.0 Environmental Background, a general understanding of the region's cultural resources is necessary for interpretations of Project area sites. The following overview was compiled mainly from the *North Dakota Comprehensive Plan for Historic Preservation: Archaeological Component* (Gregg et al. 2008), *The Souris River Study Unit* (Picha et al. 2008), and *Historic Preservation in North Dakota, 2016-2021: A Statewide Comprehensive Plan* (SHSND 2015).

The Project area is in the extreme southwest corner of McHenry County within the Northeastern Plains subarea of the Northern Plains as it has traditionally been defined (Gregg et al. 2008:Figure B.7). It also falls within the Souris River Study Unit of northern North Dakota as defined in Gregg et al. (2008: Figure B.2). The Study Unit (drainage basin) is used for prehistoric and proto-historic archeological site studies and management in the state. The Souris River Study Unit is bordered by Saskatchewan and Manitoba on the north, the Northern Red River and Sheyenne River study units on the east, and the Garrison and Southern Missouri River study units on the west and south. It covers 9,118 square miles in Benson, Bottineau, Burke, Divide, McHenry, McLean, Mountrail, Pierce, Renville, Rolette, Sheridan, and Ward counties (Picha et al. 2008). Major themes in the history of this region, as defined in North Dakota's statewide plan (SHSND 2015), include rural settlement, farming, ranching, mining, railroads, and petroleum operations.

3.1 PRECONTACT PERIOD

Prehistoric cultures within North Dakota are divided into five major traditions: Paleoindian; Plains Archaic; Plains Woodland; Plains Village; and Equestrian Nomadic. These traditions are divided into stages based largely on technical innovations that can be observed in the archaeological record. This includes changes in the forms of projectile point styles or the decoration of pottery. Behavioral adaptations such as changing subsistence and mobility patterns also serve as points of reference when determining the transition from one tradition to another.

3.1.1 Paleoindian Tradition (11,500 – 7,500 B.P.)

Opinions vary as to the timing of the first human occupations in North America; pre-Paleoindian groups could have arrived near the Last Glacial Maximum, around 16,500-13,000 years ago (Goebel et al. 2008). At the time of this report, no pre-Paleoindian sites have been discovered in North Dakota. The Paleoindian Tradition covers the time from the first evidence of Clovis groups in North Dakota until the transition into Plains Archaic lifeways. In general, the Paleoindian Tradition is characterized by hunting and gathering adaptations with a notable concentration on now-extinct big game animals. The beginning of the Paleoindian Tradition focused attention on Pleistocene fauna such as mammoths and camels; later, species of bison intermediate in size between late Pleistocene and modern forms became important. Other characteristics of the Paleoindian Tradition include geographically extensive interaction networks (Hayden 1981) and distinctive lanceolate projectile point styles by which the various Paleoindian cultural complexes are identified. Cultural complexes represented in North Dakota from oldest to youngest include Clovis, Goshen, Folsom, Hell Gap-Agate Basin, Cody, Parallel-Oblique Flaked, Pryor Stemmed, and Caribou Lake.

While there is no official record of Paleoindian sites in the Project vicinity, the SHSND collections contain a number of Paleoindian points, as do private collections examined by Miller (1992). Paleoindian artifacts appear to be fairly common in the Souris River Study Unit compared with other

parts of North Dakota outside the KRF quarry heartland (Picha et al. 2008). Complete and fragmentary projectile points of various styles have been found in northern McHenry County, attesting to the regular presence of people from about 10,000-7,500 B.P. in the vicinity of the Project area.

3.1.2 Plains Archaic Tradition (7,500 – 2,400 B.P.)

Spanning five thousand years, the Plains Archaic is divided into Early (7,500 - 4,500 B.P.), Middle (4,500 - 3,000 B.P.), and Late (3,000 – 2,400 B.P.) periods. This tradition continued the hunting and gathering adaptation of the Paleoindian Tradition but with a focus on bison procurement. The Plains Archaic period appears to have been marked by other cultural changes such as (1) further regionalization in projectile point styles, (2) a decline in the quality of flint knapping craftsmanship, and (3) reduction in the degree and extent of interactions between human populations in different regions. Hayden (1981) proposed that these changes point to more reliable access to subsistence resources to the extent that extensive alliance networks – maintained as "insurance" in times of resource failure - were no longer necessary. It seems equally likely that the negative environmental effects of the Altithermal led to a decline in the human carrying capacity on the Great Plains, which in turn led to population reduction and the disruption of existing social networks (Frison 1991).

Plains Archaic complexes recognized in North Dakota include Oxbow, McKean Lanceolate, Duncan, Hanna, Pelican Lake, and Yonkee. In the Souris River Study Unit, known Plains Archaic sites are not very common (Picha et al. 2008). Projectile points from the Des Lacs-Souris basin appear to span all of the Plains Archaic periods, although early styles are poorly represented. This may be because much of the Souris basin was likely uninhabitable during most of the Atlantic and Sub-Boreal episodes due to severe drought conditions. Middle Plains Archaic projectile points are more common, attesting to a likely increase in occupational intensity during this time. Late Plains Archaic points are even better represented. Thus, Middle and Late Plains Archaic groups appear to have used the Souris River Study Unit on a fairly regular basis. Settlement types included residential bases, temporary camps, and burial locations.

3.1.3 Plains Woodland Tradition (2,400 – 800 B.P.)

Like the preceding Plains Archaic Tradition, the Plains Woodland Tradition is also divided into three periods: Early (2,400 – 2,100 B.P.), Middle (2,100 – 1,400 B.P.), and Late (1,400 – 800 B.P.). Plains Woodland lifeways are thought to have been similar in many ways to those of the preceding Plains Archaic Tradition. Notable changes, however, include the practice of mound burial mortuary ceremonialism, the production and use of ceramic vessels, and possibly intensified use of native seedy plants and grasses for food (Gregg 1994; Gregg et al. 1996). Plains Woodland complexes recognized in North Dakota include Sonota/Besant, Laurel, Avonlea, Brainerd, Blackduck, Mortlach, Old Women's, and Sandy Lake.

There is variability in the occurrence of Plains Woodland components throughout the state. In general, early Plains Woodland components (which have not been given a complex name) are not very frequent, including in the vicinity of the Project area. The earliest production and use of ceramic vessels in the Northern Plains occurred during the Early Plains Woodland period (Picha et al. 2008).

Middle Plains Woodland period subsistence probably included some gardening as well as hunting and gathering. Eventually during this period, the bow and arrow largely replaced the atlatl and dart.

Interaction and exchange among different groups appears to have been more extensive during the Middle Plains Woodland compared with the Early Plains Woodland period. For example, artifacts made of KRF probably originating in North Dakota have been recovered from Middle Plains Woodland components in western Iowa (Benn 1983). Obsidian was also exchanged over vast regions of North America during this period (Anderson et al. 1986; Griffin et al. 1969). In addition to materials, long-distance interaction likely also transmitted knowledge about new cultigens and gardening practices. Burial mortuary ceremonialism appears to have begun early in the Middle Plains Woodland period in North Dakota, and people in some parts of the state clearly were connected with the Hopewell Interaction Sphere (Picha et al. 2008).

During the Late Plains Woodland period, use of the bow and arrow was well established and ceramic vessels were generally thinner walled, better made, and probably larger than earlier periods. Like the Middle Plains Woodland, Late Plains Woodland people subsisted mainly by hunting and gathering supplemented by horticulture. Conical mounds - initially constructed and used during the Middle Woodland period - sometimes continued to be used into the Late Woodland period. Linear mound construction was likely an early Late Woodland development in the Northeastern Plains and Middle Missouri subareas of North Dakota (Chomko and Wood 1973:15). Most mounds occur in the eastern one-third of the state (Picha et al. 2008). Six Late Plains Woodland ceramic wares signal the presence of the Avonlea, Brainerd, Blackduck, Mortlach, Old Women's, and Sandy Lake complexes. While these are regarded by most as Woodland ceramics, the latter four of the six were made largely within the subsequent Plains Village period.

Sites associated with the Plains Woodland Tradition period are more common than sites from any other cultural-temporal tradition within the Souris River Study Unit (Picha et al. 2008: Table 11.3). This may be due in part to population increases and concomitant increase in the number of occupied sites during this period. According to Picha and colleagues (2008), stone circle sites are perhaps the most common site type in the Souris basin, and the majority of these may well be from the Plains Woodland Sonota/Besant, Laurel, Avonlea, Blackduck, or Mortlach complexes. In addition, the occurrence of a few burial mounds in the Souris River Study Unit indicates that at least some Woodland peoples used the southern part of the Souris basin. Information is lacking about Plains Woodland ceramic and other technological developments in the Souris basin, although Middle Woodland Besant/Sonota sherds were found at the Buffalo Lodge Lake and Towner localities near the Souris River in McHenry County (Wood 1962).

3.1.4 Plains Village Tradition (A.D. 1200 - 1780)

Unlike earlier cultural traditions, the Plains Village Tradition relied heavily upon maize horticulture, bison hunting, and gathering (Ahler and Kay 2007). The production of a dependable, storable surplus food supply primarily in the form of dried corn is thought to be the key element in Plains Village society (Lovick and Ahler 1982:55). Stored food surpluses of facilitated the formation of larger, more permanently situated residential earthlodge village communities. It has been suggested that Plains Villagers were culturally dominant in North Dakota over other groups who continued living Plains Woodland or Plains Archaic lifeways.

The Plains Village Tradition endured until the late 1800s along the Missouri River in western North Dakota. Most earthlodge village townsites are situated in the Middle Missouri archeological subarea and this is where most Plains Village archaeology has taken place. There are presently no earthlodge

villages documented in the vicinity of the Project (Picha et al. 2008: Table 11.3). According to Picha and colleagues (2008) most Plains Village sites in the Souris River Study Unit may present a blend of cultural elements derived from Villagers and northern Woodland groups. Moreover, Plains Villagers may have left behind relatively "weak" archaeological signatures - temporary hunting camps and other briefly occupied settlement types – as they crossed the Des Lacs-Souris basin while hunting, gathering, and trading.

3.1.5 Proto-Historic Period (A.D. 1650-1800) and Equestrian Nomadic Tradition (ca. 1780 - 1880)

The Proto-historic period in North Dakota (1650-1800) was a time of Euro-American cultural impact on Native cultures and came first from the north in the form of French and English trade goods. Trace amounts of European materials may have been available as early as 1613 when they could have been scavenged from the ships and stores abandoned by Hudson Bay exploration expeditions of 1612 and 1619 (Russell 1982). Goods may have also been acquired later from trading posts along the Saskatchewan River in southern Manitoba and Saskatchewan in the York Factory area of Hudson Bay in the fall of 1682 (Russell 1982).

The first Europeans to visit what is now North Dakota were the French missionaries of the Roman Catholic Church. In 1630, Father Le Caron, a priest of the order of St. Francis, was likely the first missionary to meet with the Indians in the Red River Valley. Missionaries continued to have a presence in the area into the late 1800's, meeting with various tribes and establishing missions across the territory. The first known Euro-American expedition into what is now North Dakota was conducted by the French explorer and fur trader, Pierre Gaultier de la Vérendrye. In 1738 he visited Mandan villages near present-day Bismarck. During the time of contact, the region was also home to the Ojibwa, Yanktonai, and Teton Sioux. By the 1790's the Canadian North West Company and Hudson's Bay Company erected trading posts on the Red River of the North and in the northeastern corner of the state.

The Equestrian Nomadic Tradition includes lifeways dependent upon horses during proto-historic and early historic times in the Northern Plains. Native peoples in North Dakota probably acquired horses in the early-1700s from adjacent areas to the south. Lehmer (1971:32) suggested 1720 as a date for the "beginning of the florescence of the horse culture" in the Northern Plains. Horses were a considerable improvement over dogs as beasts of burden (Fredlund 1973), and they greatly increased the capacity of groups who adopted them to acquire and transport food (Beardsley et al. 1956). The introduction of horses into the Native American cultures of the Plains produced significant changes in subsistence economies, demographics, social organization, and settlement patterns. These lifeways were taken up by diverse groups who had their origins in various cultural traditions: Plains Archaic (e.g., the Algonkian Blackfeet), Plains Village (the Siouan Crow), and Woodland (the Siouan Middle Dakota). Intensive interactions facilitated by horse travel acted to level cultural differences amongst these groups.

Proto-historic use of the Souris River Study Unit is poorly documented (Picha et al. 2008: Table 11.3). Picha and colleagues (2008) state that horses were probably rare to nonexistent in the Study Unit until sometime between A.D. 1725 and 1750. However, they also propose that some Equestrian peoples, such as the Assiniboine, had core territories somewhere within the Souris basin. Further,

they argue that many stone circle sites were occupied by Equestrian peoples, despite the lack of diagnostic artifacts such as gun flints, glass beads, or actual horse bones at stone circle sites.

3.2 HISTORIC PERIOD

The following descriptions for the Historic Period were compiled from *Early History of North Dakota: Essential Outlines of American History* (Lounsberry 1919), *Out Where the West Begins: Early and Romantic History of North Dakota* (Trinka 1920), *Soil Survey of McHenry County, North Dakota* (DesLauriers 1990), and from McHenry County, North Dakota (McHenry County 2016).

In 1803, the United States purchased the Louisiana Territory which included present-day North Dakota, although the northern boundary with Canada was not decided until 1818. In 1804, the Lewis and Clark Expedition reached North Dakota during their Corp of Discovery Expedition to the Pacific Coast. In November of 1804, Lewis and Clark wintered in North Dakota with the Hidatsa and Arahami tribes and established Fort Mandan six miles below the mouth of the Knife River.

In 1861, the Dakota Territory was created and included North Dakota, South Dakota, Wyoming and Montana. When warfare broke out between the Sioux and white settlers in neighboring Minnesota the following year, the Sioux sought refuge in the Dakota Territory, but were mostly confined to the area west of the Missouri River. By 1872, the Northern Pacific Railroad was built as far as Bismarck, which led to an influx of immigrants including many Norwegians and Germans. The "bonanza farm" craze of the 1870s-80s attracted many settlers and North Dakota entered the Union on November 2, 1889, as the 39th state. In 1900, the Bismarck, Washburn, and Great Falls Railroad Company extended a track from Bismarck to Wilton, which aided in the development of coal mining in the area (Schmidt and Vermeer 2009). In the 1920s, prices for farm crops dropped, and many banks failed.

During the Great Depression of the 1930s, many people left the state, and many businesses collapsed, including the Bismarck, Washburn, and Great Falls Railroad Company, which filed for bankruptcy in 1937 (Schmidt and Vermeer 2009). Prosperity returned during World War II and by 1944, the once bankrupt Bismarck, Washburn, and Great Falls Railroad was purchased and renamed the Minneapolis, St. Paul, and Sault Ste. Marie Railroad (Soo Line), a subsidiary of the Canadian Pacific Railway. The presence of this railroad in the region has been instrumental for the transportation of coal and grain to markets outside the region.

McHenry County was formed in 1873 from part of Bottineau County by an act of the Dakota Territorial Legislature. It was named for James McHenry, an early settler of Vermillion, South Dakota. The county's first seat was Villard (1884-1885), followed by Scriptown (1885-1886), and then Towner (originally named Newport). Towner was located on the west side of the Souris River, but when the railroad came it was moved about 4 miles to the east along the railroad. It remains the county seat today.

The first settlers in the county were ranchers, who arrived in 1882. These ranchers initially settled mostly in the Towner area. Farmers began to settle in the county by about 1901, and by 1905 most of the land had been claimed. With the settlement by farmers, the original ranching declined. By 1900 there were over a thousand farms and ranches in the county. The number peaked at 2,329 in 1910, and then it gradually decreased to below a thousand in the late 20th century.

Farming and ranching continue to be the most important industries in McHenry County. About 30 percent of the county is rangeland and about 60 percent is cultivated. Important crops are several varieties of wheat, sunflowers, barley, flax, oats, rye, and alfalfa. Wildlife refuges are another important feature of the county and include the J. Clark Salyer National Wildlife refuge, Cottonwood Lake National Wildlife Refuge and Wintering River National Wildlife Refuge.

In 1880 there were virtually no settlers in McHenry County, but by 1890 the population was nearly 1,600. In 1910 the population peaked at 17,637, only to decline dramatically through the 20th century. By 1980 it had decreased to 7,850 and today the county is home to around 5,400 people (McHenry County 2016).

4.0 RESEARCH DESIGN

The objective of this survey investigation was to conduct a Class III archaeological survey for any additional facility locations as recommended by the State Historical Society of North Dakota (SHSND) in their September 2, 2016 letter. The SHSND noted that the previous Class III survey was for right-angled corners while current practice is to survey gentler arcs to be sure that areas to be impacted by heavy equipment are fully surveyed, as well as crane paths, met towers, access roads, and staging areas. Depending on the type of resource(s) encountered, a wide range of research topics could potentially be addressed by cultural resources identified by the investigation (or subsequently in the event of an unanticipated discovery). Pre-survey research efforts involved archival research to determine if cultural resources have been previously recorded within 1 mile of the Project area and what past land uses may have impacted the APE or left archaeological remains (see Section 5.1). A pedestrian survey of the APE was then designed based upon this information. During the survey one newly identified resource was mapped and described. No subsurface testing was performed during the pedestrian survey.

4.1 EXPECTED SITE TYPES

The cultural and archaeological contexts of the Project area, as well as the archival research described in Section 5.1 have revealed that the Project and surrounding areas have been minimally surveyed; consisting of 16 surveys having been conducted in the APE. The surveys were conducted for road and highway improvements, industrial and commercial development, abandoned mine lands, fiber optic, cell tower, wind energy development, gas pipeline, and water pipeline projects. Thirty-seven previously recorded cultural resources have been identified within the APE. The resources that have been identified within the surrounding area include 32 archaeological resources (prehistoric, historic, and multicomponent) and five architectural resources. The archaeological resources include one Isolated Find (IF) (prehistoric lithic flake) and 31 sites or site leads (25 prehistoric and 6 historic). The 25 prehistoric archaeological sites consist of three cairn(s), and 22 lithic scatters. The historic archeological sites and site leads consist of two mines, a post office, a stone wall, a dump, and a railroad segment. The five architectural resources are all sites and consist of a church, a stone homestead, farmstead, a livestock structure, and a collapsed barn.

The potential site types described in Table 4-1 are based upon the cultural, natural, and archaeological context of the APE.

Table 4-1. Expected Site Types within the Project Survey Area

Chronological Context	Expected Site Types
Prehistoric	Lithic Scatters or Deposits Temporary Camp Sites IFs
Historic	Refuse Scatters, Deposits, or IFs Homestead/Farmstead Buildings and Remnants Historic Roads or Trails

5.0 METHODOLOGY

Identification efforts for this cultural resource investigation included a review of existing site records, previously conducted surveys in the area, and historic maps, as well as an intensive level pedestrian survey. The Research area included a 1-mile buffer around the Project corridor. No consultations with or inquiries of Native American individuals or tribes have been conducted at this time. A letter describing the Project was submitted to the SHSND for comment and the SHSND recommended that a records search and pedestrian survey of the transmission line be conducted.

5.1 RECORDS SEARCH AND ARCHIVAL RESEARCH RESULTS

A records search (Anderson 2016) was conducted through at the SHSND office in July 2016. The search included the Project area and a 1-mile buffer (Research area) surrounding the wind facility and the associated transmission line. The transmission line findings are included in a separate report. As part of this record search, the SHSND database of survey reports and overviews as well as documented archaeological resources and ethnic resources were consulted. Additionally, the search included a review of the following publications and lists: the NRHP, ethnographic information, historical literature, historical maps and GLO plats, and local historic resource inventories.

5.1.1 Previously Conducted Surveys

Within the Research area, the records search revealed that 16 prior investigations have been undertaken (Table 5-1). These 16 surveys consist of road and highway improvements, industrial and commercial development, abandoned mine lands, fiber optic, cell tower, wind energy development, gas pipeline, and water pipeline projects.

Table 5-1. Previous Surveys and Overviews Identified by the Project Records Search

Manuscript Number	Author(s)	Title	Year
9507	Amy Belier	Archer Daniels Midland Facility Expansion; A Class III Cultural Resource Inventory	2005
7309	Thomas K. Larson	Results of a Class II and Class III Cultural Resource Inventory for NDDOT Project Area NH-4-052(031)112 McHenry County, ND	1998
0136	F. Schneider	Preliminary Field Reconnaissance and Literature Search of Cultural Resources in the Burlington Dam Project; Preliminary Cultural Resource Investigation of the Upper Souris River Basin, North Dakota.	1977
0306	Woolworth Research Associates	A Report on an Archeological and Historical Reconnaissance Survey of the Great Lakes Gas Transmission Company Pipeline Route in North Dakota and Minnesota.	1978
1007	Michael Gregg	Class III Intensive Inventory for all Cultural Resource at a Proposed Industrial Park Development, Town of Velva, McHenry County, North Dakota.	1980
3000	Bruce Rippeteau	A Cultural Resource Survey for Wold Engineering, CAP-2542(81), Survey of County Road Improvement, McHenry County, North Dakota; Dickinson Bureau of Land Management District Office.	1981
3024	Richard A. Fox, Jr.	Class III Intensive Inventory for all Cultural Resources at a Proposed Industrial Park Sewage Lagoon Town of Velva, McHenry County, North Dakota.	1980

Manuscript Number	Author(s)	Title	Year
3249	Michael L. Gregg	Consolidation Coal Company's Velva Mine, Ward County, North Dakota: Class III Intensive Inventory for all Cultural Resources in Noncontiguous Parcels Totaling ca. 150 Acres.	1984
9946	Damita Hiemstra	Velva Sunflower Road: A Class III Cultural Resource Survey for Road Improvements Along State Route 97 South of Velva in McHenry County, North Dakota.	2006
10035	Damita Hiemstra and Andrea Kulevsky	Northern Prairie Rural Waterline: A Class II and Class III Cultural Resource Inventory in McHenry County, North Dakota.	2007
10046	David W. Kluth	A Cultural Resource Inventory of Three Proposed Fiber Duct Installations in North Central North Dakota.	2007
12995	Jennifer L. Harty and Sophia L. Asbury; Jennifer L. Harty and Jennifer N. Macy	New Frontier Wind Project: A Class III Cultural Resource Investigation in McHenry County, North Dakota. And Addendum.	2011, 2012
13859	Damita Engel	North Central Rural Water Consortium Anamoose/Benedict Area Segment B: A Class II and Class III Cultural Resource Inventory of a Proposed Waterline in McHenry, McLean and Ward Counties, North Dakota.	2010
14964	John F. Hoffecker	Class III Cultural Resources Inventory ND006 Ruso 29th Street NW, Ruso McLean County, North Dakota Section 1, T 150 N R 80 W.	2014
15254	John G. Hodgson	Results of a Class I and Class III Archaeological and Cultural Resources Investigation: Proposed ND006 Ruso 404' Cellular Telecommunications Tower Location, Section 1, Township 150 North, Range 80 West, McLean County, North Dakota.	2014
15503	Amie Meade, Caitlin Carlson, and William Bluemle	SRT Communications' Butte Exchange: A Class II and Class III Cultural Resource Inventory in McHenry, McLean, and Sheridan Counties, North Dakota.	2014

5.1.2 Previously Recorded Cultural Resources

Twenty-eight previously recorded cultural resources were identified by the records search within the Research area. Of the 28 cultural resources located within the Research area, 23 consist of archaeological resources (Table 5-2) (prehistoric, historic, and multicomponent) and five are architectural resources (Table 5-3). Of the 23 archaeological resources, six are historic and 17 are prehistoric. The historic sites consist of two mines, a post office, a stone wall, and a segment of the Canadian Pacific Soo Line railroad. The prehistoric sites include three cairn sites and 17 lithic scatter site leads. The five architectural resources consist of a stone homestead, a farmstead, a livestock structure, a collapsed barn, and the First Lutheran Church of Ruso.

Of the 28 cultural resources (archaeological and architectural) one site (32MH188) is assessed as eligible for inclusion into the NRHP, two sites (32MH406 and 32MH407) are assessed as not eligible, and the remaining 25 sites and site leads have not been assessed for eligibility.

Table 5-2. Records Search Data: Previously Recorded Archaeological Resources within the New Frontier Wind Energy Project Class I Research Area.

Site Number	Record Type	Time Period	Site Type	NRHP Eligibility
32MH188	Archeological	Historical	Canadian Pacific/Soo Line Railroad	Eligible
32MH406	Archeological	Historical	Dump	Not Eligible
32MH407	Archeological	Historical	Stone Wall	Not Eligible
32MH408	Archeological	Prehistoric	Cairn	Unevaluated
32MH409	Archeological	Prehistoric	Cairns	Unevaluated
32MH410	Archeological	Prehistoric	Cairn	Unevaluated
32MHX061	Archeological	Prehistoric	Lithic Scatter	Unevaluated
32MHX063	Archeological	Prehistoric	Lithic Scatter	Unevaluated
32MHX064	Archeological	Prehistoric	Lithic Scatter	Unevaluated
32MHX065	Archeological	Prehistoric	Lithic Scatter	Unevaluated
32MHX066	Archeological	Prehistoric	Lithic Scatter	Unevaluated
32MHX067	Archeological	Prehistoric	Lithic Scatter	Unevaluated
32MHX068	Archeological	Prehistoric	Lithic Scatter	Unevaluated
32MHX069	Archeological	Prehistoric	Lithic Scatter	Unevaluated
32MHX070	Archeological	Prehistoric	Lithic Scatter	Unevaluated
32MHX071	Archeological	Prehistoric	Lithic Scatter	Unevaluated
32MHX072	Archeological	Prehistoric	Lithic Scatter	Unevaluated
32MHX073	Archeological	Prehistoric	Lithic Scatter	Unevaluated
32MHX085	Archeological	Prehistoric	Lithic Scatter	Unevaluated
32MHX255	Archeological	Prehistoric	Lithic Scatter	Unevaluated
32WDX047	Archeological	Historical	Grelland Post Office	Unevaluated
32WDX588	Archeological	Historical	Truax-Traer Mine	Unevaluated
32WDX589	Archeological	Historical	Quist Mine	Unevaluated

Table 5-3. Site File Search Data: Previously Recorded Architectural Resources within the New Frontier Wind Energy Project Class I Research Area.

Site Number	Record Type	Site Type	Site Type or Name	NRHP Eligibility
32MH402	Architectural	Historical	Stone Homestead	Unevaluated
32MH403	Architectural	Historical	Farmstead	Unevaluated
32MH404	Architectural	Historical	Livestock Structure	Unevaluated
32MH405	Architectural	Historical	Collapsed Barn	Unevaluated
32ML945	Architectural	Historical	First Lutheran Church of Ruso	Unevaluated

5.1.3 Historic Map Review

Review of historic cartographic resources can help determine whether vestiges of trails, transportation routes, homesteads, or other historic resources may be present within the APE. In addition to the records search, BLM GLO records, the National Park Service's National Historic Trails Map, and U.S. Geological Survey quadrangles were reviewed. A review of the North Dakota GLO Original Survey Plats 1884, 1889, 1892, and 1895 identified six potential historic resources located within the Research area. The potential resources consist of two historic structures and four historic road segments. (Table 5-4). The potential resources have not been recorded or assessed for eligibility for inclusion into the NRHP and should be avoided.

Table 5-4. Records Search Data: Potential Historic Resources noted on GLO Plats within the New Frontier Wind Energy Project Class I Research Area.

Potential Resource	Plat Date	Township and Range	Section
Structure	1892	T151N R80W	5 SE, SW
Structure	1892	T151N R80W	16 SW, SE
East to West Trending Road Segment	1892	T151N R80W	16, 17
East to West Trending Road Segment	1896	T151N R81W	1
North to South Trending Road Segment	1892	T151N R80W	4, 9, 16, 20, 21, 29, 32
Northwest to Southeast Trending Road Segment	1892	T151N R80W	21, 22

5.2 PEDESTRIAN ARCHAEOLOGICAL SURVEY

The pedestrian survey covered 43 additional locations. Fieldwork was conducted by Tetra Tech cultural resources staff Stephen Anderson, RPA; Matthew Neff, RPA; and Emily Milton over two days on October 4 and 5, 2016 and again on November 13, 2016 by Stephen Anderson, RPA and Matthew Neff, RPA. Mr. Anderson was the Principal Investigator for this Project.

The survey was conducted using three (October 4 and 5) and two (November 13) archaeologists walking 10-meter transect intervals within the APE. When the cultural resource was located, crew members walked concentric and/or closely-spaced linear transects to determine the presence of any additional surface artifacts. Locations of artifacts and/or feature(s) were marked with pin flags to aid in determining the surface extent of the sites and to aid in mapping them. For the purposes of this survey and in conjunction with the SHSND definitions, isolated finds were defined as resources consisting of five or fewer artifacts and sites were defined as six or more artifacts or any feature. The resource was given a unique temporary identification number in the format of NFR-SA-01. A digital site datum was established using a handheld Trimble 2008 Geo XH Global Positioning System unit. All features were mapped, photographed, and described. All features, and any geographical points of reference, such as tree lines, drainages or roads, were recorded using the Global Positioning System unit. A North Dakota Cultural Resource Archaeological Site Form was completed in the field and finalized in the office. No artifacts were collected during the survey.

6.0 REPORT OF FINDINGS

The pedestrian surveys identified one previously unidentified archaeological site. No previously recorded resources or architectural resources were identified within the APE. Few historic buildings and farms were noted in the surrounding area during the survey. These were not formally recorded during the survey and are located outside the APE. However, the Project may be visible from these locations.

6.1 NEWLY RECORDED ARCHAEOLOGICAL SITES

6.1.1 32MHXXX (NFR-SA-01): Historic Foundation

Site 32MHXXX is located approximately 260 feet east of Highway 41 (16th Avenue North) and consists of a concrete foundation. The foundation is constructed of form poured concrete and measures approximately 35 feet long north to south by 30 feet wide east to west. The foundation measures approximately 12 inches high above the ground surface. The site is heavily overgrown and has been used as a receptacle for discarded corrugated metal drain pipes and other metal scraps. The remnants of a red brick chimney were observed in the northwest corner of the foundation. The foundation is encompassed by a rectangular array of arranged conifer and deciduous trees which served as a wind break. The tree array measures 320 feet long north to south by 280 feet wide east to west.

Figure 6-1. Chimney remnants at 32MHXXX, View looking north.

Figure 6-2. Historic foundation at 32MHXXX, View looking east.

Figure 6-3. Historic foundation at 32MHXXX, View looking north.

7.0 DISCUSSION AND INTERPRETATIONS

Archival research and survey efforts for the proposed Project have identified one archaeological site within the survey area. The research design for this survey identified various expected site types, both prehistoric and historic. The resources identified within the survey area represent none of the expected prehistoric-era resource types and two of the expected historic-era site types (homestead or farmstead). No unexpected site types were encountered.

Preliminary recommendations of NRHP eligibility are provided here for the resources recorded during the survey. These recommendations are based solely on surface assemblages and cursory research. Site evaluation criteria for NRHP eligibility are provided in Section 7.1. Detailed eligibility recommendation arguments and management recommendations the newly recorded site is provided in Section 7.2. Table 7-1 summarizes the NRHP-eligibility and management recommendations for the site encountered during the survey.

Table 7-1. Cultural Resource Identified within the Survey Area and NRHP Eligibility Recommendations

Temporary Number	Smithsonian Number	Time Period	Description	NRHP Eligibility Recommendation	Management Recommendation
NFR-SA-01	32MHXXX	Historic	Foundation	Not Eligible	No further management.

7.1 SITE EVALUATION CRITERIA

Preliminary recommendations for eligibility are based on the following criteria codified in Title 36 CFR Part 60.4 and specified below:

> The quality of significance in American history, architecture, archaeology, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and:
>
> A. that are associated with events that have made a significant contribution to the broad patterns of our history; or
> B. that are associated with the lives of persons significant in the past; or
> C. that embody the distinctive characteristics of a type, period, or method of construction, or that represents the work of a master, or that possess high artistic value, or that represent a significant or distinguishable entity whose components may lack individual distinction; or
> D. that have yielded, or are likely to yield, information important in prehistory or history.
>
> Ordinarily, cemeteries, birthplaces, or graves of historical figures; property owned by religious institutions or used for religious purposes; structures that have been removed from their original location; reconstructed historic buildings; properties that are primarily commemorative in nature; and properties that have achieved significance within the last 50 years shall not be considered eligible for the National Register. However, such properties will qualify if they are integral parts of districts that do meet the criteria, or if they fall within the following categories:

- a religious property deriving primary significance from architectural or artistic distinction or historical importance; or
- a building or structure removed from its original location but which is significant primarily for its architecture, or which is the surviving structure most importantly associated with an historic person or event; or
- a birthplace or grave of an historical figure of outstanding importance if there is no other appropriate site or building directly associated with his or her productive life; or
- a cemetery which derives its primary significance from graves of persons of transcendent importance, from age, from distinctive design features, or from association with historic events; or
- a reconstructed building when accurately executed in a suitable environment and presented in a dignified manner as part of a restoration master plan and when no building or structure with the same association has survived; or
- a property primarily commemorative in intent if design, age, tradition, or symbolic value has invested it with its own historical significance; or
- a property achieving significance within the past 50 years if it is of exceptional importance.

The archaeological resource was evaluated based on the criteria listed above. Eligible sites are those that meet one or more of the criteria for eligibility. In addition, sites evaluated as eligible must retain physical integrity. Eroded or otherwise heavily disturbed sites are generally not considered eligible. Unevaluated sites are those considered as needing data that may conform to the eligibility criteria but require further work to determine NRHP status. In most cases, these sites are pre-contact or historic sites with suspected buried materials or historic sites where additional research is necessary to determine historical importance. Sites that are evaluated as not eligible do not meet any of the eligibility criteria and/or have lost physical integrity.

7.2 ELIGIBILITY RECOMMENDATIONS FOR NEWLY RECORDED SITES

7.2.1 32MHXXX (NF-SA-01)

32MHXXX (Temporary Site NFR-SA-01) consists of a historic concrete foundation surrounded by a rectangular, landscaped array of trees. A building located at this spot on the Blacktail Coulee 1981 quadrangle is referred to as "Town hall". A search of the 1892 T151N R80W GLO Plat does not show a structure in the southwest ¼ of Section 21. No land patent information was available on the BLM website. A search of the 1910 Bjornson Township Historic Atlas indicates that the southwest ¼ of Section 21 was patented to Peter Trygstad. The 1929 Bjornson Township Historic Atlas indicates that the southwest ½ of Section 21 was patented to Lloyd S. McCarthy. The 1963 Bjornson Township Historic Atlas indicates that the southwest ½ of Section 21 was patented to Thomas and Jerry Nurnberger. The site lacks most of the seven aspects of physical integrity (location, design, setting, materials, workmanship, feeling, and association). The site may have served as a farmstead sometime after 1900 and later used as the Bjornson Township "Town hall", although it is unclear. It is therefore not clearly associated with the early homesteading of the region or the early establishment of Bjornson Township (significant event-Criterion A). It is doubtful that the site is associated with a significant person (Criterion B) within North Dakota's or our nation's history. The site does not embody any distinctive characteristics of an architectural style, architect, or school, nor does it

exhibit high artistic value (Criterion C). No artifacts were observed at the site outside of the foundation. The recordation of the features has most likely exhausted the data potential of the site (Criterion D). Therefore, the site is recommended as not eligible for listing on the NRHP, and no further management consideration of the resource is necessary.

8.0 MANAGEMENT CONSIDERATIONS

Several factors have been considered in evaluating the impact of the proposed Project on cultural resources within the survey area as well as the appropriate mitigation measures to lessen or prevent those impacts. These factors are summarized in this section.

This report was prepared as Capital Power's compliance with the PSC requirements to assess potential impacts on cultural resources. Archival research included a records search, review of previously conducted survey reports, and review of historic maps. This research indicated 28 previously recorded cultural resources were identified within one-mile of the APE. The pedestrian survey conducted for this Project recorded one newly identified archaeological site.

8.1 IMPACT SIGNIFICANCE CRITERIA

The Project is currently proposed on private land and does not require federal or state funding. However, the Project is subject to PSC permitting that would trigger consultation with SHSND under PSC guidelines. This impact analysis utilizes the Section 106 of NHPA as a proxy to assess the potential impacts of the Project. Section 800.5(2) of 36 CFR 800, "Protection of Historic Resources," includes a discussion of potential adverse effects on historic properties. Examples that would be applicable to the potential impacts of the Project include physical destruction of or damage to all or part of the property; change of the character of the property's use or of physical features within the property's setting that contribute to its historic significance; and introduction of visual, atmospheric or audible elements that diminish the integrity of the property's significant historic features. Impacts on cultural resources are normally considered permanent as these resources are finite and disturbance of them, particularly archeological sites, cannot be reversed. However, impacts on historic landscapes or the viewsheds of historic or other significant areas can be temporary if projects do not permanently impact associated resources and are removed at a future date.

Direct effects from the Project could result from: vegetation clearing; grading of access roads; excavation and modification of the Project site; trenching for electrical collection lines, and drainage diversions; auguring for foundations for turbines; and any other earth-moving activity that disturbs historical resources or historic properties, previously undisturbed cultural resources, or cultural resources unevaluated for NRHP eligibility.

8.2 IDENTIFIED PROJECT IMPACTS ON CULTURAL RESOURCES

The following impacts on cultural resources may occur as a result of the proposed Project. Based on the analyses presented below, the Project is unlikely to have an adverse effect on archaeological historic properties, but may adversely affect the visual landscape/setting of architectural historic properties. The presence or absence of human remains as well as Native American resources is unknown. However, by implementing recommended mitigation measures, the impacts may be reduced.

8.2.1 Archaeological Resources

The pedestrian survey has identified one archaeological site within the survey area. Typically, archaeological sites are assessed for NRHP eligibility based on their untapped data potential. The site has been recommended as NRHP ineligible and therefore is not considered a historic property.

Therefore, construction-related disturbance of this resource would not be considered an adverse effect.

Given the low site density and inferred moderate archaeological sensitivity areas within proximity to permanent water sources within the APE, the potential to encounter additional resources within the subsurface of these areas is considered moderate. However, to reduce any impact on unanticipated archaeological resources, the measures listed below in Section 8.3 should be incorporated into the Project.

8.2.2 Native American Resources

In August of 2016, a notification letter was sent to the North Dakota Indian Affairs Commission. At the time of this report no responses had been received. No known Traditional Cultural Properties are in the APE or in the area surrounding the Project.

8.2.3 Historic Built Environment Resources

No eligible historic built environment resources were identified within the APE. Therefore, no direct impacts on historic built environment resources are expected from construction of the Project. However, the Project may be visible from undetermined historic buildings in the surrounding landscape or the towns of Ruso or Kongsberg. Visual impacts on these buildings may constitute an adverse effect should the rural setting of the region play a role in any significance the building may have. Therefore, there is potential for the Project to cause an adverse effect. An historic architecture survey of historic buildings from which the Project would be fully or partially visible has been conducted for the Project; results of this survey is provided in a separate report.

8.3 RECOMMENDED MANAGEMENT AND MITIGATION MEASURES

It is recommended that the protective measures outlined below be considered prior to and during Project implementation in order to reduce potential impacts on cultural resources.

Unanticipated and Inadvertent Discoveries—If construction staff or others observe previously unidentified archaeological resources during construction, work in the vicinity of the find(s) will halt and the Project Archaeologist will be notified immediately so that the resource value may be assessed as soon as possible and appropriate next steps determined in coordination with the land owner. Such finds will be formally recorded and evaluated for NRHP eligibility, as appropriate. The resource will be protected from further disturbance or looting pending evaluation and agreement from the SHSND regarding the resource's eligibility status. Should the unanticipated discovery be determined to be a historic property and cannot be avoided, Capital Power will provide justification as to why the resource cannot be avoided and recommend treatment options (i.e., data recovery) to the SHSND and interested Native American tribes for agreement.

As per the North Dakota Burial Laws (NDCC 23-06-27 and accompanying administrative rules NDAC 40-02-03), if human remains are inadvertently discovered during construction activities, all work in the vicinity of the find will cease and the appropriate law enforcement office will be contacted immediately.

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Appendix H:
Shadow Flicker Analysis

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Shadow Flicker Impact Analysis for the New Frontier Wind Energy Project McHenry County, North Dakota

Prepared for

Capital Power

Prepared by

TETRA TECH

November 2016

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Acronyms and Abbreviations

Hz	Hertz
NCDC	National Climatic Data Center
Project	New Frontier Wind Energy Project
rpm	rotations per minute
UTM	Universal Transverse Mercator

1.0 OVERVIEW

On April 26, 2012, the North Dakota Public Service Commission (PSC or Commission) issued Certificate of Site Compatibility (CSC) Number 29 (PSC Order) to Meadowlark Wind I, LLC (Meadowlark or Applicant) for the New Frontier Wind Energy Project (Project) in McHenry County, North Dakota (Figure 1). In December 2014, Capital Power Investments LLC, a subsidiary of Capital Power Corporation (Capital Power), completed the acquisition of Element Power US, LLC (Element Power), which included Meadowlark and the Project. In February 2016, Capital Power contracted Tetra Tech to conduct the following shadow flicker analysis for the Project to support the Certification of Continuing Suitability Application for the Project.

2.0 PROJECT COMPONENTS

The Project will consist of up to 49 wind turbines. Four different wind turbine model options were evaluated for potential shadow flicker impacts. Details for each wind turbine model are given below:

- **Acciona AW125/3150** – 3-blade 125 meter (m) rotor diameter, with a hub height of 87.5 m and generating capacity of 3.15 MW. The AW125/3150 has a normal high rotor speed of 14.7 rotations per minute (rpm) which translates to a blade pass frequency of 0.74 hertz (Hz) (0.74 alternations per second).
- **GE 2.5-116** – 3-blade 116 m rotor diameter, with a hub height of 90 meters and generating capacity of 2.5 MW. The GE 2.5-116 has a normal high rotor speed of 13 rotations per minute (rpm) which translates to a blade pass frequency of 0.65 hertz (Hz) (0.65 alternations per second).
- **Vestas V100-2.0** – 3-blade 100 m rotor diameter, with a hub height of 80 meters and generating capacity of 2.0 MW. The V100-2.0 has a normal high rotor speed of 15.2 rotations per minute (rpm) which translates to a blade pass frequency of 0.76 hertz (Hz) (0.76 alternations per second).
- **Vestas V126-3.45** – 3-blade 126 m rotor diameter, with a hub height of 87 meters and generating capacity of 3.45 MW. The V126-3.45 has a normal high rotor speed of 12.8 rotations per minute (rpm) which translates to a blade pass frequency of 0.64 hertz (Hz) (0.64 alternations per second).

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. In addition, shadow flicker is only an issue when at least 20 percent of the sun's disc is covered by the turbine blades.

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 discos 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 0.87 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. However, a widely used industry standard of 30 hours per year, has been used for this shadow flicker impact analysis.

4.0 WINDPRO SHADOW FLICKER ANALYSIS

An analysis of potential shadow flicker impacts from the Project was conducted using the WindPro software package. As described above, the Project will install up to 49 wind turbines. While only one turbine model will be constructed, four different turbine models have been evaluated with WindPro. If one of the larger turbine models (in terms of megawatts) is selected, less than 49 turbines will be constructed. However, the shadow flicker analysis has conservatively evaluated all 49 turbine locations for all four turbine model options.

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 turbines. The realistic impact condition scenario is based on the following:

- The elevation and position geometries of the wind turbines and surrounding receptors (potentially occupied residences). Elevations were determined using U.S. Geological Survey digital elevation model data. Positions geometries were determined using geographic information system and referenced to Universal Transverse Mercator (UTM) Zone 14 (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 [NOAA 2015] for nearby Bismarck, North Dakota) used in this analysis are as follows:

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
54%	52%	61%	58%	64%	67%	75%	72%	67%	53%	42%	45%

- Estimated wind turbine operations and orientation based on wind data (wind speed and direction) measured at meteorological towers located on the Project site.

- 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 Section 3. Since shadow flicker is only an issue when at least 20 percent of the sun disc is covered by the blades, WindPro uses blade width dimension data to calculate the maximum distance from the turbine where shadow flicker must be calculated. Beyond this distance, the turbine will not contribute to

the shadow flicker impact. 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 accounted for despite the likelihood of their reducing or eliminating shadow flicker impacts to receptors.

A total of 47 residential structures were identified within and near the Project Area as occupied or potentially occupied residences 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 all 47 identified residential structures, along with the 49 potential turbine locations considered.

5.0 SHADOW FLICKER ANALYSIS RESULTS

As expected, WindPro predicts that shadow flicker impacts will be greatest at locations closer to the wind turbines. Figures 2 through 5 illustrate the WindPro predicted shadow flicker impact areas for each of the turbine model scenarios.

Table 1 presents the WindPro predicted shadow flicker impacts for the top ten worst case impacts receptors, for each of the turbine model scenarios. Table 2 summarizes the shadow flicker impact prediction statistics. The predicted shadow flicker for all 47 receptors is presented in Appendix A for each of the turbine model scenarios. Because the Project is using a minimum turbine siting setback requirement of 1,400 feet to occupied residences as required by the North Dakota Public Service Commission Order for the Project (Certificate of Site Compatibility Number 29 issued April 26, 2012), 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 91 hours and 7 minutes per year (Receptor 3). This is approximately 2.04 percent of the potential available daylight hours. There are five occupied receptors (Receptors 2, 3, 5, 12, and 44) with shadow flicker impacts greater than 30 hours per year. All of these residences are owned by landowners that are participating in the Project. Receptors 2, 3, 5, and 12 from the current study correspond to the worst case receptors in the 2011 shadow flicker study (Receptors M, H, and O with anticipated impacts greater than 30 hours and Receptor K with anticipated impacts just below 30 hours). Receptor 44 is a structure that was not in existence in 2011, therefore this receptor was not analyzed in the 2011 shadow flicker analysis.

Table 1. WindPro Top Ten Expected Shadow Flicker Impacts						
			Expected Shadow Hours per Year (hours / year)			
Receptor ID	Receptor Type	Receptor Project Participation Status	Acciona AW 125/3150	GE 2.5-116	Vestas V100-2.0	Vestas V126-3.45
3	Resident	Participant	88.97	79.83	58.82	91.12
12	Resident	Participant	69.38	61.93	51.65	71.28
44	Resident	Participant	56.47	50.95	37.88	57.87
2	Resident	Participant	50.37	42.77	32.38	52.35
5	Resident	Participant	32.40	29.07	21.02	33.15
4	Resident	Participant	27.55	25.00	18.48	28.22
14	Resident	Participant	25.30	22.55	15.35	25.90
1	Resident	Participant	24.45	22.00	15.58	24.97
13	Resident	Participant	23.92	21.75	15.75	24.47
6	Resident	Participant	20.93	18.73	13.82	21.42

Table 2. Statistical Summary of WindPro Expected Shadow Flicker Impacts– Number of Modeled Receptors				
Cumulative Shadow Flicker Time (expected)	Acciona AW125/3150	GE 2.5-116	Vestas V100-2.0	Vestas V126-3.45
Total	47	47	47	47
= 0 Hours	26	27	27	26
> 0 Hours < 10 Hours	10	9	10	10
≥ 10 Hours < 20 Hours	1	2	5	1
≥ 20 Hours < 30 Hours	5	5	1	5
≥ 30 Hours	5	4	4	5

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 within acceptable ranges for avoiding nuisance conditions. There are five occupied receptors with shadow flicker impacts greater than 30 hours per year, however all of these residences are owned by landowners that are participating in the Project. 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, impacts from the worst case turbine model were presented, and the actual impacts may be less depending on the turbine model selected.

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 November 2015.

National Oceanic and Atmospheric Administration (NOAA). 2015. Comparative Climatic Data for the United States Through 2015.

Figures

NEW FRONTIER WIND ENERGY PROJECT

Figure 1: Turbine and Receptor Locations

- Turbine
- Participant Receptor
- Non-Participant Receptor

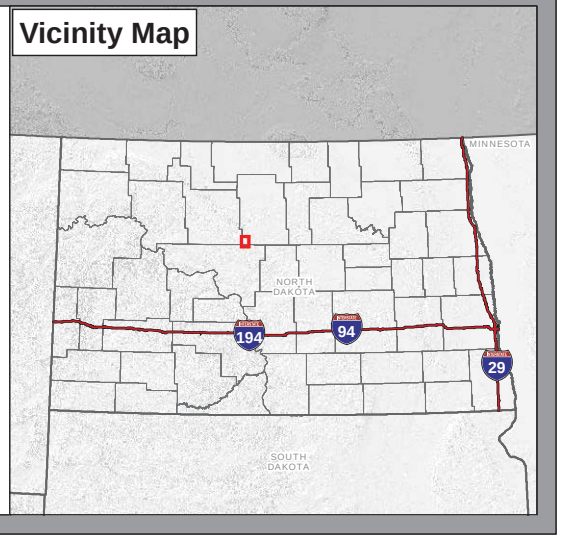
0 0.25 0.5 Miles

Scale is 1:18,000 when printed at 22x34"

TETRA TECH

P:\5563_New_Frontier_Wind\GIS\Layouts\Shadow_Flicker\Receptors.mxd Source: BTS, ESRI, NREL, FCC, DOD, and Ventyx Last Modified: 11/14/2016

Vicinity Map



NEW FRONTIER WIND ENERGY PROJECT

Figure 2: Expected Shadow Flicker Impact Areas
Acciona AWT 3150-125 Array

0 0.25 0.5 Miles

Scale is 1:24,000 when printed at 22x34"

- Acciona AWT 3150-125 Turbine Array
- Participant Receptor
- Non-Participant Receptor

Shadow Flicker (hours per year)

- 0 - 15
- >15 - 30
- >30 - 50
- >50 - 100
- >100 - 200
- >200

TETRA TECH

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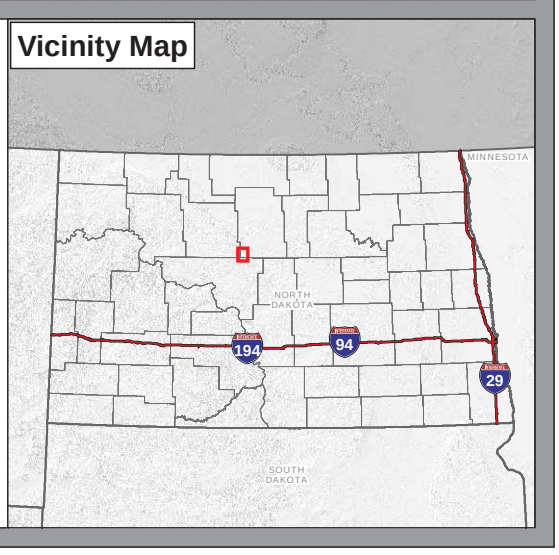
Vicinity Map



NEW FRONTIER WIND ENERGY PROJECT

Figure 3: Expected Shadow Flicker Impact Areas
GE 2.5-116 Array

0 0.25 0.5 Miles

Scale is 1:24,000 when printed at 22x34"

- GE 2.5-116 Turbine Array
- Participant Receptor
- Non-Participant Receptor

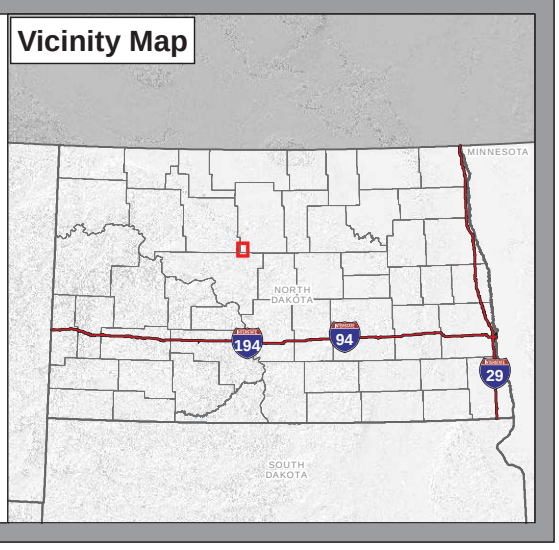
Shadow Flicker (hours per year)

- 0 - 15
- >15 - 30
- >30 - 50
- >50 - 100
- >100 - 200
- >200

TETRA TECH

P:\5563_New_Frontier_Wind\GIS\Layouts\Shadow_Flicker\ShadowFlicker_GE_2pt5_116.mxd Source: BTS, ESRI, NREL, FCC, DOD, and Ventyx Last Modified: 11/14/2016

Vicinity Map



NEW FRONTIER WIND ENERGY PROJECT

Figure 4: Expected Shadow Flicker Impact Areas
Vestas V100 Array

0 0.25 0.5 Miles

Scale is 1:24,000 when printed at 22x34"

- Vestas V100 Turbine Array
- Participant Receptor
- Non-Participant Receptor

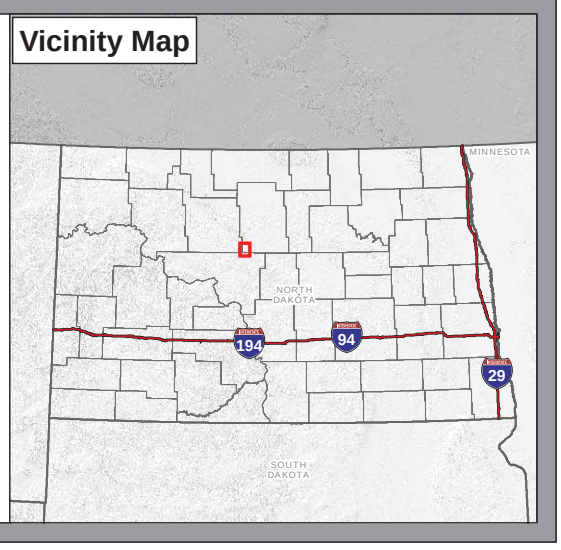
Shadow Flicker (hours per year)

- 0 - 15
- >15 - 30
- >30 - 50
- >50 - 100
- >100 - 200
- >200

TETRA TECH

P:\5563_New_Frontier_Wind\GIS\Layouts\Shadow_Flicker\ShadowFlicker_Vestas_V100.mxd Source: BTS, ESRI, NREL, FCC, DOD, and Ventyx Last Modified: 11/7/2016

Vicinity Map



NEW FRONTIER WIND ENERGY PROJECT

Figure 5: Expected Shadow Flicker Impact Areas
Vestas V126 Array

0 0.25 0.5 Miles

Scale is 1:24,000 when printed at 22x34"

- Vestas V126 Turbine Array
- Participant Receptor
- Non-Participant Receptor

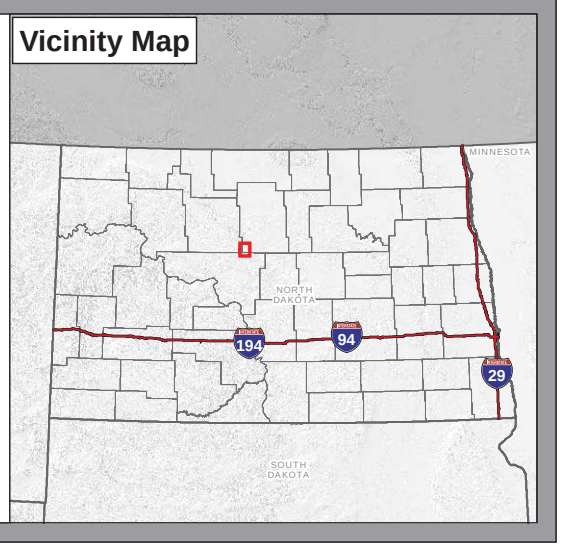
Shadow Flicker (hours per year)

- 0 - 15
- >15 - 30
- >30 - 50
- >50 - 100
- >100 - 200
- >200

TETRA TECH

P:\5563_New_Frontier_Wind\GIS\Layouts\Shadow_Flicker\ShadowFlicker_Vestas_V126.mxd Source: BTS, ESRI, NREL, FCC, DOD, and Ventyx Last Modified: 11/14/2016

Vicinity Map



Attachment A:
Detailed Summary of WindPro Shadow Flicker Analysis Results

Detailed Summary of WindPro Shadow Flicker Analysis Results – Acciona AW125/3150

Capital Power New Frontier Receptor ID	UTM-E (m)	UTM-N (m)	WindPro Predicted Expected Shadow Flicker (Hours per Year)	Status
1	355605.40	5301329.12	24.45	Resident
2	355661.04	5302441.06	50.37	Resident
3	355701.95	5304237.91	88.97	Resident
4	354027.18	5303758.70	27.55	Resident
5	354097.00	5304133.53	32.40	Resident
6	355606.23	5307543.03	20.93	Resident
7	355126.06	5306944.55	15.45	Resident
8	356588.12	5306314.94	3.68	Resident
9	355289.86	5309264.74	9.42	Resident
10	355228.99	5309342.92	8.68	Resident
11	354396.88	5309448.87	0.00	Resident
12	354113.94	5306610.85	69.38	Resident
13	354128.83	5306369.78	23.92	Resident
14	352764.09	5304471.09	25.30	Resident
15	356023.92	5307978.07	6.62	Missile Site
16	355934.85	5310391.99	0.00	Resident
17	357492.91	5309064.75	0.00	Resident
18	360751.46	5304943.70	0.00	Resident
19	348671.06	5304721.90	0.00	Resident
20	348189.46	5304542.92	0.00	Resident
21	355635.43	5300982.28	0.25	Resident
22	355939.73	5308365.07	8.17	Resident
23	357655.42	5306177.53	1.62	Resident
24	355731.47	5300485.94	0.00	Resident
25	355618.73	5299997.13	0.00	Resident
26	355445.39	5300001.72	0.00	Resident
27	355400.62	5300005.16	0.00	Resident
28	355289.26	5300129.61	0.00	Resident
29	355309.24	5300408.57	0.00	Resident
30	355798.51	5299703.70	0.00	Resident
31	358962.39	5301029.91	4.12	Resident
32	353241.16	5300542.53	0.00	Resident
33	355840.17	5311882.33	0.00	Resident
34	357660.51	5310795.29	0.00	Resident
35	355462.08	5309266.00	6.05	Resident
36	360761.37	5306287.05	0.00	Resident
37	358897.97	5299450.61	0.00	Resident
38	354691.97	5299450.42	0.00	Resident
39	355368.25	5299419.73	0.00	Resident
40	355103.66	5300326.72	0.00	Resident
41	352663.41	5299129.48	0.00	Resident
42	354311.50	5309444.28	0.00	Resident
43	355272.03	5309369.84	8.22	Resident
44	355889.74	5305977.17	56.47	Resident
45	361732.60	5299729.17	0.00	Resident
46	362417.60	5300028.31	0.00	Resident
47	357737.12	5299653.55	0.00	Resident

Detailed Summary of WindPro Shadow Flicker Analysis Results – GE 2.5-116

Infinity Western Plains Receptor ID	UTM-E (m)	UTM-N (m)	WindPro Predicted Expected Shadow Flicker (Hours per Year)	Status
1	355605.40	5301329.12	22.00	Resident
2	355661.04	5302441.06	42.77	Resident
3	355701.95	5304237.91	79.83	Resident
4	354027.18	5303758.70	25.00	Resident
5	354097.00	5304133.53	29.07	Resident
6	355606.23	5307543.03	18.73	Resident
7	355126.06	5306944.55	13.67	Resident
8	356588.12	5306314.94	2.92	Resident
9	355289.86	5309264.74	8.23	Resident
10	355228.99	5309342.92	8.05	Resident
11	354396.88	5309448.87	0.00	Resident
12	354113.94	5306610.85	61.93	Resident
13	354128.83	5306369.78	21.75	Resident
14	352764.09	5304471.09	22.55	Resident
15	356023.92	5307978.07	6.02	Missile Site
16	355934.85	5310391.99	0.00	Resident
17	357492.91	5309064.75	0.00	Resident
18	360751.46	5304943.70	0.00	Resident
19	348671.06	5304721.90	0.00	Resident
20	348189.46	5304542.92	0.00	Resident
21	355635.43	5300982.28	0.00	Resident
22	355939.73	5308365.07	7.52	Resident
23	357655.42	5306177.53	1.48	Resident
24	355731.47	5300485.94	0.00	Resident
25	355618.73	5299997.13	0.00	Resident
26	355445.39	5300001.72	0.00	Resident
27	355400.62	5300005.16	0.00	Resident
28	355289.26	5300129.61	0.00	Resident
29	355309.24	5300408.57	0.00	Resident
30	355798.51	5299703.70	0.00	Resident
31	358962.39	5301029.91	3.75	Resident
32	353241.16	5300542.53	0.00	Resident
33	355840.17	5311882.33	0.00	Resident
34	357660.51	5310795.29	0.00	Resident
35	355462.08	5309266.00	5.33	Resident
36	360761.37	5306287.05	0.00	Resident
37	358897.97	5299450.61	0.00	Resident
38	354691.97	5299450.42	0.00	Resident
39	355368.25	5299419.73	0.00	Resident
40	355103.66	5300326.72	0.00	Resident
41	352663.41	5299129.48	0.00	Resident
42	354311.50	5309444.28	0.00	Resident
43	355272.03	5309369.84	7.60	Resident
44	355889.74	5305977.17	50.95	Resident
45	361732.60	5299729.17	0.00	Resident
46	362417.60	5300028.31	0.00	Resident
47	357737.12	5299653.55	0.00	Resident

Detailed Summary of WindPro Shadow Flicker Analysis Results – Vestas V100-2.0

Infinity Western Plains Receptor ID	UTM-E (m)	UTM-N (m)	WindPro Predicted Expected Shadow Flicker (Hours per Year)	Status
1	355605.40	5301329.12	15.58	Resident
2	355661.04	5302441.06	32.38	Resident
3	355701.95	5304237.91	58.82	Resident
4	354027.18	5303758.70	18.48	Resident
5	354097.00	5304133.53	21.02	Resident
6	355606.23	5307543.03	13.82	Resident
7	355126.06	5306944.55	9.75	Resident
8	356588.12	5306314.94	2.03	Resident
9	355289.86	5309264.74	6.45	Resident
10	355228.99	5309342.92	5.80	Resident
11	354396.88	5309448.87	0.00	Resident
12	354113.94	5306610.85	51.65	Resident
13	354128.83	5306369.78	15.75	Resident
14	352764.09	5304471.09	15.35	Resident
15	356023.92	5307978.07	3.92	Missile Site
16	355934.85	5310391.99	0.00	Resident
17	357492.91	5309064.75	0.00	Resident
18	360751.46	5304943.70	0.00	Resident
19	348671.06	5304721.90	0.00	Resident
20	348189.46	5304542.92	0.00	Resident
21	355635.43	5300982.28	0.00	Resident
22	355939.73	5308365.07	5.38	Resident
23	357655.42	5306177.53	1.10	Resident
24	355731.47	5300485.94	0.00	Resident
25	355618.73	5299997.13	0.00	Resident
26	355445.39	5300001.72	0.00	Resident
27	355400.62	5300005.16	0.00	Resident
28	355289.26	5300129.61	0.00	Resident
29	355309.24	5300408.57	0.00	Resident
30	355798.51	5299703.70	0.00	Resident
31	358962.39	5301029.91	2.52	Resident
32	353241.16	5300542.53	0.00	Resident
33	355840.17	5311882.33	0.00	Resident
34	357660.51	5310795.29	0.00	Resident
35	355462.08	5309266.00	3.15	Resident
36	360761.37	5306287.05	0.00	Resident
37	358897.97	5299450.61	0.00	Resident
38	354691.97	5299450.42	0.00	Resident
39	355368.25	5299419.73	0.00	Resident
40	355103.66	5300326.72	0.00	Resident
41	352663.41	5299129.48	0.00	Resident
42	354311.50	5309444.28	0.00	Resident
43	355272.03	5309369.84	5.57	Resident
44	355889.74	5305977.17	37.88	Resident
45	361732.60	5299729.17	0.00	Resident
46	362417.60	5300028.31	0.00	Resident
47	357737.12	5299653.55	0.00	Resident

Detailed Summary of WindPro Shadow Flicker Analysis Results – Vestas V126-3.45

Infinity Western Plains Receptor ID	UTM-E (m)	UTM-N (m)	WindPro Predicted Expected Shadow Flicker (Hours per Year)	Status
1	355605.40	5301329.12	24.97	Resident
2	355661.04	5302441.06	52.35	Resident
3	355701.95	5304237.91	91.12	Resident
4	354027.18	5303758.70	28.22	Resident
5	354097.00	5304133.53	33.15	Resident
6	355606.23	5307543.03	21.42	Resident
7	355126.06	5306944.55	15.83	Resident
8	356588.12	5306314.94	3.78	Resident
9	355289.86	5309264.74	9.65	Resident
10	355228.99	5309342.92	8.88	Resident
11	354396.88	5309448.87	0.00	Resident
12	354113.94	5306610.85	71.28	Resident
13	354128.83	5306369.78	24.47	Resident
14	352764.09	5304471.09	25.90	Resident
15	356023.92	5307978.07	6.78	Missile Site
16	355934.85	5310391.99	0.00	Resident
17	357492.91	5309064.75	0.00	Resident
18	360751.46	5304943.70	0.00	Resident
19	348671.06	5304721.90	0.00	Resident
20	348189.46	5304542.92	0.00	Resident
21	355635.43	5300982.28	0.35	Resident
22	355939.73	5308365.07	8.35	Resident
23	357655.42	5306177.53	1.67	Resident
24	355731.47	5300485.94	0.00	Resident
25	355618.73	5299997.13	0.00	Resident
26	355445.39	5300001.72	0.00	Resident
27	355400.62	5300005.16	0.00	Resident
28	355289.26	5300129.61	0.00	Resident
29	355309.24	5300408.57	0.00	Resident
30	355798.51	5299703.70	0.00	Resident
31	358962.39	5301029.91	4.20	Resident
32	353241.16	5300542.53	0.00	Resident
33	355840.17	5311882.33	0.00	Resident
34	357660.51	5310795.29	0.00	Resident
35	355462.08	5309266.00	6.17	Resident
36	360761.37	5306287.05	0.00	Resident
37	358897.97	5299450.61	0.00	Resident
38	354691.97	5299450.42	0.00	Resident
39	355368.25	5299419.73	0.00	Resident
40	355103.66	5300326.72	0.00	Resident
41	352663.41	5299129.48	0.00	Resident
42	354311.50	5309444.28	0.00	Resident
43	355272.03	5309369.84	8.40	Resident
44	355889.74	5305977.17	57.87	Resident
45	361732.60	5299729.17	0.00	Resident
46	362417.60	5300028.31	0.00	Resident
47	357737.12	5299653.55	0.00	Resident

Appendix I:
New Frontier Wind Energy Project – 2016 Interim Avian Report

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TETRA TECH

Memorandum

To: Capital Power
From: Sarah McCall, Tetra Tech, Inc.
Date: September 6, 2016
Project: New Frontier Wind Energy Project
Subject: Interim Avian Report

Introduction

On April 26, 2012, the North Dakota Public Service Commission (PSC or Commission) issued Certificate of Site Compatibility (CSC) Number 29 (PSC Order) to Meadowlark Wind I, LLC (Applicant) for the New Frontier Wind Energy Project (Project) in McHenry County, North Dakota. In December 2014, Capital Power Investments LLC, a subsidiary of Capital Power Corporation (Capital Power), completed the acquisition of Element Power US, LLC (Element Power), which included Meadowlark and the Project. In February 2016, Tetra Tech, Inc. (Tetra Tech) was contracted by Capital Power to undertake three seasons of avian use point-count surveys (spring, summer, and fall), raptor nest surveys, and lek surveys for the Project. The studies are being conducted to identify potential avian impacts associated with constructing and operating a wind energy facility. Birds have been identified as a group potentially at risk because of collisions with wind turbines and power lines, and displacement due to the presence of the associated structures. The point-count surveys, initiated on March 30, 2016, are ongoing and scheduled to continue through mid-November 2016. Spring and partial-summer results reported here are through August 2, 2016. Full summer results will be presented in the final report after completion of summer (through August 15, 2016) and fall (August 16 through November 15, 2016) surveys.

Methods

Point-count Surveys

Point-count surveys were conducted two times a month at the Project from March 30 through August 2, 2016, which included spring migration and summer breeding seasons, for a total of 10 survey rounds (Table 1). Each round of avian use surveys were conducted over two days. The protocol for data collection at the Project Area was designed to be responsive to the level of effort recommended in the National Wind Coordinating Committee's Comprehensive Guide to Studying Wind Energy/Wildlife Interactions (Strickland et al. 2011) and the voluntary U.S. Fish and Wildlife Service Land-Based Wind Energy Guidelines (USFWS 2012).

Avian use surveys were conducted at nine point-count locations (fixed 800-meter [m] or [0.50 mile] radius) distributed throughout the Project Area (Figure 1). An experienced field biologist conducted 20-minute (min) use surveys collecting data on all birds detected within the point-count area to evaluate avian use, behavior, and species richness. Tetra Tech distributed the survey locations along publicly accessible roads and chose locations that maximized the 360-degree sight distance for the observer.

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The survey protocol used in these studies is designed to collect data on all bird species and to provide results that are comparable with other studies at wind energy facilities, rather than to target specific taxa. The benefit of using this protocol is that it estimates avian use throughout the day and captures activity by a variety of bird species. During the spring migration, songbirds are most active in the morning and can be difficult to detect during the afternoon. In contrast, raptors become active as the sunlight heats the air and creates thermals, which individual raptors use for soaring. Thus, raptors are more readily detected several hours after sunrise. Therefore, this protocol is appropriate for characterizing the entire bird community. It should be noted, however, that this survey protocol can only detect nocturnal migrants should they be local breeders or if they utilize the Project as stopover habitat. Tetra Tech chose 20-min survey periods because they provide adequate time to detect both raptors and non-raptors. However, time periods of 20 minutes may lead to double-counting of songbirds (i.e., counting the same individual more than once) because individuals may appear and disappear from view. Double-counting of birds is not problematic for this type of survey because the objective is to document use in terms of number of birds noted per 20-min survey, not number of distinct individual birds.

Detectability varies among species and potentially not all individuals within the 800-m (0.50 mile) radius were counted. This variation in detectability could result in an overestimate of mean use for conspicuous species and an underestimate of mean use for reclusive species. Birds not easily identifiable, such as those seen under low light conditions or small birds seen at a distance were identified to the lowest taxonomic level possible. Hence, unidentified birds are included in the results.

Incidental observations including those made during transit between point-count locations and before or after the official 20-min survey period were also recorded. The biologist recorded observations of large flocks or unusual species not captured during avian use surveys. These data were not used in formal analyses; however, a summary of incidentally observed species is presented to provide additional information about species found in the local area.

Raptor Nest Surveys

Raptor nest surveys were conducted aerially on March 14-15, 2016, with ground-based follow up occurring continuously between mid-April and June 2016. The aerial survey consisted of searches for all raptor nests (including eagles) along transects spaced 1.61 kilometers [km] (one-mile) apart within the Project Area plus a one-mile buffer (Raptor Nest Survey Area) and for eagle nests specifically in suitable habitat out to 16.1 km (10 miles) from the Project Boundary (Eagle Nest Survey Area). Within the Eagle Nest Survey Area, surveys focused on potentially suitable nesting habitat along large bodies of water and other areas with large trees sufficient to support nesting by large raptors. Prior to the survey, information on known eagle nests was requested from the USFWS and the North Dakota Game and Fish Department (NDGFD); NDGFD reported that no eagle nests were known to exist within the Eagle Nest Survey Area. Ground-based follow up surveys were conducted to locate any late-nesting raptors within the Raptor Nest Survey Area and to determine or update the status of raptor nests located during the aerial survey. The ground-based surveys were conducted from public roadways by a biologist equipped with a spotting scope. The biologist collected data on species, location, and activity status for all stick nests observed within the Raptor Nest Survey Area and only for potential eagle nests within the Eagle Nest Survey Area.

Lek Surveys

A biologist conducted grouse lek surveys on six days from mid-April through mid-May to coincide with the prairie grouse breeding season. Surveys were conducted from approximately an hour before sunrise to two hours after sunrise. The biologist drove county roads as access allowed through areas identified as potential lek habitat: open, short grass vegetation with some agriculture, stopping every 800 m (0.5 mile) and listened for a minimum of five minutes for vocalizations of displaying males. The biologist did not conduct listening stops when winds exceeded 16kph (10 mph) or if there was any type of precipitation. If a lek was located and visible, the biologist observed the lek for at least 10 minutes to count the number of males and females. If displaying grouse were heard, but the lek was not visible, the biologist attempted to pinpoint the location by driving county roads and triangulating back to the lek location.

Results

Point-count Surveys

A total of 10,139 birds from 119 species and 10 individuals from unknown hawk species were observed during the spring and summer avian use surveys (Table 2). Overall mean bird use within the Project Area was 112.66 birds/20-min and ranged from 9 to 895 birds/20-min survey. The species group with the overall highest mean use was songbirds (77.68 birds/20 min). Other groups with Project-relative high mean use included waterfowl, and gulls/terns (13.46 and 11.58 birds/20 min, respectively). The species with the highest overall mean use were the red-winged blackbird, horned lark, Franklin's gull, and mallard (35.68, 18.17, 9.47 and 5.23 birds/20 min, respectively). All other species had an overall mean use of less than 5.00 birds per 20 minutes. Overall, red-winged blackbird and horned lark accounted for 31.7 and 16.1 percent of all birds observed during the time period represented in this report.

Mean use by species varied between seasons. Similar to overall results, in spring, red-winged blackbird, horned lark, Franklin's gull and mallard had the highest mean uses (49.69, 29.80, 11.19 and 6.39 birds/20 min, respectively). All other species had a spring mean use of less than 5.00 birds per 20 minutes. Similarly to spring and overall, the red-winged blackbird showed the highest summer mean use of 14.67 birds per 20 minutes. However, the Franklin's gull had the second highest summer mean use (6.89 birds/20 min). All other species had a summer mean use of less than 5.00 birds per 20 minutes. The song sparrow and ring-necked pheasant were species with relatively moderate overall mean uses but high overall frequencies of observation (0.93 and 0.84 birds/20 min, observed in 68.9 and 62.2 percent of all surveys, respectively; Tables 2 and 3). Additionally, 30 sandhill cranes were observed incidentally to avian surveys in the spring. This species was not captured during regular avian use surveys.

High raptor use (greater than 2.00 birds/20 min) has been associated with high raptor mortality at wind facilities. Conversely, raptor mortality appears to be low when raptor use is low (less than 1.00 birds/20 min). Overall raptor use at the Project was moderate (1.26 birds/20 min) during the time period represented in this report. Eight raptor species including red-tailed hawk, northern harrier, Swainson's hawk, American kestrel, turkey vulture, sharp-shinned hawk, short-eared owl, ferruginous hawk and 10 individuals that could only be identified as hawk species, were observed during the time period represented in this report. The red-tailed hawk had the highest mean use in each season and overall

(0.76, 0.42, and 0.62 birds per 20 min, spring, summer, and overall; Table 2). All other raptor species had an overall mean use less than 0.20 birds/20-min.

No federally listed threatened or endangered species were detected during the 2016 point-count surveys. North Dakota's State Wildlife Action Plan identifies Species of Conservation Priority and categorizes these species into 3 levels based on decline (Hagen et al. 2005, NDGFD 2015). The American bittern, American white pelican, chestnut-collard longspur, ferruginous hawk, Franklin's gull, lark bunting, marbled godwit, Swainson's hawk, upland sandpiper, and willet—all observed during this survey—are identified as a Level I, defined as species which are in decline and receive little or no monetary support or conservation efforts (Dyke et al. 2015). These species are not afforded any formal protection by the state of North Dakota and there are no state permitting requirements for them. Only species protected by the Endangered Species Act are considered threatened or endangered in North Dakota.

Raptor Nest Surveys

No eagle nests were located within the Project Area. Three confirmed bald eagle nests were observed during the surveys. Two nests were found just outside the 10-mile buffer survey area; a bald eagle nest confirmed Occupied Active (adults with eggs or young present) and the other Unoccupied (no adults or sign of use). The third nest was located about 8 miles northwest of the Project and was confirmed Occupied Inactive (no eggs or young but signs of use). Additionally, eight raptor nests were observed within the Raptor Survey Area. Raptor nests detected within the Raptor Survey Area included three Occupied Active great-horned owl nests, three Occupied Active red-tailed hawk nests, and one unoccupied stick nest (Figure 2).

Lek Surveys

Two rounds of leks surveys were completed between April 12 and May 8, 2016. Two sharp-tailed grou.se leks were detected within the Project Area and one-mile buffer (Figure 3). The location of Historic Lek H-MCW18, approximately one mile from the nearest proposed turbine location (T-18), was provided by NDGFD and was confirmed active during this survey. Lek 1, approximately 3.22 km (two miles) from the nearest turbine location (T-1), was detected during the first round of surveys only (Figure 3). The number of displaying males ranged from 2-12 (average across both leks = 7). No other grouse species were detected during surveys.

Conclusions

The avian community detected within the Project Area during the spring and partial summer avian surveys was characterized by species typical of wetlands, agricultural lands and remnant grasslands in North Dakota. These habitats, as represented in the Project Area, are previously disturbed and fragmented, primarily due to the land use practices present in the area. Within previously disturbed and/or fragmented habitats, the greatest potential impact of wind facilities to avian species is risk of collisions with turbines rather than disturbance or displacement.

The North Dakota population of the red-winged blackbird, the species with overall highest mean use, is stable. Impacts to individuals from wind turbines are unlikely to cause population-level impacts as the

population is large and widely distributed (PIFSC 2013, Sauer et al. 2014). The raptor species with highest seasonal and overall mean use was the red-tailed hawk, and three occupied, active red-tailed hawk nests were detected within the Project Area and one mile buffer. Drewitt and Langston (2008) suggested that bird activity in general is typically higher near active nests than areas without active nests, and records of fatalities for the red-tailed hawk exist for wind facilities with publically available fatality data. Fatalities of red-tailed hawks at the Project, however, are not expected to have population-level impacts because North Dakota red-tailed hawk populations are large and relatively stable (PIFSC 2013, Sauer et al. 2014).

References

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Figure 1

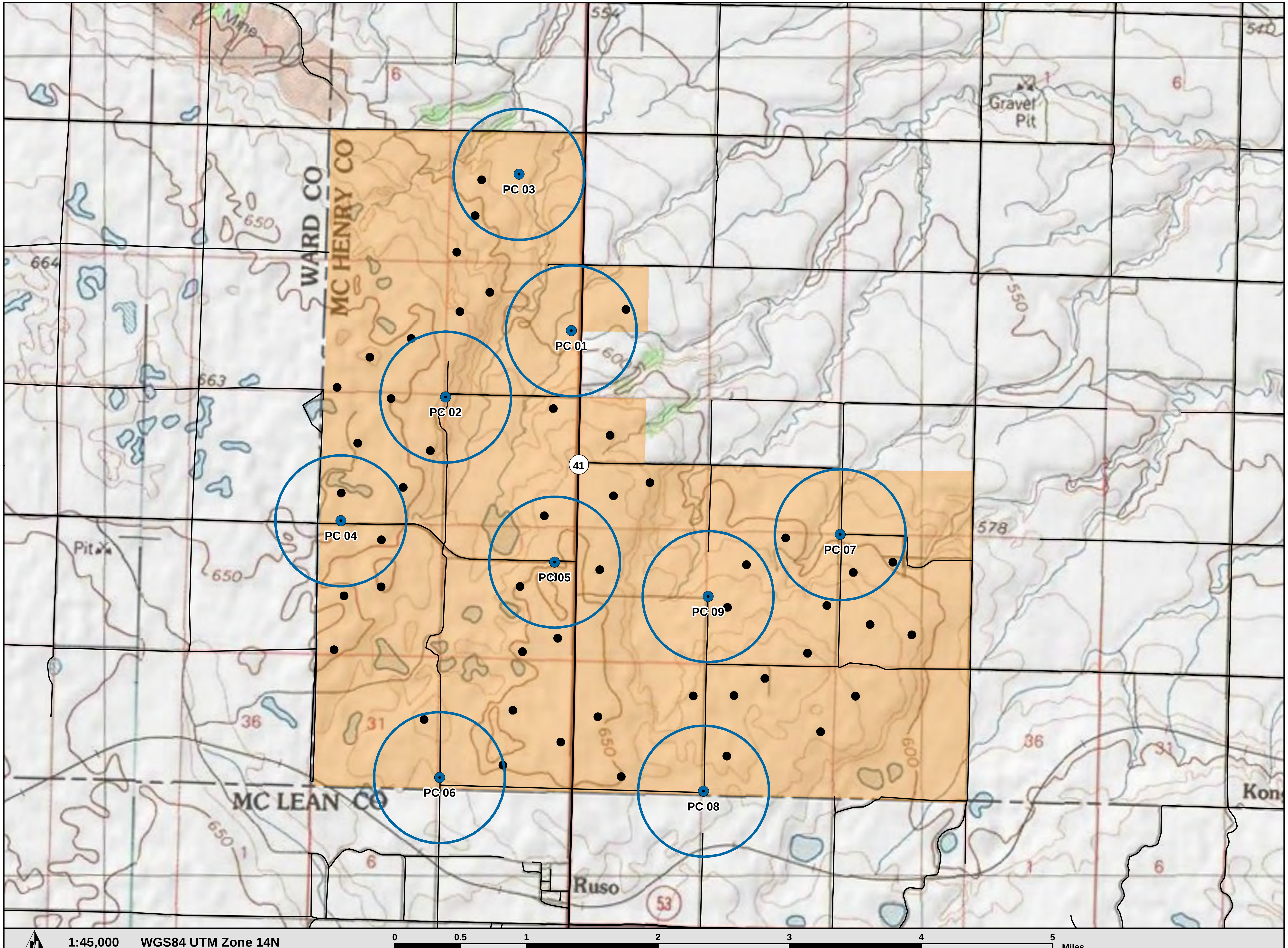
Point-count location map

Capital Power

New Frontier Wind Energy Project

McHenry County, ND

Last modified: 08-22-2016



- Avian Survey Point
- Avian Survey Point 800-m Radius
- PC# Point-count number
- Project Area (03-22-2016)
- Proposed Turbines (3-22-2016)
- Secondary Road
- Local Road

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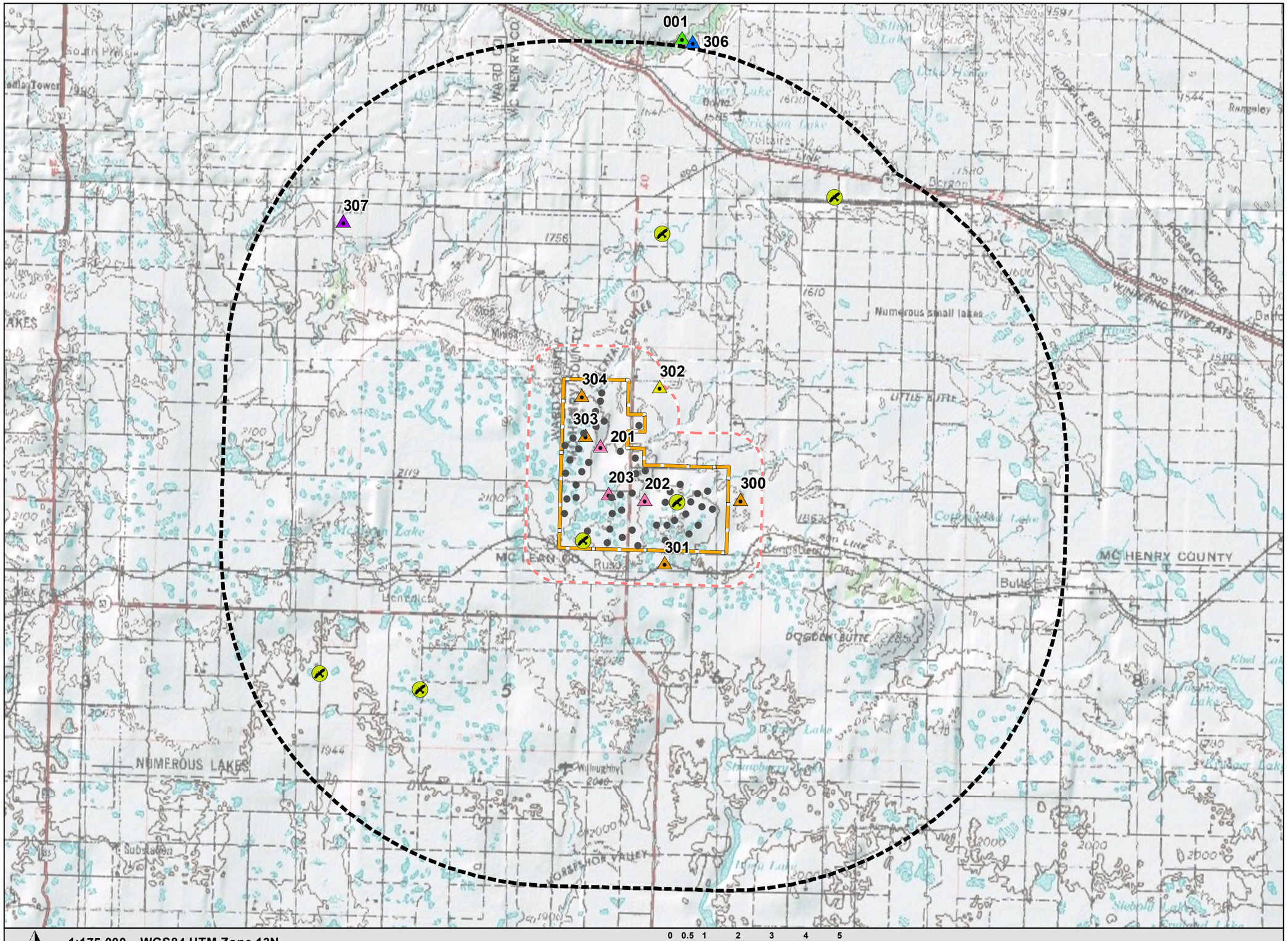

Figure 2

Captial Power

New Frontier Wind Energy Project

Raptor Nest Survey Results

McHenry County, ND
August 2016

- Occupied Active Bald Eagle Nest
- Occupied Inactive Bald Eagle Nest
- Unoccupied Bald Eagle Nest
- Occupied Active Great Horned Owl Nest
- Occupied Active Red-tailed Hawk
- Small Unoccupied Stick Nest
- Incidental Bald Eagle Sightings
- Project Boundary (03-22-2016)
- Project Area 1-mile Buffer
- Project Area 10-mile Buffer
- Proposed Turbine Locations (08-22-2016)

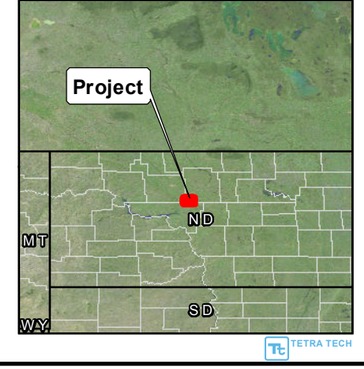

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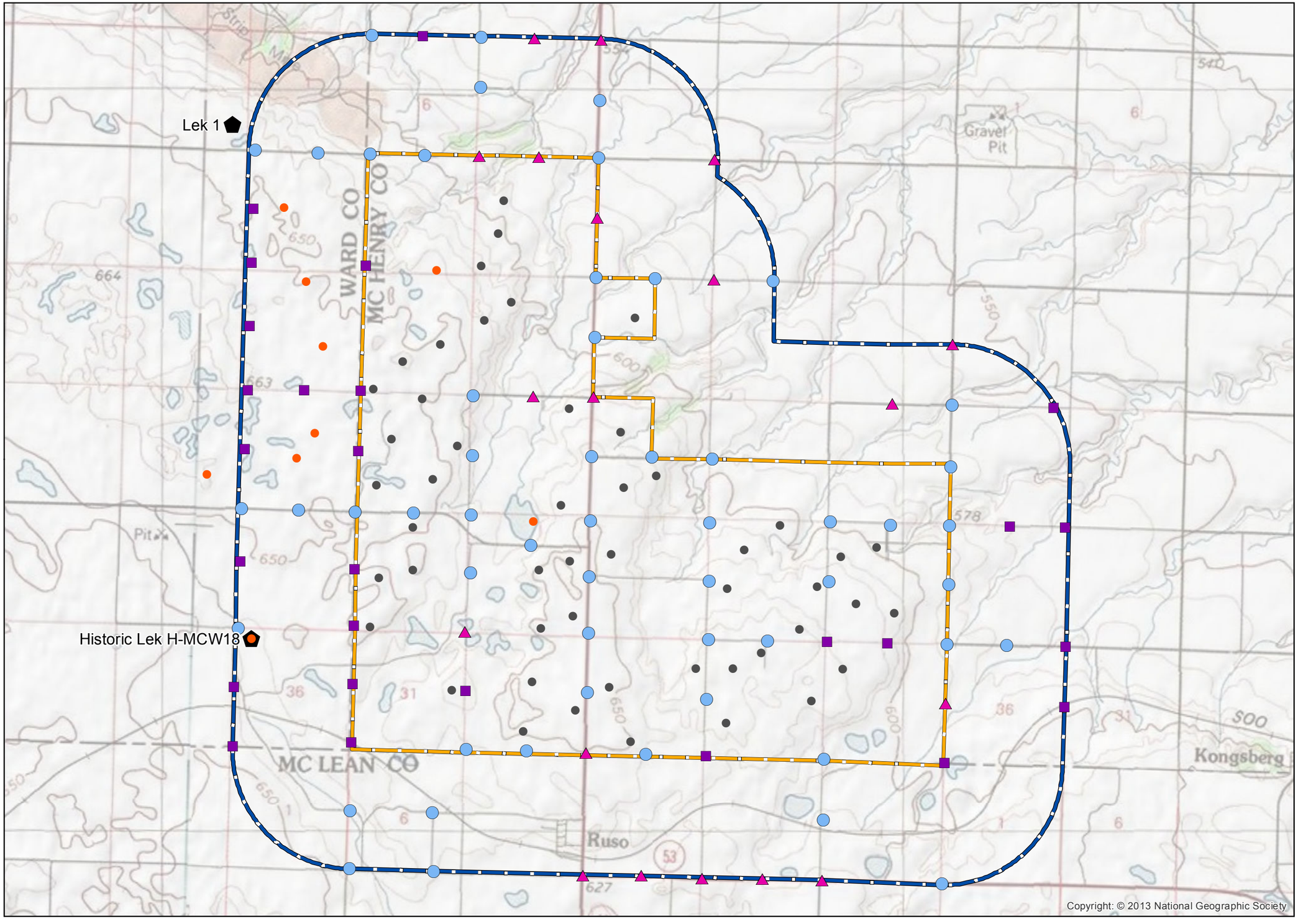
Figure 3

Captial Power
New Frontier Wind Energy Project

Lek Survey Results and Listening Stop Locations

McHenry County, ND
August 2016



- Project Boundary (03-22-2016)
- Project Boundary 1-mile Buffer
- Proposed Turbine Locations (08-22-2016)

Survey Point Status

- Listening Stop Location
- No Access
- Not Suitable Habitat
- NDGF Grouse Leks
- Leks Detected by Tetra Tech Biologist

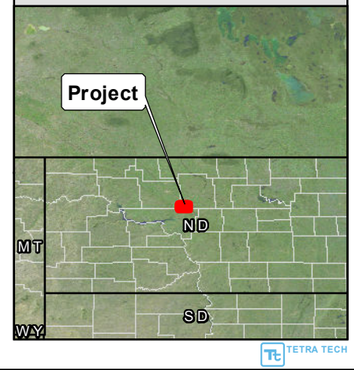


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Table 1. Avian point-count survey dates by season, at the New Frontier Wind Energy Project.

	Survey Number	Date(s)	Year
Spring 2016			
	1	3/30-3/31	2016
	2	4/10-4/11	2016
	3	4/25-4/26	2016
	4	5/9-5/10	2016
	5	5/23-5/24	2016
	6	6/6-6/7	2016
Partial-Summer 2016			
	7	6/20-6/21	2016
	8	7/4-7/5	2016
	9	7/18-7/19	2016
	10	8/1-8/2	2016

Table 2. Avian mean use, by species group, observed during 2016 spring and partial-summer point-count surveys at the New Frontier Wind Energy Project.

Species Group Species	Spring 2016			Summer 2016			Overall		
	# Birds	# Obs.	Mean Use # birds/ 20 min.	# Birds	# Obs.	Mean Use # birds/20 min.	# Birds	# Obs.	Mean Use # birds/ 20 min.
Songbirds									
red-winged blackbird	2683	89	49.69	528	51	14.67	3211	140	35.68
horned lark	1609	57	29.80	26	21	0.72	1635	78	18.17
common grackle	169	27	3.13	106	31	2.94	275	58	3.06
American robin	168	52	3.11	57	35	1.58	225	87	2.50
American crow	200	22	3.70	15	4	0.42	215	26	2.39
brown-headed cowbird	90	25	1.67	72	33	2.00	162	58	1.80
yellow-headed blackbird	51	19	0.94	101	12	2.81	152	31	1.69
cliff swallow	8	6	0.15	98	13	2.72	106	19	1.18
European starling	42	20	0.78	49	18	1.36	91	38	1.01
tree swallow	33	17	0.61	55	21	1.53	88	38	0.98
song sparrow	37	36	0.69	47	47	1.31	84	83	0.93
Lapland longspur	72	4	1.33	0	0	0.00	72	4	0.80
western meadowlark	43	42	0.80	19	18	0.53	62	60	0.69
cedar waxwing	44	5	0.81	17	6	0.47	61	11	0.68
barn swallow	20	12	0.37	36	19	1.00	56	31	0.62
American goldfinch	19	11	0.35	34	27	0.94	53	38	0.59
clay-colored sparrow	21	19	0.39	27	26	0.75	48	45	0.53
vesper sparrow	15	14	0.28	24	23	0.67	39	37	0.43
savannah sparrow	20	18	0.37	18	18	0.50	38	36	0.42
northern rough-winged swallow	11	5	0.20	24	10	0.67	35	15	0.39
eastern kingbird	10	9	0.19	24	19	0.67	34	28	0.38
bobolink	12	9	0.22	13	12	0.36	25	21	0.28
house sparrow	11	5	0.20	10	3	0.28	21	8	0.23
snow bunting	20	2	0.37	0	0	0.00	20	2	0.22

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	# Birds	# Obs.	Mean Use # birds/ 20 min.	# Birds	# Obs.	Mean Use # birds/20 min.	# Birds	# Obs.	Mean Use # birds/ 20 min.
yellow warbler	5	5	0.09	13	13	0.36	18	18	0.20
common yellowthroat	2	2	0.04	14	14	0.39	16	16	0.18
chestnut-collared longspur	15	1	0.28	0	0	0.00	15	1	0.17
western kingbird	4	3	0.07	8	8	0.22	12	11	0.13
least flycatcher	5	5	0.09	7	7	0.19	12	12	0.13
chipping sparrow	5	5	0.09	6	6	0.17	11	11	0.12
house finch	4	4	0.07	4	2	0.11	8	6	0.09
dark-eyed junco	8	4	0.15	0	0	0.00	8	4	0.09
purple martin	0	0	0.00	7	5	0.19	7	5	0.08
lark bunting	2	2	0.04	5	3	0.14	7	5	0.08
dickcissel	1	1	0.02	5	3	0.14	6	4	0.07
warbling vireo	1	1	0.02	4	4	0.11	5	5	0.06
eastern bluebird	0	0	0.00	5	5	0.14	5	5	0.06
black-capped chickadee	3	2	0.06	2	2	0.06	5	4	0.06
American redstart	1	1	0.02	4	4	0.11	5	5	0.06
eastern wood-pewee	1	1	0.02	3	3	0.08	4	4	0.04
eastern phoebe	3	3	0.06	1	1	0.03	4	4	0.04
common raven	3	2	0.06	1	1	0.03	4	3	0.04
black-billed magpie	3	3	0.06	1	1	0.03	4	4	0.04
Baltimore oriole	0	0	0.00	3	3	0.08	3	3	0.03
American tree sparrow	3	1	0.06	0	0	0.00	3	1	0.03
willow flycatcher	0	0	0.00	2	2	0.06	2	2	0.02
marsh wren	0	0	0.00	2	2	0.06	2	2	0.02
house wren	0	0	0.00	2	2	0.06	2	2	0.02
Harris's sparrow	2	2	0.04	0	0	0.00	2	2	0.02

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	# Birds	# Obs.	Mean Use # birds/ 20 min.	# Birds	# Obs.	Mean Use # birds/20 min.	# Birds	# Obs.	Mean Use # birds/ 20 min.
black-and-white warbler	1	1	0.02	1	1	0.03	2	2	0.02
American pipit	1	1	0.02	1	1	0.03	2	2	0.02
Wilson's warbler	1	1	0.02	0	0	0.00	1	1	0.01
swamp sparrow	0	0	0.00	1	1	0.03	1	1	0.01
rusty blackbird	1	1	0.02	0	0	0.00	1	1	0.01
orchard oriole	0	0	0.00	1	1	0.03	1	1	0.01
loggerhead shrike	0	0	0.00	1	1	0.03	1	1	0.01
lark sparrow	0	0	0.00	1	1	0.03	1	1	0.01
gray catbird	1	1	0.02	0	0	0.00	1	1	0.01
blue jay	1	1	0.02	0	0	0.00	1	1	0.01
bank swallow	1	1	0.02	0	0	0.00	1	1	0.01
Group Total	**5486**	**580**	**101.59**	**1505**	**564**	**41.81**	**6991**	**1144**	**77.68**
Waterfowl									
mallard	345	92	6.39	126	23	3.50	471	115	5.23
Canada goose	180	49	3.33	3	2	0.08	183	51	2.03
snow goose	120	1	2.22	0	0	0.00	120	1	1.33
lesser scaup	97	10	1.80	6	3	0.17	103	13	1.14
gadwall	50	18	0.93	9	6	0.25	59	24	0.66
blue-winged teal	32	16	0.59	22	8	0.61	54	24	0.60
American wigeon	28	15	0.52	24	4	0.67	52	19	0.58
green-winged teal	26	11	0.48	23	6	0.64	49	17	0.54
northern pintail	21	9	0.39	14	6	0.39	35	15	0.39
redhead	23	5	0.43	3	2	0.08	26	7	0.29
ring-necked duck	19	5	0.35	0	0	0.00	19	5	0.21
canvasback	14	3	0.26	2	1	0.06	16	4	0.18

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Species Group Species	Spring 2016			Summer 2016			Overall		
	# Birds	# Obs.	Mean Use # birds/ 20 min.	# Birds	# Obs.	Mean Use # birds/20 min.	# Birds	# Obs.	Mean Use # birds/ 20 min.
northern shoveler	10	7	0.19	4	3	0.11	14	10	0.16
ruddy duck	3	1	0.06	3	1	0.08	6	2	0.07
bufflehead	3	2	0.06	0	0	0.00	3	2	0.03
wood duck	1	1	0.02	0	0	0.00	1	1	0.01
Group Total	**972**	**245**	**18.00**	**239**	**65**	**6.64**	**1211**	**310**	**13.46**
Gulls/Terns									
Franklin's gull	604	12	11.19	248	4	6.89	852	16	9.47
ring-billed gull	115	38	2.13	41	28	1.14	156	66	1.73
black tern	3	2	0.06	25	9	0.69	28	11	0.31
Bonaparte's gull	3	1	0.06	0	0	0.00	3	1	0.03
California gull	0	0	0.00	2	2	0.06	2	2	0.02
herring gull	1	1	0.02	0	0	0.00	1	1	0.01
Group Total	**726**	**54**	**13.44**	**316**	**43**	**8.78**	**1042**	**97**	**11.58**
Waterbirds									
killdeer	125	75	2.31	41	31	1.14	166	106	1.84
American white pelican	26	10	0.48	68	12	1.89	94	22	1.04
double-crested cormorant	38	10	0.70	20	14	0.56	58	24	0.64
Wilson's snipe	26	26	0.48	2	2	0.06	28	28	0.31
upland sandpiper	8	8	0.15	11	10	0.31	19	18	0.21
lesser yellowlegs	12	4	0.22	3	3	0.08	15	7	0.17
willet	7	6	0.13	1	1	0.03	8	7	0.09
pied-billed grebe	2	2	0.04	3	3	0.08	5	5	0.06
great blue heron	3	2	0.06	1	1	0.03	4	3	0.04
spotted sandpiper	1	1	0.02	2	2	0.06	3	3	0.03
black-crowned night-heron	0	0	0.00	3	3	0.08	3	3	0.03

Table 2. Avian mean use, by species group, observed during 2016 spring and partial-summer point-count surveys at the New Frontier Wind energy Project.

Species Group Species	Spring 2016			Summer 2016			Overall		
	# Birds	# Obs.	Mean Use # birds/ 20 min.	# Birds	# Obs.	Mean Use # birds/20 min.	# Birds	# Obs.	Mean Use # birds/ 20 min.
American bittern	2	1	0.04	1	1	0.03	3	2	0.03
greater yellowlegs	2	1	0.04	0	0	0.00	2	1	0.02
American avocet	2	1	0.04	0	0	0.00	2	1	0.02
solitary sandpiper	0	0	0.00	1	1	0.03	1	1	0.01
marbled godwit	1	1	0.02	0	0	0.00	1	1	0.01
Group Total	**255**	**148**	**4.72**	**157**	**84**	**4.36**	**412**	**232**	**4.58**
Cranes/Rails									
sandhill crane	176	7	3.26	1	1	0.03	177	8	1.97
American coot	9	1	0.17	1	1	0.03	10	2	0.11
sora	1	1	0.02	0	0	0.00	1	1	0.01
Group Total	**186**	**9**	**3.44**	**2**	**2**	**0.06**	**188**	**11**	**2.09**
Raptors									
red-tailed hawk	41	33	0.76	15	15	0.42	56	48	0.62
northern harrier	14	13	0.26	3	3	0.08	17	16	0.19
Swainson's hawk	8	8	0.15	7	7	0.19	15	15	0.17
unidentified buteo	10	1	0.19	0	0	0.00	10	1	0.11
American kestrel	3	3	0.06	3	3	0.08	6	6	0.07
turkey vulture	1	1	0.02	3	3	0.08	4	4	0.04
sharp-shinned hawk	3	3	0.06	0	0	0.00	3	3	0.03
short-eared owl	0	0	0.00	1	1	0.03	1	1	0.01
ferruginous hawk	1	1	0.02	0	0	0.00	1	1	0.01
Group Total	**81**	**63**	**1.50**	**32**	**32**	**0.89**	**113**	**95**	**1.26**
Gamebirds									
ring-necked pheasant	55	54	1.02	21	20	0.58	76	74	0.84

Table 2. Avian mean use, by species group, observed during 2016 spring and partial-summer point-count surveys at the New Frontier Wind Energy Project.

Species Group Species	Spring 2016			Summer 2016			Overall		
	# Birds	# Obs.	Mean Use # birds/ 20 min.	# Birds	# Obs.	Mean Use # birds/20 min.	# Birds	# Obs.	Mean Use # birds/ 20 min.
wild turkey	1	1	0.02	2	1	0.06	3	2	0.03
sharp-tailed grouse	2	1	0.04	0	0	0.00	2	1	0.02
gray partridge	1	1	0.02	0	0	0.00	1	1	0.01
Group Total	**59**	**57**	**1.09**	**23**	**21**	**0.64**	**82**	**78**	**0.91**
Pigeons/Doves									
mourning dove	30	21	0.56	38	23	1.06	68	44	0.76
rock pigeon	7	2	0.13	6	3	0.17	13	5	0.14
Group Total	**37**	**23**	**0.69**	**44**	**26**	**1.22**	**81**	**49**	**0.90**
Woodpeckers									
northern flicker	6	6	0.11	4	4	0.11	10	10	0.11
downy woodpecker	3	3	0.06	5	5	0.14	8	8	0.09
Group Total	**9**	**9**	**0.17**	**9**	**9**	**0.25**	**18**	**18**	**0.20**
Swifts/Hummingbirds									
ruby-throated hummingbird	0	0	0.00	1	1	0.03	1	1	0.01
Group Total	**0**	**0**	**0.00**	**1**	**1**	**0.03**	**1**	**1**	**0.01**
Grand Total	**7811**	**1188**	**144.65**	**2328**	**847**	**64.67**	**10139**	**2035**	**112.66**

Table 3. Avian percent composition and frequency, sorted by species group, observed during 2016 spring and partial-summer point-count surveys at the New Frontier Wind Energy Project.

Species Group Species	Spring 2016		Summer 2016		Overall	
	Percent Composition	**Frequency** % of surveys detected	**Percent Composition**	**Frequency** % of surveys detected	**Percent Composition**	**Frequency** % of surveys detected
Songbirds						
red-winged blackbird	34.3	90.7	22.7	88.9	31.7	90.0
horned lark	20.6	57.4	1.1	44.4	16.1	52.2
common grackle	2.2	44.4	4.6	69.4	2.7	54.4
American robin	2.2	66.7	2.4	63.9	2.2	65.6
American crow	2.6	37.0	0.6	11.1	2.1	26.7
brown-headed cowbird	1.2	42.6	3.1	66.7	1.6	52.2
yellow-headed blackbird	0.7	27.8	4.3	27.8	1.5	27.8
cliff swallow	0.1	11.1	4.2	33.3	1.0	20.0
European starling	0.5	35.2	2.1	38.9	0.9	36.7
tree swallow	0.4	27.8	2.4	44.4	0.9	34.4
song sparrow	0.5	51.9	2.0	94.4	0.8	68.9
Lapland longspur	0.9	5.6	0.0	0.0	0.7	3.3
western meadowlark	0.6	59.3	0.8	44.4	0.6	53.3
cedar waxwing	0.6	7.4	0.7	16.7	0.6	11.1
barn swallow	0.3	18.5	1.5	47.2	0.6	30.0
American goldfinch	0.2	20.4	1.5	63.9	0.5	37.8
clay-colored sparrow	0.3	22.2	1.2	52.8	0.5	34.4
vesper sparrow	0.2	24.1	1.0	44.4	0.4	32.2
savannah sparrow	0.3	24.1	0.8	38.9	0.4	30.0
northern rough-winged swallow	0.1	9.3	1.0	19.4	0.3	13.3
eastern kingbird	0.1	16.7	1.0	47.2	0.3	28.9
bobolink	0.2	13.0	0.6	25.0	0.2	17.8
house sparrow	0.1	9.3	0.4	8.3	0.2	8.9
snow bunting	0.3	3.7	0.0	0.0	0.2	2.2
yellow warbler	0.1	9.3	0.6	33.3	0.2	18.9
common yellowthroat	0.0	3.7	0.6	38.9	0.2	17.8
chestnut-collared longspur	0.2	1.9	0.0	0.0	0.1	1.1

Table 3. Avian percent composition and frequency, sorted by species group, observed during 2016 spring and partial-summer point-count surveys at the New Frontier Wind Energy Project.

Species Group Species	Spring 2016		Summer 2016		Overall	
	Percent Composition	**Frequency** % of surveys detected	**Percent Composition**	**Frequency** % of surveys detected	**Percent Composition**	**Frequency** % of surveys detected
western kingbird	0.1	5.6	0.3	19.4	0.1	11.1
least flycatcher	0.1	9.3	0.3	19.4	0.1	13.3
chipping sparrow	0.1	9.3	0.3	13.9	0.1	11.1
house finch	0.1	7.4	0.2	5.6	0.1	6.7
dark-eyed junco	0.1	7.4	0.0	0.0	0.1	4.4
purple martin	0.0	0.0	0.3	13.9	0.1	5.6
lark bunting	0.0	3.7	0.2	8.3	0.1	5.6
dickcissel	0.0	1.9	0.2	8.3	0.1	4.4
warbling vireo	0.0	1.9	0.2	11.1	0.0	5.6
eastern bluebird	0.0	0.0	0.2	13.9	0.0	5.6
black-capped chickadee	0.0	3.7	0.1	5.6	0.0	4.4
American redstart	0.0	1.9	0.2	11.1	0.0	5.6
eastern wood-pewee	0.0	1.9	0.1	8.3	0.0	4.4
eastern phoebe	0.0	5.6	0.0	2.8	0.0	4.4
common raven	0.0	3.7	0.0	2.8	0.0	3.3
black-billed magpie	0.0	5.6	0.0	2.8	0.0	4.4
Baltimore oriole	0.0	0.0	0.1	8.3	0.0	3.3
American tree sparrow	0.0	1.9	0.0	0.0	0.0	1.1
willow flycatcher	0.0	0.0	0.1	5.6	0.0	2.2
marsh wren	0.0	0.0	0.1	5.6	0.0	2.2
house wren	0.0	0.0	0.1	5.6	0.0	2.2
Harris's sparrow	0.0	3.7	0.0	0.0	0.0	2.2
black-and-white warbler	0.0	1.9	0.0	2.8	0.0	2.2
American pipit	0.0	1.9	0.0	2.8	0.0	2.2
Wilson's warbler	0.0	1.9	0.0	0.0	0.0	1.1
swamp sparrow	0.0	0.0	0.0	2.8	0.0	1.1
rusty blackbird	0.0	1.9	0.0	0.0	0.0	1.1
orchard oriole	0.0	0.0	0.0	2.8	0.0	1.1

Table 3. Avian percent composition and frequency, sorted by species group, observed during 2016 spring and partial-summer point-count surveys at the New Frontier Wind Energy Project.

Species Group Species	Spring 2016		Summer 2016		Overall	
	Percent Composition	**Frequency** % of surveys detected	**Percent Composition**	**Frequency** % of surveys detected	**Percent Composition**	**Frequency** % of surveys detected
loggerhead shrike	0.0	0.0	0.0	2.8	0.0	1.1
lark sparrow	0.0	0.0	0.0	2.8	0.0	1.1
gray catbird	0.0	1.9	0.0	0.0	0.0	1.1
blue jay	0.0	1.9	0.0	0.0	0.0	1.1
bank swallow	0.0	1.9	0.0	0.0	0.0	1.1
Group Total	**70.2**	**100.0**	**64.6**	**100.0**	**69.0**	**100.0**
Waterfowl						
mallard	4.4	75.9	5.4	47.2	4.6	64.4
Canada goose	2.3	53.7	0.1	5.6	1.8	34.4
snow goose	1.5	1.9	0.0	0.0	1.2	1.1
lesser scaup	1.2	14.8	0.3	8.3	1.0	12.2
gadwall	0.6	29.6	0.4	13.9	0.6	23.3
blue-winged teal	0.4	20.4	0.9	22.2	0.5	21.1
American wigeon	0.4	25.9	1.0	8.3	0.5	18.9
green-winged teal	0.3	20.4	1.0	16.7	0.5	18.9
northern pintail	0.3	16.7	0.6	16.7	0.3	16.7
redhead	0.3	9.3	0.1	5.6	0.3	7.8
ring-necked duck	0.2	9.3	0.0	0.0	0.2	5.6
canvasback	0.2	5.6	0.1	2.8	0.2	4.4
northern shoveler	0.1	13.0	0.2	8.3	0.1	11.1
ruddy duck	0.0	1.9	0.1	2.8	0.1	2.2
bufflehead	0.0	3.7	0.0	0.0	0.0	2.2
wood duck	0.0	1.9	0.0	0.0	0.0	1.1
Group Total	**12.4**	**87.0**	**10.3**	**52.8**	**11.9**	**73.3**
Gulls/Terns						
Franklin's gull	7.7	18.5	10.7	11.1	8.4	15.6
ring-billed gull	1.5	51.9	1.8	61.1	1.5	55.6

Table 3. Avian percent composition and frequency, sorted by species group, observed during 2016 spring and partial-summer point-count surveys at the New Frontier Wind Energy Project.

Species Group Species	Spring 2016		Summer 2016		Overall	
	Percent Composition	**Frequency** % of surveys detected	**Percent Composition**	**Frequency** % of surveys detected	**Percent Composition**	**Frequency** % of surveys detected
black tern	0.0	3.7	1.1	22.2	0.3	11.1
Bonaparte's gull	0.0	1.9	0.0	0.0	0.0	1.1
California gull	0.0	0.0	0.1	5.6	0.0	2.2
herring gull	0.0	1.9	0.0	0.0	0.0	1.1
Group Total	**9.3**	**63.0**	**13.6**	**66.7**	**10.3**	**64.4**
Waterbirds						
killdeer	1.6	77.8	1.8	58.3	1.6	70.0
American white pelican	0.3	18.5	2.9	30.6	0.9	23.3
double-crested cormorant	0.5	18.5	0.9	36.1	0.6	25.6
Wilson's snipe	0.3	37.0	0.1	5.6	0.3	24.4
upland sandpiper	0.1	11.1	0.5	27.8	0.2	17.8
lesser yellowlegs	0.2	7.4	0.1	8.3	0.1	7.8
willet	0.1	11.1	0.0	2.8	0.1	7.8
pied-billed grebe	0.0	3.7	0.1	8.3	0.0	5.6
great blue heron	0.0	3.7	0.0	2.8	0.0	3.3
spotted sandpiper	0.0	1.9	0.1	5.6	0.0	3.3
black-crowned night-heron	0.0	0.0	0.1	8.3	0.0	3.3
American bittern	0.0	1.9	0.0	2.8	0.0	2.2
greater yellowlegs	0.0	1.9	0.0	0.0	0.0	1.1
American avocet	0.0	1.9	0.0	0.0	0.0	1.1
solitary sandpiper	0.0	0.0	0.0	2.8	0.0	1.1
marbled godwit	0.0	1.9	0.0	0.0	0.0	1.1
Group Total	**3.3**	**94.4**	**6.7**	**88.9**	**4.1**	**92.2**
Cranes/Rails						
sandhill crane	2.3	11.1	0.0	2.8	1.7	7.8
American coot	0.1	1.9	0.0	2.8	0.1	2.2
sora	0.0	1.9	0.0	0.0	0.0	1.1

Table 3. Avian percent composition and frequency, sorted by species group, observed during 2016 spring and partial-summer point-count surveys at the New Frontier Wind Energy Project.

Species Group Species	Spring 2016		Summer 2016		Overall	
	Percent Composition	**Frequency** % of surveys detected	**Percent Composition**	**Frequency** % of surveys detected	**Percent Composition**	**Frequency** % of surveys detected
Group Total	**2.4**	**14.8**	**0.1**	**5.6**	**1.9**	**11.1**
Raptors						
red-tailed hawk	0.5	42.6	0.6	25.0	0.6	35.6
northern harrier	0.2	16.7	0.1	8.3	0.2	13.3
Swainson's hawk	0.1	13.0	0.3	13.9	0.1	13.3
unidentified buteo	0.1	1.9	0.0	0.0	0.1	1.1
American kestrel	0.0	5.6	0.1	8.3	0.1	6.7
turkey vulture	0.0	1.9	0.1	8.3	0.0	4.4
sharp-shinned hawk	0.0	5.6	0.0	0.0	0.0	3.3
short-eared owl	0.0	0.0	0.0	2.8	0.0	1.1
ferruginous hawk	0.0	1.9	0.0	0.0	0.0	1.1
Group Total	**1.0**	**68.5**	**1.4**	**47.2**	**1.1**	**60.0**
Gamebirds						
ring-necked pheasant	0.7	74.1	0.9	44.4	0.7	62.2
wild turkey	0.0	1.9	0.1	2.8	0.0	2.2
sharp-tailed grouse	0.0	1.9	0.0	0.0	0.0	1.1
gray partridge	0.0	1.9	0.0	0.0	0.0	1.1
Group Total	**0.8**	**75.9**	**1.0**	**47.2**	**0.8**	**64.4**
Pigeons/Doves						
mourning dove	0.4	31.5	1.6	55.6	0.7	41.1
rock pigeon	0.1	3.7	0.3	8.3	0.1	5.6
Group Total	**0.5**	**33.3**	**1.9**	**58.3**	**0.8**	**43.3**
Woodpeckers						
northern flicker	0.1	11.1	0.2	11.1	0.1	11.1
downy woodpecker	0.0	5.6	0.2	13.9	0.1	8.9
Group Total	**0.1**	**16.7**	**0.4**	**19.4**	**0.2**	**17.8**

Table 3. Avian percent composition and frequency, sorted by species group, observed during 2016 spring and partial-summer point-count surveys at the New Frontier Wind Energy Project.

Species Group Species	Spring 2016		Summer 2016		Overall	
	Percent Composition	**Frequency** % of surveys detected	**Percent Composition**	**Frequency** % of surveys detected	**Percent Composition**	**Frequency** % of surveys detected
Swifts/Hummingbirds						
ruby-throated hummingbird	0.0	0.0	0.0	2.8	0.0	1.1
Group Total	**0.0**	**0.0**	**0.0**	**2.8**	**0.0**	**1.1**

Appendix J:
New Frontier Wind Energy Project – 2016 Interim Eagle Use Report

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TETRA TECH

Memorandum

To: Capital Power
From: Sarah McCall, Tetra Tech, Inc.
Date: September 6, 2016
Project: New Frontier Wind Energy Project
Subject: Interim Eagle Use Report

Introduction

On April 26, 2012, the North Dakota Public Service Commission (PSC or Commission) issued Certificate of Site Compatibility (CSC) Number 29 (PSC Order) to Meadowlark Wind I, LLC (Applicant) for the New Frontier Wind Energy Project (Project) in McHenry County, North Dakota (Figure 1). In December 2014, Capital Power Investments LLC, a subsidiary of Capital Power Corporation (Capital Power), completed the acquisition of Element Power US, LLC (Element Power), which included Meadowlark and the Project. In February 2016, contracted Tetra Tech, Inc. (Tetra Tech) to conduct a full year of eagle use surveys in the Project Area, starting March 2016. The objective of the eagle use surveys was to document eagle movements and behavior within and adjacent to the Project Area. For these surveys, Tetra Tech used standardized protocols that were designed to be responsive to the level of effort recommended in Tier 3 of the voluntary Land-Based Wind Energy Guidelines (WEG; USFWS 2012) and Stage 2 of the Eagle Conservation Plan Guidance (ECP Guidance; USFWS 2013). This report describes eagle use surveys conducted from March 30, 2016 through August 2, 2016, dates which capture the spring and partial-summer seasons (March 16 – June 15 and June 16 – August 15, respectively). The summer season extends until August 15; results for the full summer season will be presented in the final report.

Methods

Eagle Use Surveys

Nine eagle survey points were established in March 2016 within the Project Area (Figure 1). The nine survey points provide spatial coverage of approximately 30 percent of a one-kilometer buffer around the proposed turbine locations (dated March 22, 2016), consistent with recommendations in the ECP Guidance (USFWS 2013).

Each round of eagle use surveys were conducted over two days, twice monthly for a total of 10 rounds from March 30, 2016 to August 2, 2016. Surveys were conducted for 60 minutes at each point, with the first 20 minutes of eagle use surveys conducted concurrently with the general avian surveys (Table 1). The total eagle survey time at the Project Area was 90 hours (Table 1). Surveys were conducted during daylight hours, however, the order in which the points were surveyed was altered between survey weeks so that each point was surveyed at different times of the day over the course of a season. Surveys were not conducted if fog or low cloud-cover reduced visibility to less than 400 meters of horizontal distance or less than 200 meters of vertical distance.

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During each eagle use survey, the biologist continuously scanned the surrounding landscape for eagle activity using an unlimited viewshed. For each eagle observed, the biologist recorded the species, age class (Adult, Immature, or Unknown), time first and last observed, minimum and maximum flight heights, and flight behavior. Eagle flights were classified in two height categories (less than or equal to 200 meters and greater than 200 meters above ground), based on the ECP Guidance. The time an observed eagle spent flying within the 800-meter(m) radius circular plot around the count location at each of these height categories was recorded and rounded up, in one-minute intervals, so that these data could then be translated into eagle exposure minutes for projected fatality modeling. In accordance with the ECP Guidance, exposure minutes were defined as the number of minutes that an eagle was observed below 200 meters within the 800-m radius circular plot. Flight paths were drawn for each eagle within the viewshed on a topographic map of the Project Area, and later digitized using a geographic information system (GIS) software.

Incidental Observations

Eagles observed during the surveys outside the 800-m radius circular plot, as well as eagles observed within or near the Project Area but outside of the survey period (such as when the biologist was traveling between observation points), were recorded as incidental observations. Flight paths of eagles observed during the surveys outside the 800-m radius circular plot were collected; however, flight paths were not recorded for incidental eagles observed while in transit. Exposure minutes were not recorded for the incidental eagle observations. Therefore, incidental observations were not included in the analysis and are presented in this report as supplemental information to the eagle use and point-count data to describe the overall activity by eagles within the Project Area. The biologist also noted incidental observations of other raptors, large birds, and avian species that were uncommon or unusual within the Project Area.

Results

Eagle Use Surveys

One adult and one immature bald eagle and no golden eagles were observed within the 800-m radius circular plots during 90 hours of monitoring, during eagle use surveys (Table 1). Both observations occurred separately on March 31, 2016. Three total eagle exposure minutes were recorded for these two observations and accounted for the total number of eagle exposure minutes recorded over 90 hours of observation during 10 rounds of surveys (Table 1). The adult eagle was observed flying entirely below 200 meters, traveling between observation points 5 and 9 and entering each 800-m radius for a total of two exposure minutes (Figure 1). The immature eagle was observed flying below 200 meters and within 800 meters of observation point 2 for a total of one exposure minute, and was observed traveling above 200 meters for seven minutes, from observation point 1 to observation point 2 (Figure 1). Overall mean use, calculated as the total number of eagles observed divided by the total number of observation hours, was 0.02 eagles per hour.

Incidental Observations

Three separate bald and one golden eagle were observed incidentally during the eagle use surveys (Figure 1). One adult bald eagle was observed within the Project Area, during survey point location micro-

siting on March 29 prior the initiation of surveys. This individual was perched in a tree to the east of point-count location 6, within the 800m radius and flying over disturbed grassland, below 15 meters. Another adult and one immature bald eagle were observed separately during use surveys, on April 10 flying outside of the 800-m point-count buffers. The adult bald eagle was observed flying below 200 meters at about 1729 meters southwest of point count 8. The immature bald eagle was observed flying from 175 to 300 meters at about 1324 meters southeast of point count 6. One immature golden eagle was observed on April 14 flying from a tree approximately 1560 meters to the north of point-count location 9, within the Project Area and flying southeast, below five meters. No flight paths or eagle exposure minutes were recorded for incidental eagle observations. There were no other eagle observations for the March 2016 to August 2016 survey period.

During the entire survey period, the biologist documented five other raptor species of interest as incidental observations to eagle use surveys (Table 2): red-tailed hawk (two individuals), sharp-shinned hawk (one individual), northern harrier (one individual), American kestrel (one individual) and rough-legged hawk (one individual). Bald and golden eagles are protected by the Bald and Golden Protection Act which affords federal protection for both species. Along with the bald and golden eagle, the American kestrel and northern harrier are designated level II species of conservation priority by the North Dakota Game and Fish Department, which have either a moderate level of conservation priority or a high level of conservation priority, but a substantial level of non-SWG funding is available to them (Dyke et al. 2015). Species of conservation priority are not afforded any formal protection by the state of North Dakota and there are no state permitting requirements for them.

Conclusions

The three bald and one golden eagle observations were made prior to mid-April which coincides with both the eagle spring migrations season, and eagle breeding season in North Dakota (Johnson 2015). However since no golden eagle nests and only one active bald eagle nest was found within ten miles of the Project Area it is likely that these eagles were migrants rather than breeding birds, Data presented in this report consist of spring and partial-summer results and they will be combined with fall and winter data and will be presented and fully analyzed in the final report, expected completion in May 2017.

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Figure 1

Eagle Survey Locations and Observations

Capital Power

New Frontier Wind Energy Project

McHenry County, ND
Last modified: 08-29-2016

PC 03
PC 01
PC 02
PC 04
PC 05
PC 09
PC 07
PC 06
PC 08

WARD CO
MC HENRY CO
MC LEAN CO
Gravel Pit
Pit
Ruso

- Eagle Survey Point
- Eagle Survey Point 800-m Radius

PC# Point-count number

Bald Eagle Flight Path Observation

- Above 200m (3-31-2016)
- Below 200m (3-31-2016)
- Bald Eagle Perch Point

Incidental Observation

- bald eagle
- golden eagle
- Proposed Turbines (3-22-2016)
- Project Area (03-22-2016)
- 1-km Turbine Buffer (3-22-2016)

1:45,000 WGS84 UTM Zone 14N

0 0.5 1 2 3 4 5 Miles

TETRA TECH

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Table 1. Eagle activity recorded during 2016 spring and partial-summer eagle use surveys at the New Frontier Wind Energy Project, March 30 - August 2, 2016

Survey	Dates	Number of points surveyed	Length of surveys (Hours)	Number of eagles	Flights observed		Minutes of eagle flight below 200 meters and within 800 meters of observation point		Minutes of eagle flight above 200 meters and within 800 meters of observation point	
					Bald Eagle	Golden Eagle	Bald Eagle	Golden Eagle	Bald Eagle	Golden Eagle
1	3/30-3/31	9	9	2	2	0	3	0	7	0
2	4/10-4/11	9	9	0	0	0	0	0	0	0
3	4/25-4/26	9	9	0	0	0	0	0	0	0
4	5/9-5/10	9	9	0	0	0	0	0	0	0
5	5/23-5/24	9	9	0	0	0	0	0	0	0
6	6/6-6/7	9	9	0	0	0	0	0	0	0
7	6/20-6/21	9	9	0	0	0	0	0	0	0
8	7/4-7/5	9	9	0	0	0	0	0	0	0
9	7/18-7/19	9	9	0	0	0	0	0	0	0
10	8/1-8/2	9	9	0	0	0	0	0	0	0
Total	**-**	**90**	**90**	**2**	**2**	**0**	**3**	**0**	**7**	**0**

Table 2. Observations of birds recorded incidentally to 2016 spring and partial-summer eagle use surveys at New Frontier Wind Energy Project, March 29 - August 2, 2016.

Species	Number of Birds
bald eagle*	3
red-tailed hawk	2
sharp-shinned hawk	1
northern harrier	1
American kestrel*	1
rough-legged hawk	1
golden eagle*	1

*Level II Species of Conservation Priority in the North Dakota State Wildlife Action Plan (2015)

Appendix K:
New Frontier Wind Energy Project – 2016 Interim Bat Report

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TETRA TECH

Memorandum

To: Capital Power
From: Sarah McCall, Tetra Tech, Inc.
Date: September 6, 2016
Project: New Frontier Wind Energy Project
Subject: Interim Bat Report

Introduction

On April 26, 2012, the North Dakota Public Service Commission (PSC or Commission) issued Certificate of Site Compatibility (CSC) Number 29 (PSC Order) to Meadowlark Wind I, LLC (Applicant) for the New Frontier Wind Energy Project (Project) in McHenry County, North Dakota. In December 2014, Capital Power Investments LLC, a subsidiary of Capital Power Corporation (Capital Power), completed the acquisition of Element Power US, LLC (Element Power), which included Meadowlark and the Project. In February 2016, Capital Power contracted Tetra Tech, Inc. (Tetra Tech) to perform acoustic monitoring surveys for bat species in the Project area from spring through the fall of 2016 in order to capture activity associated with spring and fall migration and summer residency periods. This memo provides preliminary results of the spring and early summer acoustic surveys from April 13, 2016 through July 18, 2016. The complete results of the bat acoustical monitoring studies through the fall of 2016 at the New Frontier Wind Energy Project will be included in a stand-alone report upon completion of the survey period (October 31, 2016). Migratory tree bats will have typically moved through the region by the end of October (Cryan 2003).

The southern and western portion of the Project area lie within the Missouri Coteau region, characterized by numerous wetlands and prairie potholes. This ecoregion and transitions to the Drift Plains region to the north and east, which were historic grasslands that have largely been converted to croplands (Bryce et al. 1998). Although these regions lack large tracks of contiguous forest, potential roosting and foraging habitat for bats occurs within shelterbelts, riparian woodlands, and buildings. Eleven bat species are known to occur in North Dakota (Gullickson n.d.). Of these 11 species, available information about species-specific suitable habitat, known distribution ranges, and documented occurrences indicate that five species (big brown bat [*Eptesicus fuscus*], little brown bat [*Myotis lucifugus*], eastern red bat [*Lasiurus borealis*], hoary bat [*Lasiurus cinereus*], and silver-haired bat [*Lasionycteris noctivagans*]) are expected to have a moderate or high potential to occur within the vicinity of the Project Area. The remaining six species that occur in North Dakota (fringed bat [*Myotis thysanodes*], long-eared bat [*Myotis evotis*], long-legged bat [*Myotis volans*], Townsend's big -eared bat [*Corynorhinus townsendii*], western small-footed bat [*Myotis ciliolabrum*], and the federally threatened northern long-eared bat [NLEB, *Myotis septentrionalis*]) are restricted to the riparian areas in the center portion of the state and more mountainous regions in the western portion of the state (NDGF 2015, USFWS 2016a).

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Tel 303.988.2202 Fax 303.980.3539
www.tetratech.com

Methods

The objective of acoustic monitoring is to assess bat occurrence and use of the Project area by local and migratory bat species. Tetra Tech used Wildlife Acoustic Song Meter SM3BAT Monitoring Systems (bat detectors) for the duration of the acoustic monitoring survey. Each bat detector station consisted of the acoustic detector, powered by a 20-watt solar panel and a 12-volt DC battery, encased in a waterproof housing. The SM3-U1 microphone was elevated to approximately 1.5 meters to clear and avoid vegetation and attached to the recording unit by a high-quality, low-loss 3-meter microphone cable. Each bat detector was manually checked by trained technicians approximately twice per month during the survey period. Tetra Tech deployed four ground-based bat detectors within the Project Area on April 13, 2016. Sampling sites were located within representative habitats within the Project area, in areas with potential for high bat activity and diversity, and in areas available for access under existing lease agreements. (Figure 1).

Results

During the spring and early summer survey period, 350 detector-nights were monitored over 96 calendar nights between April 13 and July 18, 2016. Brief power outages at Stations 2 and 3 accounted for the data gaps. All recorded data files were filtered using automated bat call identification software approved by the USFWS to identify data files containing potential bat passes. Data were scrubbed and analyzed using Kaleidoscope Pro (Wildlife Acoustics, Inc.) version 3.1.7 and the classifier “Bats of North America 3.1.0” for species of bats in North Dakota. A sensitivity level of “-1 more sensitive/liberal” was used per Wildlife Acoustics and USFWS recommendations (USFWS 2016b). Signals of interest ranged from 16-120 kHz lasting 2–500 milliseconds with a minimum of two call pulses.

Auto-classifications for non-listed species were assumed to be accurate. A subset of recordings auto-classified as NLEB were manually reviewed by Tetra Tech in full spectrum format using SonoBat 3.2.0 (SonoBat, Inc.) to confirm the automated classifications. To ensure the highest quality recordings were reviewed to facilitate accurate species identification, Tetra Tech considered bat passes that contained greater than 5 call pulses and in which there was auto-classification agreement for greater than 60% of the pulses as suitable for manual review. Tetra Tech summarized the occurrence and use of the Project area by bat species using an index of activity, defined by the number of bat passes per detector per night.

A total of 35,006 bat passes were recorded at the four stations with an overall mean of 100.1 bat passes/detector night (Table 1). The highest activity rate was at Station 3 with a mean of 239.5 passes/detector night. Five bat species were confirmed within the project area with little brown bat having the highest activity rate (82.57 passes/detector -nights) (Table 2). Of the 673 bat passes auto-classified as NLEB, 101 meet quality standards and were manually reviewed. None were determined to be NLEB during manual review with the majority of these files conclusively identified as little brown bat and the remainder as “high frequency species” because the characteristic frequency center was greater than 40 kHz and passes lacked detail to be identified at the species level (e.g., too far from the microphone or noise interference). Shorter, higher frequency call types within the little brown bat call repertoire can overlap with calls of NLEB and false positives are not uncommon. Particularly when there is a large volume of little brown bat passes (28,227 bat passes auto-classified as little brown bat vs. 673 as NLEB).

Overall Maximum Likelihood Estimates (MLEs) generated by Kaleidoscope Pro (p= 1.0) suggest that NLEB is not present within the Study Area.

The little brown bat is considered the most common and widespread bat in North Dakota (Johnson and Isakson 2014) and accounted for 83 percent of bat passes recorded (Johnson and Isakson 2014). Migratory tree bats (eastern red bat, hoary bat, and silver-haired bat) accounted for the remaining 17 percent. Less than one percent belonged to big brown bat. Continued monitoring through late summer and fall will likely reduce the overall activity rate, and allow for a more complete assessment of temporal use by resident and migratory bat species within the Project area.

Table 1.
Summary of Acoustic Bat Monitoring Surveys at the Proposed New Frontier Wind Project

Detector		Level of Effort			Bat Pass Summary		
Station	Operational Period (2016)	Detector-Nights	Nights Available	Total # of Bat Passes	Min.	Max.	Mean Activity Rate[1] (SE)[2]
1	April 13- July 18	94	94	12,293	0	951	132.2 (21.4)
2	April 13- July 2	78	94	4,718	0	48	5.4 (0.8)
3	April 13, 26- July 18	84	94	20,122	0	1,823	239.5 (37.9)
4	April 13- July 18	94	94	2,173	0	210	23.1 (3.9)
Overall		350	376	35,006	0	2,639	100.1

[1] Mean bat passes per detector-night.
[2] SE = Standard error
[3] Represents overall activity rate for all detectors (35,006 bat passes/350 detector-nights)

Table 2.
Mean Activity Rates (Bat Passes/Detector -Night) Recorded per Species at Each by Station

Station	Mean Activity Rate				
	Big Brown Bat	Eastern Red Bat	Hoary Bat	Silver-Haired Bat	Little Brown Bat
1	0.72	11.39	3.12	11.87	103.67
2	0.01	0.78	1.51	1.31	1.74
3	1.44	17.99	4.43	10.32	205.37
4	0.10	2.32	1.00	0.89	18.81
Overall	0.57	8.17	2.51	6.20	82.57

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NEW FRONTIER WIND ENERGY PROJECT

Project Location - Bat Detectors

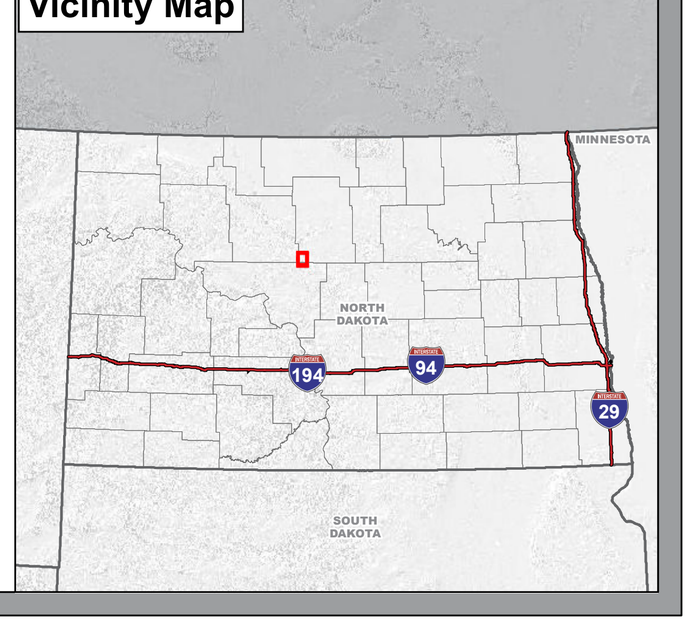
- Bat Detector Location
- Project Area
- Turbine
- Access Road
- Collector Line
- O & M Building
- Substation

0 0.25 0.5 Miles

Scale is 1:18,000 when printed at 22x34"

TETRA TECH

Vicinity Map



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Appendix L:
New Frontier Wind Energy Project Dakota Skipper Occupancy Survey Report

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2016 Dakota skipper (*Hesperia dacotae*) Habitat Assessment and Survey Report

New Frontier Wind Energy Project

McHenry County, North Dakota
September 21, 2016

Summary

On April 26, 2012, the North Dakota Public Service Commission (PSC or Commission) issued Certificate of Site Compatibility (CSC) Number 29 (PSC Order) to Meadowlark Wind I, LLC (Applicant) for the New Frontier Wind Energy Project (Project) in McHenry County, North Dakota. In December 2014, Capital Power Investments LLC, a subsidiary of Capital Power Corporation (Capital Power), completed the acquisition of Element Power US, LLC (Element Power), which included Meadowlark and the Project. The New Frontier Wind Project is sited on privately-owned land in the southwest corner of McHenry County, North Dakota at the confluence of McHenry, Ward, and McClean counties.

In February 2016, Tetra Tech, Inc. (Tetra Tech) was contracted by Capital Power to undertake environmental permitting activities for the Project. In October 2014, the Dakota skipper was listed as a threatened species under the Endangered Species Act of 1973 (ESA). The U.S. Fish and Wildlife Service (USFWS) county distribution lists indicate that the species is known to occur in McHenry County, North Dakota. HDR Engineering, Inc., (HDR) was retained by Tetra Tech to conduct flight surveys for the presence of Dakota skipper (*Hesperia dacotae*) to comply with the ESA. Tetra Tech contracted HDR to conduct flight surveys to determine the presence or absence of Dakota skipper during the peak flight period on tracts within the Project area that exhibit characteristics consistent with their habitat requirements. An HDR biologist conducted three sets of flight surveys between June 29 and July 8, 2016. The survey dates fell between the earliest USFWS reports of adult Dakota skipper emergence on June 18, 2016 and the last reported observation of July 14, 2016.

HDR used a two-step process to identify sites where Dakota skipper flight surveys would be conducted for the Project. The two phases included:

1. Desktop and ground survey land classification by Tetra Tech;

2. On-site field assessment and verification by HDR.

HDR surveyed three parcels within the Project area for the presence of Dakota skippers. Dakota skippers were observed on one parcel within the Project area during the 2016 surveys. The flight surveys took place on grassland habitats where native plant

assemblages are consistent with use by prairie obligate butterflies such as the Dakota skipper.

Table of Contents

Introduction

Capital Power is proposing to develop the New Frontier Wind Energy Project (Project) in McHenry County, North Dakota. Capital Power's consultant Tetra Tech retained HDR Engineering Inc. (HDR) to conduct flight surveys within the Project area for the threatened butterfly Dakota skipper (Hesperia dacotae), which is a prairie obligate species that occurs in McHenry County. The U.S, Fish and Wildlife Service (USFWS) listed the Dakota skipper as a threatened species with regulatory protection afforded under the Endangered Species Act on October 23, 2014.

Dakota skippers complete one generation per year and pass through four developmental stages: egg, larva, pupa, and adult. The Dakota skipper lives the majority of its life cycle in the larval stage which is dependent upon abundant native grasses for food and shelter. The adult butterflies develop through six or seven larval stages (Dana 1991; McCabe 1981). Larvae spend the winter at ground level or in subsurface shelters during either the fourth or fifth instar developmental stage (Dana 1991; McCabe 1979, 1981). Larvae resume feeding the following spring and undergo two additional instar molts before they pupate. During the last two instars, larvae of this species shift from buried shelters to horizontal shelters at the soil surface (Dana 1991) in the spring. Adult Dakota skippers emerge from their pupae in mid-June or early July depending upon weather conditions. Males emerge as adults about five days earlier than females (Dana 1991). The adult flight period at a specific location lasts between two to four weeks with mating and egg-laying occurring throughout this period (McCabe 1979, Dana 1991). In Minnesota, the average Dakota skipper life span or time they are present at a specific site before emigration is three to 10 days (Dana 1991).

Grassland fire, grass species composition, soil pH, humidity, and extremes of low temperatures may be important in determining larval survival for this species (McCabe 1979, 1981). Dakota skippers occupy high quality prairie, ranging from wet-mesic tallgrass prairie to dry-mesic mixed grass prairie dominated by mid-height grasses (Dana 1991). High quality prairie is defined as sites containing assemblages of native plant species, including native grasses used by larvae for food and shelter, and forbs used by adults for nectaring. Low quality prairie (sites that are no longer recognizable as native prairie but where some native forbs or grasses occur) and grasslands dominated by invasive or non-native grasses are not used by this species. Swengel and Swengel (1999) reported a significant negative relationship between habitat degradation and Dakota skipper

abundance. Changes in vegetation, hydrology, or soil structure adversely affect one or more of the life stages of the Dakota skipper on degraded sites. Additionally, fewer native plants, particularly nectar plants, occur on degraded sites, reducing survival of adults that rely on nectar for water and for supplemental fat reserves used to meet energy demands (Dana 1991).

In North Dakota, Royer (2004, 2008) describes two general habitat types where Dakota skippers occur. The first type (Type A) is low (wet) prairie that occurs on glacial lake deposits where bluestem (*Andropogon* and *Schizachyrium*) species are dominant and wood lily (*Lilium philadelphicum*), bluebell bellflower (*Campanula rotundifolia*), and camas (*Zigadenus elegans*) are present and blooming during the flight period of Dakota skippers. Type A habitat occurs where the water table is near the soil surface and portions of this habitat may be flooded in some years. Rigney (2013) and Lenz (1999) both noted that this habitat type varies over the course of the growing season and that additional forbs indicative of this prairie habitat type include: blazing star *(Liatris ligulistylis*), Canada goldenrod (*Solidago canadensis*), blue-eyed grass (*Sisyrinchium montanum*), common goldstar (*Hypoxis hirsuta*), and black–eyed Susan (*Rudbeckia hirta*). Royers' second general habitat type (Type B) occurs on more rolling terrain. This prairie type is dominated by native grasses such as big bluestem (*Andopogon gerardii*), little bluestem (*Schizachyrium scoparium*), porcupine grasses (*Hesperostipa sativa, H. comata*), western wheatgrass (*Pascopyrum smithii*), prairie dropseed (*Sporobolus heterolepis*), and side-oats grama (*Bouteloua cirtipendula*). Forb communities in Type B habitat exhibit an abundance of purple coneflower (*Echinacea angustifolia*), with wood lily, bluebell, and blanket flower (*Gaillardia aristata*) also occurring in this community type. As with the Royer Type A habitat type, Type B communities vary over the course of a growing season and exhibit a variety of forbs and grasses maturing at different times. The proposed Project occurs on habitats where most of the remaining habitat is a variant of the Type B habitat.

Methods

Tetra Tech coordinated implementation of Dakota skipper habitat assessments and flight surveys for the Project with the Bismarck office of the USFWS. HDR conducted habitat assessments and flight surveys within selected Project parcels. The habitat assessment evaluated grassland habitats and the native plant assemblages used by the prairie obligate Dakota skipper in two phases. The flight survey methods were conducted following the protocol in the *Dakota Skipper Guidance for Interagency Cooperation under Section 7 (a)(2) of the Endangered Species Act Version 1.0 USFWS, Regions 3 and 6,* February 2015.

Habitat Assessment Methods

HDR implemented qualitative habitat assessments for 15 areas mapped by Tetra Tech biologists as potentially containing native grassland habitat. The habitat assessment evaluated grassland habitats within these 15 areas for presence of native plant assemblages used by the Dakota skipper. Assessment of habitat conditions occurred in two phases:

1. Phase 1 consisted of a desktop assessment and preliminary field-verification surveys conducted by Tetra Tech to identify potential native prairie habitat within the Project area.
2. During Phase 2, HDR used information prepared by Tetra Tech to identify plant community characteristics present during the 2016 flight period and to focus flight survey efforts on parcels with habitat capable of supporting Dakota skippers. HDR evaluated grassland habitat and native plant assemblages present within areas of potential native habitat mapped by Tetra Tech during Phase I to verify community quality and abundance was consistent with habitats used by the prairie obligate Dakota skipper.

Phase 1 Desktop Assessment and Preliminary Field-verification Surveys

Phase 1 consisted of a desktop assessment which mapped areas of potential native prairie habitat within the Project area. These areas were digitized on aerial photographs. In May 2016, Tetra Tech biologists conducted preliminary field-verification surveys at the Project. During these preliminary field-verification surveys, areas mapped as potential native prairie habitat during the desktop assessment were visually assessed, primarily from public rights-of-ways, to identify whether native prairie habitat existed and the extent of this habitat in these areas. Boundaries of areas mapped as potential native prairie habitat during the desktop assessment were revised following field-verification surveys. During the field-verification surveys, dominant species presence of native grasses and forbs (to the extent possible given the early timing of the surveys), and shrub or tree encroachment were also noted.

Phase 2 Flight Season Habitat Identification

During Phase 2, HDR evaluated the extent and overall quality of native prairie occurring within the potential native prairie areas identified during Phase 1. An ecologist permitted to conduct surveys for Dakota skippers reviewed the areas identified during Phase 1 prior to conducting flight surveys. The Phase 2 evaluation identified habitats that exhibit vegetative characteristics consistent with the presence of Dakota skippers. The habitat assessment included a subjective measure of the relative abundance of key indicator species (forbs

and graminoids) and an overall subjective ranking of the habitat quality. HDR took photographs of each site and noted the presence or absence of habitat that could support Dakota skippers. The following minimum habitat characteristics are necessary for larval and adult forms of the Dakota skipper to persist and were used to identify sites for flight survey efforts.

1. Sites dominated by native graminoids or co-dominant with shrubs, throughout unshaded portions of the site. Overall plant species diversity is low because of the loss of native prairie associated species.

2. Sites may contain moderately abundant cover of invasive species, including smooth brome (*Bromus inermis*), Kentucky bluegrass (*Poa pratensis*), Canada bluegrass (*P.compressa*), desert wheatgrass (*Agropyron desertortum*), timothy (*Phleum pratense*), sweetclover (*Melilotus albus, M.officinalis*), black medick (*Medicago lupulina*), white clover (*Trifolium repens*), or creeping bentgrass (*Agrostis stolonifera*), but the sites are still recognizable as harboring native graminoids and forbs as dominant species.

3. Sites containing native graminoids and forbs as the dominant species but are grazed by cattle, where the ground surface has undergone moderate compaction or has terraced slopes.

Flight Surveys

Survey methods follow *the Dakota Skipper Guidance for Interagency Cooperation under Section 7(a)(2) of the Endangered Species Act Version 1.0 U.S. Fish & Wildlife Service Regions 3 and 6* (February 2015). Surveyors conducting searches for Dakota skipper hold a Native Endangered Species Recovery permit (Number TE64077B-0) obtained from the USFWS to conduct surveys for this species.

Royer and Marrone (1992) and Dana (1991) indicate that the flight period for adult Dakota skippers occurs between mid-June and early July. In order to determine timing of flight surveys, HDR coordinated with USFWS personnel, used a degree-day model which predicts adult emergence, communicated with other biologists conducting surveys for Dakota skippers, and used plant phenology to predict when Dakota skippers would emerge from pupae and begin the adult flights. Royer and Marrone (1992) noted that the following plants are almost always present and blooming during the Dakota skipper flight period: wood lily, bluebell bellflower, camas, purple coneflower, and blanket flower.

HDR conducted flight surveys within 3 sites exhibiting plant community characteristics indicative of native prairie. Flight survey sites were chosen that exhibited native grasses and an abundance of nectar sources including purple coneflower and on sites or where other prairie obligate butterflies were observed. HDR used habitat-centered Pollard-style surveyor directed walks according to the following parameters:

- The sampling day began after 9:00 am and ended after butterfly activity was visibly diminished (usually after 5:00 pm).
- Only individual butterflies identified within an estimated 5.0 meters on either side of the surveyor, within 5.0 meters of the ground, or 5.0 meters to the front were considered an “encounter”.
- Identification was initially made with binoculars, captured with a net, or confirmed by close-up observation and photographic documentation.

HDR used a hand-held GPS to record butterfly observations when confirmed to species level. HDR used the Pollard style surveyor directed walk on parcels with characteristics described in the Survey Timing and Location section of this report. Biologists conducting the surveys focused on suitable habitat where native grasses and an abundance of nectar sources including purple coneflower occurred and on sites where other prairie obligate butterflies were observed. More time was allotted to higher quality habitats than in areas degraded by plowing, overgrazing or where non-native grasses, trees or shrubs dominated the landscape.

Results

Habitat Assessments

During the Phase 1 habitat assessment, Tetra Tech biologists identified 21 areas within the Project area that potentially contained native prairie habitat. Three sites that were designated as separate grassland polygons were combined by HDR into other nearby grassland polygons due to their common vegetative characteristics and locations within the Project area (Figure 1). Three sites also contained native prairie characteristics that required flight surveys. The combining of these polygons and the isolation of three sites for flight survey reduced the number of sites to depicted in Figure 1 to 15. During Phase 2 flight season habitat identification, HDR conducted field reviews of the grassland habitats identified during Phase 1 to areas exhibiting habitat characteristics consistent with the presence of larval and adult forms of Dakota skippers. Three sites exhibited habitat

characteristics suitable for the presence of Dakota skipper. These were designated Site 1, Site 2 and Site 3 (Figure 1). The remaining areas, are designated “Grassland“ followed by a number (Grassland 1, Grassland 2, Grassland 3 etc.) in Figure 1, were excluded from flight survey effort. Descriptions of these habitats and reasons for exclusion from flight surveys are further described below.

Grassland 1 is located at the northwestern boundary of the Project area and is situated on rolling topography. There is a ridgeline running in a northwest-southeast direction with several summits that harbor native prairie. The ridgeline transitions into undulating grasslands and pothole wetlands to the southwest. This area contains numerous pothole wetlands surrounded by uplands that are dominated by native grass species such as little bluestem, side-oats grama, and porcupine grass. However, native forbs used by Dakota skippers as nectar sources are absent from grasslands and native prairie in this area. HDR ecologists noted dead forb species across most of this site. When forbs were noted they occurred in small pockets or near areas dominated by shrubs and trees. ATV tracks crisscrossed the site and in many areas were observed running parallel across this area. It appears that there was active management trying to eliminate forb species on this site.

Photograph of Grassland 1 showing lack of native forbs and ATV tracks covering grassland habitat.

Grassland 2 is located along an intermittent stream that flows in a southwest-northeast direction. Grasslands occur along portions of this drain but are dominated by Kentucky bluegrass and silverberry (*Elaeagnus commutata*). The dominance of non-native grasses and abundance of shrubs preclude the use of this site by Dakota skippers.

Photograph of Grassland 2 showing dominance of non-native grasses and shrubs.

Grassland 3 is located directly south of Grassland 1 and west of Grassland 2 on the northern half of the Project area. This parcel was actively grazed in June and July of 2016. Vegetative structure was obliterated by cattle and no native forbs were noted. Native grasses do occur on the northeast facing slopes and at hilltop locations but native forbs were absent. Valleys between slopes were dominated by green ash (*Fraxinus pensylvanica*) and silverberry. The lack of native forbs and grasses available for larval formation were the basis for eliminating this area from flight surveys in 2016.

Photograph of Grassland 3 depicting wooded valleys, grazed slopes and absence of native forbs.

Grassland 4 was a small wetland basin surrounded by cultivated lands. Open water surrounded by cattails characterizes this area. The area was too wet to harbor Dakota skippers and was eliminated from flight surveys.

Grassland 5 is located south of Grassland 3 and west of Grassland 4. This site is located on rolling terrain and is dominated by Kentucky bluegrass, smooth brome, and alfalfa (*Medicago sativa*) with some forbs such as milkweed (*Asclepias syriaca*) and dandelion (*Taraxicum officinale*). These same characteristics were evident on sites designated as Grassland 6, 7, 8, 9, 10, 11, 13, 14 and 15. The lack of native grasses and forbs was the basis for eliminating these areas from flight surveys.

Photograph of Grassland 5 depicting non-native character and rolling topography.

Grassland 12 is located on the southeast portion of the Project area. This is a large pasture area characterized by rolling topography and a significant ridge along the eastern portion of the site. Areas lying below the ridge are cropped or dominated by non-native grasses and shrubs and trees. The rolling portions of this parcel are heavily overgrown with silverberry and are succumbing to successional vegetative changes that are eliminating prairie habitat. Some small pockets of prairie occur but are widely separated by shrubs, trees, or non-native grassland. The lack of contiguous habitat was the basis for excluding this area from flight surveys.

Photograph of Grassland 12 ridgeline. Photograph depicting non-native grasses in the lowland areas (foreground) and shrub rich slopes and grassland areas on the ridge.

Flight Surveys

Flight surveys for Dakota skipper were conducted between June 26, 2016 and July 14, 2016. Weather during surveys was generally seasonal to cool with one survey being conducted during overcast skies. Dakota skippers were observed at other sites outside of the Project area in South Dakota and North Dakota beginning June 8, 2016 and continuing through July 14, 2016. The presence of Dakota skippers by others conducting surveys for this species indicate that surveys conducted by HDR fell within suitable detection limits for the Dakota skipper in 2016.

Site 1

As stated above, HDR conducted flight surveys at three parcels within the Project area (Figure 1). Dakota skippers were documented at Site 1, located near the center of the Project area during the 2016 surveys. Two female and two male Dakota skippers were

observed on July 3, 2016. The parcel where Dakota skippers occur is pastured but retains abundant native grasses and forbs. Many areas within this parcel are being encroached upon by silverberry but native grasses and abundant native forbs provide larval food and adult energy sources. Native grasses and forbs that could be used by larvae and adult Dakota skippers are abundant but patchily distributed in the north half of the site. Nectar species observed on these parcels included purple coneflower, silverleaf scurfpea (*Pediomelum argophyllum*), wood lily, stiff sunflower (*Helianthus pauciflora*), and blanket flower.

The 2016 surveys conducted by HDR complies with USFWS survey conditions outlined in *the Dakota Skipper Guidance for Interagency Cooperation under Section 7 (a)(2) of the Endangered Species Act Version 1.0 USFWS, Regions 3 and 6*, February 2015. The following Site 1 Weather Conditions summary provides information on the date, time of survey, survey length, and weather encountered during each of the survey rounds. A description of the site follows the weather data.

SITE-1 WEATHER CONDITIONS

Survey 1			
McHenry County, North Dakota			
Date	June 29, 2016		
Surveyor	Scott Krych		
Time	10:40 a.m. –1:58 p.m.	3 hr 18 min	
Weather			
10:40 a. m.	Temp. 80°F	Wind = 3-5 NW	%Clear = 50
12:50 p.m.	Temp. 83°F	Wind = 3 NW	%Clear = 30-60
Survey 2			
Date	July 3, 2016		
Surveyor	Scott Krych		
Time	3:02 p.m. –6:47 p.m.	3 hr 45 min	
Weather			
3:00 p.m.	Temp. 77°F	Wind = 7 W	%Clear = 50
6:47 p.m.	Temp. 77°F	Wind = 8 W	%Clear = 20

Primary Target Species Observed: Four Dakota skippers

Surveys of Site 1 (Figure 2) evaluated lands that were predominantly grassland and avoided areas that are succumbing to successional growth of shrubs and trees. This site is characterized by dissected slopes with abundant native grasses and forbs. Grazing on this site is moderate to severe. The southern portions of the site maintain their native plant community character but grazing has diminished vegetative integrity and has provided an opportunity for invasive and shrub species such as leafy spurge (*Euphorbia esula*) and silverberry.

During the first survey, Polites skippers and *Colias* sp. was the dominant butterfly species observed throughout the site. During the second survey, a female Dakota skipper was observed less than 5 minutes into the survey despite sustained winds of 8-10 mph.

Additional Dakota skipper males were observed on west-facing slopes where nectar sources were abundant and few to no shrub encroachment was encountered. The last encounter of a Dakota skipper was a female at the north end of the site on a portion of the site where native grasses and forbs were dominant but shrubs were beginning to encroach on the grassland. Table 1 provides a summary of butterfly species observed during each round of surveys conducted at Site 1.

Photograph 1 of Site 1. Photograph showing abundance of native forbs and vegetative characteristics of remaining native prairie at this site.

Table 1.

Species Observed	Numbers observed Survey 1	Numbers observed Survey 2
Meadow Fritillary *(Boloria bellona)*	7	9
Common Ringlet (*Coenonympha tullia*)	2	2
Common Wood-Nymph *(Cercyonis pegala)*	7	28
Sulphur *(Colias sp.)*	43	47
Variegated Fritillary *(Euptoieta claudia)*	2	1
Dakota Skipper (*Hesperia dakotae*)	0	4
Unidentified Skipper (*Hesperia* sp?)	0	3
Melissa Blue *(Lycaeides melissa)*	7	1
Black Swallowtail *(Papilio polyxenes)*	1	0
NorthernCrescent *(Phyciodes cocyta)*	2	1
Unidentified Skipper (Polites sp?)	0	1
Long-dash Skipper *(Polites mystic)*	12	9
Peck's Skipper *(Polites peckius)*	5	1
Tawny-edged Skipper *(Polites themistocles)*	2	0
American Lady (*Vanessa virginiensis*)	3	3
Total Count:	93	110
Total Species	11	13
Total Hours	3.3	3.75
Observations/Hour	27.8	29.33

Site 2

The Site 2 Weather Conditions summary provides information on the date, time of survey, survey length, and weather encountered during each of the survey rounds. A description of Site 2 plant characteristics follows the weather data.

SITE-2 WEATHER CONDITIONS

Survey 1			
McHenry County, North Dakota			
Date	June 29, 2016		
Surveyor	Scott Krych		
Time	12:55 p.m. –3:53 p.m.	2 hr. 58 min.	
Weather			
12:55 p. m.	Temp. 83°F	Wind = 2-4 SW	%Clear = 50
3:53 p.m.	Temp. 83°F	Wind = 6-8 SW	%Clear = 20-50
Survey 2			
Date	July 5, 2016		
Surveyor	Scott Krych		
Time	4:00 p.m. –5:42 p.m.	1 hr 42 min	
Weather			
4:00 p.m.	Temp. 77°F	Wind = 7 E	%Clear = 40
5:42 p.m.	Temp. 78°F	Wind = 7 E	%Clear = 40
Survey 3			
Date	July 8, 2016		
Surveyor	Scott Krych		
Time	10:04 a.m. –11:10 a.m.	1 hr 6 min	
Weather			
10:04 a.m.	Temp. 72°F	Wind = 4 E	%Clear = 10-20
11:10 a.m.	Temp. 74°F	Wind = 4 E	%Clear = 10-20

Primary Target Species Observed: None, No Dakota skippers, (1) Regal Fritillary

A survey of grassland dominated areas on this site (Figure 3) found native grasses and forbs affected by heavy grazing pressure (see photo below). Grass species composition was made up of porcupine grass, side-oats grama, little bluestem, Kentucky bluegrass, and smooth brome. Forb composition harbored an abundance of purple coneflower, marbleseed (*Onosmodium molle*), Lambert's locoweed (*Oxytrorpis lambertii*), and upright prairie coneflower (*Ratibida columnifera*). Much of this site is overgrown with shrubby species (silverberry, and green ash) in the valleys and on hilltops with native prairie being limited to patches on the steepest slopes.

Butterfly activity on this site was low during all three site visits. The most abundant species was the habitat generalist *Colias* sp. Cattle use precluded survey of southwest portion of the site during the third survey. Table 2 provides a summary of species observed during each round of surveys conducted at Site 2.

Table 2.

Species Observed	Numbers observed Survey 1	Numbers observed Survey 2	Numbers observed Survey 3
Meadow Fritillary *(Boloria bellona)*			1
Common Wood-Nymph (Cercyonis pegala)		1	
Sulphur *(Colias sp.)*	3	3	1
Variegated Fritillary (Euptoieta claudia)			1
Melissa Blue (Lycaeides melissa)		1	
Long-dash Skipper *(Polites mystic)*	2		
Tawny-edged Skipper *(Polites themistocle)*			3
Peck's Skipper *(Polites peckii)*	1	1	
Aphrodite Fritillary *(Speyeria aphrodite*)		2	
Regal Fritillary (*Speyeria idalia*)		1	
Total Count:	6	9	6
Total Species	2	6	3
Total Hours	2.96	1.7	1.1
Observations/Hour	2	5.29	4.5

Photograph of Site 2 showing grazed slopes, shrub encroachment and forested drainage running through the site.

Site 3

The following Site 3 weather conditions summary provides information on the date, time of survey, survey length, and weather encountered during each of the survey rounds. A description of the site follows the weather data.

SITE-3 WEATHER CONDITIONS

Survey 1			
McHenry County, North Dakota			
Date	June 29, 2016		
Surveyor	Scott Krych		
Time	4:05 p.m. –5:13 p.m.	1 hr. 08 min.	
Weather			
4:05 p. m.	Temp. 85°F	Wind = 2-4 SW	%Clear = 50
5:13 p.m.	Temp. 85°F	Wind = 6-8 SW	%Clear = 20-50
Survey 2			
Date	July 5, 2016		
Surveyor	Scott Krych		
Time	4:00 p.m. –4:53 p.m.	53 min	
Weather			
4:00 p.m.	Temp. 78°F	Wind = 8 E	%Clear = 40
4:53 p.m.	Temp. 78°F	Wind = 8 E	%Clear = 40
Survey 3			
Date	July 8, 2016		
Surveyor	Scott Krych		
Time	11:17 a.m. –11:50 a.m.	33 min	
Weather			
11:17 a.m.	Temp. 74°F	Wind = 7 E	%Clear = 10-20
11:50 a.m.	Temp. 74°F	Wind = 7 E	%Clear = 10-20

Primary Target Species Observed: None, No Dakota skippers

A survey of grassland dominated areas within Site 3 (Figure 4) found native grasses and forbs affected by heavy grazing pressure. Grass species composition was made up of porcupine grass, hairy grama, little bluestem, smooth brome, and Kentucky bluegrass. Forb composition in grassland dominated areas harbored some native species including, purple coneflower, Lambert's locoweed, and upright prairie coneflower, but also harbored invasive thistles such as nodding plumeless thistle (*Carduus nutans)*. These areas also exhibited indications of over grazing such as soil compaction, lack of vegetative stratification, and exposed soil. Much of this site is overgrown with shrubby species (silverberry and green ash) in the valleys and on hilltops with native prairie being limited to patches on the steepest slopes.

Butterfly activity on this site was low during all three site visits. The most abundant species was the habitat generalist *Colias* sp. Table 3 provides a summary of species observed during each round of surveys conducted at Site 3.

Table 3.

Species Observed	Numbers observed Survey 1	Numbers observed Survey 2	Numbers observed Survey 3
Common Wood-Nymph *(Cercyonis pegala)*		2	1
Sulphur *(Colias sp.)*	2	1	1
Tawny-edged Skipper *(Polites themistocle)*			1
Aphrodite Fritillary *(Speyeria aphrodite*)		1	1
Total Count:	2	4	4
Total Species	1	3	4
Total Hours	1.13	0.88	0.55
Observations/Hour	1.77	4.55	7.27

Literature Cited

Dana, R.P. 1991. Conservation Management of the Prairie Skippers Hesperia dacotae and Hesperia ottoe: basic biology and threat of mortality during prescribed burning in spring. Minnesota Agricultural Experiment Station Bulletin 594-1991 (AD-SB-5511-S). University of Minnesota, St. Paul. 63pp.

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Rigney, C.L. 2013. Habitat characterization and biology of the threatened Dakota skipper (Hesperia dacotae) in Manitoba. Masters of Science. The University of Winnipeg, Winnipeg, Manitoba, Canada. 259p.

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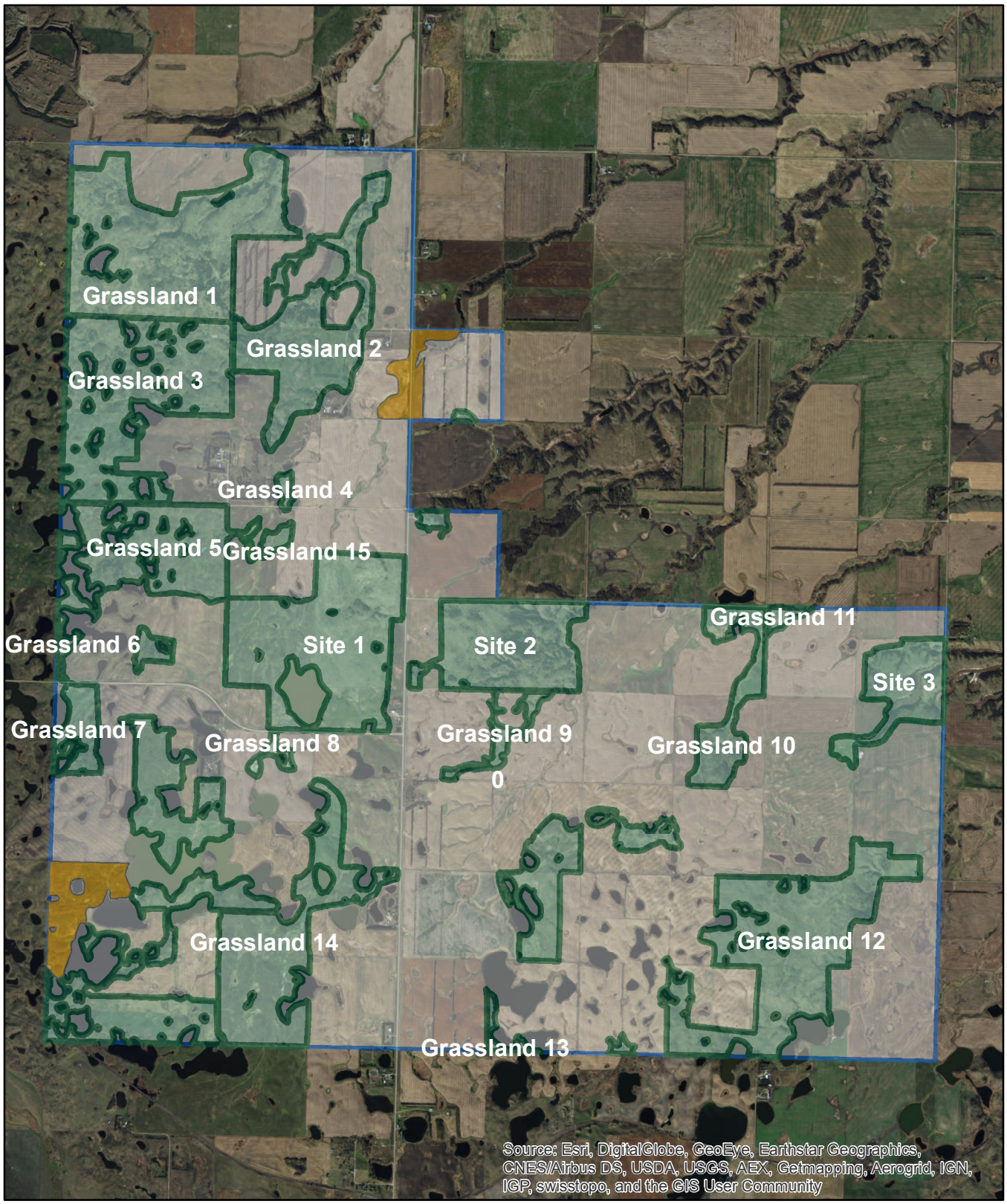
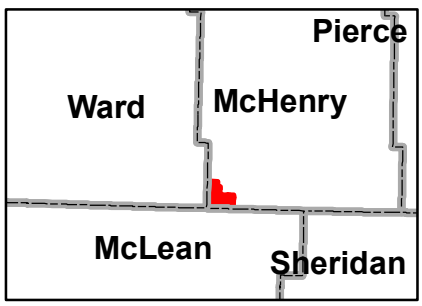
Swengel, A.B. and S.R. Swengel. 1999. Observations of prairie skippers (Oarisma poweshiek, Hesperia dacotae, H. ottoe, H. leonardus pawnee, and Atrytone Arogos iowa {Lepidoptera: Hesperiidae} in Iowa, Minnesota, and North Dakota during 1988-1997. The Great Lakes Entomologist Vol. 32 No. 4. pp.267-299

USFWS. February 2015. Dakota Skipper Guidance for Interagency Cooperation under Section 7 (a)(2) of the Endangered Species Act Version 1.0 USFWS, Regions 3 and 6.



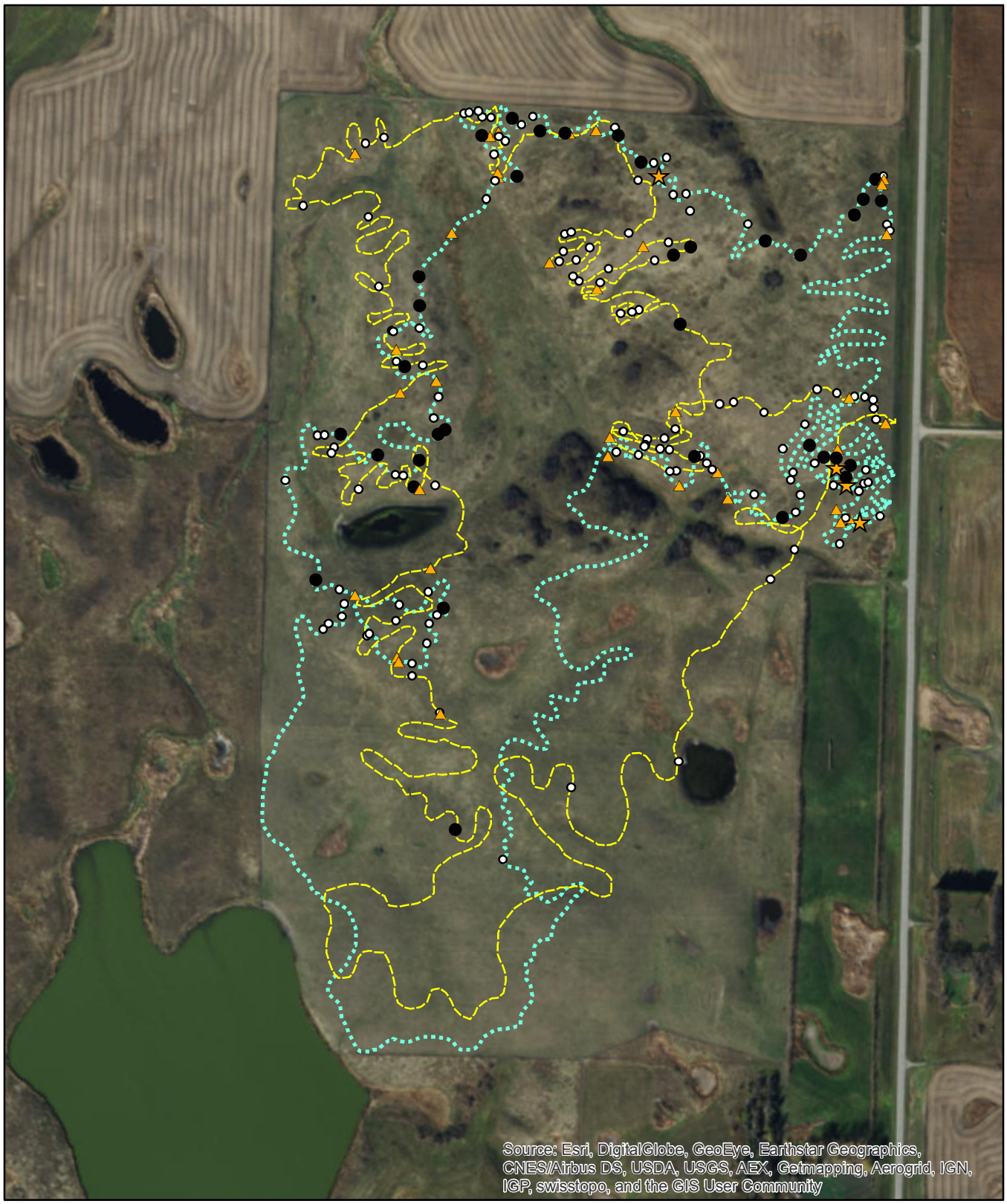


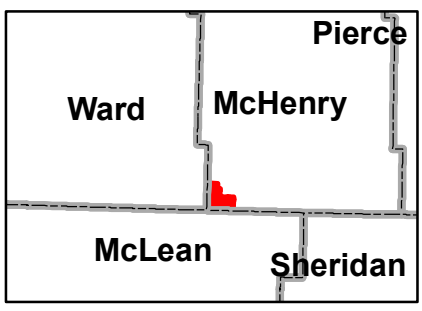
Legend

Grassland Habitats

- Cropland
- Grassland
- Hay

Figure 1
New Frontier Wind Energy Project
2016 Habitat Assessment Sites
McHenry County, North Dakota





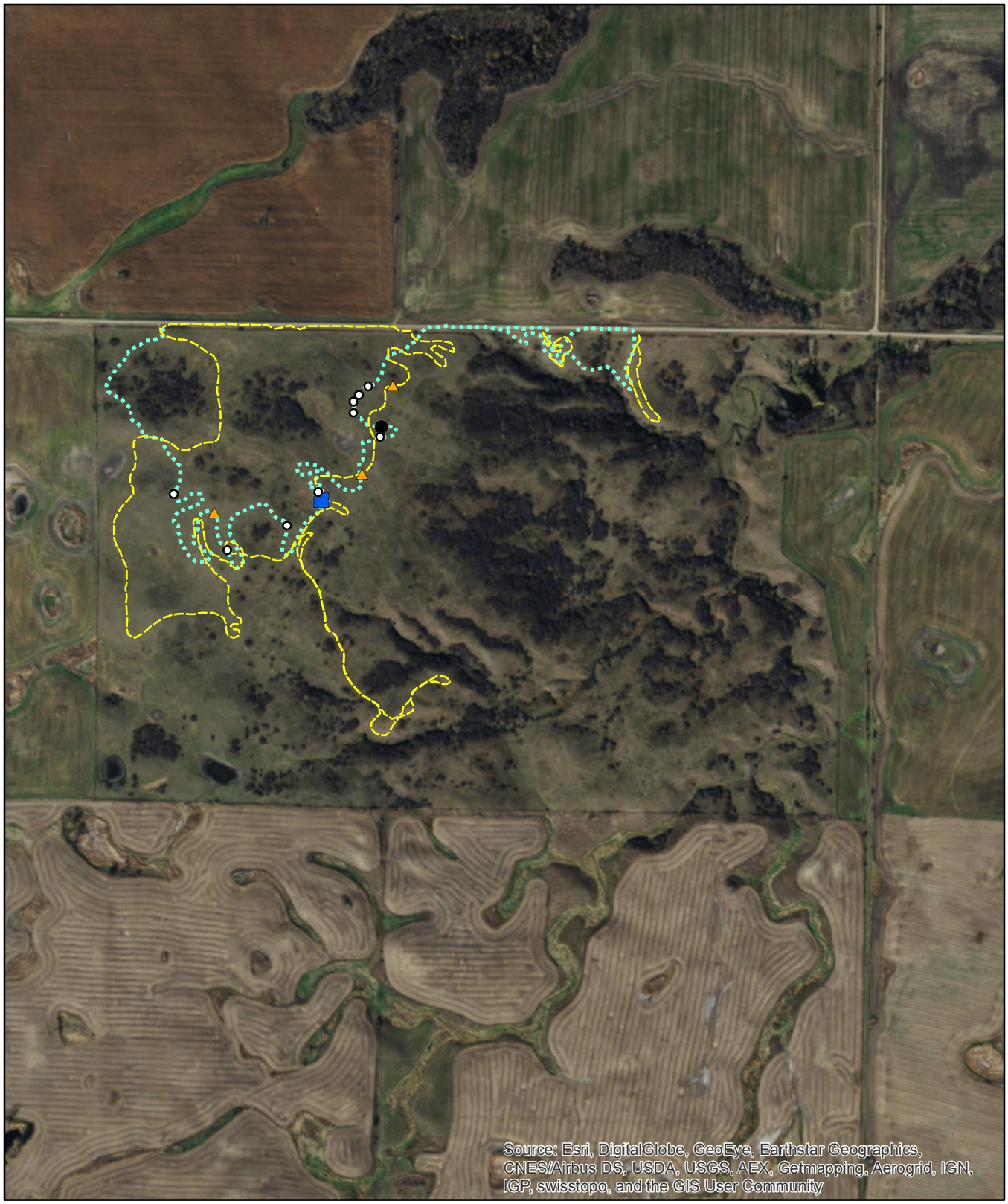
Legend

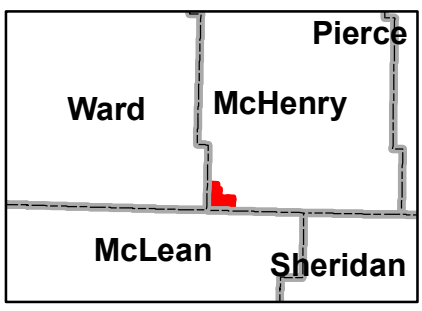
Butterflies

- Other Butterlies
- Common Wood Nymph
- Dakota Skipper
- Non-target skippers
- Regal Fritillary

- tracklog
- tracklog 2

Figure 2
New Frontier Wind Energy Project
Site 1 Flight Survey
McHenry County, North Dakota





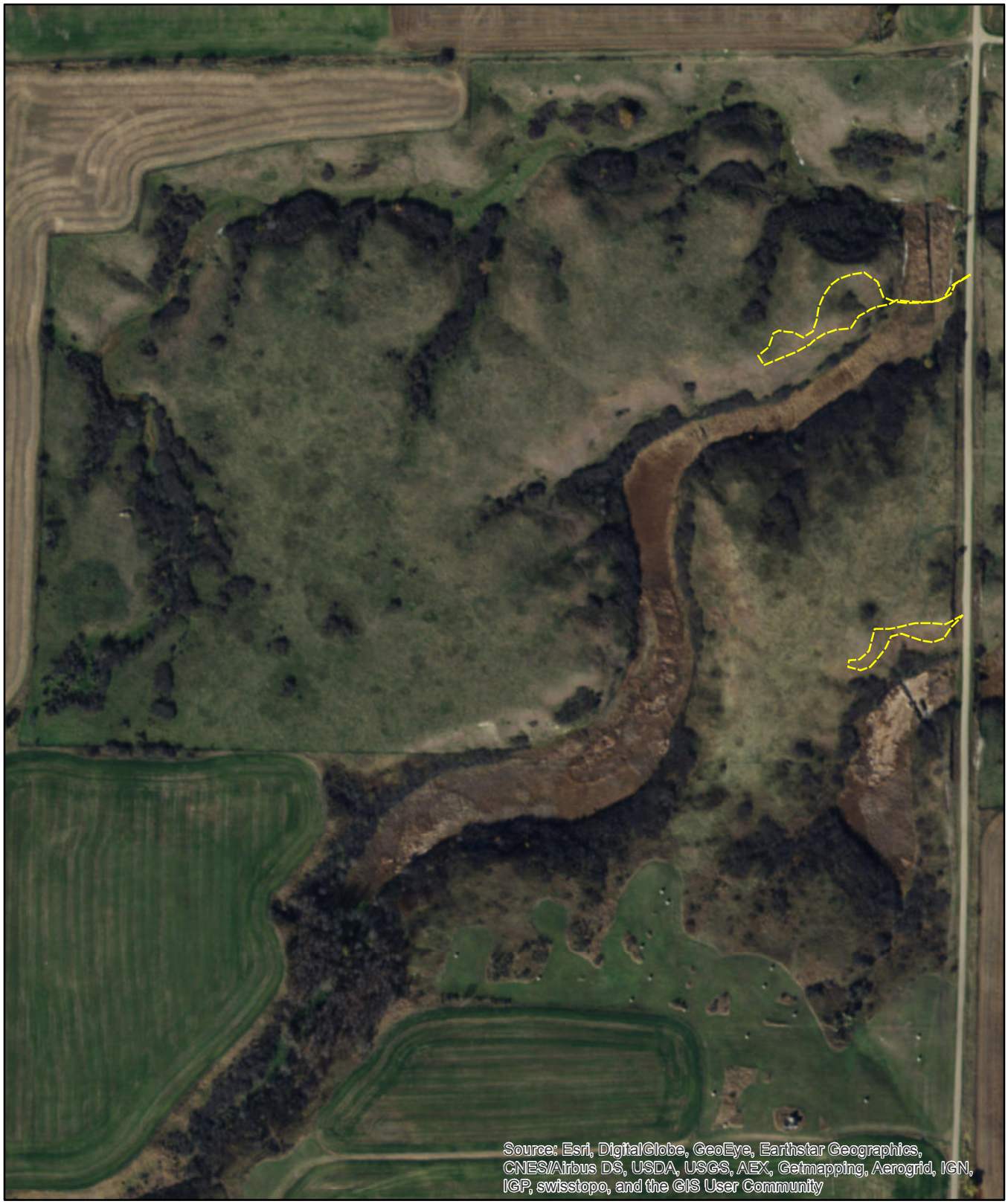
Legend

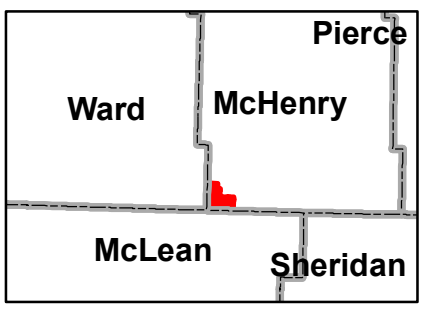
Butterflies

- Other Butterlies
- Common Wood Nymph
- Dakota Skipper
- Non-target skippers
- Regal Fritillary

- tracklog
- tracklog 2

Figure 3
New Frontier Wind Energy Project
Site 2 Flight Survey
McHenry County, North Dakota





Legend

Butterflies

- Other Butterlies
- Common Wood Nymph
- Dakota Skipper
- Non-target skippers
- Regal Fritillary

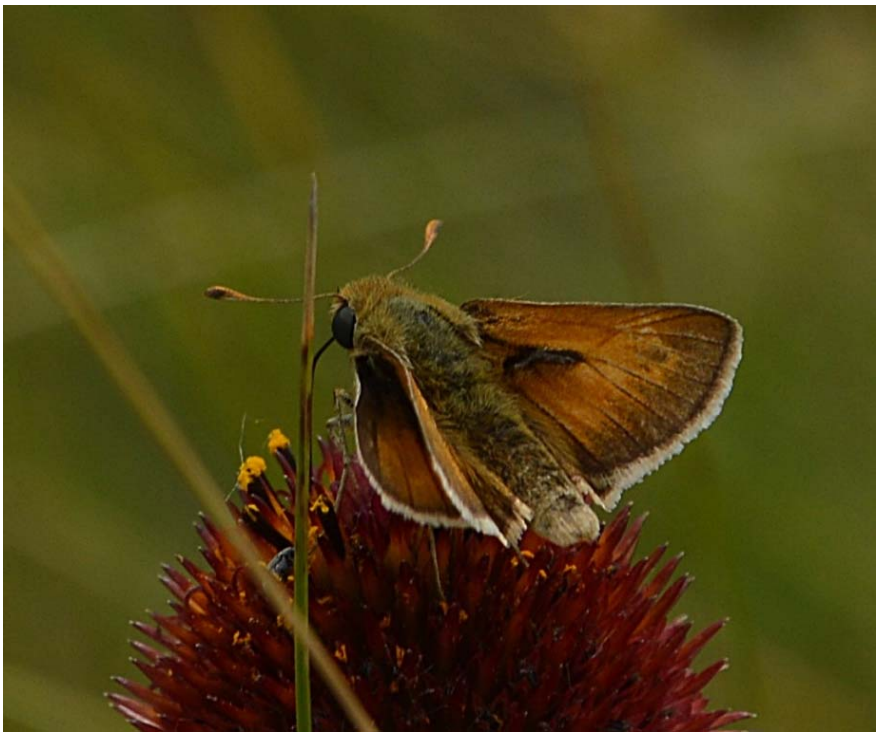
tracklog

Figure 4
New Frontier Wind Energy Project
Site 3 Flight Survey
McHenry County, North Dakota

A

Appendix

Photographic Vouchers



HDR ROLE
Habitat Assessment/Flight Survey

LOCATION
McHenry County

TYPE OF WORK
Resource Surveys

New Frontier Wind Energy Project

Tetra Tech
McHenryCounty, North Dakota

Photographic voucher: ventral and dorsal views of a male Dakota skipper (*Hesperia dacotae*) observed Site 1.

HDR ROLE
Habitat Assessment/Flight Survey

LOCATION
McHenry County

TYPE OF WORK
Resource Survey

New Frontier Wind Energy Project

Tetra Tech
McHenry County, North Dakota

Photographic vouchers: ventral and dorsal views of female Dakota skipper observed on Site 1.

Appendix M:
IPaC Trust Resources Report

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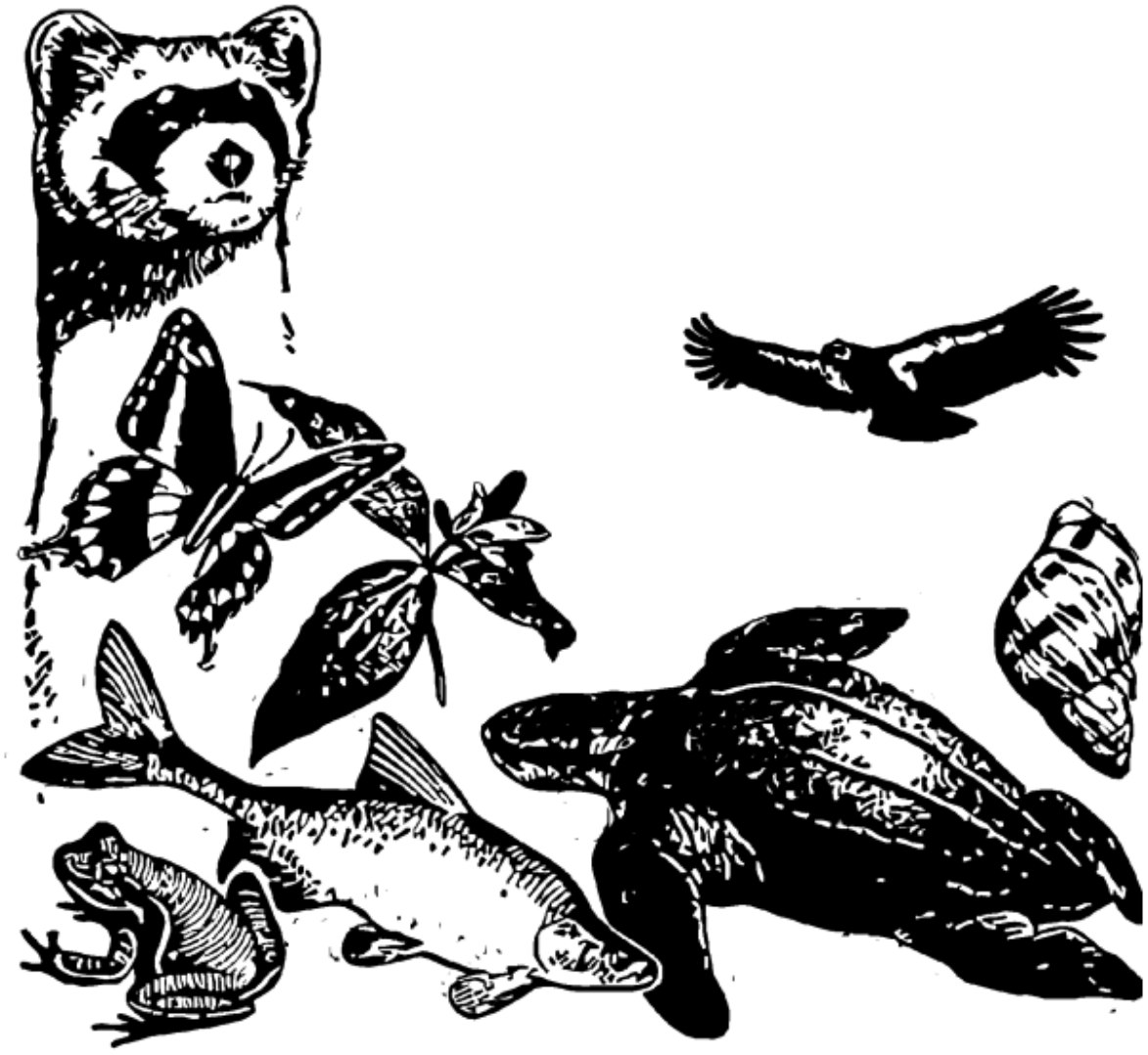
U.S. Fish & Wildlife Service

New Frontier

IPaC Trust Resources Report

Generated August 26, 2016 10:42 AM MDT, IPaC v3.0.8

This report is for informational purposes only and should not be used for planning or analyzing project level impacts. For project reviews that require U.S. Fish & Wildlife Service review or concurrence, please return to the IPaC website and request an official species list from the Regulatory Documents page.



IPaC - Information for Planning and Conservation (https://ecos.fws.gov/ipac/): A project planning tool to help streamline the U.S. Fish & Wildlife Service environmental review process.

Table of Contents

U.S. Fish & Wildlife Service

IPaC Trust Resources Report

NAME

New Frontier

LOCATION

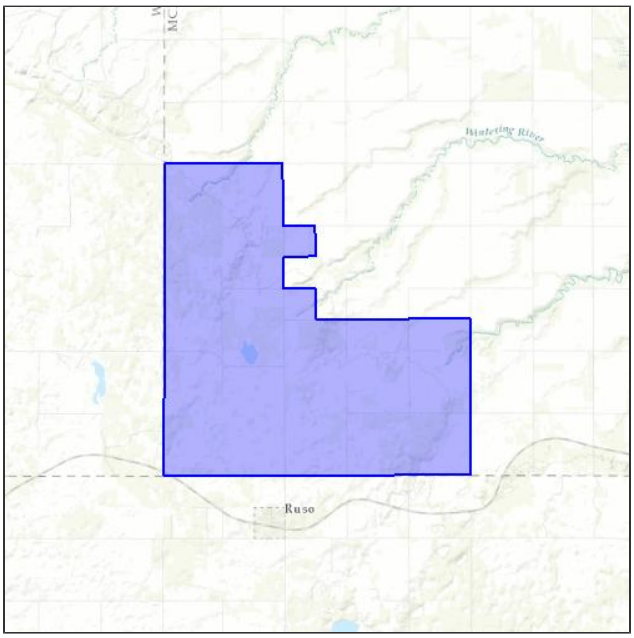
McHenry, McLean and Ward counties, North Dakota

DESCRIPTION

Wind Energy Project

IPAC LINK

https://ecos.fws.gov/ipac/project/XSVWM-YX2ZJ-BHDKA-FBWFO-VFJSO4



U.S. Fish & Wildlife Service Contact Information

Trust resources in this location are managed by:

North Dakota Ecological Services Field Office
3425 Miriam Avenue
Bismarck, ND 58501-7926
(701) 250-4481

Endangered Species

Proposed, candidate, threatened, and endangered species are managed by the Endangered Species Program of the U.S. Fish & Wildlife Service.

This USFWS trust resource report is for informational purposes only and should not be used for planning or analyzing project level impacts.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list from the Regulatory Documents section.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency.

A letter from the local office and a species list which fulfills this requirement can only be obtained by requesting an official species list either from the Regulatory Documents section in IPaC or from the local field office directly.

The list of species below are those that may occur or could potentially be affected by activities in this location:

Birds

Least Tern Sterna antillarum — Endangered

CRITICAL HABITAT

No critical habitat has been designated for this species.

http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B07N

Piping Plover Charadrius melodus — Threatened

CRITICAL HABITAT

There is **final** critical habitat designated for this species.

http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B079

Red Knot Calidris canutus rufa — Threatened

CRITICAL HABITAT

No critical habitat has been designated for this species.

http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0DM

Whooping Crane Grus americana — Endangered

CRITICAL HABITAT

There is **final** critical habitat designated for this species.

http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B003

Fishes

Pallid Sturgeon Scaphirhynchus albus — Endangered

CRITICAL HABITAT

No critical habitat has been designated for this species.

http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=E06X

Insects

Dakota Skipper Hesperia dacotae — Threatened

CRITICAL HABITAT

There is **final** critical habitat designated for this species.

http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=I011

Mammals

Gray Wolf Canis lupus — Endangered

CRITICAL HABITAT

No critical habitat has been designated for this species.

http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=A00D

Northern Long-eared Bat Myotis septentrionalis — Threatened

CRITICAL HABITAT

No critical habitat has been designated for this species.

http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=A0JE

Critical Habitats

There are no critical habitats in this location

Migratory Birds

Birds are protected by the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act.

Any activity that results in the take of migratory birds or eagles is prohibited unless authorized by the U.S. Fish & Wildlife Service.[1] There are no provisions for allowing the take of migratory birds that are unintentionally killed or injured.

Any person or organization who plans or conducts activities that may result in the take of migratory birds is responsible for complying with the appropriate regulations and implementing appropriate conservation measures.

---

1. 50 C.F.R. Sec. 10.12 and 16 U.S.C. Sec. 668(a)

Additional information can be found using the following links:

- Birds of Conservation Concern
  http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php
- Conservation measures for birds
  http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Year-round bird occurrence data
  http://www.birdscanada.org/birdmon/default/datasummaries.jsp

The following species of migratory birds could potentially be affected by activities in this location:

American Bittern Botaurus lentiginosus — Bird of conservation concern
Season: Breeding
http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0F3

Baird's Sparrow Ammodramus bairdii — Bird of conservation concern
Season: Breeding
http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B09B

Bald Eagle Haliaeetus leucocephalus — Bird of conservation concern
Season: Wintering
http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B008

Black Tern Chlidonias niger — Bird of conservation concern
Season: Breeding
http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B09F

Black-billed Cuckoo Coccyzus erythropthalmus — Bird of conservation concern
Season: Breeding
http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0HI

Common Tern Sterna hirundo — Bird of conservation concern
Season: Breeding
http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B09G

Dickcissel Spiza americana — Bird of conservation concern
Season: Breeding

Ferruginous Hawk Buteo regalis — Bird of conservation concern
Season: Breeding
http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B06X

Golden Eagle Aquila chrysaetos — Bird of conservation concern
Season: Wintering
http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0DV

Grasshopper Sparrow Ammodramus savannarum — Bird of conservation concern
Season: Breeding
http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0G0

Hudsonian Godwit Limosa haemastica — Bird of conservation concern
Season: Migrating

Loggerhead Shrike Lanius ludovicianus — Bird of conservation concern
Season: Breeding
http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0FY

Marbled Godwit Limosa fedoa — Bird of conservation concern
Season: Breeding
http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0JL

Nelson's Sparrow Ammodramus nelsoni — Bird of conservation concern
Season: Breeding

Red-headed Woodpecker Melanerpes erythrocephalus — Bird of conservation concern
Season: Breeding

Short-eared Owl Asio flammeus — Bird of conservation concern
Season: Breeding
http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0HD

Sprague's Pipit Anthus spragueii — Bird of conservation concern
Season: Breeding
http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0GD

Swainson's Hawk Buteo swainsoni — Bird of conservation concern
Season: Breeding
http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B070

Upland Sandpiper Bartramia longicauda — Bird of conservation concern

Season: Breeding

http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0HC

Western Grebe aechmophorus occidentalis — Bird of conservation concern

Season: Breeding

http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0EA

Willow Flycatcher Empidonax traillii — Bird of conservation concern

Season: Breeding

http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0F6

Yellow Rail Coturnicops noveboracensis — Bird of conservation concern

Season: Breeding

http://ecos.fws.gov/tess_public/profile/speciesProfile.action?spcode=B0JG

Wildlife refuges and fish hatcheries

There are no refuges or fish hatcheries in this location

Wetlands in the National Wetlands Inventory

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

DATA LIMITATIONS

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

DATA EXCLUSIONS

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

DATA PRECAUTIONS

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

This location overlaps all or part of the following wetlands:

The area of this project is too large for IPaC to load all NWI wetlands in the area. The list below may be incomplete. Please contact the local U.S. Fish & Wildlife Service office or visit the NWI map for a full list.

Freshwater Emergent Wetland

PEM1/ABF
PEM1/ABFd
PEM1/FOA

PEM1/FOAd
PEM1A
PEM1Ad
PEM1Ax
PEM1C
PEM1Cd
PEM1Cx

Freshwater Pond

PABF
PABFd
PABFh
PABFx

Lake

L2ABG

A full description for each wetland code can be found at the National Wetlands Inventory website: http://107.20.228.18/decoders/wetlands.aspx

Appendix N:
Agency Coordination since Issuance of PSC Order

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2016 Agency Consultation Letters

New Frontier Wind Energy Project - 2016 State and Local Agency Consultation Letters								
Prefix	**Name**	**Surname**	**Title**	**Agency Name 1**	**Agency Name 2**	**Address Line 1**	**Address Line 2**	**Date Sent**
Mr.	Kyle	Wanner	Executive Director	North Dakota Aeronautics Commission		Bismarck Municipal Airport - General Aviation; 2301 University Dr. - Bldg 22	Bismarck, ND 58504	26-Aug-16
Attorney General	Wayne	Stenehjem	Attorney General	State of North Dakota	Office of Attorney General	600 E Boulevard Ave, Dept. 125	Bismarck, ND 58505	26-Aug-16
Mr.	Doug	Goehring	Agriculture Commissioner	North Dakota Department of Agriculture		600 E Boulevard Ave, Dept. 602	Bismarck, ND 58505	26-Aug-16
Mr.	L. David	Glatt	Chief	North Dakota Department of Health	Environmental Health Section	918 East Divide Ave	Bismarck, ND 58501-1947	26-Aug-16
Ms.	Maggie	Anderson	Executive Director	North Dakota Department of Human Services		600 E Boulevard Ave, Dept. 325	Bismarck, ND 58505-0250	26-Aug-16
Mr.	Troy	Seibel	Commissioner of Labor	North Dakota Department of Labor		600 E Boulevard Ave, Dept. 406	Bismarck, ND 58505-0340	26-Aug-16
Mr.	Wayne	Kutzer	Director and Executive Officer	North Dakota Department of Career and Technical Education		600 E Boulevard Ave, Dept. 270	Bismarck, ND 58505-0610	26-Aug-16
Mr.	Paul	Lucy	Director	North Dakota Department of Commerce	Economic Development and Finance Division	1600 E. Century Ave., Suite 2	Bismarck, ND 58503	26-Aug-16
Ms.	Pam	Sharp	Director	North Dakota Office of Management and Budget		600 E Boulevard Ave, Dept. 110	Bismarck, ND 58505-0400	26-Aug-16
Mr.	Edward C.	Murphy	State Geologist	North Dakota Geological Survey		600 E Boulevard Ave	Bismarck, ND 58505-0840	26-Aug-16
Governor	Jack	Dalrymple	Governor	State of North Dakota		600 E Boulevard Ave	Bismarck, ND 58505-0001	26-Aug-16
Mr.	Grant	Levi	Director	North Dakota Department of Transportation	Office of Project Development	608 E Boulevard Ave	Bismarck, ND 58505-0700	26-Aug-16
Mr.	Scott J.	Davis	Executive Director	North Dakota Indian Affairs Commission		600 E Boulevard Ave 1st Floor, Judicial Wing, Room 117	Bismarck, ND 58505	26-Aug-16
Ms.	Kristie	Tollefson	UI Tax Field Rep	Job Service North Dakota		301 College Drive South	Devils Lake, ND 58301	5-Aug-16
Mr.	Lance	Gaebe	Director	North Dakota Department of Trust Lands		1707 North 9th Street, PO Box 5523	Bismarck, ND 58506-5523	26-Aug-16
Mr.	Jesse	Hanson	Director	North Dakota Parks and Recreation Department	Planning and Natural Resources Division	1600 E Century Ave, Suite 3	Bismarck, ND 58503-0649	26-Aug-16
Mr.	Al	Anderson	Commissioner	North Dakota Department of Commerce		1600 E Century Ave, Suite 2	Bismarck, ND 58503	26-Aug-16
Mr.	Scott	Hochhalter	Soil Conservation Specialist	North Dakota State Soil Conservation Committee	NDSU Extension Service	2718 Gateway Avenue, Suite 104	Bismarck, ND 58503	26-Aug-16

Mr.	Garland	Erbele	State Engineer	North Dakota State Water Commission		900 E Boulevard Ave, Dept. 770	Bismarck, ND 58505-0850	26-Aug-16
Ms.	Susan	Quinnell	Review and Compliance Coordinator	State Historical Society of North Dakota		612 East Boulevard Ave.	Bismarck, ND 58505	2-Sep-16
Ms.	Darlene	Carpenter	County Auditor	McHenry County		407 Main St S., Suite 201	Towner, ND 58788	5-Apr-16

New Frontier Wind Energy Project - 2016 Federal Agency Consultation Letters								
Prefix	**Name**	**Surname**	**Title**	**Agency Name 1**	**Agency Name 2**	**Address Line 1**	**Address Line 2**	**Date Sent**
Mr.	Aaron	Krauter	State Executive Director	U.S. Department of Agriculture	North Dakota Farm Service Agency	1025 28th Street South	Fargo, ND 58103-2372	26-Aug-16
Mr.	Daniel	Cimarosti	Regulatory Program Manager	U.S. Army Corps of Engineers Omaha District	North Dakota Regulatory Office	1513 South 12th St	Bismarck, ND 58504	26-Aug-16
Mr.	Douglas D.	Dragseth	District Conservationist	U.S. Department of Agriculture	Natural Resources Conservation Service	705 Main Street South, Suite 2	Towner, ND 58788	26-Aug-16
Mr.	Cy	Munos		U.S. Air Force			cy.munos@us.af.mil	26-Aug-16
Mr.	Kevin	Shelley	North Dakota State Supervisor	U.S. Fish and Wildlife Service		3425 Miriam Avenue	Bismarck, North Dakota 58501	20-Oct-15
Mr.	Tom	Zick	Assistant Wetland District Manager	U.S. Department of the Interior, Fish and Wildlife Service	J. Clark Salyer National Wildlife Refuge	681 Salyer Road	Upham, ND 58789-0066	10-Nov-16
Mr.	Cesar	Perez	Program Analyst, FAA OEG - NAVTECH Support	Federal Aviation Administration		1701 Columbia Ave.	College Park, GA 30337	17-Oct-16

Capital Power Corporation
155 Federal Street, Suite 1200
Boston, MA 02110
T 617-330-1340 F 617-274-7701
www.capitalpower.com

August 24, 2016

Dear [Government Official]

As a follow-up to our phone conversation of August _, 2016, I am writing to provide you with an update on Meadowlark Wind I LLC ("Meadowlark") and the New Frontier Wind Energy Project (the "Project").

In December 2014, Capital Power Investments LLC, a subsidiary of Capital Power Corporation (Capital Power), completed the acquisition of Element Power US, LLC (Element Power), which included Meadowlark and the Project.

About Capital Power
Capital Power is a publicly-traded, growth-oriented North American power producer, with more than a century of innovation and reliable performance. We're headquartered in Edmonton, Alberta, Canada, with a U.S. development office based in Boston, Massachusetts. Capital Power has a strong record of developing, building, and operating wind power projects, with seven projects (totaling 757 megawatts - "MW") in operation or under construction. Capital Power and its employees have a long history of working closely and productively with landowners, government agencies, municipalities and our neighbors, and we look forward to continuing that tradition in North Dakota. If you want more information on Capital Power or our projects, please visit www.capitalpower.com.

New Frontier Wind Acquisition
As I noted in our phone conversation, Capital Power is continuing the development of the New Frontier Wind Energy Project in McHenry County, North Dakota (see enclosed map). The following table includes the sections for the Project area and generation transmission line, plus a one-mile buffer of the Project area:

County	Township	Range	Sections
McHenry	152N	80W	2-3, 10-11, 14-15, 22-23, 25-27, 34- 36
	151N	80W	1-2, 4-9, 11- 14, 16-36
Ward	151N	81W	1, 12, 13, 24, 25, 36
McLean	150N	81W	1
	150N	80W	1- 6

The enclosed map is similar to the one sent to you in a letter dated _____ (copy enclosed) and indicates the same Project area and transmission line route to the existing McHenry substation near Voltaire. Specific attributes (i.e. turbine size, turbine types, etc.) are not known at this time,

Capital Power Corporation

though the number of turbine locations will be reduced from 66 to a range between 30 and 49. The reduced subset of turbines will be located on the same locations as those outlined in the Final Project Layout dated December 2, 2011 (copy enclosed).The capacity of the Project will still be approximately 99 MW. Meadowlark will submit an application for a Certificate of Continuing Suitability with the North Dakota Public Service Commission in September 2016. The Project has a planned commercial operation date in the second quarter of 2018.

Meadowlark requests your assistance in identifying issues within the Project area that would influence a decision regarding the use of the land and any input your agency may have in the development of this Project. This information will be used to help guide project development through identification and avoidance of impacts to sensitive resources where practicable. Meadowlark has requested similar input from other federal, state, and local agencies, including all those identified in Section 69-06-01-05 of the North Dakota Administrative Code.

In addition to the erection of wind turbines, the Project would involve: improvements to existing roads; construction of new gravel access roads; installation of underground electrical collection lines; construction of an operation and maintenance building; construction of an electrical switchgear facility; erection of permanent meteorological masts; and construction of an interconnection substation facility and an aboveground 115 kV transmission line. A temporary construction staging and laydown area would also be used during the construction phase of the Project.

Thank you for your assistance with this matter. If you have any questions or require additional information, please feel free to call me at 617-330-1324 (office) or 508-734-0919 (mobile).

Sincerely,

William R. Behling
Business Development Manager
Capital Power Corporation
155 Federal Street, Suite 1200
Boston, MA 02110
T: 617-330-1324, c: 508-734-0919

U.S. Fish and Wildlife Service Coordination

memorandum

DATE: October 20, 2015

TO: Kevin Shelley, USFWS

FROM: Paul Wendelgass and Bill Behling

CC: Terry VanDeWalle

SUBJECT: New Frontier Wind Power Project -- Background

This memo has been prepared to follow up on a meeting between Capital Power Corporation (Capital Power) representatives and Kevin Shelley, North Dakota State Supervisor, US Fish & Wildlife Service (FWS), on September 10, 2015, concerning the New Frontier wind power project (Project). It presents the process that has been followed in developing the Project from its inception through its current status.

New Frontier Renewable Energy began developing the New Frontier Wind Resource Area in 2007 with the signing of the first landowner leases and installation of the first meteorological tower in November 2007. The Project area was selected to include all areas necessary to optimize the wind resource while avoiding and minimizing impact on environmental resources. The site location was chosen based on a combination of factors, including 1) quality of the wind resource; 2) available land with landowners willing to execute lease agreements; 3) proximity to the electrical transmission system to allow for the economical delivery of power to customers; and 4) location in an area where environmental issues or existing land uses or activities would not prohibit project development..

North-central North Dakota is well suited for wind development because it features large expanses of open terrain and has a robust wind resource and land available for wind turbine siting. On-site wind data from two 60 meter met towers, along with data from two 60 meter met towers from a separate project located to the southeast of the Project site, were used to capture sufficient wind data for the Project site. The data show that the wind resource at the site exceeds 9.0 meters per second (m/s) at hub height, making it one of the more robust wind resources in North Dakota.

The Project area is located within the Drift Prairie and Missouri Coteau Ecoregions. Both of these ecoregions were influenced by glacial activity which created the “prairie pothole” landscape. Historically, vegetation within both ecoregions was a transition zone of tall-grass to short-grass prairie, but today, most of these ecoregions have been converted to agricultural use with crop production and livestock grazing being the primary activities.. The town of Ruso is located approximately 0.5 mile south of the Project area. With the exception of paved State Highway 41, transportation consists of gravel and two-track roads that, in more level terrain, are laid out on section lines. Land use within and surrounding the Project Area is rural in nature, with cultivated croplands and hay and pasture areas accounting for nearly two-thirds of the land within the Project area.

Though the Project made its initial application for interconnection to the Midwest Independent System Operator (“MISO”) in August 2007, for a 99 megawatt (MW) project on the site, the MISO queue was very long at that time and the 2007 interconnection application resulted in a number of studies over several years. The Project executed an Interconnection Agreement (IA) with MISO in 2012, and the

IA was filed with the Federal Energy Regulatory Commission in October 2012.The interconnection, to the Great River Energy (GRE) McHenry substation, is very low in cost for a project in this region of MISO, because the lines in the area are relatively lightly loaded, making this a very viable point to inject wind energy into the bulk transmission system. The 115 kilovolt (kV) transmission line required from the Project substation to the McHenry substation is less than 12 miles in length, across agricultural lands for which the project has all the necessary rights to build the line, including a McHenry County Conditional Use Permit issued in 2011.

Element Power purchased the Project from New Frontier Renewable Energy in 2010. Element Power, d/b/a Meadowlark Wind I, LLC applied to the North Dakota Public Service Commission (PSC) for a Certificate of Site Compatibility (Certificate) in August 2011. The PSC issued the Certificate in April 2012. Element conducted pre-construction avian and bat surveys at the site in 2011 and 2012 to characterize the bird and bat use in the Project area. It should be noted that the FWS's Land-Based Wind Energy Guidelines were only released in final form in March 2012, by which time the Project had obtained all of its permits and signed the IA.

Capital Power acquired the site from Element Power in December 2014. Capital Power is using the tiered approach described in the USFWS Land-Based Wind Energy Guidelines (WEG; USFWS 2012) to assess the potential impacts to wildlife and has commissioned Stantec Consulting Services, Inc. to compile the findings of Tier 1, 2, and 3 studies completed to-date. The *Site Characterization Report*, dated October 2015, is appended to this memo. Field surveys at the site conducted by Element Power indicate the presence of migratory birds, bald eagles, raptors, sharp-tailed grouse, federally listed species, and species of habitat fragmentation concern within the project area. No bat acoustical or habitat surveys have been completed at the project area; however, a desktop review indicates the presence of suitable bat summer habitat within the Project area.

Capital Power now wishes to work with the USFWS to determine if additional Tier 3 studies should be conducted at the site in order to conclude the analysis of the site and move it forward into construction. Capital Power is committed to environmentally responsible development of the site, and believes that can be accomplished through appropriate analysis and responsive project design and operation.

CONFIDENTIAL BUSINESS INFORMATION

BIOLOGICAL RESOURCES SITE CHARACTERIZATION REPORT

New Frontier Wind Energy Project
McHenry County, North Dakota

Prepared for:
Capital Power Corporation
99 Summer Street, Suite 1000
Boston, MA 02110

Prepared by:
Stantec Consulting Services Inc.
2300 Swan Lake Blvd., Suite 102
Independence, IA 50644
Phone: (319) 334-3755
Fax: (319) 334-3780

Project #193703715

October 19, 2015

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1.0 INTRODUCTION

1.1 PROJECT DESCRIPTION

Stantec Consulting Services Inc. (Stantec) performed a site characterization study, including a threatened and endangered species habitat assessment within the project boundary (project area) of the proposed New Frontier Wind Energy Project (Project). The Project is located in the southwest portion of McHenry County in north-central North Dakota, between the cities of Benedict, Bergen, and Velva (Figure 1). In addition, a 15.3-mile-long transmission corridor is proposed to connect the wind farm to an existing power grid (Figure 1).

This report presents the methodology, results and conclusions of Stantec's investigations.

1.2 REGULATORY BACKGROUND

Endangered Species Act

The federal Endangered Species Act (ESA) of 1973 (16 U.S.C. §§1531 et seq.) provides for the listing, conservation, and recovery of endangered species. Section 9 of the ESA prohibits the take of any endangered or threatened species listed under the ESA. Under the ESA, in reference to fish and wildlife the term "take" is defined as "...to harass, pursue, hunt, shoot, wound, kill, trap, capture, or collect: species listed as endangered or threatened, or to attempt to engage in any such conduct." In reference to plants, under the ESA "take" is defined as "...to collect, pick, cut, dig up, or destroy in any manner."

Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA; 16 U.S.C. §§ 703-712) prohibits the taking, killing, injuring or capture of listed migratory birds. Neither the MBTA nor its implementing regulations found in 50 Code of Federal Regulations (CFR) Part 21 provide for the permitting of "incidental take" of migratory birds that may be killed or injured by wind turbines.

Bald and Golden Eagle Protection Act

On July 9, 2007, the United States (U.S.) Fish and Wildlife Service (USFWS) announced that the bald eagle (*Haliaeetus leucocephalus*) would be removed in the lower 48 states from the Federal List of Endangered and Threatened Wildlife (72 FR 37346-37372). The rule became effective on August 8, 2007. The bald eagle remains protected under the Bald and Golden Eagle Protection Act of 1940 (BGEPA) and is listed as a species of special concern in North Dakota.

The BGEPA (16 USC 668-668d and 50 CFR 22.26), and its implementing regulations, provides additional protection to bald eagles and golden eagles (*Aquila chrysaetos*) such that it is unlawful to take an eagle. In this statute, the definition of "take" is to "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or disturb." The term "disturb" is defined in 50 CFR 22.3 to include "to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best available 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."

The USFWS published a final rule (Eagle Permit Rule) on September 11, 2009 under the BGEPA (50 CFR 22.26) authorizing limited issuance of permits to take bald eagles and golden eagles. This permit term was extended to a maximum of 30-years in the December 9, 2013 ruling (78 FR 73704). A permit would authorize the take of bald eagles and golden eagles where the take is compatible with the preservation of the bald eagle and the golden eagle; necessary to protect an interest in a particular locality; associated with but not the purpose of the activity; and

1) for individual incidences of take: the take cannot be practicably avoided; and,
2) for programmatic take: the take is unavoidable even though advanced conservation practices are being implemented.

State of North Dakota

Per the North Dakota Game and Fish Department (NDGFD) website[1], North Dakota does not have a state endangered or threatened species list. Only those species listed by the ESA of 1973 are considered threatened or endangered in North Dakota. The USFWS – North Dakota Ecological Services Field Office has primary oversight of threatened and endangered species within the state.

The North Dakota Comprehensive Wildlife Conservation Strategy (CWCS) issued in 2005 identifies 100 wildlife Species of Conservation Priority (SCP) and provides a conservation priority designation for each species (Level I – III; NDGFD 2005; NDGFD 2012). These species are not afforded any legal protection by state regulations; however, the NDGFD uses State Wildlife Grant (SWG) funding to implement conservation actions that directly benefit those species (NDGFD 2012). The CWCS provides information on species distribution, abundance, habitat requirements, threats, conservation actions, and monitoring techniques.

- Level I – High level of conservation priority because of declining status either in North Dakota or across the species range or high rate of occurrence in North Dakota constituting the core of the species' breeding range but are at-risk range wide.
- Level II – moderate level of conservation priority or a high level of conservation priority but a substantial level of non-SWG funding is available to them.
- Level III – moderate level of conservation priority but are believed to be peripheral or nonbreeding in North Dakota.

1.3 PURPOSE AND OBJECTIVES

Capital Power Corporation (Capital Power) is using the tiered approach described in the USFWS Land-Based Wind Energy Guidelines (WEG; USFWS 2012) to assess the potential impacts to wildlife.

Tier 1 (Preliminary Site Evaluation), as described in the WEG (USFWS 2012), is a landscape-scale screening process using existing information sources to identify blocks of native habitat, ecological communities, and other areas of broad-scale wildlife value.

The objective of Tier 1 is to answer the following questions at the landscape level (USFWS 2012):

[1] http://gf.nd.gov/wildlife/fish-wildlife/threatened-and-endangered-species

1. *Are there species of concern present on the potential site(s), or is habitat (including designated critical habitat) present for these species?*

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

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

4. *Are there large areas of intact habitat with the potential for fragmentation, with respect to species of habitat fragmentation concern needing large contiguous blocks of habitat?*

Tier 2 (Site Characterization) focuses on site-specific natural resource information and existing information specific to the project area to evaluate potential risks to sensitive or protected natural resource features.

The objective of Tier 2 is to answer the following questions at the site level (USFWS 2012):

1. *Are known species of concern present at the proposed site, or is habitat (including designated critical habitat) present for these species?*

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

3. *Are there plant communities of concern present or likely to be present at the site?*

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

5. *Using best scientific information has the developer or relevant federal, state, tribal, and/or local agency identified the potential presence of a population of a species of habitat fragmentation concern?*

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

7. *Is there a potential for significant adverse impacts to species of concern based on the answers to the questions above, and considering the design of the proposed project?*

Tier 3 of the WEG addresses field studies to document wildlife and habitat and predict potential impacts. The objective of Tier 3 is to answer the following questions at the site level (USFWS 2012):

1. *Do field studies indicate that species of concern are present on or likely to use the proposed site?*

2. *Do field studies indicate the potential for significant adverse impacts on affected population of species of habitat fragmentation concern?*

3. *What is the distribution, abundance, behavior, and site use of species of concern identified in Tiers 1 or 2, and to what extent do these factors expose these species to risk from the proposed wind energy project?*

4. *What are the potential risks of adverse impacts of the proposed wind energy project to individuals and local populations of species of concern and their habitats?*

5. *How can developers mitigate identified significant adverse impacts?*

6. *Are there studies that should be initiated at this stage that would be continued in post-construction?*

Surveys were conducted in 2011 and 2012 for Meadowlark Wind I LLC's (Meadowlark; Element Power US, LLC) proposed New Frontier Wind Resource Area (NFWRA), which includes most of the project area for Capital Power's proposed Project (approximately 10,973 acres [96.4%] of the proposed project area overlap with the 2011 NFWRA). Figure 1 provides a boundary comparison of these two projects. Summaries of the results of the 2011 surveys for the NFWRA are included in this report. Survey results from 2012, if available, had not been provided to Stantec at the time of this report issuance. Desktop review and survey results answer questions from Tier 3 of the WEG and help to refine Stage 1 and 2 assessments for the Project.

2.0 METHODS

Tier 1, 2, and 3 investigations focused on species of concern and their habitats, as well as a general site habitat characterization (Figures 1 – 9) to answer the questions outlined in Section 1.2. Species of concern, as identified by the USFWS, include: migratory birds; bats; bald and golden eagles and other birds of prey; prairie and sage grouse; listed, proposed, or candidate endangered and threatened species; and species of habitat fragmentation concern. Methods and metrics followed those outlined in the WEG (USFWS 2012) and are described in Sections 2.1 to 2.6.

2.1 MIGRATORY BIRDS

To assess the Project's potential impact on migratory birds, several publicly available post-construction bird mortality monitoring studies in the Midwest were reviewed. The USFWS Birds of Conservation Concern report (USFWS 2008), the U.S. Geological Survey (USGS) North American Breeding Bird Survey (BBS) website (Saur et al. 2014), and NDGFD SCP website (NDGFD 2012) were also consulted. Then, desktop habitat assessments for designated natural resource areas and suitable habitat potentially occurring within the project area for these species were conducted using Geographic Information System (GIS) data. These GIS data sources are outlined in further detail in Section 3.0. Refer to Section 4.1 for the results of these habitat assessments.

In addition, Western EcoSystems Technology, Inc. (WEST), on behalf of Meadowlark, conducted a fixed-point bird survey from September to November 2011 for the NFWRA (WEST 2012). The survey area for the NFWRA includes approximately 10,973 acres (96.4%) of the project area for Capital Power's proposed Project.

The objective of the fixed-point bird 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). The interim pre-construction diurnal avian use survey was designed to address the study objective by documenting and characterizing general bird use within and adjacent to the NFWRA project area, which includes a majority of the proposed project area, during the fall migration season.

A total of 10 points were selected to survey representative habitats and topography of the NFWRA, while achieving relatively even coverage of the study area (WEST 2012). Each survey plot was a 0.5-mile (0.8 kilometer) radius circle centered on the point; the plots were visited once per week from September 1 to November 15, 2011.

All surveys were conducted by a qualified ornithologist using methods described by Reynolds et al. (1980) to provide measures of species composition, use, relative abundance, and flight height of birds within the NFWRA.

Individual point counts were 20 minutes in length. While the focus of the survey was for large birds, all species of birds observed during each fixed-point bird use survey were recorded. Observations of large birds beyond the 0.5-mile (0.8 kilometer) radius were recorded, but were not included in the statistical analyses; for small birds, observations beyond a 328-foot (100 meter) radius were excluded from analysis. Large birds include waterbirds, waterfowl, rails/coots, shorebirds, diurnal raptors, owls, vultures, upland game birds, doves/pigeons, and large corvids (e.g., ravens, magpies, and some crows). Passerines (excluding large corvids), swifts/hummingbirds, woodpeckers, and cuckoos are considered small birds.

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. 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 16 foot (5 meter) interval. For large birds, their flight path was recorded on topographical maps from initial sighting until a general flight direction was determined or they left the survey plot. Other information recorded included whether or not the observation was auditory only and the 10 minute interval of the 20 minute survey in which the observation was initially noted.

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. Refer to Section 4.1 for these survey results.

Incidental wildlife observations provide records of wildlife seen outside of the standardized surveys. All 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 using distance descriptions from known landmarks and/or a hand-held Global Positioning System (GPS) unit.

This level of survey effort (i.e., fall migration season) is not consistent with the pre-construction bird survey efforts being performed at other wind energy projects in other Midwestern states, as it lacks surveys during the winter, spring migration, and summer breeding seasons; per the recommendations given by the WEG (USFWS 2012). However, per Meadowlark's Avian and Bat Protection Plan (ABPP) for the NFWRA prepared in November 2011, WEST conducted avian field surveys through the end of October 2012. A copy of this avian point-count survey report and 2012 results were not provided to Stantec at the time of this report issuance.

2.2 BATS

Publicly available post-construction bat mortality monitoring studies in the Midwest for comparative background information on the adverse impacts on bat species at nearby wind farms were reviewed. In addition, bat species that are likely to occur within the project area were identified based on agency information and scientific reports (Batcon.org 2014).

Several references were used to compile baseline information about the federally listed northern long-eared bat (*Myotis septentrionalis*), including natural history, range of the species within North Dakota and summer and winter habitat preferences. A desktop review of maps and GIS data was performed to evaluate the physical attributes of the project area and sensitive environmental areas within or near the project area that may influence the distribution of the northern long-eared bat (Figures 3 – 7). Examples of physical attributes that could influence bats include project size, habitat characteristics and suitability, topography, infrastructure, and environmental corridors. Examples of sensitive environmental areas include State Natural Areas, State Wildlife Management Areas (WMAs), and National Wildlife Refuges (NWRs).

Based upon published literature on home range size (Owen et al. 2003; Carter and Feldhamer 2005; Lacki et al. 2009) and USFWS guidance on the northern long-eared bat (USFWS 2014b), for the purposes of assessing bat summer habitat suitability (i.e., non-winter), woodlands within the project area and within a one-mile buffer (1.6 kilometers) of the project area were categorized into three groups using GIS tools (refer to Figure 7):

- Small Foraging/Roosting Areas - Woodlands 15 to 49 acres in size.
- Commuting/Travel Corridors - Woodlands less than 15 acres in size, but within 1,000 feet (304.8 meters) of foraging/roosting areas.
- Unsuitable Due to Lack of Connectivity - Woodlands less than 15 acres in size and not within 1,000 feet (304.8 meters) of foraging/roosting areas.

For comparison, the USGS National Gap Analysis Program (GAP) data were used to determine the known or predicted occurrence of habitat for the northern long-eared bat within the project area (USGS 2015). GAP distribution models represent the areas where species are predicted to occur based on habitat associations. GAP distribution models show the spatial arrangement of environments suitable for occupation by a species (USGS 2015). Refer to Section 4.2 for the results of these habitat assessments.

Per Meadowlark's ABPP for the NFWRA prepared in November 2011, WEST conducted bat surveys through the end of October 2012. However, a copy of this bat acoustical monitoring report and survey results, if available, were not provided to Stantec at the time of this report

issuance. Therefore, Tier 3 investigation results for bat species have not been provided in this report.

2.3 EAGLES AND RAPTORS

To assess the Project's potential impact on bald and golden eagles and other raptors, several publicly available post-construction bird mortality monitoring studies in the Midwest were reviewed. The USGS BBS and NDGFD SCP websites were also reviewed. Then, desktop habitat assessments for designated natural resource areas and suitable habitat potentially occurring within the project area for these species were conducted using GIS data. These GIS data sources are outlined in further detail in Section 3.0. Refer to Section 4.3 for the results of these habitat assessments.

In addition, although no eagle use surveys were conducted for the NFWRA, WEST conducted a raptor stick nest survey in spring 2011 (WEST 2011a). The objective of the raptor nest surveys was to locate and record potential raptor nests that may be subject to disturbance and/or displacement effects by wind-energy facility construction and/or operation (WEST 2011a). Surveys were focused on large, stick nest structures, and did not include searches for cavity nests or nests on the ground.

Two survey methods were used during April and May 2011 to document potential raptor nests within and adjacent to the NFWRA. A two-mile (3.2 kilometers) buffer surrounding the NFWRA, which includes a majority of the proposed project area, was surveyed by fixed-winged aircraft to document large nest structures indicative of eagle nests (Meadowlark 2011). This buffer area was flown at an approximate height of 200 feet (61 meters) along approximately 0.5-mile (0.8 kilometer) spaced intervals. A GPS unit was used to record potential raptor stick nest locations.

A second type of raptor nest survey was ground based and completed by driving and walking along public roads and accessible private roads within the NFWRA and a one-mile (1.6 kilometer) buffer surrounding the NFWRA boundary during leaf-off conditions, looking for raptor nest structures within areas of suitable habitat (e.g., trees, power line poles, etc.). Potential raptor nests were recorded on aerial photo maps and digitized with GIS software. Other information recorded included nest status, nest height, and nest material. Refer to Figure 8 and Section 4.3 for the results of these surveys.

2.4 PRAIRIE AND SAGE-GROUSE

Publicly available resources were reviewed, including the NDGFD website, USFWS website, and the USGS Northern Prairie Wildlife Research Center (NPWRC) website to determine the current distribution and known habitat range of these species (NDGFD 2015; USFWS 2013c; USGS 2013).

In addition, WEST conducted a raptor stick nest survey in spring 2011 (WEST 2011a). The objective of the aerial sharp-tailed grouse (*Tympanuchus phasianellus*) 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 NFWRA, which includes a majority of the proposed project area, during peak lekking activity (i.e., early April through mid-May). Survey methodology was similar to that used for greater prairie chickens (*Tympanuchus cupido*) in Oklahoma (Martin and Knopf 1981).

North/south running transects started 0.5 mile (0.8 kilometer) outside the east/west NFWRA boundary and were placed at approximate 0.25 mile (0.4 kilometer) intervals, covering the

entire NFWRA, which includes a majority of the proposed project area (Figure 9; WEST 2011a). The length of each transect varied based on the project boundary but each transect extended 0.5 mile (0.8 kilometer) beyond the boundary. Each transect was flown with fixed-winged aircraft at an approximate height of 100 to 150 feet (30 – 46 meters) above ground level during three separate survey periods. Surveys were conducted approximately two weeks apart and occurred during normal sharp-tailed grouse lekking activity on the northern plains.

Surveys began between 15 minutes before sunrise depending on cloud cover and lasted for up to two hours. The location of any sharp-tailed grouse observed was recorded with a GPS unit. The number, activity, and lek status at each location was recorded.

Refer to Figure 9 and Section 4.3 for the results of these surveys.

2.5 FEDERALLY AND STATE-LISTED SPECIES

As part of this investigation, a list of federally threatened or endangered species potentially occurring in McHenry County was obtained from the USFWS Endangered Species website (USFWS 2015a).[2] As discussed in Section 1.2, North Dakota does not have a state endangered or threatened species list. Desktop habitat assessments for these federally listed species potentially occurring within the project area were conducted.

A number of information sources were reviewed to determine the habitat preferences of rare species (threatened, endangered, and candidate species or SCP) potentially occurring within the project area. These sources included:

- NDGFD Website (NDGFD 2015)
- NDGFD Species of Conservation Priority (NDGFD 2012)
- USFWS Endangered Species website (USFWS 2015a)

Then, desktop habitat assessments for designated natural resource areas and suitable habitat potentially occurring within the project area for these species were conducted using GIS data. These GIS data sources are outlined in further detail in Section 3.0. Refer to Section 4.5 for the results of these habitat assessments.

2.6 SPECIES OF HABITAT FRAGMENTATION CONCERN

Habitat fragmentation is defined as the separation of a block of habitat for a species into segments, such that the genetic or demographic viability of the populations surviving in the remaining habitat segments is reduced; and risk, in this case, is defined as the probability that this fragmentation will occur as a result of the Project (USFWS 2012).

The USFWS North Dakota Field Office website was reviewed for a list of species of habitat fragmentation concern in the state of North Dakota (USFWS 2013c). Then, desktop habitat assessments for designated natural resource areas and suitable habitat potentially occurring within the project area for these species were conducted using GIS data. These GIS data sources are outlined in further detail in Section 3.0. Refer to Section 4.6 for the results of these habitat assessments.

[2] http://www.fws.gov/northdakotafieldoffice/county_list.htm

3.0 ENVIRONMENTAL SETTING

A variety of GIS data sources were used in addition to photographs taken by WEST during 2011 field visits to determine the environmental setting within the project area and the surrounding landscape. GIS data included USGS topographic maps, orthophotography (NAIP 2014), the USFWS's National Wetlands Inventory (NWI) digital data, the USGS's National Hydrography Dataset (NHD; USGS 2014), national land cover data (NLCD 2006; Fry et al. 2011) prepared by the Multi-Resolution Land Characteristics (MRLC) Consortium, the National Conservation Easement Database (NCED; NCED 2014) and the USGS GAP prediction habitat and Protected Areas Data Portal (PAD-US; USGS 2015).

Refer to Sections 3.1 to 3.3 for an overview of the land cover, wetlands, streams, and designated natural areas in the project area. In addition, Figures 1 through 5 illustrate this information.

3.1 GENERAL LANDSCAPE CHARACTERISTICS

The percent of each land cover type present within the project area was determined using NLCD and GIS tools (Figure 3). The project area is generally flat with rolling hills.

The project area is approximately 11,387 acres in size (Figure 3; NLCD 2006). Combined, cultivated agricultural lands, hay/pasture land, and grassland (herbaceous) are the predominant land cover types within the project area, comprising approximately 9,307 acres (81.7%) (Table 1, Figure 3).

Table 1. Land cover type and amount within the proposed project area determined through analysis of land cover data (NLCD 2006).

Land Cover Type	Total Acres	Percent of Total
Agricultural Lands (Cultivated Crops)	3,877.2	34.0
Hay/Pasture Land	3,784.2	33.2
Barren Land	0.0	0.0
Developed Lands (Open Space and Low Intensity Development)	411.4	3.6
Forest (Deciduous and Evergreen)	218.8	1.9
Grassland (Herbaceous)	1,645.4	14.5
Scrub-shrub Land	0.0	0.0
Open Water	592.8	5.2
Emergent Herbaceous Wetlands	792.3	7.0
Woody Wetlands	64.8	0.6
Total[1]	11,386.9	

[1] The total reflects actual values and does not account for rounding error in the table above.

The USGS Land Cover Institute (LCI) defines "herbaceous" cover (categorized as grassland in Table 1) broadly as areas dominated by upland grasses and forbs (i.e., herbaceous vegetation accounts for 75-100% of cover) that are not subject to intensive management, but are often used for grazing (USGS LCI 2012). This land cover type could consist of prairie land.

Hay/pasture land is defined by the LCI as areas of grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops (USGS LCI 2012).

The LCI categorizes scrub-shrub land separately from wetlands (i.e., emergent herbaceous and woody) as areas dominated by shrubs (i.e., shrub canopy accounts for 25-100% of cover) of natural or semi-natural woody vegetation with aerial stems, generally less than 19.6 feet (6 meters) tall; including both evergreen and deciduous species of true shrubs and young or stunted trees (USGS LCI 2012).

The LCI categorizes wetlands as areas where the soil or substrate is periodically saturated or covered with water; with emergent herbaceous categorized as wetland areas where perennial herbaceous vegetation accounts for 75 to 100 percent of the cover and woody categorized as wetland areas where forest or scrub-shrub vegetation accounts for 25 to 100 percent of the cover (USGS LCI 2012). No woody wetland was identified by the NLCD within the project area.

Site photographs taken by WEST in 2011 illustrate the project area is highly agricultural and hay/pasture land, with grassland, wetlands, and open water (Appendix A). The project area also contains tree lines/windbreaks and small sections of forest, generally located in the northern portion of the project area, near Blacktail Coulee and its unnamed tributaries (Figures 2 – 3).

3.2 WETLANDS AND STREAMS

Broad-scale information concerning wetlands is based on the USFWS's NWI data (Figure 4), land cover mapping (Figure 3), and aerial photography. On behalf of Meadowlark, HDR Engineering conducted a field reconnaissance of wetlands and streams in October 2011 for the NFWRA, which includes most of project area for the proposed Project (HDR Engineering 2011). HDR Engineering prepared a map of potential wetlands and streams within the NFWRA generated as a result of field investigation for use by Meadowlark in micro-siting project infrastructure and as an initial step in determining the potential for impacts to wetlands and other Waters of the U.S (WOUS; i.e., streams) resulting from the Project (HDR Engineering 2011). A formal delineation of wetland boundaries was not conducted as part of this initial investigation.

Stantec was unable to obtain shapefile data from these field surveys, so this report is limited to information from publicly available resources and a review of the 2011 survey maps; no 2011 survey results are shown on the project figures or included in the summary tables.

Based upon NWI data, approximately 844.8 acres (7.4%) of the project area is wetland and deepwater habitat (Table 2). Of the wetland areas, the dominant wetland type is palustrine emergent (PEM) wetland. The wetlands are typically isolated and found within pasture land or grassland. Whereas, the NLCD identifies 1,449.9 acres (12.7%) of open water, emergent herbaceous wetland, and forested wetland areas within the project area. These numbers are similar; discrepancies between the two data sources may result from differences in the analysis process to determine wetland presence. Table 2 provides a summary of the NWI data within the project area; Figure 4 illustrates NWI data within the project area.

Table 2. Wetland types present within the project area through analysis of the National Wetlands Inventory

Wetland Type	Total Acres	Percent of Total
Emergent Wetland[1,2]	656.1	77.7
Forested Wetland	0.0	0.0
Scrub-Shrub Wetland	0.0	0.0
Pond	126.9	15.0
Lake	61.9	7.3
Riverine	0.0	0.0
Total[3]	844.8	

[1] Contains approximately 1.1 acres of PEM/palustrine forested (PFO) wetland complex.
[2] Contains approximately 167.0 acres of PEM/palustrine aquatic bed (PAB; ponds) wetland complex.
[3] The total reflects actual values and does not account for rounding error in the table above.

Based upon NWI data, the project area contains one deepwater habitat type (water depth >6.6 feet [2 meters]): Lake; and three Palustrine wetland types (water depth <6.6 feet [2 meters]): PEM, palustrine forested (PFO), and palustrine aquatic bed (PAB) wetlands. For the purposes of the NWI, the USFWS defines PAB wetlands as: "[wetland] habitats dominated by plants that grow principally on or below the surface of the water for most of the growing season in most years" (USFWS 1992). PAB wetlands represent a diverse group of plant communities that require surface water for optimum growth and reproduction; the plants are either attached to the substrate or float freely in the water above the bottom or on the surface (USFWS 1992). In Table 2, PAB wetlands are categorized as ponds. Based upon NWI data, approximately 5.8 percent (656.1 acres) of the project area is potentially jurisdictional wetland (i.e., PEM or PFO types) under Section 404 of the Clean Water Act. Farm ponds (PAB) and deepwater habitat types are generally not jurisdictional, but may contain wetland fringe.

Based upon review of the USGS Topographic layer (Figure 2) and the NHD, named streams within the project area include Blacktail Coulee, Spring Coulee, and Wintering River. Woodlands are associated with these waterways and their unnamed tributaries; however, in most cases the streams are not entirely wooded. Upland grass and shrub buffers are present along some streams within the project area.

3.3 DESIGNATED NATURAL RESOURCE AREAS

Upon review of the NCED (NCED 2014) and the USGS's PAD-US (USGS 2015), one WMA is located within the project area (USGS 2015). The WMA is owned by the USFWS (Figures 4 and 5) and are likely protected by the Grassland Easement Program (GEP) established in 2000 (USFWS 2015d). Based on the USFWS Refuge System Planning website[3], the GEP preserves quality, mixed-grass prairie habitat in the Missouri Coteau region by 1) protecting native mixed-grass prairie from agricultural conversion, 2) protecting wetlands from siltation and chemical contamination, and 3) promoting ecosystem management to maintain and enhance the historical biodiversity of native mixed-grass prairie (USFWS 2015d). The USFWS will preserve mixed-grass prairie primarily through the purchase of perpetual grassland easements and associated wetland easements from willing sellers. Based on a review of the Environmental Assessment (EA) for the *Proposed*

[3] http://www.fws.gov/mountain-prairie/refuges/lpp_ndw.php

North Dakota Wildlife Management Area Grassland Easement Program, the project area appears to be located within the Missouri Coteau, a hilly region formed by glacial deposition that lies to the north and east of the Missouri River (USFWS 2000). Historically, millions of waterfowl nested on the Missouri Coteau, shorebirds stopped over during migration, and grassland songbirds completed their life cycles among a diversity of invertebrates, amphibians, reptiles, and small mammals (USFWS 2015b). The Missouri Coteau region extends from the northwest corner to the south-central portion of North Dakota.

Two state land tracts are located adjacent to, and may be located within, the southwest portion of the project area: 231043 and 231793. These tracts are owned by the North Dakota Department of Trust Lands (NDDTL) and are managed for multiple uses (e.g., mining, logging, off-highway vehicle [OHV] use; USGS 2015).

Although there is no federally recommended guidance or policy regarding the distance around a wind farm project to conduct a desktop review for natural resource areas, Stantec typically consults publicly available resources within a 15-mile buffer of a project area. Five NWRs (i.e., Camp Lake, Cottonwood Lake, Lake Nettie, Lake Otis, and Wintering River); 14 WMAs; and 4 Waterfowl Production Areas (WPAs; i.e., McHenry County, McLean County, Sheridan County, and Ward County) are located within a 15-mile (24.1-kilometers) buffer of the project area. In addition, 37 state land tracts (owned by the NDDTL or the NDGFD) are located within a 15-mile (24.1-kilometers) buffer of the project area. Lake Sakakawea is a man-made reservoir managed by the U.S. Army Corps of Engineers located approximately 13 miles (20.9 kilometers) southwest of the project area. One Wetland Reserve Program easement is located approximately six miles (9.7 kilometers) northeast of the Project.

No other designated natural resource areas were identified within publicly available databases for McHenry County (Figure 5).

4.0 RESULTS

4.1 MIGRATORY BIRDS

In the Midwest, publicly-available estimates of bird mortality at wind energy facilities range from 0.20 to 8.2 birds/MW/year (Table 3). The number of avian fatalities at wind energy facilities is generally low when compared to the total number of birds detected at these sites (Erickson et al. 2002).

No particular species has been identified as incurring significantly greater numbers of fatalities than other species which is likely due to differences in species abundance, use of habitat, and habitat availability at wind facilities. Passerines (i.e., songbirds), a group of related species of birds representing over one-half of all bird species, both resident and migrant, represent the majority (approximately 75%) of mortalities at turbines nationwide (Erickson et al. 2002, Johnson et al. 2002) and result in spring and fall peaks of bird mortality rates at most wind energy facilities due to migration (Johnson et al. 2002). Although waterbird (a group of bird species consisting of waterfowl, shorebirds, and seabirds) mortality at wind energy facilities has been highly variable, national research has demonstrated that waterbirds rarely collide with inland turbines (Everaert 2003, Kingsley and Whittam 2007 as cited in NWCC [2010]). Raptor mortality rates at Midwest sites have been very low; generally limited to one or two carcasses found per study (Poulton 2010).

Table 3. Results of publicly available post-construction bird mortality monitoring studies in the Midwest.

Study	State	Year	Birds/MW/Year[1]	Citation
Wessington Springs	SD	2009	8.2	Derby et al. 2010a[2]
Blue Sky Green Field	WI	2008-2009	7.17	Gruver et al. 2009
Buffalo Ridge Phase III	MN	1999	5.92	Johnson et al. 2000
Moraine II	MN	2009	5.5	Derby et al. 2010b[2]
Buffalo Ridge I	SD	2009-2010	4.9	Derby et al. 2010c[2]
Buffalo Ridge Phase I	MN	1996	4.24	Johnson et al. 2000
Winnebago	IA	2009-2010	3.90	Derby et al. 2010d[2]
Buffalo Ridge Phase II	MN	1999	3.57	Johnson et al. 2000
Buffalo Ridge Phase I	MN	1998	3.20	Johnson et al. 2000
Buffalo Ridge Phase I	MN	1997	2.60	Johnson et al. 2000
NPPD Ainsworth	NE	2006	1.63	Derby et al. 2007
Buffalo Ridge Phase I	MN	1999	1.44	Johnson et al. 2000
Elm Creek	MN	2009-2010	1.4	Derby et al. 2010e[2]
Top of Iowa	IA	2004	1.07	Jain 2005
Buffalo Ridge Phase II	MN	1998	0.61	Johnson et al. 2000
Top of Iowa	IA	2003	0.49	Jain 2005
Crescent Ridge	IL	2005-2006	0.20	Kerlinger et al. 2007
Arithmetic mean of estimated bird fatalities/MW/year:			3.30	

[1] Estimations based on available study periods within a year-long period.

[2] As cited in Strickland et al. 2011

Based upon land cover data, approximately 1,113.3 acres (8.8%) of the project area are wetland; approximately 756.4 acres (6.0%) are open water; approximately 1,840.7 acres (14.5%) are grassland; and approximately 207.4 acres (1.6%) are forested. Combined, these land cover types constitute approximately 30.9 percent (3,917.8 acres) of the project area (Table 1; Figure 3). Comparatively, based upon NWI data, approximately 945.7 acres (7.5%) of the project area are wetland and approximately 226.8 acres (1.8%) are lakes and ponds; which combined constitutes approximately 9.3 percent (1,172.6 acres) of the project area (Table 2; Figure 4). The riparian corridors and wetlands within the project area may contain suitable avian migration stopover habitat; also, grassland within the project area may provide suitable nesting habitat for birds. In addition, land cover data indicate approximately 4,751.4 acres (37.5%) of the project area is hay/pasture land. Hay/pasture land may provide limited suitable habitat for nesting birds, depending on the frequency of grazing use and the timing of hay cutting. Therefore, there is potential for migratory birds to be present within the project area during the spring, summer, and fall. A few species may winter in the project area.

The results below are summarized from the *Fixed-Point Survey Interim Report* for pre-construction avian surveys at the NFWRA in fall 2011 (WEST 2012), which includes 10,973 acres (96.4%) of the proposed project area.

A total of 113 20-minute fixed-point bird use surveys were conducted within the NFWRA during 12 fall visits from September 1 through November 15, 2011. During four visits, not all survey points were accessible due to impassible roads/trails. A summary of the report results is provided below:

- A total of 37 unique bird species were observed during fixed-point bird use surveys, totaling 2,282 individual birds. Also, 4 unidentified bird species and/or bird species types were documented totaling 21 individuals.

- Waterfowl were the most abundant bird type observed, accounting for 67.0 percent of all observations. This was primarily due to relatively high numbers of Canada geese (*Branta canadensis*; 966 individuals) and snow geese (*Chen caerulescens*; 434 individuals).

- Rails/coots (represented only by the American coot [*Fulica Americana*] at the NFWRA) were the second most commonly observed bird type (342 individuals; 15.0% of total observations) while passerines were the third most abundant bird type observed in the study area, representing 10.6% of all observations.

- A total of five diurnal raptor species were observed, accounting for 1.2% of all individual birds recorded. Red-tailed hawk (*Buteo jamaicensis*) and northern harrier (*Circus cyaneus*) were the most commonly observed raptor species.

- Six sensitive species were recorded during fixed-point bird use surveys:
    - Bald eagle – BFEP and state Level II SCP
    - Loggerhead shrike (*Lanius ludovicianus*) – USFWS bird of conservation concern (BCC) and a state Level II SCP
    - Northern harrier – state Level II SCP
    - Redhead (*Aythya Americana*) – state Level II SCP
    - Sharp-tailed grouse – state Level II SCP
    - Swainson's hawk (*Buteo swainsoni*) – state Level I SCP

  Of these sensitive species, the sharp-tailed grouse had the highest number of observations at the NFWRA (26 observations).

- The interim report did not provide information on flight altitudes of bird species observed or details standardized to time intervals to be used to compare with pre-construction surveys at other Midwest wind farms.

Table 4 provides the results of pre-construction avian surveys at proposed wind energy facilities within the Midwest, including: Midwest at Glacier Hills Wind Energy Facility (Cutright 2009), Forward Energy Center (Kerlinger et al. 2007), Ledge Wind Resource Area (Derby et al. 2010), Cedar Ridge Wind Farm (Guarnaccia and Kerlinger 2008), and Blue Sky Green Field Wind Energy Project (Cutright 2006).

These studies did not all follow the same design and methodology for point counts, so results were standardized to 10-minute observation periods by dividing the total number of birds observed by the total number of survey hours, and then dividing by six to get the average number of birds observed within a 10-minute period. It is important to note that the survey plots may have varied in size and points may have each been surveyed for less-than or greater-than 10-minute periods, in addition to other potential differences in survey design.

Table 4. Summary of pre-construction avian surveys at proposed wind energy facilities in agricultural landscapes in the Midwest, with observations standardized to 10-minute intervals.

Facility Name	Observations/10 minutes
Glacier Hills Wind Energy Facility	80.5
Blue Sky Green Field Wind Energy Project	49.7
Cedar Ridge Wind Farm	32.1
Ledge Wind Resource Area	25.1
Forward Energy Center	11.8
Highland Wind Energy Project	9.5

The interim results of the 2011 fixed-point bird survey for the NFWRA are limited to one migration season and therefore cannot provide sufficient comparison as to whether the proposed project area has a lower or higher level of bird activity when compared to other pre-construction avian studies in the region. However, the NFWRA results had relatively low species richness, with only 37 unique bird species and 4 unidentified bird species observed. Glacier Hills reported 151 species (Cutright 2006), and Cedar Ridge reported 120 species (Guarnaccia and Kerlinger 2008). Again, these studies differed in design which may account for some of the differences in species richness.

USFWS Birds of Conservation Concern

The USFWS lists 27 species as BCC within the U.S. portion of the Bird Conservation Region (BCR) – Prairie Potholes Region (BCR 11). This list of birds of conservation concern includes the bald eagle and Peregrine falcon (*Falco peregrinus*), which were delisted from the ESA. Although limited, there is potential for some of these species' habitat to occur within the project area, including: hardwood forests and forest openings, wetlands, pastures, hayland and fence row. In addition, a number of these species may migrate through the project area.

Two of the 27 BCC species for the Prairie-Potholes Region were observed during the fall 2011 fixed-point bird surveys at the NFWRA (i.e., bald eagle and Swainson's hawk; WEST 2012). In addition, the loggerhead shrike was observed at the NFWRA; although this species is not listed for the Prairie-Potholes Region, it is a USFWS listed BCC in the adjacent BCR - Badlands and Prairies (BCR 17).

USGS Breeding Bird Survey

The North American BBS is an international avian monitoring program started in 1966 and is used to track the status and trends of North American bird populations (Saur et al. 2014). Each BBS survey route is 24.5 miles (39.4 kilometers) long with stops at 0.5-mile (0.8 kilometer) intervals. Each year at the height of breeding season, typically the month of June, bird population data are collected at each stop using a three-minute point count. During the count, every bird seen within a 0.25-mile (0.4 kilometer) radius or heard is recorded (Saur et al. 2014).

Per a review of the USGS digital data, no BBS routes occur within the project area (Figure 8). The Denbigh Route (64028) is the closest BBS route to the project area, located approximately 20 miles (32.1 kilometers) to the northeast.

North Dakota Species of Conservation Priority

The North Dakota SCP list contains several species of migratory birds, including waterfowl, passerines, and raptors. Based upon the known geographic range of these species and a desktop habitat assessment, it is anticipated that 19 Level I – High Conservation Priority migratory bird species may be present within or near the project area: American bittern (*Botaurus tentiginosus*), American white pelican (*Pelecanus eryhrorhynchos*), Baird's sparrow (*Ammondramus bairdii*), black tern (*Chlidonias niger*), black-billed cuckoo (*Coccyzus erythropthalmus*), chestnut-collared longspur (*Calcarius omatus*), ferruginous hawk (*Buteo regalis*), Franklin's gull (*Larus pipixcan*), grasshopper sparrow (*Ammondramus savannarum*), horned grebe (*Podiceps auritus*), lark bunting (*Calamospiza melanocorys*), marbled godwit (*Limosa fedoa*), Nelson's sharp-tailed sparrow (*Ammondramus nelsonii*), Sprague's pipit (*Anthus spragueii*), Swainson's hawk, upland sandpiper (*Bartramia longicauda*), willet (*Catoptrophorus semipalmatus*), Wilson's phalarope (*Phalaropus tricolor*), and yellow rail (*Columicops noveboracensis*). As discussed in Section 1.2, these species are not afforded any legal protection by state regulations; however, the NDGFD implements conservation activities that directly benefit these species.

Three of the 100 SCP for North Dakota were observed during the fall 2011 fixed-point bird surveys at the NFWRA (i.e., bald eagle, northern harrier, and Swainson's hawk; WEST 2012).

4.2 BATS

A total of 11 species of bats occur in North Dakota. Six bat species have geographic distributions that include McHenry County (Batcon.org 2014; Table 5). One species, the northern long-eared bat, is a federally listed threatened species.

All six bat species use woodland habitat for feeding or roosting at some time during the year. In addition, many species of bats feed along stream corridors or over water. Several of the more common species, such as the little brown bat and big brown bat are known to roost in attics or the peaks of other large buildings. Natural habitat features or resource areas that typically attract bats are limited within the project area. However, large outbuildings associated with agricultural settings may provide suitable roosting locations for some of the more common bat species. Based upon the summer habitat categorization method described in Section 2.2, suitable bat summer habitat (i.e., potential roosting or foraging habitat, and commuting or travel corridors) is present within the project area and a one-mile (1.6 kilometers) buffer of the project area (Table 7; Figure 7). However, the majority (72.2%) of woodland within the project area

alone is considered to be unsuitable bat summer habitat due to a lack of connectivity with larger blocks of suitable summer roosting/foraging habitat (Table 7; Figure 7). Due to the predominance of rowcrop agriculture, hay/pasture land, and grassland, and a highly fragmented landscape within the project area, the presence of suitable summer bat habitat is likely limited and confined primarily to riparian and stream corridors.

Table 5. Abundance and winter habits of North Dakota bat species with the potential to occur in McHenry County.

Scientific Name	Common Name	Abundance[1]	Winter Habits
Myotis lucifugus	Little Brown Bat	Common	Short Distance Migrants (<186 mi)
Myotis septentrionalis	Northern Long-eared Bat	Common	Short Distance Migrants (<186 mi)
Lasionycteris noctivagans	Silver-haired Bat	Common	Long Distance Migrants (>311 mi)
Eptesicus fuscus	Big Brown Bat	Common	Short Distance Migrants (<186 mi)
Lasiurus borealis	Eastern Red Bat	Common	Long Distance Migrants (>311 mi)
Lasiurus cinereus	Hoary Bat	Common	Long Distance Migrants (>311 mi)

1 Bat Conservation International, Inc. (BatCon). 2014. Species Profiles: North Dakota. http://www.batcon.org/resources/media-education/species-profiles . Accessed July 15, 2015.

Bats may migrate through the project area during the spring and fall, although spring migration for Myotis species may be concentrated along river/wooded corridors (Hicks et al., 2012). There are no publicly available records of hibernacula in North Dakota for the bat species that could occur within the project area. However, based upon the geology and lack of caves in the project vicinity, it is not anticipated that a natural bat hibernaculum is present within the project area.

4.2.1 Northern Long-eared Bat

Prior to September 2009, no mortality of species listed as threatened or endangered under the federal ESA of 1973 (16 U.S.C. §§1531 et seq.) had been reported in connection with wind energy facilities (Arnett et al. 2008). As documented in publicly available resources at the time of this report issuance, only 36 northern long-eared bat carcasses have been recorded at North American wind-energy facilities (Table 6). The northern long-eared bat was not federally listed or proposed for listing when any of these carcasses were discovered; however, they do provide information on the rarity of northern long-eared bat carcasses, given the large number of wind

energy facilities operating within their geographic range. A summary of the publicly available northern long-eared bat carcasses is provided in Table 6.

Table 6. Results of publicly available northern long-eared bat carcasses at wind energy facilities in the United States and Canada.

Species	Wind Farm	State	Number of Carcasses	Year(s)	Season	Citation
Northern Long-eared Bat	Mountaineer	West Virginia	6	2003	Fall	Kerns and Kerlinger 2004
	Erie Shores	Ontario	6	2007	Summer & Fall	James 2008
	Steel Winds	New York	6	2007	Unknown[1]	Grehan 2008
	Noble Wethersfield	New York	6	2010; 2011	Summer; Fall	Kerlinger et. al 2011 Jain et al. 2011
	Meyersdale	Pennsylvania	2	2004	Fall	Arnett et al. 2005 Kerns et al. 2005
	Ripley	Ontario	2	2008	Fall	Jacques Whitford 2009
	PGC site 2-14[2]	Pennsylvania	1	Unknown	Unknown	J. Taucher, PGC, pers. comm.
	PGC unknown site[2]	Pennsylvania	1	Unknown	Unknown	J. Taucher, PGC, pers. comm.
	Kingsbridge 1	Ontario	1	2006	Fall	Stantec Ltd. 2007
	Mt. Storm	West Virginia	1	2008	Fall	Young et al. 2009
	Ellenburg	New York	1	2008	Unknown[3]	Jain et al. 2009
	Fowler	Indiana	1	2009	Fall	WEST 2013
	Cohocton and Dutch Hill	New York	1	2010	Summer	Stantec 2011
	Criterion	Maryland	1	2011	Summer	Young et al. 2013

[1] New York State Department of Environmental Conservation identified the bat species for this survey and provided the information via pers. comm. with WEST; species were not included in the original study report.
[2] Sites participating in the Pennsylvania Game Commission Wind Energy Voluntary Cooperation Agreement are not identified by name and no information on timing is available.
[3] This carcass was an incidental find, and no information on timing was available in the report.

Refer to Section 4.5.2.3 for a detailed habitat assessment of the northern long-eared bat within the project area.

4.3 EAGLES AND RAPTORS

Both the bald eagle and golden eagle are listed as Level II Species of Conservation Priority in North Dakota. The NDGFD implements conservation actions that benefit these species; however, they are afforded no legal protection under state regulations. However, bald and golden eagles are protected under the federal BGEPA.

Bald eagles prefer large rivers and lakes bordered with mature stands or old-growth trees such as cottonwood; breeding habitat often includes some type of edge and relatively open canopy (NDGFD 2012). Nests are usually built within tall, living trees typically less than 1.2 miles (2 kilometers) from open water (NDGFD 2012). In 2009, the NDGFD biologists estimated that 66 known nest sites were occupied by bald eagles within North Dakota (Johnson 2010).

Woodland adjacent to Blacktail Coulee may provide suitable nesting habitat for eagles within the project area, and if present, livestock operations located in the vicinity of the project area may provide a food source, thereby attracting eagles to the project area year-round.

One bald eagle was observed during the fixed-point surveys for the NFWRA in fall 2011 (WEST 2012). No eagle use surveys have been performed at the project site. However, WEST conducted a raptor stick nest survey of the NFWRA in spring 2011. Eighteen potential raptor stick nests were documented within a one-mile buffer (1.6 kilometers) of the NFWRA, 12 of which are located within the proposed project area (Figure 8). However, none of these identified nests had the structure consistent with that of an eagle nest (WEST 2011a).

The golden eagle's known geographic range for breeding and year-round distribution does not include North Dakota; however, the western portion of North Dakota (including the project area) is known to provide non-breeding habitat for golden eagles (DeLong 2004). In addition, golden eagles are known to migrate throughout the continental U.S. during winter, and may migrate through the project area (USFWS 2011). Therefore, golden eagles may be present within the project area.

No golden eagles were observed during the fixed-point count survey for the NFWRA in fall 2011 (WEST 2012). Of the 18 raptor nests identified in spring 2011, 4 were active (one red-tailed hawk nest and the other three were species unknown), 12 were inactive, and 2 nests could not be determined active or inactive, but were probable red-tailed hawk nests.

Nine raptor species are listed as North Dakota SCP: bald eagle, burrowing owl (*Athene cunicularia*), ferruginous hawk, golden eagle, northern harrier, Peregrine falcon, prairie falcon (*Falco mexicanus*), short-eared owl (*Asio flammeus*), and Swainson's hawk. Due to the presence of grassland, wetland, open water and forest, it is anticipated that project area may contain suitable habitat for all of these raptor species.

Red-tailed hawks and northern harriers were the most common raptor species observed during the fixed-point avian surveys in fall 2011 (WEST 2012). In addition, Swainson's hawk was observed during the fall 2011 survey. It is anticipated that red-tailed hawks, and other raptor species during migration, may occur within the project area.

4.4 PRAIRIE AND SAGE-GROUSE

Prairie and sage-grouse include sharp-tailed grouse, greater prairie-chickens, lesser prairie-chickens (*Tympanuchus pallidicinctus*), greater sage-grouse (*Centrocercus urophasianus*) and

Gunnison's sage-grouse (*Centrocercus minimus*). The project area does not fall into the historic or current geographic range of the lesser prairie-chicken (Vodehnal and Haufler 2008) or the Gunnison's sage-grouse (USFWS 2014a). The historic geographic ranges of the greater sage-grouse and greater prairie-chicken included North Dakota and the project area; however neither species' current geographic range includes the project area (Rowland 2004; Vodehnal and Haufler 2008).

The sharp-tailed grouse's current distribution includes the project area (Vodehnal and Haufler 2008); in addition, 26 observations of sharp-tailed grouse within the NFWRA occurred during the fixed-point bird surveys in fall 2011 (WEST 2012).

On behalf of Meadowlark, WEST conducted a sharp-tailed grouse lek field survey of the NFWRA in spring 2011 (WEST 2011a). A total of 77 individual sharp-tailed grouse were observed along approximately 115.3 miles (185.5 kilometers) of transects (WEST 2011a). Two probable leks were documented within 0.5 mile (0.8 kilometer) of the NFWRA western boundary while one probable and one possible lek were recorded within the NFWRA (Figure 9; WEST 2011a). Other observations of individual birds were also recorded but do not constitute a lek. All four probable and possible leks are located within the proposed project area (Figure 9).

4.5 FEDERALLY AND STATE-LISTED SPECIES

4.5.1 Rare Plants

As discussed in Section 1.2, North Dakota does not have a state endangered or threatened species list. Per the USFWS Endangered Species website, no federally listed plant species have geographic ranges that include McHenry County.

4.5.2 Wildlife

As discussed in Section 1.2, North Dakota does not have a state endangered or threatened species list.

Per a review of the USFWS Endangered Species website, there are six federally listed wildlife species with geographic ranges that include McHenry County:

- Dakota skipper (*Hesperia dacotae*) – Threatened
- Gray wolf (*Canis lupus*) – Endangered
- Northern long-eared bat – Threatened
- Piping plover (*Charadrius melodus*) – Threatened
- Rufa red knot (*Calidris canutus rufa*) – Threatened
- Whooping crane (*Grus americana*) – Endangered

In addition, designated critical habitat for the federally threatened Dakota skipper is located within McHenry County and designated critical habitat for the federally threatened piping plover is located within McHenry County. However, based on a review of the USFWS website, no designated critical habitat is located within the project area (USFWS 2015a).

In addition, the Sprague's pipit is a candidate species for federal listing with a geographic range that includes McHenry County. Sprague's pipit is an obligate grassland nester and suitable habitat for this species is found in the project area. This species is not currently afforded any legal protection under the ESA but is protected under the MBTA.

4.5.2.1 Dakota Skipper

The Dakota skipper is a butterfly that was listed as threatened by the USFWS on October 24, 2014 (79 FR 63671 63748).

Habitat Requirements

Dakota skippers are found in native prairie containing a high diversity of wildflowers and grasses. Habitat includes two prairie types: 1) low (wet) prairie dominated by bluestem grasses, wood lily (*Lilium philadelphicum*), harebell (*Campanula rotundifolia*), and smooth camas (*Zygadenus elegans*); and 2) upland (dry) prairie on ridges and hillsides dominated by bluestem grasses (*Schizachyrium scoparium; Andropogon gerardii*), needle grass (*Hesperostipa spartea*), pale purple coneflower (*Echinacea angustifolia*), upright coneflower (*Ratibida columnifera*) and blanket flowers (*Gaillardia sp.*; USFWS 2015a). Both of these habitat types are unlikely to be reestablished on a site that has been plowed.

Range Status

In the U.S., the species occurs in Minnesota, North Dakota, and South Dakota. The species may have once been distributed widely in the northern tallgrass prairie region, but is now extirpated from many sites in the states where it still occurs (USFWS 2015c). The Dakota skipper occurs primarily in fragmented patches of habitat within its current range.

Habitat Assessment

The USFWS does not provide publicly available location data on known occurrences for this species. Based upon land cover data, approximately 1,645.4 acres (14.5%) of the project area is grassland and 792.3 acres (7.0%) of the project area is PEM wetland (Section 3.1); these land types may contain prairie land; in comparison, based on NWI data, approximately 656.1 acres (5.8%) of the project area is PEM wetland (Section 3.2). In addition, approximately 3,784.2 acres (33.2%) of the project area is hay/pasture land (Section 3.1). The Dakota skipper requires undisturbed, high-quality prairie or wetland habitat. Potential impacts to the Dakota skipper should be considered if impacts to prairie or wetland communities will occur as a result of the Project. Areas of grassland, as determined by land cover data, may indicate the presence of prairie land within the project area.

4.5.2.2 Gray Wolf

The gray wolf was listed as endangered by the USFWS on March 11, 1967 (32 FR 4001) for the lower 48 states. The gray wolf was delisted on May 9, 2009 (74 FR 15069-15123); however, due to a federal court decision, wolves in the western Great Lakes area (including Michigan, Minnesota and Wisconsin) were relisted as endangered under the ESA effective December 19, 2014.

In addition, the gray wolf is listed as a North Dakota SCP Level III species (NDGFD 2012).

Habitat Requirements

Gray wolves are found in almost all habitat types: prairie, forest, mountains, and wetlands. In Midwestern states, habitats currently used by wolves range from mixed hardwood-coniferous forests in wilderness and sparsely settled areas, to forest and prairie landscapes dominated by agricultural and pasture lands (NDGFD 2015). Home range sizes of wolves vary, depending on prey density and pack size (NDGFD 2015).

Range Status

According to the NDGFD website, gray wolves are rare in North Dakota with occasional sightings, and there are no known breeding populations (NDGFD 2015).

As cited in the NDGFD website, wolves could recolonize portions of their former range on the prairie in the Dakotas; however, the agricultural dominated landscape (cropland, hayland and pasture) and relatively high densities of roads would facilitate negative encounters between wolves and humans, which could preclude their re-establishment (Licht and Fritts 1994).

Habitat Assessment

Wolves are alert, wary, and highly mobile; direct mortality from collision with construction equipment and operation of the wind farm is unlikely because gray wolves, if present, would likely avoid areas of increased human activity during construction and operation of the Project.

It is unknown whether any denning sites are located within the project area. Based upon land cover data, approximately 283.6 acres (2.5%) of the project area is woodland and forested wetland. The project area may contain suitable habitat for the gray wolf, however it is unlikely that this species will be impacted by the Project.

4.5.2.3 Northern Long-eared Bat

On April 2, 2015, the USFWS published a final rule in the Federal Register designating the northern long-eared bat as a threatened species under the ESA throughout its geographic range, which includes McHenry County in North Dakota. The listing and associated 4(d) rule became effective on May 4, 2015.

In addition, the northern long-eared bat is listed as a North Dakota SCP Level III species (NDGFD 2012).

Habitat Requirements

Winter: Winter habitat includes underground caves and cave-like structures such as abandoned or active mines and railroad tunnels. These hibernacula typically have high humidity, minimal air current, large passages with cracks and crevices for roosting, and maintain a relatively cool temperature (0 - 9 degrees Celsius) (USFWS 2014b).

Spring and Fall: Northern long-eared bats migrate between their winter hibernacula and summer habitat, typically between mid-March and mid-May in the spring and mid-August and mid-October in the fall. They are considered a short-distance migrant (typically 40 - 50 miles [64.4 –

80.5 kilometers]), although their known migratory distances can vary between 5 and 168 miles (8 – 270.4 kilometers) (USFWS 2014b).

Summer: Northern long-eared bats use a wide variety of forested habitats for roosting, foraging and traveling, and may also utilize some adjacent and interspersed non-forested habitat such as emergent wetlands and edges of fields. This species has also been found roosting in structures like barns and sheds (particularly when suitable tree roosts are unavailable). The bats emerge at dusk to forage in upland and lowland woodlots and tree-lined corridors, feeding on insects, which they catch while in flight using echolocation. This species also feeds by gleaning insects from vegetation and water surfaces (USFWS 2014b).

Roosting habitat includes forested areas with live trees and/or snags with a diameter at breast height (DBH) of at least 3 inches (7.6 centimeters) with exfoliating bark, cracks, crevices and/or other cavities. Trees are considered suitable roost trees if they meet those requirements and are located within 1,000 feet (304.8 meters) of another suitable roost tree, woodlot, or wooded fencerow (USFWS 2014b). Maternity habitat is defined as suitable summer habitat that is used by juveniles and reproductive females. The summer maternity season in North Dakota is April 1 through September 30 (USFWS 2014b).

Range-wide Status

The northern-long eared bat is a commonly encountered species throughout the majority of the Midwest, being commonly captured in mist-net surveys (USFWS 2013b). However, they are typically found in small numbers in hibernacula in the Midwest (USFWS 2013b). There are no publicly available records of hibernacula or tracking data for the northern long-eared bat.

Habitat Assessment

Winter: North Dakota GAP data indicate no probable northern long-eared bat winter habitat within the project area (USGS 2015; Figure 6).

Spring and Fall: Little is known about the migration patterns of bats, specifically how they disperse across the landscape during migration. Therefore, it is not possible to accurately predict an individual bat's route during migration. Based on this, migratory risk could exist anywhere within a species' geographic range, and the potential does exist for bats, including northern long-eared bats, to migrate through the project area.

Summer: Land use within the project area is dominated by agricultural land, including cultivated crops and hay/pasture lands, and grassland (81.7% of land cover within the project area), which provides limited foraging habitat for northern long-eared bats that forage primarily in upland and lowland woodlots and tree-lined corridors (USFWS 2014b). Northern long-eared bats are hesitant to traverse large areas of unforested lands (Dr. Russell Benedict, Central College, personal communication); therefore, as many waterways found within the project area do not provide continuous forested corridors across the project area, northern long-eared bat use of the large areas of cropland, grassland, or hay/pastureland within the project area is likely limited. The streams and riparian corridors located within and near the project area could provide foraging habitat and drinking sources for the northern long-eared bat in areas where the stream corridors are wooded (Figure 7).

North Dakota GAP data indicate approximately 12.0 acres of known or probable northern long-eared bat summer habitat within the project area (USGS 2015; Figure 6). To determine potential

summer bat habitat within the project area, woodlands within the project area and a one-mile buffer (1.6 kilometers) were assessed using recent aerial photography and the categorization method outlined in Section 2.2 (Table 7; Figure 7).

Table 7. Summary of Northern Long-eared Bat Summer Habitat Assessment

Location	Suitable Summer Habitat (Roost/ Foraging Areas) (acres)	Suitable Summer Habitat (Commuting/ Travel Corridors) (acres)	Unsuitable as Summer Habitat Due to Lack of Connectivity (acres)	Total Woodland[1] (acres)
Within Project Area	32.3	7.2	102.4	141.9
Outside Project Area but Within 1-mile (1.6 kilometers) Buffer	133.0	33.9	108.3	275.2
Total[1]	**165.3**	**41.1**	**210.7**	**417.1**

[1] Total reflects actual values and does not account for rounding error within the rest of the table.

Based upon the desktop review, suitable northern long-eared bat summer habitat (i.e., potential roosting or foraging habitat, and commuting or travel corridors) is present within the project area (Figure 7). Approximately 165.3 acres (39.6%) of woodland located within the project area and a one-mile (1.6 kilometers) buffer of the project area is considered suitable summer roosting/foraging habitat; of which, the majority (133.0 acres [80.4%]) is located outside of the project area but within a one-mile (1.6 kilometers) buffer of the project area. In addition, approximately 41.1 acres (9.9%) of woodland within the project area and a one-mile (1.6 kilometers) buffer of the project area is suitable summer habitat for bat commuting and travel corridors (Table 10; Figure 7).

Approximately 141.9 acres of woodland are present within the project area alone, of which the majority (72.2%) of woodland is considered to be unsuitable bat summer habitat due to a lack of connectivity with larger blocks of suitable summer roosting/foraging habitat (Table 7; Figure 7).

No field surveys for potential roost trees were conducted as part of this assessment; therefore, it is unknown whether suitable roost trees are found in any of the areas shown on Figure 7. Decrepit and abandoned dwellings, including barns and other structures, may also provide roosting and/or maternity habitat for this species in the absence of tree roosts.

4.5.2.4 Piping Plover

The piping plover was listed under the ESA in 1985 (50 FR 50726-50734); piping plovers nesting in the Great Lakes are listed as endangered; piping plovers nesting along the Atlantic Coasts and in the northern Great Plains of the U.S. and Canada are listed as threatened. All piping plovers on the wintering grounds are considered threatened.[4]

[4] http://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B079

Habitat Requirements

The Northern Great Plains population of piping plovers nest on the shorelines and islands of alkali (salty) lakes in North Dakota and Montana (USFWS 2015b). They nest on sandbar islands and reservoir shorelines along the Missouri River and reservoirs in Montana, North Dakota, South Dakota, and Nebraska. Most of the Northern Great Plains plovers winter along the Texas coast, extending into Mexico (USFWS 2015b).

Range Status

Per the USFWS website, designated critical habitat for piping plover is located within McHenry County, North Dakota. However, no designated critical habitat is located within the project area; the closest designated habitat for piping plover is located approximately 12 miles to the east of the project area (i.e., Spichke WPA).

Habitat Assessment

Based upon land cover data, the project area contains 592.8 acres (5.2%) of open water. Although no designated critical habitat is present within the project area, the presence of open bodies of water may provide suitable breeding habitat for this species. The piping plover may also pass through the project area during migration.

4.5.2.5 Rufa Red Knot

The rufa red knot is a shorebird that was listed as threatened by the USFWS on January 12, 2015 (79 FR 73705-73748).

Habitat Requirements

Rufa red knots breed in the Arctic and migrate to nonbreeding areas in South America. They are also known to occupy nonbreeding habitats along the U.S. Atlantic coast (Delaware Riverkeeper Network et al. 2005). During migration, rufa red knots stop in only a few key sites for feeding. One stopover site frequently visited during migration is the Delaware Bay in New Jersey, with many of the birds having flown directly from wintering habitats in South America. The rufa red knot breeds in drier tundra areas, such as sparsely vegetated hillsides. Outside of breeding season, the rufa red knot is found primarily in intertidal, marine habitats, especially near coastal inlets, estuaries, and bays (USFWS 2013d).

Range Status

The rufa red knot is believed to occur within McHenry County; however, this species is considered to be a rare transient throughout the upper Great Plains region.

Habitat Assessment

The rufa red knot is considered to be a rare transient throughout the Upper Great Plains region, and little is known about its use of stopover sites in the region. As a shorebird species, rufa red knots utilizing any stopover sites in the region would select wetland habitats similar to those selected by other shorebirds such as the interior least tern (*Sterna antillarum*) and piping plover. Since rufa red knot tend to migrate along the Atlantic coast, and are only rare transients in the

Midwestern U.S., the probability of the species occurring in the project area during migration is possible, but unlikely. In the federal agency comment section of the final rule that listed the rufa red knot as a threatened species, the USFWS stated that "[u]nless facilities are constructed at key stopover or wintering habitats, the USFWS does not expect wind energy development to cause significant direct habitat loss or degradation or displacement of rufa red knots from otherwise suitable habitats" (USFWS 2013d). Additionally, rufa red knots tend to migrate between 1,000 and 13,000 feet (0.3 – 4.0 kilometers) in elevation (Smithsonian 1998), which is well above the height of wind turbine rotors. Therefore, it is unlikely that the rufa red knot will utilize the project area or be impacted by the Project.

4.5.2.6 Whooping Crane

The whooping crane was listed as endangered by the USFWS on March 11, 1967 (32 FR 4001). Since then, the USFWS and state agencies have established experimental nonessential populations of whooping crane in various states, changing the federal listing status in those states. However, the whooping crane is still federally listed as endangered in North Dakota.

Habitat Requirements

Whooping cranes breed and nest in wetland habitat in Wood Buffalo National Park in Canada and migrate south though the central Great Plains to winter along the coastal marshes in Texas at the Aransas National Wildlife Refuge (USFWS 2015b). During migration, whooping cranes use a variety of habitats; however wetland mosaics appear to be the most suitable. For feeding, whooping cranes primarily use shallow, seasonally, and semi-permanently flooded palustrine wetlands for roosting, and various cropland and emergent wetlands (USFWS 2015b).

Range Status

Whooping cranes migrate across the Great Plains of the U.S. in the spring and fall of each year. The migration corridor runs in an approximately straight line from the Canadian Prairie Provinces of Alberta and Saskatchewan through the Great Plains states of eastern Montana, North Dakota, South Dakota, Nebraska, Kansas, Oklahoma, and Texas (USFWS 2015b). The complete corridor is approximately 2,400 miles (3,862 kilometers) long by 220 miles (354 kilometers) wide and includes McHenry County, North Dakota (USFWS 2015b). Autumn migration normally begins in mid-September, with most birds arriving on the Texas wintering grounds between late October and mid-November. Whooping cranes migrate south as singles, pairs, in family groups, or as small flocks of three to five birds (USFWS 2015b).

Habitat Assessment

On behalf of Meadowlark, WEST prepared a Whooping Crane Habitat Review for the NFWRA (which contains 96.4% of the proposed project area) in February 2011 (WEST 2011b). In summary, the review outlined the presence of cropland, grasslands, and wetlands within the NFWRA and surrounding areas. In addition, the review stated that the NFWRA and all four review areas (i.e., north, east, south, and west of the NFWRA) are located within the defined (95% of confirmed sightings) whooping crane migration corridor (CWCTP 2009 as cited in WEST 2011b). No whooping cranes were documented within the NFWRA; the closest confirmed sightings (through fall 2010) are located approximately eight miles (13 kilometers) to the west/southwest and northeast of the NFWRA (WEST 2011b). Confirmed whooping crane observations were more prominent to the west of the NFWRA; however, 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 (WEST 2011b). Therefore, even without documented observations within a project area, whooping cranes may still be present.

Based upon land cover data, approximately 1,645.4 acres (14.5%) of the proposed project area is grassland; 792.3 acres (7.0%) of the project area is PEM wetland; and 592.8 acres (5.2%) is open water (Section 3.1); in comparison, based on NWI data, approximately 656.1 acres (5.8%) of the project area is PEM wetland and approximately 188.7 acres (1.7%) are lakes and ponds (Section 3.2). In addition, approximately 3,784.2 acres (33.2%) of the project area is hay/pasture land and approximately 3,877.2 acres (34.0%) is cultivated crop land (Section 3.1).

Although the project area does not contain designated critical habitat for the whooping crane, the Project is located within this species' primary migration corridor. No whooping cranes were observed during the fixed-point bird survey in fall 2011; however, due to the presence of cropland, hay/pasture land, grassland in close proximity to open water and wetland, the project area does contain suitable stopover habitat for the whooping crane. Therefore, this species may be present within the project area during migration.

4.6 SPECIES OF HABITAT FRAGMENTATION CONCERN

The USFWS North Dakota Field Office has listed 11 species of habitat fragmentation concern within North Dakota. All of these species, except for the greater sage-grouse, have known geographic ranges that include McHenry County. An evaluation of suitable habitat within the project area for each of these species based on the desktop review and site photographs provided by WEST during 2011 and 2012 field surveys is provided in Table 8.

Based upon the presence of grassland, hay/pasture land, wetlands, and forest, the project area may contain suitable habitat for all of these species. Two species (i.e., northern harrier and sharp-tailed grouse) were observed during field surveys at the NFWRA in 2011. Refer to Sections 4.3 and 4.4 for additional details.

Table 8. Species of habitat fragmentation concern with the potential to occur in McHenry County.

Common Name (Scientific Name)	Habitat Preference	Habitat Presence within Project Area	Comments
Baird's Sparrow (*Ammodramus bairdii*)	Prefers native prairie, but will utilize Conservation Reserve Program (CRP) grasslands and lightly to moderately grazed pastures.[1]	Potential	Based upon land cover data, approximately 14.5 percent of the project area is grassland and 33.2 percent is hay/pasture land.
Bobolink (Dolichonyx oryzivorus)	Prefers a wide variety of grasslands including native prairie, light to moderately grazed pastures and hay fields. [1]	Potential	Based upon land cover data, approximately 14.5 percent of the project area is grassland and 33.2 percent is hay/pasture land.
Chestnut-collared Longspur (Calcarius ornatus)	Prefers native grasslands recently disturbed by fire, grazing, or mowing with vegetation height <20–30 cm, with minimal litter accumulation. Avoids areas dominated by dense vegetation and plant communities dominated by shrubs and introduced grasses such as Kentucky bluegrass. [1, 2]	Potential	Based upon land cover data, approximately 14.5 percent of the project area is grassland.
Grasshopper Sparrow (Ammodramus savannarum)	Prefers moderately open grasslands and prairies with patchy bare ground. [3]	Potential	Based upon land cover data, approximately 14.5 percent of the project area is grassland.
Greater Prairie Chicken (Tympanuchus cupido)	Historically wide-spread throughout grasslands in North Dakota, but now reduced to two primary breeding populations in Grand Forks County and the Sheyenne National Grasslands. Important breeding habitat characteristics are large open areas of mid- and tall-grass prairie with minimal trees, slightly elevated sites with short and sparse vegetation for booming (i.e., mating) grounds, and relatively dense residual cover for nesting with suitable adjacent brood-rearing habitat. [1, 4]	Unlikely	Based upon land cover data, approximately 14.5 percent of the project area is grassland. However, grasslands are typically isolated tracts surrounded by agricultural land.
Northern Harrier (Circus cyaneus)	Typical habitat includes open wetlands, including wet meadows, lightly grazed pastures; old fields, dry uplands, including upland prairies, and grasslands. [5]	Likely	Based upon land cover data, approximately 14.5 percent of the project area is grassland, 33.2 percent is hay/pasture land, and 7.0 percent is emergent wetland. In addition, this species was observed in the project area during 2011 field surveys.

Common Name (Scientific Name)	Habitat Preference	Habitat Presence within Project Area	Comments
Sedge Wren (Cistothorus platensis)	Breeding habitat includes dense, tall growths of sedges and grasses in wet meadows, hayfields, retired croplands, upland margins of ponds and marshes. [6]	Potential	Based upon land cover data, approximately 14.5 percent of the project area is grassland, 33.2 percent is hay/pasture land, and 7.0 percent is emergent wetland.
Sharp-tailed Grouse (Tympanuchus phasianellus)	Generally occurs in relatively undisturbed mixed-grass prairie. Winter habitat includes forested areas. During mild winters, also uses grain fields and CRP lands. [1, 7]	Likely	Based upon land cover data, approximately 14.5 percent of the project area is grassland and 2.5 percent of the project area is forested (upland forest and woody wetlands). In addition, this species was observed in the project area during 2011 field surveys.
Sprague's Pipit (Anthus spragueii)	Endemic to North American grasslands, predominately found in well-drained areas in open grassland devoid of shrubs and other woody vegetation. With few exceptions, requires large areas of native grasslands with grasses of intermediate height and thickness with moderate litter depths. [1, 8]	Potential	Based upon land cover data, approximately 14.5 percent of the project area is grassland.
Upland Sandpiper (Bartramia longicauda)	In general, uses dry grasslands "with low to moderate forb cover, low woody cover, moderate grass cover, moderate to high litter cover, and little bare ground." [9]	Potential	Based upon land cover data, approximately 14.5 percent of the project area is grassland.

1 Hagen et al., 2005, as cited in USFWS 2013c.
2 Hill and Gould 1997, as cited in USFWS 2013c.
3 Vickery 1996, as cited in USFWS 2013c.
4 Johnson et al., 2011, as cited in USFWS 2013c.
5 Smith et al., 2011, as cited in USFWS 2013c.
6 Herkert et al., 2001, as cited in USFWS 2013c.
7 Connelly et al., 2005, as cited in USFWS 2013c.
8 Robbins and Dale 1999, as cited in USFWS 2013c.
9 Houston et al., 2011, as cited in USFWS 2013c.

5.0 CONCLUSIONS

Based on the results of the biological resources evaluation, Stantec concludes the following in regards to the WEG Tier 3 evaluation (USFWS 2012).

Information was collected for the objectives of WEG Tiers 1 and 2 as part of the analysis in this report; in addition, a Tier II analysis was completed for the NFWRA, which includes a majority of the proposed project area (WEST 2011c).

1. ***Do field studies indicate that species of concern are present on or likely to use the proposed site?***

   Yes, field surveys indicate the presence of migratory birds, bald eagles, raptors, sharp-tailed grouse, federally listed species, and species of habitat fragmentation concern within the project area. No bat acoustical or habitat surveys were completed at the project area, however a desktop review indicated the presence of suitable bat summer habitat within the project area and a one-mile (1.6 kilometers) buffer of the project area.

   Combined, cultivated agricultural lands, hay/pasture land, and grassland (herbaceous) are the predominant land cover types within the project area, comprising approximately 9,306.9 acres (81.7%)(Table 1). Much of the project area is highly fragmented and therefore is more suited to generalist, edge-adapted species that are commonly found in agricultural landscapes. In general, wetlands are isolated in lowland areas and grasslands are isolated tracts surrounded by agricultural land. However, larger tracts of grassland are present in areas surrounding the project area.

   Many bird species and several bat species are likely to utilize the project area at some point during the year, and some of these species are known to be adversely affected by wind development to some degree. Based upon the desktop review and field surveys conducted to date, the Project may affect individuals but is unlikely to adversely affect populations. Red-tailed hawks, known to be at risk for collisions with wind turbines, are likely to utilize the project area. Passerines are also vulnerable to collision with wind turbines. Based on avian use surveys in the fall 2011, the species most likely to occur in the project area are American coots, barn swallows, Canada geese, snow geese, red-winged blackbirds (*Agelaius phoeniceus*), ring-necked pheasants (*Phasianus colchicus*), and wild turkeys (*Meleagris gallopavo*)(WEST 2012).

   A total of 37 unique bird species were observed during the fall 2011 fixed-point bird survey, totaling 2,282 individual birds. Waterfowl were the most abundant bird type observed, accounting for 67.0 percent (mainly due to relatively high numbers of Canada geese and snow geese). No information was provided regarding the altitude zone of the birds when observed flying in the interim fixed-point bird survey report.

   One bald eagle, multiple sharp-tailed grouse, and four additional state-listed SCP (i.e., loggerhead shrike, northern harrier, redhead, and Swainson's hawk) were observed during the fall 2011 surveys.

   Eighteen raptor nests were identified within or near the NFWRA (which contains 96.4% of the proposed project area) in spring 2011, 4 were active (one red-tailed hawk nest and the other three were species unknown), 12 were inactive, and 2 nests could not be determined active or inactive, but were probable red-tailed hawk nests. No eagle nests

were observed. Eagle use surveys have not been initiated for the project area at the time of this report issuance.

Six bat species have geographic distributions that include McHenry County and could potentially occur within the project area, including the federally listed northern long-eared bat. Tree-roosting bats (e.g., eastern red, silver-haired, and hoary) are likely to occur in the project area during migration. Based upon the USFWS white-nose syndrome buffer zone map (USFWS 2015e), all take for the northern long-eared bat in North Dakota is exempt per the interim 4(d) rule.

Based upon observations during the fall 2011 fixed-point bird surveys and spring 2011 lek field surveys, the project area provides suitable habitat for the sharp-tailed grouse and this species is likely to be present. Three probable leks and one possible lek were recorded within the project area (Figure 9; WEST 2011a).

Per the USFWS Endangered Species website, no federally listed plant species have geographic ranges that include McHenry County. However, the USFWS indicates six federally listed wildlife species with ranges that include McHenry (i.e., Dakota skipper, gray wolf, northern long-eared bat, piping plover, rufa red knot, and whooping crane). North Dakota does not have a state endangered or threatened species list. Based upon the desktop review, the project area may contain suitable habitat for all of these federally listed species, although the gray wolf and rufa red knot are unlikely to be present.

The Project is located within the primary migration corridor of the federally listed whooping crane and there is suitable stopover habitat within the project area; therefore this species is likely to be present during migration.

Ten species of habitat fragmentation concern listed by the USFWS in North Dakota have known geographic ranges that include McHenry County; the project area may contain suitable habitat for these species (Table 8).

The project area may contain suitable habitat for several of the North Dakota listed SCP (e.g., bald eagle, northern harrier, Swainson's hawk, etc.); however, these species are afforded no legal protection under state regulations.

2. ***Do field studies indicate the potential for significant adverse impacts on affected populations of species of habitat fragmentation concern?***

Much of the project area is highly agricultural, and as such, is highly fragmented and therefore is more suited to generalist, edge-adapted species that are commonly found in agricultural landscapes. Based upon land cover data, approximately 1,645.4 acres (14.5%) of the project area is grassland and approximately 792.3 acres (7.0%) are emergent wetland; these areas may contain native prairie habitat. In general, wetlands are isolated in lowland areas and grasslands are isolated tracts surrounded by agricultural land; however, larger tracts of grassland are present in areas surrounding the project area.

The evidence collected during this Tier 3 field investigation suggests potential impacts to sharp-tailed grouse, due to probable leks within the project area and multiple sightings of the species during fixed-point bird surveys of the NFWRA in 2011. In addition, suitable

habitat for the northern harrier is present within the project area and this species was one of the most commonly observed raptor species at the NFWRA during the 2011 field surveys.

However, it remains unclear whether impacts as a result of the Project would be adversely significant. Additional pre-construction avian surveys are recommended to identify ways to avoid, minimize or offset any potential impacts to these species of concern as a result of the Project. The permanent impacts resulting from the Project would likely occur on land already used for agriculture and would likely have minor fragmentation effects.

3. ***What are the potential risks of adverse impacts of the proposed wind energy project to individuals and local populations of species of concern and their habitats?***

The evidence collected during this Tier 3 field investigation and desktop review suggests potential impacts may occur to some species of concern (i.e., migratory birds, eagles and raptors, sharp-tailed grouse, and the northern long-eared bat). Potential impacts may include direct mortality during operation of the Project and loss of suitable habitat.

Of note, the Project is located within the primary migration corridor of the federally listed whooping crane and there is suitable stopover habitat within the project area; therefore this species is likely to be present during migration.

However, it remains unclear whether impacts as a result of the Project would be adversely significant. Additional pre-construction avian, eagle use, sharp-tailed grouse, and bat surveys are recommended to identify ways to avoid, minimize or offset any potential impacts to these species of concern as a result of the Project.

4. ***How can developers mitigate identified significant adverse impacts?***

Evidence collected during pre-construction surveys can inform siting and development decisions. Based upon the field surveys completed to date, it is unclear whether or not there would be significant adverse impacts to species of concern or their habitat as a result of the Project. Suitable habitat for migratory birds, eagles and raptors, and sharp-tailed grouse are present within the project area. There is the potential to impact these wildlife species if impacts to prairie, open water, or wetland communities will occur as a result of the Project.

Based upon the draft Avian and Bat Protection Plan for the NFWRA (Meadowlark 2013), Meadowlark proposed the following avoidance and minimization measures:

- Fire control
- Limiting public access
- Minimize impact to vegetation; reseed disturbed areas
- Control noxious weeds
- Stormwater management and minimize impact to soils
- Wildlife training for operation and maintenance (O&M) staff
  - Pet/firearm restrictions
  - Carrion removal

  - Nest management (when transmission line structures, meteorological (MET) towers, and substation equipment is used for nesting)
  - Reasonable driving speed limits
  - Vehicle travel restricted to roads
  - Good housekeeping practices to minimize garbage or debris
  - Whooping crane observations
  - No lights left on unnecessarily
- Buried collection lines
- Avian Power Line Interaction Committee (APLIC) standards
- Minimize turbine lights to the minimum required by the Federal Aviation Administration (FAA)
- Un-guyed permanent MET towers.
- Turbines sited away from suitable habitat for species of concern, where possible
- Site monitoring to inform potential adaptive management measures

In Stantec's experience, additional avoidance and minimization measures to consider for the Project include:

- Noise control
- Compliance with water laws
  - Avoid construction/refueling in riparian areas
  - Sediment control
  - Compliance with hazardous materials (HazMat) laws

5. ***Are there studies that should be initiated at this stage that would be continued in post-construction?***

Yes, eagle use surveys have not been initiated at the project area at the time of this report issuance; these surveys are recommended per the USFWS Eagle Conservation Plan Guidance: Module 1 – Land-based Wind Energy, Version 2 (USFWS 2013a) pre-construction and post-construction due to the presence of eagles at the project area during a fixed-point bird survey in 2011 in addition to the potentially suitable habitat located within and surrounding the project area.

In addition, pre-construction avian, sharp-tailed grouse, and bat surveys following the WEG guidelines are recommended to inform siting and development decisions for the Project.

Meadowlark's draft ABPP (2013) outlines wildlife mortality monitoring to follow the WEG's recommended Tier 4a guidelines. The post-construction study will be used to determine whether the pre-construction surveys were accurate and whether adaptive management is needed. The study will be designed to document fatality rates for all affected species or groups (e.g., migratory birds, raptors, and bats) and identify periods when birds and bats are at the highest risk (e.g., seasonal timeframes of peak fatality); if fatality rates are determined to be high based upon comparison to other local and regional studies, additional studies may be conducted to try and determine the primary

environmental conditions which may lead to increased risk (e.g., weather conditions; Meadowlark 2013).

Additionally, Meadowlark's draft ABPP (2013) outlines whooping crane monitoring to be initiated during the spring and fall migration periods during commercial operations.

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FIGURES

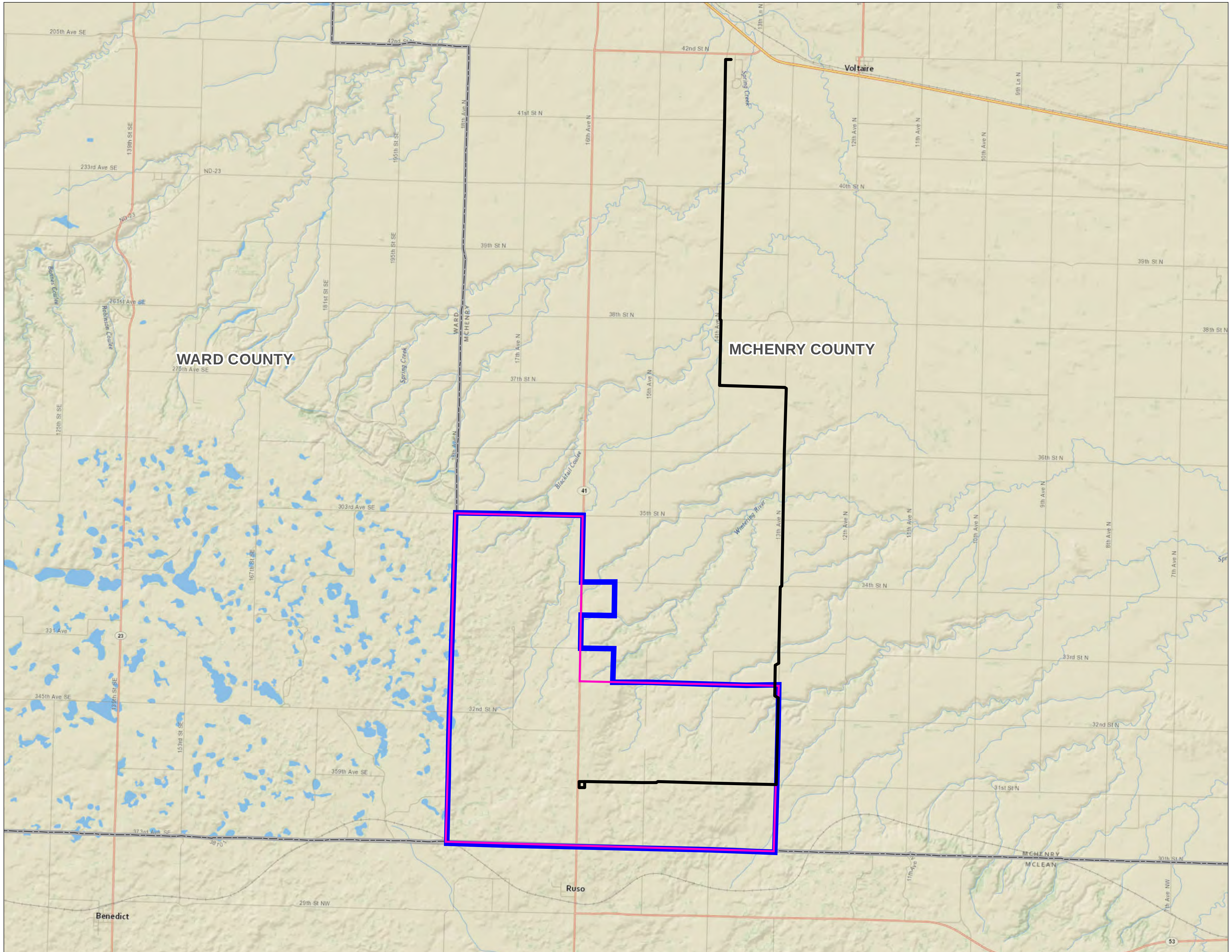

Figure No.
1

Title
Site Location

Client/Project
Capital Power Corporation
New Frontier Wind Energy Project

Project Location
McHenry County, ND

193703715
Prepared by PM on 2015-09-24
Technical Review by JD on 2015-09-24
Independent Review by SS on 2015-09-25

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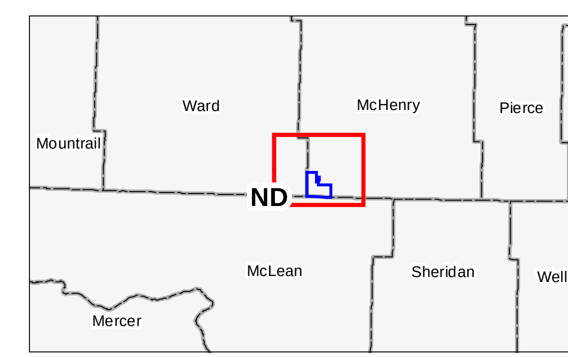
Legend
- Transmission Corridor
- New Frontier Project Area
- Meadowlark Wind I LLC – 2011 New Frontier Wind Resource Area Project Boundary
- County Boundary



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2. Data Sources Include: Stantec, Capital Power, USGS
3. Background: National Geographic

Stantec

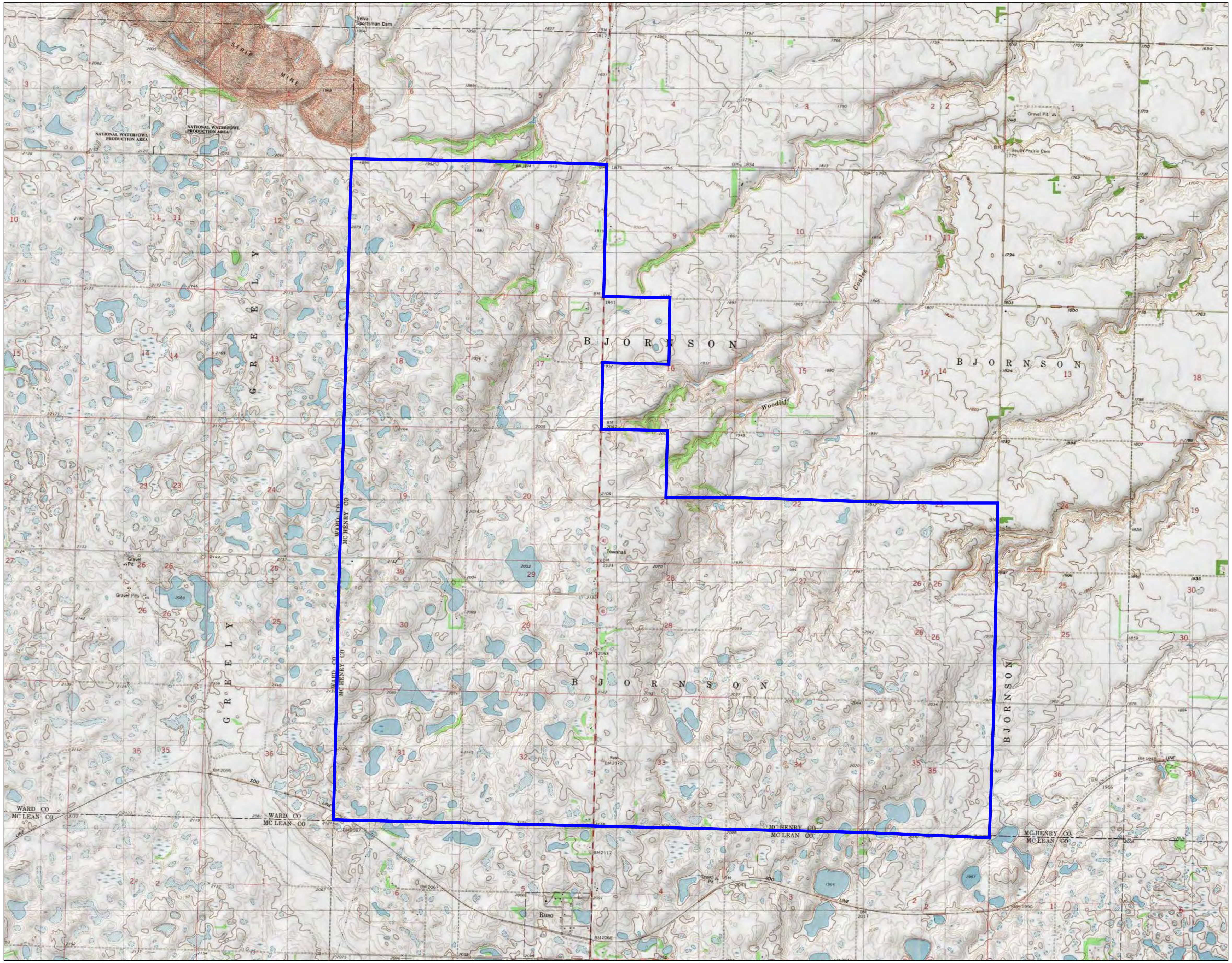

Figure No.
2

Title
Project Location and Topography

Client/Project
Capital Power Corporation
New Frontier Wind Energy Project

Project Location
McHenry County, ND

193703715
Prepared by PM on 2015-09-24
Technical Review by JD on 2015-09-24
Independent Review by SS on 2015-09-25

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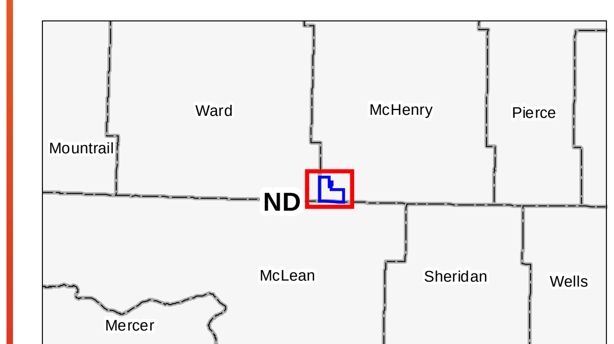
Legend

New Frontier Project Area



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2. Data Sources Include: Stantec, Capital Power, USGS
3. Background: USGS 7.5' Topographic Quadrangles

Stantec

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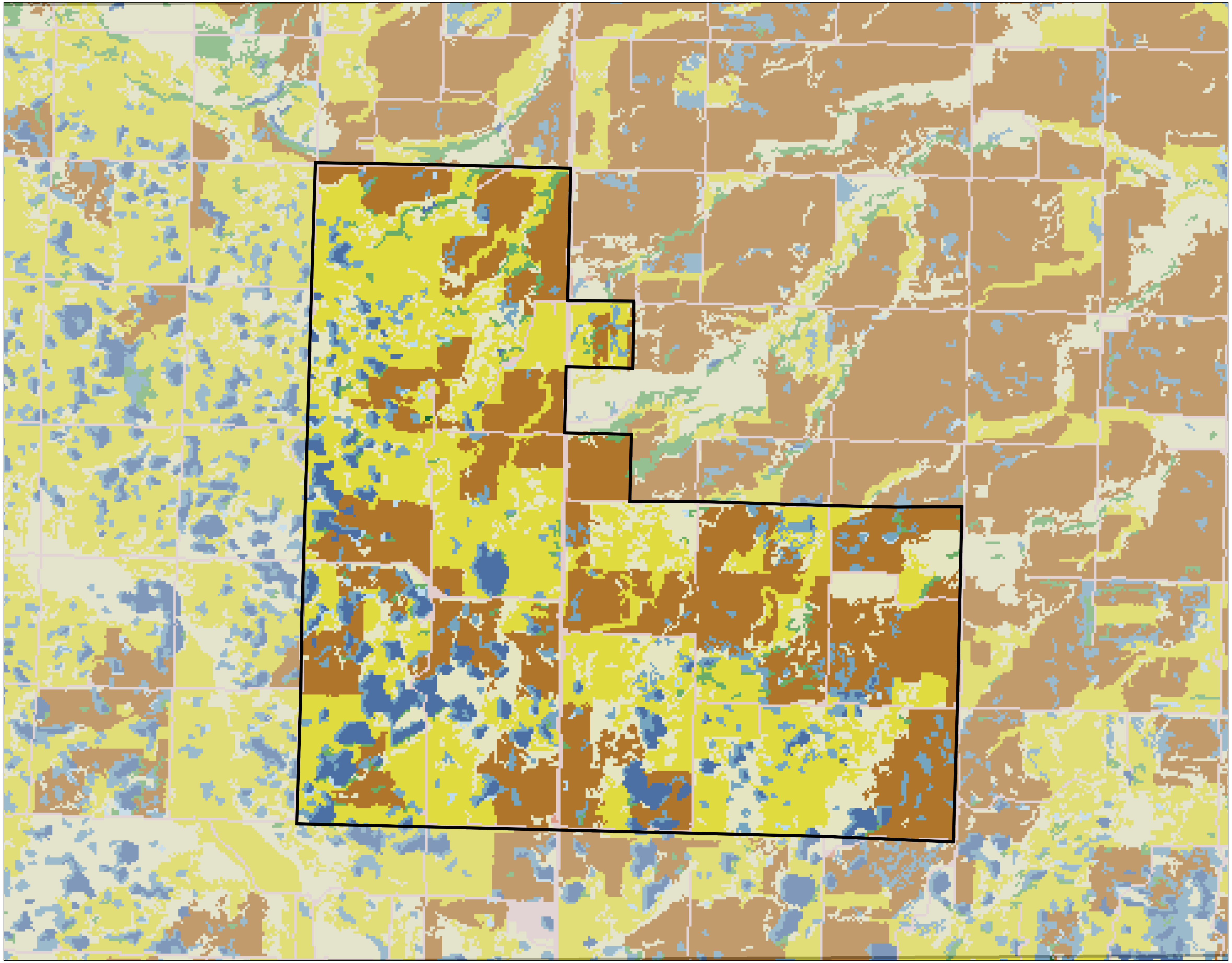

Figure No.

3

Title

National Land Cover Dataset

Client/Project

Capital Power Corporation
New Frontier Wind Energy Project

Project Location

McHenry County, ND

193703715
Prepared by PM on 2015-09-24
Technical Review by JD on 2015-09-24
Independent Review by SS on 2015-09-25

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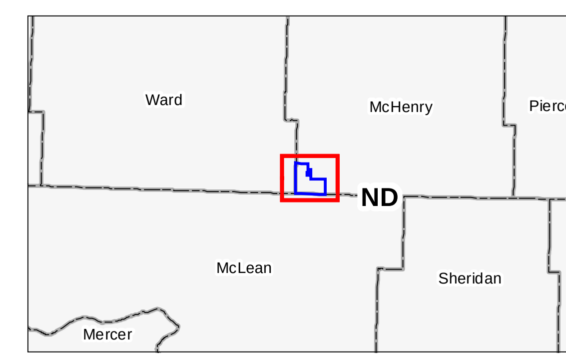
N

Legend

New Frontier Project Area

NLCD 2011

- Open Water
- Developed, Open Space
- Developed, Low Intensity
- Developed, Medium Intensity
- Deciduous Forest
- Evergreen Forest
- Herbaceuous
- Hay/Pasture
- Cultivated Crops
- Woody Wetlands
- Emergent Herbaceuous Wetlands



Notes

1. Coordinate System: WGS 1984 UTM Zone 14N
2. Data Sources Include: Stantec, Capital Power, USGS
3. Background: NLCD (2011)

Stantec

R:\gis\other PCs\193703715 CapPower NewFrontierWind\07 gis\mxds\CapPower NewFrontier Fig3 NLCDmxd.mxd Revised: 2015-09-25 By: pmarcou

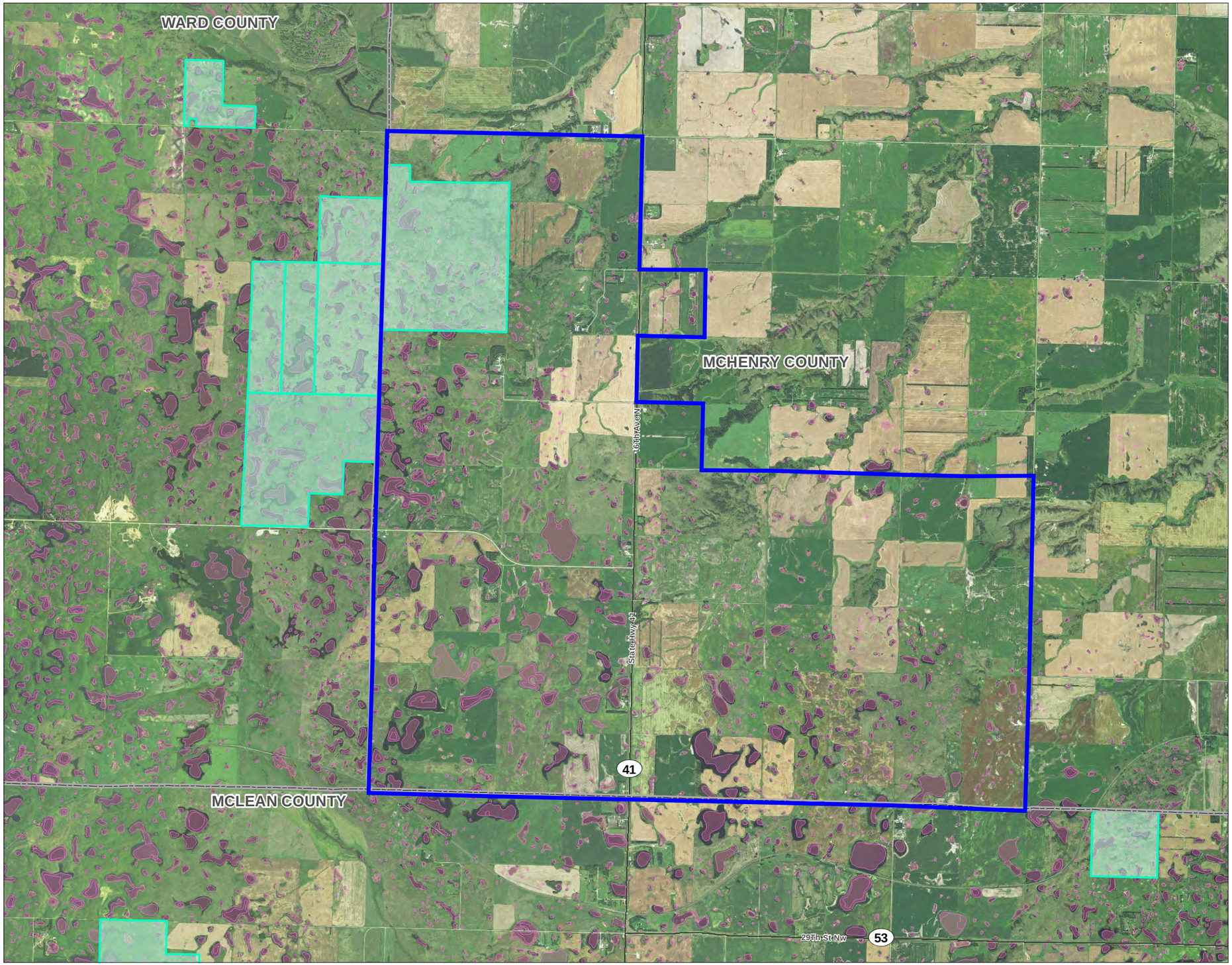


Figure No.
4

Title
National Wetlands Inventory

Client/Project
Capital Power Corporation
New Frontier Wind Energy Project

Project Location
McHenry County, ND

193703715
Prepared by PM on 2015-09-24
Technical Review by JD on 2015-09-24
Independent Review by SS on 2015-09-25

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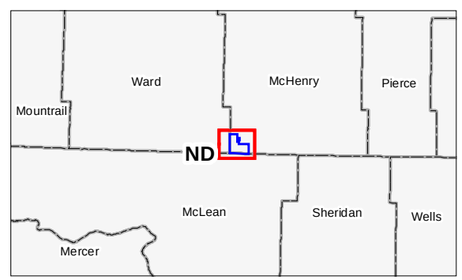
1:48,000 (At original document size of 11x17)

N

Legend
- New Frontier Project Area
- National Wetlands Inventory
- USFWS Easement Ownership (NCED 2014)
- County Boundary



Notes
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2. Data Sources Include: Stantec, Capital Power, Esri, USFWS
3. Orthophotography: 2014 NAIP

Stantec

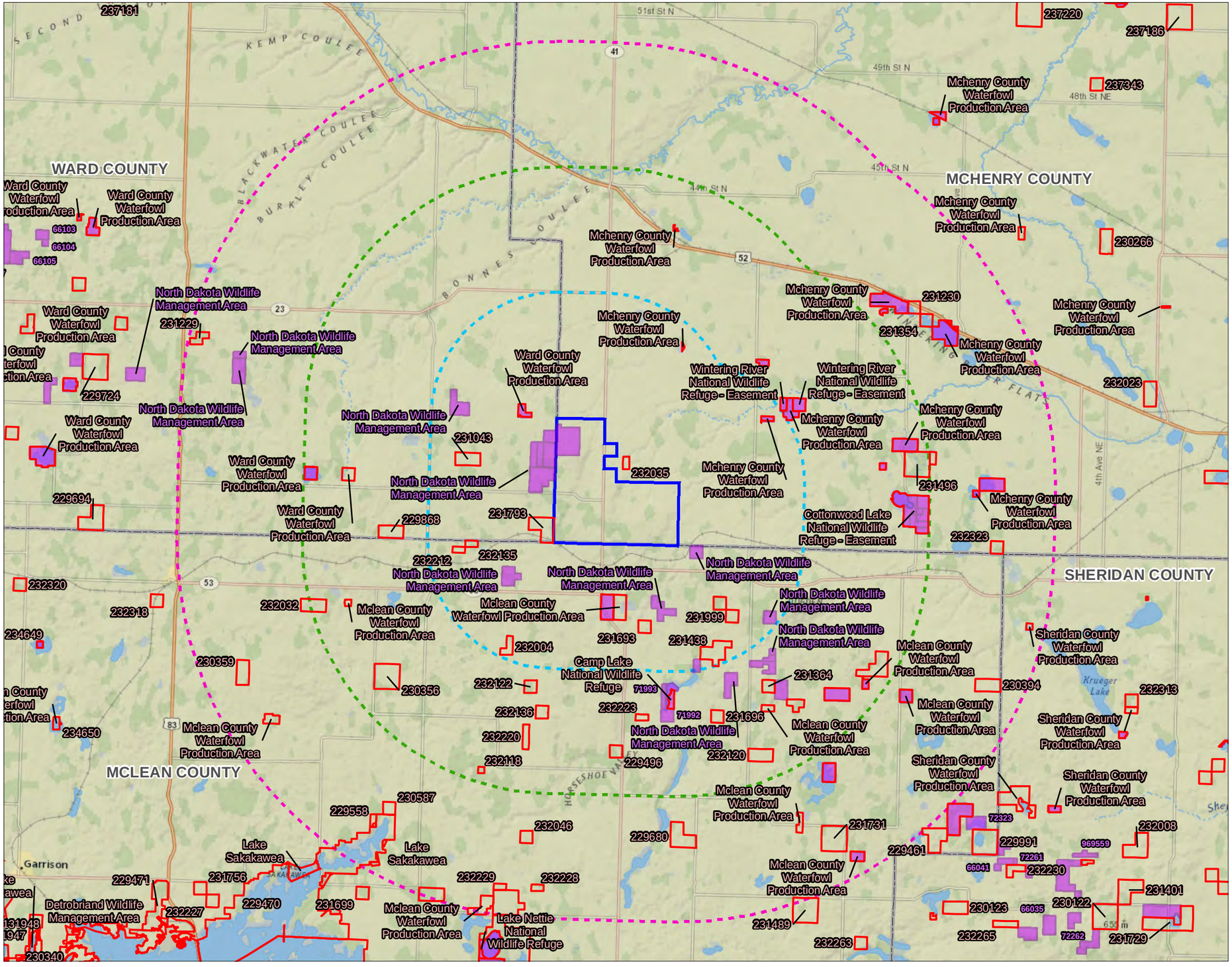

Figure No.
5

Title
National Conservation Easement Database and Protected Areas Data

Client/Project
Capital Power Corporation
New Frontier Wind Energy Project

Project Location
McHenry County, ND

193703715
Prepared by PM on 2015-09-24
Technical Review by JD on 2015-09-24
Independent Review by SS on 2015-09-25

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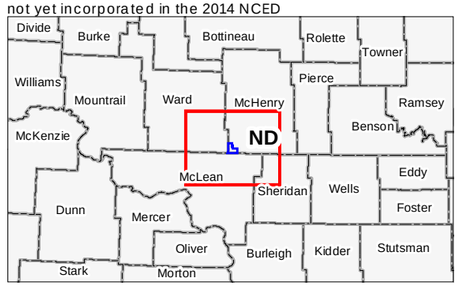
N

Legend
- New Frontier Project Area
- 5mi Buffer
- 10mi Buffer
- 15mi Buffer
- PAD-US 2012
- NCED 2014
- NRCS Easements*
- County Boundary

*Additional Natural Resources Conservation Service Easement not yet incorporated in the 2014 NCED



Notes
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2. Data Sources Include: Stantec, Capital Power, USGS, NRCS
3. Background: National Geographic

Stantec

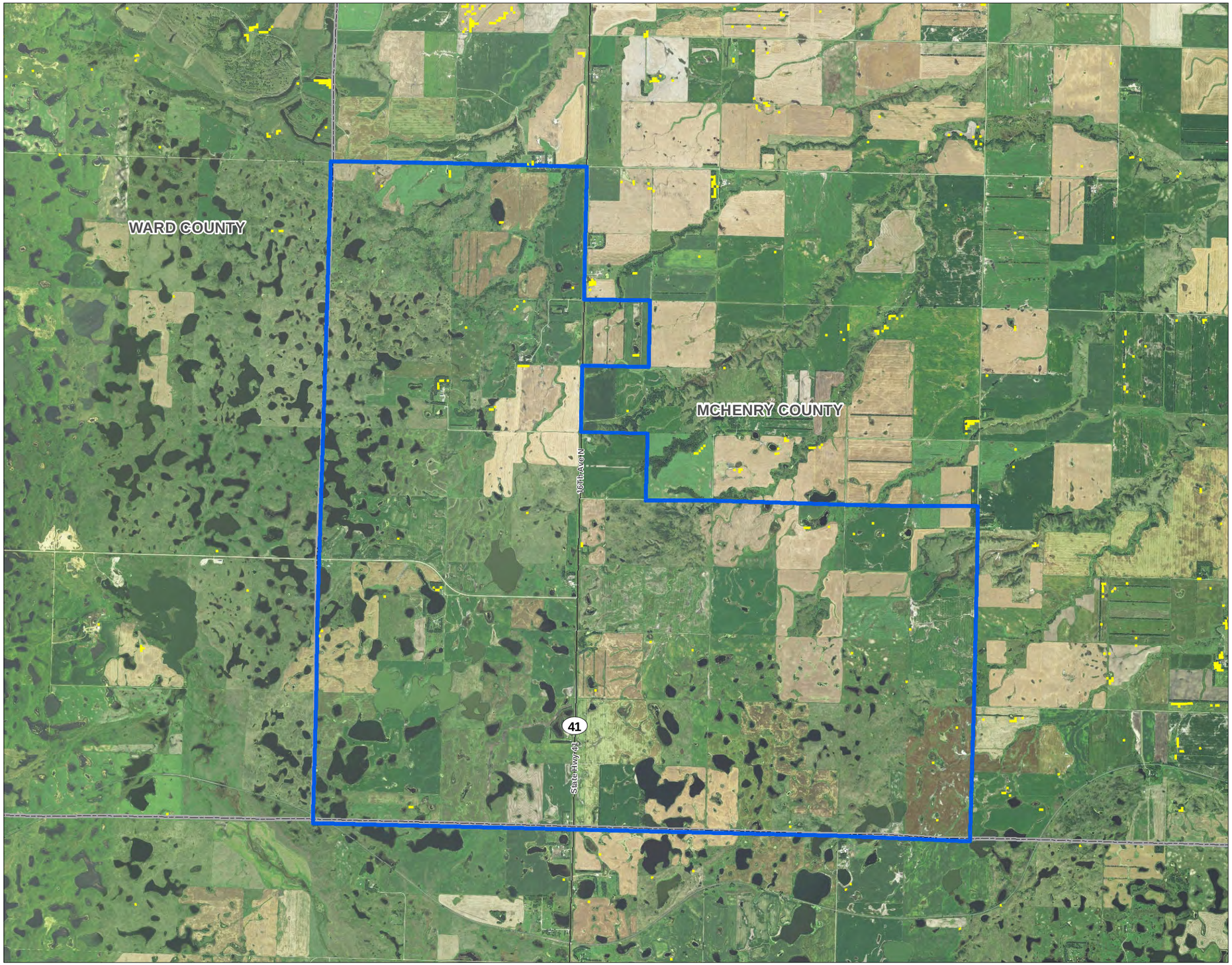


Figure No.
6

Title
National GAP Analysis Program Predicted Northern Long-eared Bat (NLEB) Habitat

Client/Project
Capital Power Corporation
New Frontier Wind Energy Project

Project Location
McHenry County, ND

193703715
Prepared by PM on 2015-09-24
Technical Review by JD on 2015-09-24
Independent Review by SS on 2015-09-25

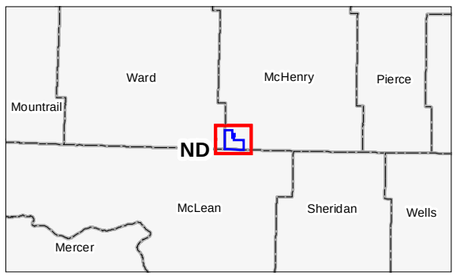
0 0.5 1 Miles
1:48,000 (At original document size of 11x17)

N

Legend
- New Frontier Project Area

GAP NLEB Data
- Probable Winter Habitat*
- Probable Summer Habitat
- County Boundary

*No probable winter habitat within map extent



Notes
1. Coordinate System: WGS 1984 UTM Zone 14N
2. Data Sources Include: Stantec, Capital Power, Esri, USGS
3. Orthophotography: 2014 NAIP

Stantec

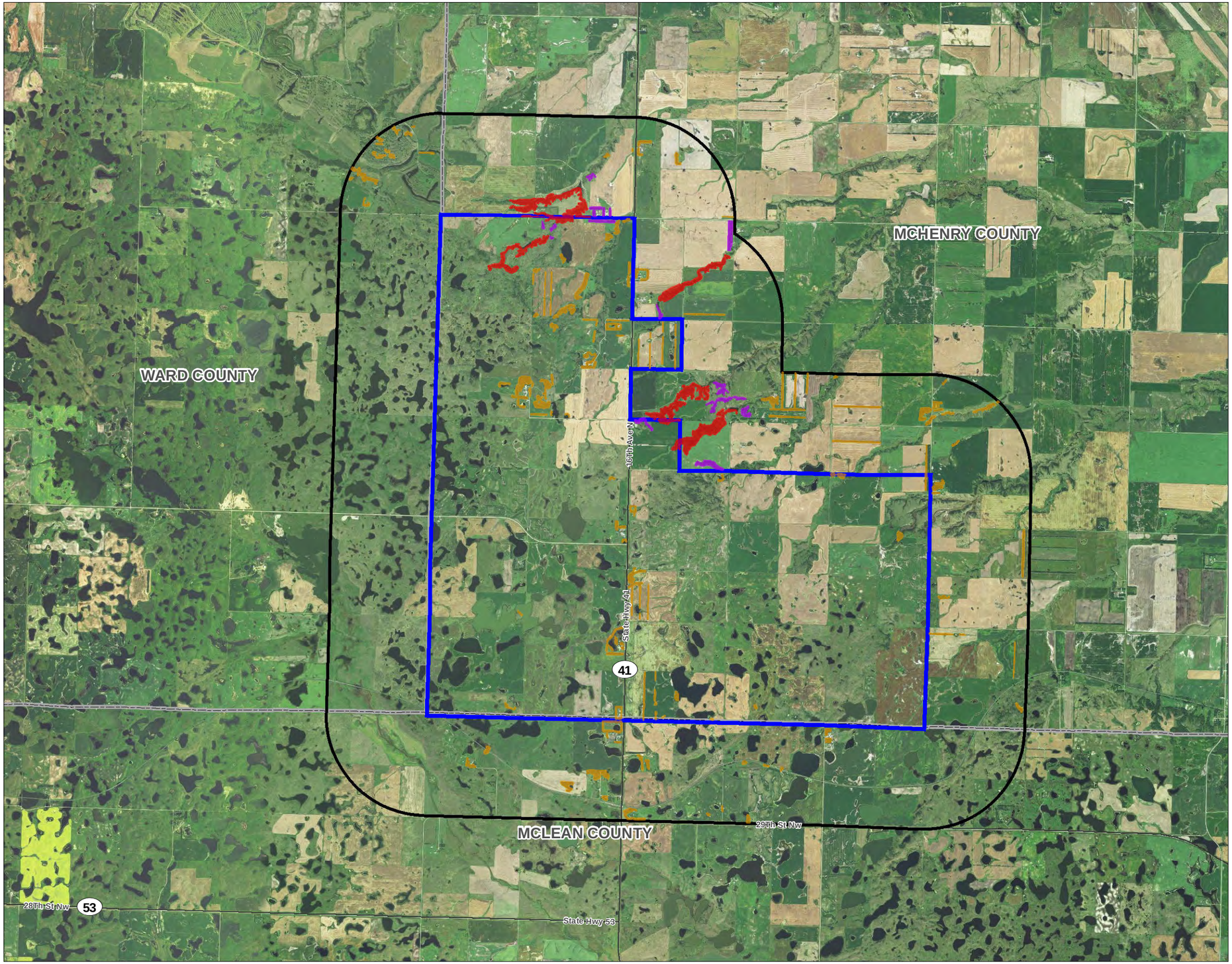


Figure No.
7

Title
Northern Long-eared Bat
Habitat Assesssment

Client/Project
Capital Power Corporation
New Frontier Wind Energy Project

Project Location
McHenry County, ND

193703715
Prepared by PM on 2015-09-24
Technical Review by JD on 2015-09-24
Independent Review by SS on 2015-09-25

0 0.5 1 Miles
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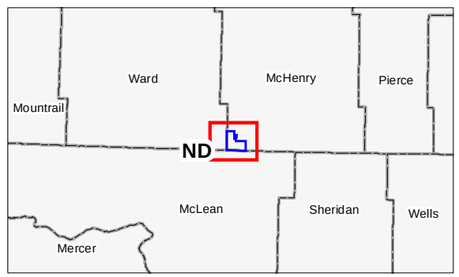
N

Legend
- New Frontier Project Area
- 1mi Buffer
- County Boundary

NLEB Habitat Assessment Type
- 15-49 acres - Small Roost/Foraging Areas
- <15 acres - Commuting/Travel Corridors
- <15 acres – Unsuitable Due to Lack of Connectivity



Notes
1. Coordinate System: WGS 1984 UTM Zone 14N
2. Data Sources Include: Stantec, Capital Power, Esri
3. Orthophotography: 2014 NAIP

Stantec

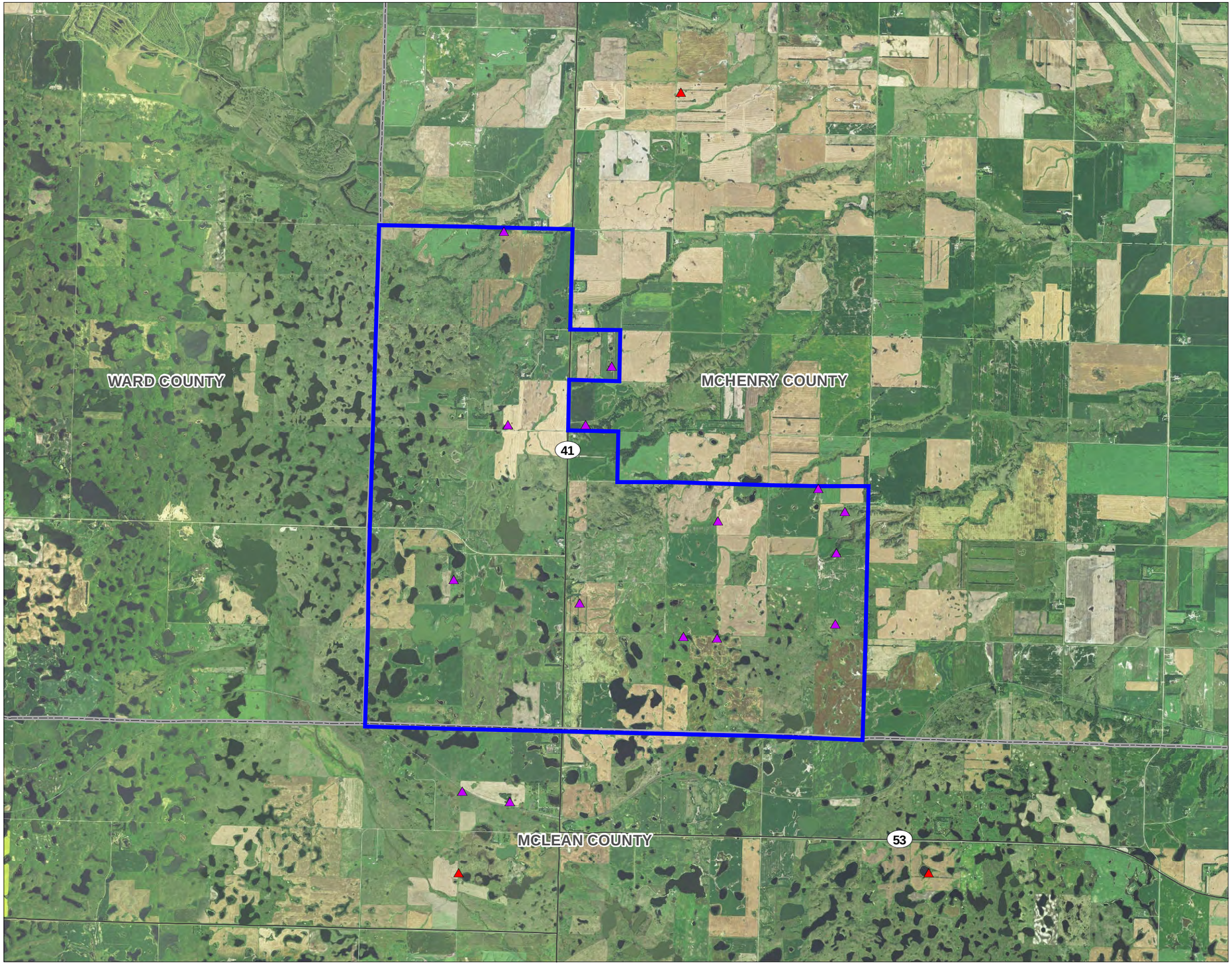


Figure No.
8

Title
USGS Breeding Bird Survey Routes and Approximate Raptor Stick Nest Locations Spring 2011

Client/Project
Capital Power Corporation
New Frontier Wind Energy Project

Project Location
McHenry County, ND

193703715
Prepared by PM on 2015-09-24
Technical Review by JD on 2015-09-24
Independent Review by SS on 2015-09-25

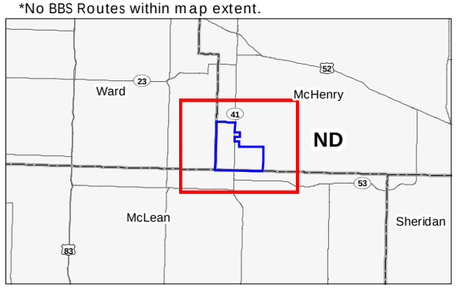
0 0.5 1 Miles
1:63,360 (At original document size of 11x17)

N

Legend
- New Frontier Project Area
- USGS Breeding Bird Survey (BBS) Route*
- County Boundary

Approximate Raptor Stick Nest Location
- Ground Survey
- Aerial Survey

*No BBS Routes within map extent.



Notes
1. Coordinate System: WGS 1984 UTM Zone 14N
2. Data Sources Include: Stantec, Capital Power, USGS, Esri
3. Background: 2014 NAIP

Stantec

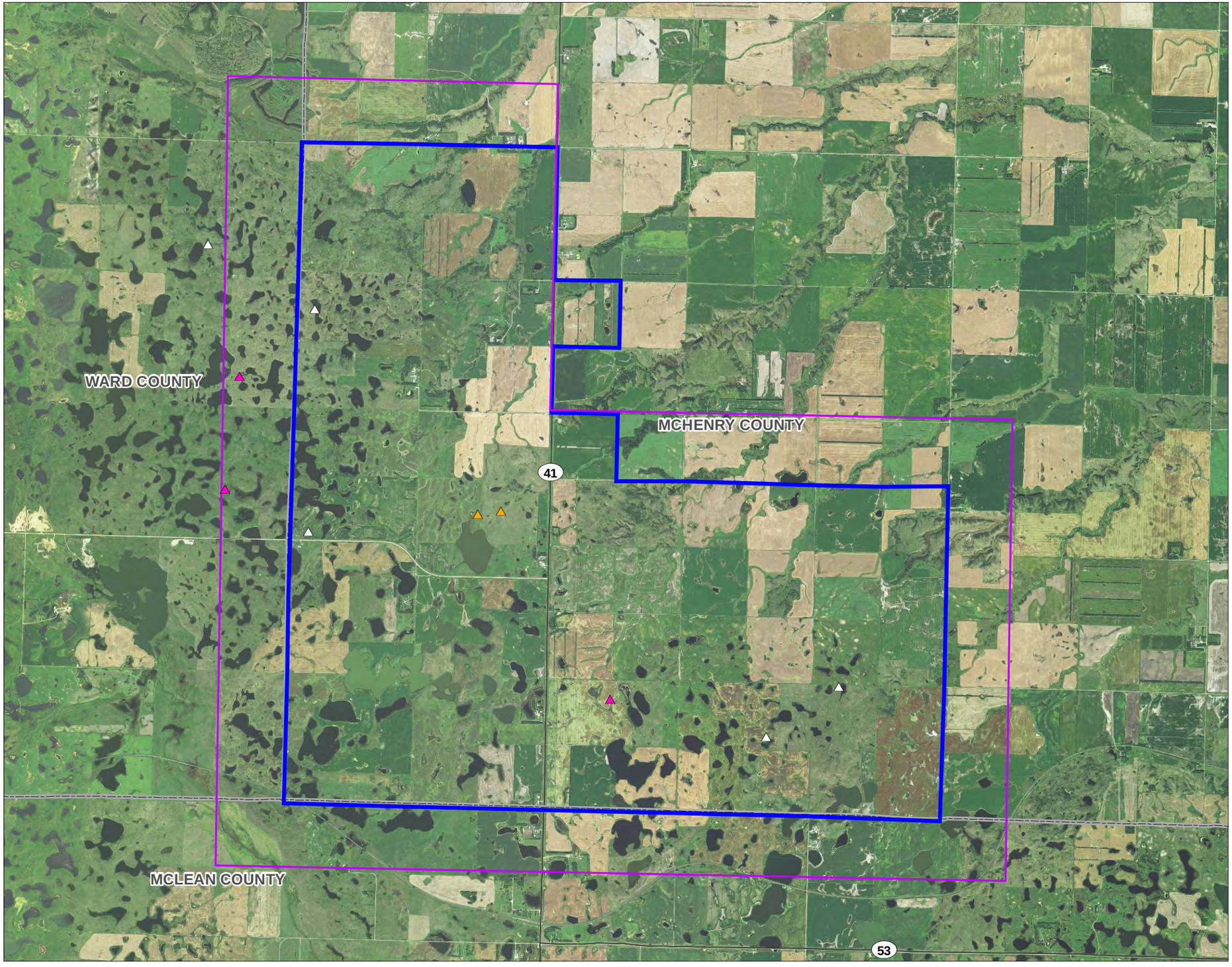


Figure No.
9

Title
Aerial Sharp-tailed Grouse Observations
Spring 2011

Client/Project
Capital Power Corporation
New Frontier Wind Energy Project

Project Location
McHenry County, ND

193703715
Prepared by PM on 2015-09-24
Technical Review by JD on 2015-09-24
Independent Review by SS on 2015-09-25

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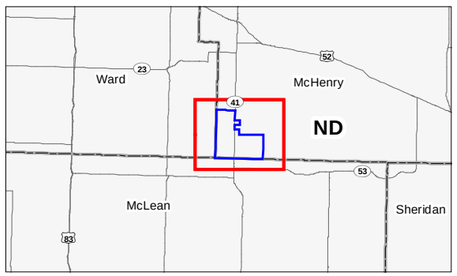
1:48,000 (At original document size of 11x17)

N

Legend
- New Frontier Project Area
- Approximate 2011 Survey Boundary
- County Boundary

Approximate Sharp-tailed Grouse Locations
- Probable Lek
- Unknown Lek
- No Lek



Notes
1. Coordinate System: WGS 1984 UTM Zone 14N
2. Data Sources Include: Stantec, Capital Power, USGS, Esri
3. Background: 2014 NAIP

Stantec

APPENDIX A

2011 Site Photographs

(Meadowlark Wind I LLC)

Photo 1. Rolling native grassland with wetlands.

Photo 2. Wheat stubble with woodlands (planted trees around farmstead) in background.

Photo 3. Woody draws with planted tree rows in background.

Photo 4. Planted grassland.

Photo 5. Potential raptor nest structures in cropland.

Photo 6. Typical emergent type wetland.

Photo 7. Larger, more permanent type wetland.

Photo 8. Un-harvested sunflower field with tree rows and woody draws in background.

NEW FRONTIER WIND

Meeting Notes – Conference Call with USFWS

January 7, 2016

Participants

- Kevin Shelley, USFWS
- Terry VanDeWalle, Senior Biologist, Stantec
- Paul Wendelgass, Director, Business Development, Capital Power
- Bill Behling, Manager, Business Development, Capital Power

Discussion Prior to Calling USFWS between Stantec and Capital Power

- Stantec had previously submitted a New Frontier Site Characterization Report (SCR) and other materials to USFWS – Get Kevin's reaction.
- How do we move through Tier 3
- Our Project schedule: We have NDPSC Certificate and MISO Interconnection Agreement. PTC has been extended. We want to start construction by December 31, 2016
- What studies should be done vs. what studies does Kevin want done: Possibilities - Species of concern including: Eagles (Eagle Use Survey, Raptor Nest Surveys, Avian Surveys, Dakota Skipper, Sprague's Pipit, Sharp-Tailed Grouse, Bats: Mist-Netting & Acoustic Monitoring, Bird and Bat Conservation Strategy (BBCS), Habitat Conservation Plans (HCPs), Wetland Permits, Section 7 permit – Biological Assessment and Opinion, Incidental Take Permit (ITP), Section 10 permit – longer-term Endangered Species, HCP
- What species is Kevin concerned about and what studies are required

Conference Call

- Kevin down to a staff of himself and two others. He is focusing more on national and regional issues than project specific issues
- Kevin found the SCR and other materials to be a "great summary" and helpful
- North Dakota Game & Fish (NDGF) – becoming more involved in discussions, more focused on issues, and a more collaborative environment with USFWS.
- Integration of state-managed and federal resources
- Sharp-tailed grouse – Kevin will bring in the State folks
- From the memo: Site selection – Criteria 4, WEG in 2003, Kevin noted and appreciated the different corporate philosophy referenced in the last paragraph.
- Eagles and Northern Long-Eared Bats (NLEBs) – USFWS has to "check off" on both.
- Sprague's Pipit & Dakota Skipper – USFWS also looking at both
- **Bats**
    - Do what is sufficient
    - North Dakota does not know much about it
    - Very rare – 14 sites through mist-netting, but where are they moving from and to
    - Expected in NE. Soon to be in ND – Plan for it
    - Is there a need to bring in an ITP or not?

- Occupancy study would be helpful – would prefer mist-netting over acoustics
- Kevin – do we think they are present?
- Encourage minimal level – acoustic for a season
- Will there be a need for design changes based on NLEBs showing up
- Presence/absence survey in summer
- If detected via acoustics, then conduct summer survey and still have time in the fall
- Terry – 1000' from suitable summer habitat, avoid risk
- Kevin – Regions 3 & 6 integrated approach. WAPA Programmatic EIS
- Assume presence unless data shows different

- **Eagles**
  - Conservation plan guidance
  - NDG&F – Sandra Johnson, most recent data
  - Are there known nests within 10 miles?
  - Kevin – data through 2013 does not show any. Migration?
- **Dakota Skipper**
  - Terry – Building environmental constraints map. Matt doing it for pipeline
  - Kevin – Enough detail for call today. McHenry County has a number of locations of Skipper. More detailed, Skipper-specific discussion at a later date.
  - Keep option open to conduct occupancy surveys. Keep open to retaining surveyors (there are 15 of them) in the event we find.
  - Have found 20 new sites for Skippers
  - 2-3 week survey period. June 10 – July 20. Hold back construction
  - Wrote 4 different biological opinions in 2015
  - Avoiding high quality grassland
  - 2 weeks of flight period June 20 - July 10
  - To get to no occupancy
  - 3 consecutive surveys at least 2 days apart
  - Get into the queue for surveyors. Send request to Kevin (Terry?), then he sends to surveyors
  - Issued Section 10 permits
  - No inventory done on site. Might be a little constrained. Create a decision pathway
  - Look at critical habitat for species, three PCEs that are very helpful in forming occupancy view. Narrative work can be done. Matt can do this – this needs to get done.
  - Do you want to put a WTG where there is high quality grassland?
- **Sprague's Pipit**
  - Listing decision sitting on desk. 1-2 months until it is published in Federal Register.
  - Plan accordingly for either decision
  - Concern for species and vulnerability remains high
  - Already on site – WEST? Near northwest boundary. Let Kevin know on WEST's bird work. Had spoken to WEST
  - Kevin – occupancy survey right away. Thinks habitat is there, is assuming presence. Where are singing males and where is territory established. Not saying can't put WTGs. Post-construction monitoring, partnering with USFWS. Pre- and post-construction assessment - contributing to knowledge.

- Kevin not aware of a mortality

- **Sharp-Tailed Grouse**
  - Not equal weight between USFWS and NDGF. NDGF wants collaborative to study. USFWS research – waiting for paper on impacts by wind and how grouse are responding.
  - If focus on Sprague's, can we expand to migratory birds. IBAs?
  - Could this be a high bird use area?
  - General avian use survey, feeding into a BBCS
  - What are dates for survey if we are not doing an eagle use survey?

CONFERENCE CALL NOTES
NEW FRONTIER WIND ENERGY PROJECT
APRIL 20, 2016

In attendance:

- Kevin Shelley, U.S. Fish and Wildlife Service (USFWS)
- Jena Tufts, William Behling, Capital Power (CP)
- Sarah McCall, Karen Brimacombe, Mark Martell, Tetra Tech (Tt)

Background

The purpose of the call was to provide information to, and receive guidance from, the USFWS on conducting surveys for the Dakota skipper (*Hesperia dacotae*) at the New Frontier Wind Energy Project in McHenry County, North Dakota. This call was a follow-up to previous discussions held between CP/Tt and USFWS. Kevin mentioned USFWS is involved in two lawsuits and that he had not had time to read the desktop analysis memo.

Desktop Native Prairie Habitat Assessment

- Tetra Tech prepared a desktop assessment to identify potential blocks of native prairie in the Project Area.
- The desktop assessment has been provided to CP and USFWS.
- Potential habitat identified in the desktop analysis totaled 4,080 acres (36% of Project Area) which includes interspersed wetlands. [Note: updated analysis identified approximately 3,850 acres (34% of Project Area) of potential habitat after removal of interspersed wetlands, see attachment.]
- An additional 156 acres identified as probable hay fields.

Ground-truthing of Potential Native Prairie

- In May, Karen will conduct field ground-truthing of the potential habitat areas identified in the desktop analysis. (Later confirmed that the ground-truthing will likely take place the week of May 9).
- Potential habitat areas will be evaluated, to the extent possible, based on presence of native prairie plants, such as little bluestem grass (*Schizachyrium scoparium*), prairie lily (*Lilium philadelphicum*), and purple coneflower (*Echinacea angustifolia*).
- Non-native grasslands (e.g., tame grassland) and other non-native prairie cover types, such as hayfields or fallow fields, will be removed from further consideration as potential skipper habitat.

Dakota skipper Occupancy Surveys

- CP will do skipper occupancy surveys during the skipper's flight stage between June 20th and July 15th in those areas identified as native prairie following the ground-truthing in May which will rule-out low-quality habitat areas .
- Kevin noted that USFWS is working on standardized survey protocols but they are not completed yet.
- Tetra Tech will send GIS shapefiles of the Project area to the USFWS for review against the Dakota skipper database. Kevin noted that potential skipper habitat area doubled following occupancy surveys conducted in 2015. However, skipper habitat is being lost due perhaps, to turnover to agriculture, climate change, chemicals, etc.
- The skipper is a very hard species for which to conduct surveys, as they can only be seen during their flight period and they are very difficult to find if there are not good weather conditions. If surveys are conducted over three consecutive years without determining occupancy, then a "highly unlikely" occupancy determination would be given.
- Kevin provided a list of qualified surveyors (Table 1).
- Kevin recommended the following be included in the protocol
    - Each site should be surveyed 3 times on different days separated from each other by a minimum of 2 days.
    - If there is a large amount of potential habitat surveying a subset is acceptable.
- There is not a standardized skipper survey protocol and USFWS will not have it for North Dakota this season. Therefore, we should continue consultation with USFWS on survey protocols. Talking/communicating frequently with USFWS for the time leading up to the surveys is important.
- If an occupancy survey is not done a detailed vegetation survey can be used.
    - Use standard range inventory techniques utilizing the Daubenmire method.
    - Daubenmire approach would document percent cover by species.
    - The downside to this approach is that a judgement would have to be made as to whether or not the area is occupied.

Site specific issues and Section 9 liability

- If there is Dakota skipper occupancy detected then there will likely be a need for site specific visits by USFWS and CP.
    - Because the habitat has heterogeneity it will be necessary to identify specific parts of parcels to avoid take of Dakota skippers.
    - Will need to find "inclusions" of non-suitable habitat for structure placement.
    - We should look to about ¼ acre as the survey size minimum.

- If a detailed vegetation analysis is done it could also identify areas where offset might occur if avoiding good habitat is unavoidable.
- The skipper can travel up to 1 kilometer. The skippers do not get up into the rotor swept area. They "bounce" from hill to hill, attracted to nectaring sources.

New Habitat Model

- Kevin brought up a new model developed and used by Scott Krych, one of the surveyors listed by Kevin.
- It is a robust model that has been validated by occupancy surveys.
- Uses Landsat light signature data to identify likely occupied habitat.
- Likely habitat is categorized into 4 levels from low to high probability.
- Kevin has not reviewed Scott's protocol

Action Items

- CP/Tt removed wetland areas from likely habitats in desktop model (see attached).
- CP/Tt will engage the services of a Dakota skipper occupancy surveyor.
- CP/Tt will conduct ground-truthing of likely habitat identified in the desktop analysis.
- CP/Tt will continue consultation with USFWS on protocols and results of surveys.

Table 1. List of Dakota skipper surveyors provide by USFWS

Name	Phone	Email
Dennis Skadsen	cell 605-880-2406	diskadsen@venturecomm.net
Jim Reiser	402-676-0599	jimreiser@cox.net
Neil Dankert	308-440-7096	neildankert@q.com
Scott Krych (HDR):		Scott.Krych@hdrinc.com
Gerald Selby:		jselby@mchsi.com
SWCA **Jake Powell and Ken Kingsley**	(701) 258-6622	

TETRA TECH

TO:	Capital Power Corporation
FROM:	Tetra Tech, Inc.
DATE:	April 21, 2016
SUBJECT:	New Frontier Wind Energy Project – Desktop Native Prairie Habitat Assessment

Introduction

Tetra Tech, Inc. (Tetra Tech) performed a desktop native prairie habitat assessment to map potential habitat for the Dakota skipper (*Hesperia dacotae*) at the proposed New Frontier Wind Energy Project (Project) in McHenry County, North Dakota. The approximately 11,390-acre Project area is located in north-central North Dakota approximately nine miles south of the city of Velva (Figure 1). The Project area is located in the Northwestern Glaciated and the Northern Glaciated Plains ecoregions (Bryce et al. 1996). The Northwestern Glaciated Plains Ecoregion marks the region of the westernmost extent of glaciation and the landscape is characterized by substantial surface irregularity and a high concentration of wetlands (Bryce et al. 1996). The Northern Glaciated Plains Ecoregion is characterized by a more flat to gently rolling landscape with a high concentration of temporary and seasonal wetlands (Bryce et al. 1996). Land use in the area is a mixture of agriculture and grazing and many of the historic grasslands in the area have largely been replaced by agriculture (Bryce et al. 1996).

Dakota skipper

The Dakota skipper is a butterfly species federally protected as threatened under the Endangered Species Act (ESA). It is an obligate user of undisturbed high-quality native prairie. Although its historic range once consisted of vast, unbroken native prairie in the north-central U.S. and south-central Canada, its current range is now limited to scattered remnants of high quality native prairie in Minnesota, North Dakota, South Dakota, and southern Manitoba and Saskatchewan (USFWS 2015a). The Dakota skipper population has declined due to sensitivity to disturbances, such as grazing and fire, and the loss of native prairie habitat. Preferred habitat includes prairie dominated by little bluestem grass (*Schizachyrium scoparium*) and needlegrasses (e.g., *Hesperostipa spartea*), with the presence of wood lily (*Lilium philadelphicum*), bluebell bellflower (*Campanula rotundifolia*), purple coneflower (*Echinacea angustifolia*), upright prairie

coneflower (*Ratibida columnifera*), common gaillardia (*Gaillardia aristata*), and/or Mountain deathcamas (smooth camas; *Zigadenus elegans*) (USFWS 2014a). Designated critical habitat for the Dakota skipper is located within McHenry County; however, no designated critical habitat occurs within the Project area (USFWS 2015b). The closest designated critical habitat to the Project area is approximately 25 miles to the northeast (Figure 1). Because the Project area is close to designated critical habitat and because the Dakota skipper is known to occur in McHenry County, there is a moderate likelihood for the species to occur within the Project area.

Methods

The desktop native prairie habitat assessment for the Project area was conducted in April 2016. The desktop assessment preliminarily classified areas of potential native prairie within the Project area using the following geographic information system (GIS) and spatial imagery data:

- National Land Cover Database (NLCD) 2011 land cover data (Homer et al. 2015),
- USDA (2013) cropland data,
- Google Earth Pro (2014).

The NLCD and cropland data were clipped to the Project area and were viewed in Google Earth Pro. Utilizing the above data sources, areas within the Project area that appeared to potentially contain native prairie vegetation were delineated in Google Earth Pro. These potential native prairie polygons were then digitized using ArcGIS software.

Because species composition of potential grassland habitats could not be identified based on desktop review, potential native prairie identified in the desktop assessment could include other apparently similar land cover types such as tame grassland (i.e., grasslands comprised primarily of non-native species) and hayfields. Therefore, Tetra Tech recommends that field verification surveys be conducted to verify potential native prairie. During field verification surveys, areas delineated as potential native prairie during the desktop habitat assessment should be visuallyassessed. Visual assessment will be conducted from public rights of way and is intended to confirm, to the extent possible, the presence of native prairie vegetation and to rule out polygons delineated during the desktop assessment that consist of tame grasslands, hayfields, and/or fallow fields.

Results, Discussion and Next Steps

Approximately 3,846 acres (34 percent) of the 11,390-acre Project area were identified as potential native prairie based on the desktop assessment (Figure 2). As noted above, because species composition of potential grassland habitats could not be identified based on desktop review, the 3,846 acres of potential native prairie identified in the desktop analyses could include other apparently similar land cover types such as tame grassland (i.e., grasslands comprised primarily of non-native species) and hayfields. Based on aerial imagery and NLCD and cropland data, two polygons, totaling approximately 151 acres, appear to potentially consist of hayfields or fallow fields and; therefore, would not provide potential habitat to Dakota skipper (Figure 2). These areas are not included as part of the 3,846 acres of potential native prairie. However, Tetra Tech recommends that the vegetation composition of these polygons should be checked during field verification surveys to confirm this classification. Additionally, during the desktop analysis, areas appearing to contain open water were removed from potential native prairie polygons to the extent possible; however, additional small areas of emergent wetlands and/or open water may still occur in areas delineated as potential native prairie habitat. Although, wet prairies can provide habitat for Dakota skipper, areas of open water and emergent wetland vegetation do not provide potential habitat.

Because the area delineated as potential native prairie habitat for Dakota skipper may include areas of tame grassland, hayfields, open water, and emergent wetland the 3,846 acres delineated as potential native prairie habitat likely overestimates the actual area of potential habitat located within the Project area.

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Attachments

Figure 1. Project Vicinity

Figure 2. Potential Native Prairie Desktop Assessment

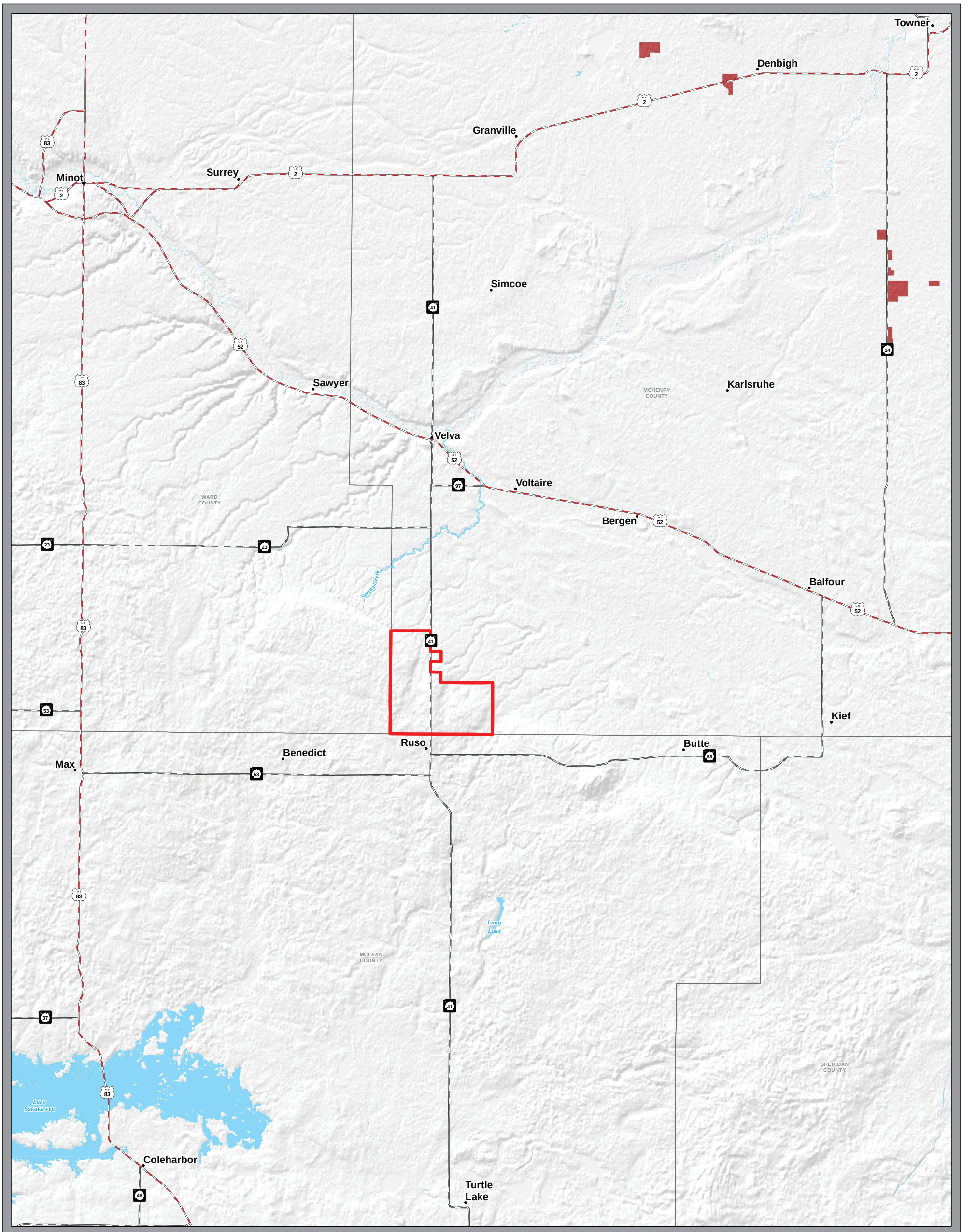

Figure 1: Project Vicinity Map

NEW FRONTIER WIND ENERGY PROJECT

0 0.5 1 Miles

Scale is 1:24,000 when printed at 22x34"

Legend

- Project Area
- Possible Hayfield or Fallow Field
- Potential Native Prairie Habitat

Vicinity Map

TETRA TECH

P:\5563_New_Frontier_Wind\GIS\Layouts\Native_Prairie\Native_Prairie.mxd Source: BTS, ESRI, NREL, FCC, DOD, and Ventyx Last Modified: 4/19/2016

Figure 2: Potential Native Prairie Desktop Assessment

CONFERENCE CALL NOTES
NEW FRONTIER WIND ENERGY PROJECT
July 8, 2016

In attendance:

- Kevin Shelley, U.S. Fish and Wildlife Service (USFWS)
- Jena Tufts, Bill Behling, Capital Power (CP)
- Sarah McCall, Jenny Taylor, Tetra Tech (Tt)
- Scott Krych, HDR

Background

The purpose of the call was to provide information to, and receive guidance from, the USFWS regarding results of surveys for the Dakota skipper (*Hesperia dacotae*) at the New Frontier Wind Energy Project in McHenry County, North Dakota. This call was a follow-up to previous discussions held between CP/Tt and USFWS.

Discussion Regarding Dakota Skipper Occupancy Surveys

- Scott Krych conducted Dakota skipper occupancy surveys during the skipper's flight stage in the project area (June 28 – July 7). Many of the properties in the project area are either hayed or heavily grazed. Herbicide application has occurred in many places within the project area.
- Scott identified 3-4 parcels with forb components, and conducted surveys on these parcels. Scott surveyed all potential habitat within the project boundary and surveys were finished on July 6. Scott identified 4 Dakota skippers in the second round of surveys on one parcel, and provided this data to the USFWS.
- Aerial photography suggests good habitat in the north and southeast portions of the project area. However, field review confirmed that these areas have had applied herbicides and/or are heavily grazed.
- The suitable habitat identified during the survey of the project area is in central portion of the project along Hwy 41 (approximately 120-160 acres), as well as some very small pockets in the southeast containing knolls and shrubs.
- The next steps are for Scott to provide documentation of the areas where surveys were conducted as well as the butterfly sightings. Scott will also provide a summary report.
- CP will decide from a development standpoint about how to move forward. Kevin Shelley said that it may be valuable to run the model developed by HDR through the entire project to characterize classes and outputs from the model, and include this in the report or as an addendum. This may lend insight as to how much one could infer

occupancy beyond what was surveyed. If Scott has surveyed all the suitable habitat within the project area, this may not be useful. However, for future land use with a change in land use practices this model may be useful to inform where potential habitat could occur. CP, Tt, and HDR will discuss this offline.

Avian Surveys

- There will be an upcoming call to discuss the results of the ongoing surveys. Kevin's availability for the next call will be Thursday 7/14 1 – 3 PM or 8 – 10 AM central; his schedule is better for the following week. Kevin will be glad to discuss eagles, cranes, plovers, and Dakota skippers on the next call. Mark Martell from Tt has been discussing fragmentation concerns regarding grouse with the North Dakota Game & Fish as well.

Permitting and Construction Timeline

- Bill explained that CP is pursuing a Certification of Continuing Suitability with the PSC and is updating project design. Turbines will be between 2.0 and 3.3 MW. This will reduce 66 turbines to 30-49 turbine locations, using the original turbine locations and similar collection systems and access roads. CP is pulling together studies and design.
- Capital Power would like to place an equipment order by the end of this year to meet IRS construction start requirements for qualifying the project for the full Production Tax Credit and potentially build in 2017.

Action Items

- HDR to provide areas where surveys were conducted, butterfly sightings, and summary report.
- CP/Tt/HDR to discuss the applicability of Scott's model.
- CP/Tt to schedule upcoming call with USFWS.
- CP/Tt will continue consultation with USFWS on protocols and results of surveys.

TETRA TECH

CONFERENCE CALL NOTES
NEW FRONTIER WIND ENERGY PROJECT
July 14, 2016

In attendance:

- Kevin Shelley, U.S. Fish and Wildlife Service (USFWS)
- Jena Tufts, Bill Behling, Capital Power (CP)
- Sarah McCall, Mark Martell, Tetra Tech (Tt)
- Scott Krych, HDR

Background

The purpose of the call was to provide information to, and receive guidance from, the USFWS regarding results of surveys for the Dakota skipper (*Hesperia dacotae*) and avian surveys at the New Frontier Wind Energy Project (the "Project") in McHenry County, North Dakota. This call was a follow-up to previous discussions held between CP/Tt and USFWS.

Discussion Regarding Dakota Skipper Occupancy Surveys

- Follow up discussion from 7/8/2016 conference call regarding Scott Krych's model
    - Scott said that based on results of the field effort, running the model will be superfluous to the field reconnaissance he conducted for the Project. Scott did an assessment of potential suitable habitat for Dakota skipper presence and areas to harbor the skipper at the field level. The model will be coarser than the field effort and the field effort would delineate the habitat better than would the model. Kevin Shelley agreed that it did not make sense to run the model and it is better to get on-the-ground data as was done for the Project. Kevin requested to see the vegetation data once it is available.
    - Scott has prepared a summary of components for each area visited, as well as conditions for the site. This will be quantitative at the quadrat level.
    - Kevin asked if there was quantitative data developed for the vegetation in the past. Capital Power is still going through the previous files, and has not seen all the previous data yet. Kevin said ideally the quadrat level data will be more insightful than a species list or broad-scale assessment of plant community (qualitative vs. quantitative).
- Proposed mitigation for avoidance of occupied habitat
    - CP is proposing to remove project infrastructure from the occupied habitat as identified by Scott Krych during field surveys. Kevin would like a diagram of the

mitigation CP is proposing. Kevin would like to look at the relative proximity to occupied habitat and juxtaposition of the infrastructure.

- The original project had 66 turbines, and CP is reducing this number to 30 – 49. One of the turbines is within the occupied habitat as identified through field surveys. CP is proposing to remove this turbine and will put this into a diagram and memo for Kevin. North Dakota Highway 41 borders the eastern part of this habitat. The turbine location would be moved to a location approximately 1.5 miles east of Highway 41.
- Kevin said this mitigation would likely eliminate the direct exposure and stressors. Kevin would like to see the diagram to determine any indirect effects; we can discuss this further once the diagram is produced and reviewed by Kevin.

Avian Surveys

- Preliminary eagle survey results
  - Mark Martell said that raptor and eagle nest surveys did not turn up any eagle nests in the Project area; a bald eagle nest was found to the N/NW about 8 miles outside the Project boundary and a second bald eagle nest was found over 10 miles from the Project boundary.
  - Eagle surveys started in mid-March. A total of 6 eagles were seen from March 29 – April 14 (5 bald and 1 golden). The golden eagle and one of the bald eagle observations incidentals observed outside of surveys. There has been a total of 5 eagle minutes (recorded below 200 m within the 800 m survey radius) within 72 hours of survey time. Kevin said this is consistent with spatial data that the USFWS has. The eagles observed appear to be spring migrants and Tt is not seeing regular use of the Project area.
  - Tt is also doing avian point-count surveys and has not identified any threatened or endangered species. The species identified to date include typical grassland birds, gulls, and water birds. Point-count surveys began in mid-March and are ongoing through fall. Quality control has not been completed yet, but preliminary results indicate that Tt has recorded 145 birds per 20 minute survey (spring) and 75 birds per 20 minute survey (summer). Kevin asked how many pipits were picked up; Mark said that one American pipit was seen in spring, but no Sprague's pipits. Kevin noted that pipits had been found in the area during previous surveys but there have been a lot of land use changes in this area in the past few years and the habitat may no longer be suitable.
  - Regarding sharp-tailed grouse, Tt conducted two rounds of surveys and two leks turned up during the second round. One historic lek was detected 1 mile to the west of the western Project boundary and one new lek was detected approximately 1.2 miles northwest of the northwestern corner of the Project

boundary. Tt will share this information with North Dakota Game and Fish in their reports and provide NDGF with coordinate data as well.

- Discussion regarding whooping cranes and piping plovers
  - Kevin has data from a USGS study of radio-tagged whooping cranes and habitat mapping. There are approximately 30 whooping cranes (approximately 10 percent of the population) that have been radio-tagged.
  - Kevin described another study of frequency of use quartiles within the migration corridor. The use intensity is very low in the approximate location of the Project.
  - This information will contribute to the decision that needs to be made on exposure risk to cranes. Kevin will make these whooping crane study data available to CP/Tt. Kevin would like to get together in a face-to-face meeting and talk more about T&E exposure risk to wrap this information into the decision-making.
  - Regarding piping plovers, USGS Jamestown has been working on plover studies. Kevin said they have been rolling out interim reports on a long-term study of overland movement patterns between rivers, lakes, and alkali wetlands. There is no critical habitat close to the Project. They do not know the height of the flight paths, but what we can look at is the approximate location of flight corridors. Kevin can send CP/Tt preliminary summaries from USGS.
  - Kevin said that Western Area Power Administration (Western) has released a Programmatic Environmental Impact Statement (EIS) [see https://www.wapa.gov/regions/UGP/Environment/Pages/ugp-nepa.aspx]. The spatial layout and parameters to help developers address exposure risk to plovers. This plover research may add an enhanced perspective. There have been setback buffers proposed from plover habitat; the Project is not within plover habitat. Programmatic consistency evaluation form is a checklist for developers; Kevin suggests that even on private developments this is a useful tool for seeing where a project would land from a risk perspective. This evaluation form is available on-line [see https://www.wapa.gov/regions/UGP/Environment/Documents/Project%20Consistency%20Evaluation%20Form.pdf].

Other Discussion

- Kevin asked CP to give him advance notice of what review will be needed from the USFWS and the timing for review. CP is putting together a schedule that will be submitted to the Public Service Commission as part of the Certificate of Continuing Suitability and Bill will share this with Kevin when ready.

Action Items/Next Steps

- CP to submit map of proposed avoidance of habitat.
- Kevin to send links to data discussed during the call.

- CP/Tt to look up Western EIS.
- CP to provide schedule to USFWS when available.
- CP to schedule a face-to-face meeting in the future.
- CP/Tt will continue consultation with USFWS on protocols and results of surveys.

NEW FRONTIER WIND ENERGY PROJECT

Dakota Skipper Occupancy Survey - Project Layout
July 2016 (prior to mitigation)

Project Area
Turbine
Dakota Skipper Occurence
Access Road
Collector Line
O & M Building
Substation
Dakota Skipper Occupied Habitat

0 0.5 1 Miles

Scale is 1:18,000 when printed at 22x34"

TETRA TECH

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Vicinity Map

NEW FRONTIER WIND ENERGY PROJECT

Dakota Skipper Occupancy Survey - Proposed Revisions to Layout

0 0.5 1 Miles

Scale is 1:18,000 when printed at 22x34"

- Project Area
- Turbine
- Dakota Skipper Occurence
- Access Road
- Collector Line
- O & M Building
- Substation
- Dakota Skipper Occupied Habitat

TETRA TECH

Vicinity Map

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MEETING NOTES
NEW FRONTIER WIND ENERGY PROJECT
September 8, 2016

In attendance:

- Kevin Shelley, U.S. Fish and Wildlife Service (USFWS)
- Jena Tufts, Bill Behling, Capital Power (CP)
- Mark Martell, Sarah McCall, Tetra Tech (Tt)
- Scott Krych, HDR

Background

The purpose of the meeting was to provide information to, and receive guidance from, the USFWS regarding results of surveys for the Dakota skipper (*Hesperia dacotae*) and avian surveys at the New Frontier Wind Energy Project (the "Project") in McHenry County, North Dakota. CP will also provide an update regarding the status of permit application submittals, project development, and the schedule for construction. This meeting was a follow-up to previous discussions held between CP/Tt and USFWS.

Dakota Skipper Occupancy Surveys

- Update from USFWS regarding Dakota skipper:
    - USFWS will release Dakota skipper spatial range-wide locational data soon.
    - The USFWS will not issue a Dakota skipper survey protocol certified by the Service across the range. However, Kevin Shelley said his office is going to issue a protocol for North Dakota.
    - The USFWS is hiring two full-time positions (energy and aquatic), the BLM is hiring one position, and there will be a Forest Service-funded position for Section 7 consultation.
- Recap of previous conversations and survey results
    - Tt conducted a desktop prairie analysis and field-verification of potential habitat at the Project area.
    - Scott Krych from HDR conducted occupancy surveys at the Project area.
    - Kevin asked if there were any areas of unoccupied habitat within the Project area. Scott replied that in addition to the area near the center of the Project west of Hwy 41, he also found habitat in the area across Hwy 41 and along 13th Avenue (see attached map). He conducted three surveys in each of these areas, and did not find

Dakota skipper on any of the parcels where habitat was delineated east of Hwy 41.

- Kevin asked for a summary of native grasslands, as well as a summary of suitable habitat or not within the Project area. Kevin would like to know why we were expecting more skipper habitat only to find the forb component was missing. Scott replied that from an aerial perspective, the northwestern portion of the Project area along the western boundary is consistent with native prairie. Scott conducted a walk-through of all the areas showing a grassland signature within the Project boundary. Once Scott evaluated the northwestern portion of the Project area on the ground, it appeared that an ATV had applied a broadleaf application to this area. There were almost no native forbs or nectaring forbs in this area at all. In some cases, these areas have been converted completely into non-native grasslands. Scott said these conditions are similar on the southern half of the Project area, however this area has experienced shrub and tree encroachment due to lack of grazing and fire.

- Discussion of proposed mitigation
  - Kevin asked about potential opportunities for mitigation. In response to the Dakota skipper survey results, CP has eliminated Turbine #20 and has added Turbine #66 to the Project to avoid the occupied habitat that was delineated. Collector lines on the east side of Hwy 41 that were encroaching on the habitat have been moved to avoid the habitat.
  - Kevin asked about the community north of Turbine #23. Scott said the entire parcel in this area is grass pasture. A lot of the area excluded from the delineation in the center is a low area dominated by shrubs, trees, and wetlands and is not Dakota skipper habitat. In the southern portion, it is more frequently grazed and compacted ground. There are native grasses that occur in the area delineated; outside of this area there are invasive species (leafy spurge) encroachment as well as compaction and rutting. The grazing pressure is so great that it has removed some of the grasses down to the soil. Anything outside of the delineated area is highly compacted, leafy spurge encroachment, and would exclude use by Dakota skippers. There is somewhat less pressure on the sloped areas than on the flat ground. The proximity to the lake to the south may also influence grazing in this area. There is a large distinction between the northern half and southern half of this delineated area; the northern half is more high-quality native prairie and the south end is not. Bill will let the landowner know about the Dakota skipper habitat on their land; Kevin offered to participate in this discussion. Bill and Kevin will set up a meeting with the landowner the week of September 19. [A subsequent call to the landowner set a meeting for September 21st at 2;00 pm.]

- Kevin asked if there is a net change on the impact to native grasses from the reduction from 66 to 49 turbines and infrastructure, including successional changes as well as delineated occupied Dakota skipper habitat. Kevin would like to see successional changes captured as spatial locations or a summary table. The USFWS is in conversations with several other departments within the state regarding recovery of the species.
- For the purposes of the Project, CP has removed Turbine 20 and is avoiding all direct disturbances to suitable Dakota skipper habitat. This is acceptable to Kevin for mitigation of direct effects.
- Jena asked if Kevin has concerns about disclosure of locations of this species. The USFWS has tools for a producer to use to manage land, but there are conversations that should accompany the use of these tools. Kevin would want to make the landowner aware of what they can and cannot do, and would advise the landowner of the associated legal issues. The producer would need to know the locations of this species. Kevin said it was acceptable to release the locations within reports to the Public Service Commission (PSC). Kevin would like to discuss this with the landowner prior to submittal of these materials to PSC.
- Regarding indirect effects, indirect stressors to the Dakota skipper include dust, vehicle traffic, and impacts during the mobile flight period. Kevin suggested that one mitigating approach would be to minimize traffic during the flight period on Project roads during construction and operation. Kevin has previously suggested (on other projects) to assume that the flight period occurs between June 10 through July 20 to obtain 100% assurance of being within the flight dates. The access road between Turbine #22 and #19 may possibly contribute to fugitive dust, depending on traffic volumes, substrate of roads, and wind. Kevin said there have been studies done on fugitive dust and affects to transpiration of plants and grasses; a species like Dakota skipper is relatively sensitive to minor changes. Kevin said this is primarily a concern during spring, summer, and fall. A limit on vehicle speed may help reduce risk, but Kevin would not recommend this unless there was a legitimate risk. Kevin has previously suggested that magnesium chloride could be added to water to be used for dust abatement; this has previously been accepted for use near sensitive aquatic areas and has been used by the oil and gas industry to mitigate potential impacts near skipper habitat.
- Regarding the weed management plan for operation and maintenance, Kevin stated that how you spray and what you spray adjacent to skipper habitat matters. Broadcasting herbicide application is not protected by the 4D rule and thus not recommended. Spot treatment of leafy spurge from a backpack or other application is included in the 4D rule and would be acceptable. Generally, with no

Project infrastructure being located in Dakota skipper habitat this should not be an issue. Kevin said that a USGS study demonstrated that over time, if weeds are not managed vegetative changes can occur out to 100 meters and could impact native grasslands. The USFWS would suggest treatment of adjacent Project roads to manage weeds.

Avian Surveys

- Discussion of interim survey reports for upcoming PSC Certificate of Continuing Suitability (CCS) application
    - Bats – acoustic monitors on site have recorded no Northern long-eared bat, mostly little brown bat. The USFWS will be conducting a status review of little brown bat within the next five years. This will be an evaluation of the species and the threats associated, including white nose syndrome.
    - Eagles – three exposure minutes within 90 hours of surveys. Three bald and one golden eagle incidentals (likely migrants). No golden eagle nests within 10 miles of the Project. There is one occupied bald eagle nest within 10 miles, and another occupied nest just outside the 10 mile buffer. Tt's interpretation is that there is low eagle use of the Project area. Kevin asked if there are any prairie dog towns within the Project area; Mark will check with NDGF regarding data on prairie dog towns.
    - Avian – no listed species have been identified during avian surveys between March and August, including Sprague's pipit. Kevin asked if this has been cross-walked with the previous work done on migratory birds. USFWS has discussed grassland birds with the previous owners, and has prepared a response not in favor of the Project to the previous owners. Kevin stated at this time, the previous opinion would still stand. If this risk scenario has changed, Kevin would like to see CP make this case.
    - Leks – Two active sharp-tailed grouse leks were found within two miles of the Project. The closest lek was one mile from the nearest turbine (Lek H-MCW18 and turbine T-18).

Status of PSC and McHenry County Application Submittals

- CP and their legal counsel Fredrickson & Byron are meeting with PSC staff this afternoon to introduce CP and let the PSC know that CP will be submitting the CCS application sometime this month.
- CP is filing the Conditional Use Permit (CUP) applications with McHenry County tomorrow. The Zoning Board hearing will be held on Thursday, September 22 with the McHenry County Commissioners meeting to be held Tuesday October 4.

Status of Project Development and Construction Schedule

- Design/engineering
  - The original design was for 66 1.5 megawatt (MW) turbines, but CP is now looking at 2 MW – 3.45 MW turbines due to improvements in technology since the Project was originally permitted. The Project design is now in the range of 29 to 49 turbines.
  - Under the original PSC certificate, the Project would have needed to start construction this past April. As construction did not start this spring, we are preparing a CCS to the PSC. The CCS will evaluate up to 49 turbine locations.
- Interconnection
  - The interconnection is capped at 99 MW.
  - CP has a signed interconnection agreement with MISO and Great River Energy for interconnection at GRE's McHenry substation.
- Schedule
  - CP will be placing an equipment order to meet the Production Tax Credit deadline of December 31, 2016.
  - The plan is to begin construction in Q2 of 2017.
  - CP is targeting commercial operations in January 2018.

Other Discussion

- USFWS is reviewing the western bumblebee as part of the recently released ESA National Listing Work Plan [see https://www.fws.gov/endangered/improving_esa/listing_workplan.html]. The state is discussing listings of pollinators. The state does not have statutory authority for listing species.
- Kevin asked about a Bird and Bat Conservation Strategy (BBCS). CP is planning to prepare a BBCS, but has not begun preparing this document.

Action Items/Next Steps

- Bill and Kevin to set up a meeting with the landowner where the Dakota skipper occurrences were found during the week of September 19 [scheduled for September 21].
- Capital Power will obtain prairie dog colony data from NDGF.
- Capital Power will compare 2016 avian survey results to results of avian surveys previously done for the Project.

- Capital Power will conduct a comparative analysis of impacts to native prairie from Project infrastructure from the original layout (66 turbines) versus the proposed layout (49 turbines).

NEW FRONTIER WIND ENERGY PROJECT

Dakota Skipper Occupancy Survey - Proposed Revisions to Layout

0 0.5 1 Miles

Scale is 1:18,000 when printed at 22x34"

- Project Area
- Turbine
- Dakota Skipper Occurence
- Access Road
- Collector Line
- O & M Building
- Substation
- Dakota Skipper Occupied Habitat

TETRA TECH

Vicinity Map

P:\5563_New_Frontier_Wind\GIS\Layouts\Project_Layout_DakotaSkipper.mxd Source: BTS, ESRI, NREL, FCC, DOD, and Ventyx Last Modified: 8/4/2016

MCHENRY COUNTY

33RD ST

32 1/2 ST

31 1/2 ST

41

47

19

21

22

23

54

25

24

NEW FRONTIER WIND ENERGY PROJECT

Dakota Skipper Occupancy Survey - Proposed Revisions to Layout

0 500 1,000 Feet

Scale is 1:5,000 when printed at 22x34"

- Project Area
- Turbine
- Dakota Skipper Occurence
- Access Road
- Collector Line
- O & M Building
- Substation
- Dakota Skipper Occupied Habitat

TETRA TECH

Vicinity Map

P:\5563_New_Frontier_Wind\GIS\Layouts\Project_Layout_DakotaSkipper_zoom.mxd Source: BTS, ESRI, NREL, FCC, DOD, and Ventyx Last Modified: 8/26/2016

North Dakota Game and Fish Department Coordination

GIS DATA SHARING AGREEMENT
NORTH DAKOTA GAME AND FISH DEPARTMENT

This is to serve as a formal agreement with: Mark Martell, Tetra Tech, Inc., Golden, CO and Bloomington, MN; and Jena Tufts, Capital Power Corporation.

The data includes: Bald and golden eagle nests and sharp-tailed grouse leks within 10 miles of two proposed wind farm projects, New Frontier and Garrison Butte, in McHenry County and Mercer County.

This data will be used for: Minimizing impacts to sensitive species during project development.

It is agreed that:

1. *Access to this data or web services will be restricted to the individuals or groups listed in this document.*

2. *All data provided or access to the web services will be used for these purposes only, and will not be given or sold to anyone not affiliated with these purposes. The information contained hereon is intended for the user and may not be copied, duplicated, or redistributed in any way, in whole or in part, without the written consent of the North Dakota Game and Fish Department. Confidentiality of information continues beyond the term of this agreement, or any extensions or renewals of it.*

3. *The North Dakota Game and Fish Department provides no guarantee, express or implied, as to the accuracy and/or completeness of the information contained hereon.*

4. *The user shall provide results of wildlife surveys conducted for the specified project, including on known or newly discovered wildlife features (e.g. golden eagle nest status, sharp-tailed grouse leks), to the North Dakota Game and Fish Department upon project completion. Spatial information must be compatible with ESRI ArcGIS formats.*

Signed: _____ Date: 3-2-2016
North Dakota Game and Fish Department

Signed: _____ Date: 3-Mar-2016
Mark Martell 3/3/2016

From: Martell, Mark
To: Bill Behling; Jena Tufts
Cc: McCall, Sarah; Taylor, Jennifer
Subject: North Dakota sharp-tailed grouse buffers
Date: Friday, July 29, 2016 10:12:35 AM

Bill and Jena,

I just spoke to Aaron Robinson at North Dakota Game and Fish (NDGF) today. He told me that NDGF is not setting sharp-tailed grouse buffer recommendations at this time but instead have decided that more research is needed. He informed me that he is putting together a group which would include Audubon, NDGF, USFWS, North Dakota State University, and a wind developer to fund and work on the research. They are scheduled to have a conference call next week. The idea is that they would study a grouse population before and after a wind farm was developed to determine the effect the development had on the birds (we did not discuss any specifics because they have not been developed yet).

He also told me that he is looking for wind developers who would be interested in working with them (ie. provide funding or a proposed site) on the project.

At this point any buffers recommendations from NDGF are a few years away. Aaron said the earliest the study would begin is next spring during the lek season.

Mark Martell | **Senior Ecologist**
Direct: 612-643-2245 | Cell: 612-961-3926
mark.martell@tetratech.com

Tetra Tech, Inc. | **Sciences**

350 Indiana St., Suite 500, Golden, CO 80401
and
2001 Killebrew Dr. Suite 141, Bloomington, MN 55425
www.tetratech.com

State Historical Society of North Dakota Coordination

STATE HISTORICAL SOCIETY OF NORTH DAKOTA

September 2, 2016

Mr. William R. Behling
Business Development Manager
Capital Power Corporation
155 Federal Street, Suite 1200
Boston, MA 02110

ND SHPO REF: 16-1726 ND PSC – Proposed 99 MW New Frontier Wind Energy Project, McHenry County, North Dakota

Dear Mr. Behling,

Thank you for your preliminary information on ND SHPO REF: 16-1726 ND PSC – Proposed 99 MW New Frontier Wind Energy Project, McHenry County, North Dakota.

We reviewed the previous Class III archaeological survey and recommend the following for this revitalized project.

- A current Class I (file search) to determine any additional recorded cultural resources in the previously surveyed area.
- A Class III (pedestrian) survey by a permitted architectural historian for standing buildings and structures (including cemeteries) over 50 years old in the visual Area of Potential Effect (APE). This is within a 2 mile radius of individual turbine locations. The purpose is to evaluate any architectural or structural features that may be eligible for nomination to the National Register of Historic Places. At least three out of the seven aspects of integrity used to evaluate historic properties could be impacted by the proposed project: the setting, feeling, and association of historic sites.
- If there was a previous survey for the transmission line (going north in your current documentation), we don't have it. We recommend a Class III archaeological survey of the transmission line.
- A Class III archaeological survey for any additional direct impacts not previously surveyed. For example, I note right-angled corners in the previous Class III survey while current practice is to survey gentler arcs to be sure that areas to be impacted by heavy equipment are fully surveyed, as well as crane paths, met towers, access roads, and staging areas.

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, as well as any meetings you may wish to hold at our office in Bismarck, on the state capitol grounds. 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,

Claudia J. Berg, Director State Historical Society of North Dakota

U.S. Air Force Coordination

From: Bill Behling
To: MUNOS, CY I GS-11 USAF AFGSC 91 MMXS/MMXSFK
Subject: RE: New Frontier Wind Energy Project

Cy:

Our setback requirement is 100' from your cable. Are you able to tell me which collector line comes within 45' of your cable such that we can relocate the collector line?

Thank you,

Bill

-----Original Message-----
From: MUNOS, CY I GS-11 USAF AFGSC 91 MMXS/MMXSFK [mailto:cy.munos@us.af.mil]
Sent: Thursday, August 25, 2016 9:24 AM
To: Bill Behling
Subject: RE: New Frontier Wind Energy Project

Notice: External Email

Bill,

Thanks for the files, this one has a little changes from the files we received in 2011. I'll be sending it up to our community planner for review.
As far as conflicts with the missile cable, 3 access roads and 3 collector lines will cross our cable. We also have an area where the collector line comes approx. 45ft from our cable.
Our regulations for crossing our buried cable
- No dirt moved on our cable easement (16.5') without AF personnel on site.
- Minimum 2' of separation, incased in metallic conduit the width of our cable easement (16.5)'
- No cable crossing within 50ft of our buried splices (no conflicts)
- We will not allow any ditch cutting for access roads on our easement without approval.
- We require a 48hr notice prior to cable crossing. (Cable Affairs Office 701-723-6053)

We will contact you after all agencies has reviewed the project. Thanks,

Cy Munos
Cable Affairs Officer
91 MMXS/MMXSFK
Minot AFB, ND
W. 701-723-6053
C. 701-720-8274

-----Original Message-----
From: Bill Behling [mailto:wbehling@capitalpower.com]
Sent: Thursday, August 25, 2016 5:31 AM
To: MUNOS, CY I GS-11 USAF AFGSC 91 MMXS/MMXSFK <cy.munos@us.af.mil>
Subject: RE: New Frontier Wind Energy Project

Cy:

Additional files attached. Let me know if you need additional information.

Bill

-----Original Message-----
From: MUNOS, CY I GS-11 USAF AFGSC 91 MMXS/MMXSFK [mailto:cy.munos@us.af.mil]
Sent: Wednesday, August 24, 2016 1:14 PM
To: Bill Behling
Subject: RE: New Frontier Wind Energy Project

Notice: External Email

I received the files, can I get the rest of the files? Thanks.

Cy Munos
Cable Affairs Officer
91 MMXS/MMXSFK
Minot AFB, ND
W. 701-723-6053
C. 701-720-8274

-----Original Message-----
From: Bill Behling [mailto:wbehling@capitalpower.com]
Sent: Wednesday, August 24, 2016 9:43 AM
To: MUNOS, CY I GS-11 USAF AFGSC 91 MMXS/MMXSFK <cy.munos@us.af.mil>
Subject: RE: New Frontier Wind Energy Project

Cy:

OK. My laptop does not have shapefile software on it and I leave it to our GIS folks to put together the shapefile maps. I have only sent you .shp files. Let me know if the attached work for you, or if you need additional, unzipped files (.shx, .dbf, .prj?)

Thank you,

Bill

-----Original Message-----
From: MUNOS, CY I GS-11 USAF AFGSC 91 MMXS/MMXSFK [mailto:cy.munos@us.af.mil]
Sent: Wednesday, August 24, 2016 10:27 AM
To: Bill Behling
Subject: RE: New Frontier Wind Energy Project

Notice: External Email

Bill,

Our network blocked the attachments, usually we can receive them if they come unzipped.

Cy Munos
Cable Affairs Officer
91 MMXS/MMXSFK
Minot AFB, ND
W. 701-723-6053
C. 701-720-8274

-----Original Message-----
From: Bill Behling [mailto:wbehling@capitalpower.com]
Sent: Wednesday, August 24, 2016 9:20 AM
To: MUNOS, CY I GS-11 USAF AFGSC 91 MMXS/MMXSFK <cy.munos@us.af.mil>
Subject: RE: New Frontier Wind Energy Project

Hi Cy:

Yes, please see the attached and let me know if you need any additional information.

Thank you,

Bill

-----Original Message-----
From: MUNOS, CY I GS-11 USAF AFGSC 91 MMXS/MMXSFK [mailto:cy.munos@us.af.mil]
Sent: Wednesday, August 24, 2016 10:11 AM
To: Bill Behling
Subject: RE: New Frontier Wind Energy Project

Notice: External Email

Bill,

Any chance we could get your most current shape files for this project? Thanks.

Cy Munos
Cable Affairs Officer
91 MMXS/MMXSFK
Minot AFB, ND
W. 701-723-6053
C. 701-720-8274

-----Original Message-----
From: Bill Behling [mailto:wbehling@capitalpower.com]
Sent: Wednesday, August 24, 2016 8:30 AM

To: MUNOS, CY I GS-11 USAF AFGSC 91 MMXS/MMXSFK <cy.munos@us.af.mil>
Subject: New Frontier Wind Energy Project

Hi Mr. Munos:

As we discussed earlier this month, please see the attached regarding the New Frontier Wind Energy Project.

Sincerely,

Bill

William R. Behling

Business Development Manager, Commercial Services

Capital Power Corporation

155 Federal Street, Suite 1200 I Boston, MA 02110

t: 617-330-1324 I m: 508-734-0919 I e: wbehling@capitalpower.com

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U.S. Army Corps of Engineers Coordination

CONFERENCE CALL NOTES
NEW FRONTIER WIND ENERGY PROJECT
November 1, 2016

In attendance:

- Jason Renschler, U.S. Army Corps of Engineers (USACE)
- Jena Tufts, Bill Behling, Capital Power (CP)
- Sarah McCall, Steve Yarbrough, Bob Evans, Tetra Tech (Tt)

Background

The purpose of the call was to provide information to, and receive guidance from, the USACE regarding the previous wetland jurisdictional determination (JD) for the New Frontier Wind Energy Project (the "Project") in McHenry County, North Dakota.

Discussion Regarding Ownership of the Project and Changes to Layout

- Bill Behling explained that Capital Power bought the New Frontier Project from Element Power. The LLC for the Project is Meadowlark Wind I, LLC. The Project was previously permitted by the North Dakota Public Service Commission (PSC) and McHenry County, and these permits have expired.
- Capital Power has obtained updated Conditional Use Permits for the Project and for the Transmission Line from McHenry County.
- The PSC certificate was issued four years ago and Meadowlark needed to begin construction by April 2016, which did not take place. A Certificate of Continuing Suitability is being prepared for the PSC now, as well as updated environmental studies.
- Bill sent a letter on August 26, 2016 to Daniel Cimarosti of the USACE to re-introduce the Project; Jason said that Daniel Cimarosti has since retired and he has not seen this letter. Bill will email Jason a copy of this letter for his files.
- Bill said that the Project was currently planned for 66 turbines and the interconnection agreement is capped at 99 megawatts. Capital Power is revising the design to reduce the number of turbines to between 29 and 49 turbines and the turbines will all be in the same locations as previous. Some of the turbines would be moved slightly (on the order of 50 feet) to avoid setback restrictions, and all shifts will be evaluated for impacts to wetlands.

Previous Jurisdictional Determination and Applicability to Current Project

- The wetland JD was issued for the Project in February 2012. The existing JD expires February 24, 2017 and the existing nationwide permit (NWP) 12 expires March 18, 2017. Steve asked Jason what would be the options moving forward as construction of the

Project will not be completed by February 2017. Jason asked if the 16 wetlands identified in the JD request and the Project has remained the same except for the date of construction, and Bill explained that the impacts to wetlands have if anything decreased due to the reduction in number of turbines and associated facilities.

- The impact for jurisdictional wetland D4-3b would be less than 1/10 acre under the current Project layout. Jason verified that Capital Power would not need to prepare a Pre-Construction Notification under the current requirements for a NWP 12. He clarified that North Dakota does not have a regional condition for impacts to special aquatic sites (i.e., wetlands), as Kansas does. After March 18, 2017 the NWP 12 will change and additional regional conditions may be added, but Jason did not think that this condition would be added.
- Jason said that to re-verify the JD, a letter would need to be sent to USACE to request the JD to be good for another five years. Jason said there is a 21-day statutory requirement for EPA's review but it is likely that the JD could be issued in one month or less. Jason said that all correspondence should include the permit number from the previous JD (NWO-2011-2588-BIS).
- Jason suggested stating to the PSC that Capital Power is coordinating with the USACE Regulatory Office, as wind farms have come under scrutiny by the PSC lately.

Action Items

- CP/Tt to submit the request to USACE to re-verify the JD for another five years.

National Telecommunications and Information Administration Coordination

UNITED STATES DEPARTMENT OF COMMERCE
National Telecommunications and Information Administration
Washington, D.C. 20230

NOV - 1 2016

Mr. B. Benjamin Evans, P. E.
Evans Engineering Solutions, LLC
524 Alta Loma Drive
Thiensville, WI 53092

Re: New Frontier Project: McHenry County, ND

Dear Mr. Evans:

In response to your request on August 29, 2016, the National Telecommunications and Information Administration provided to the federal agencies represented in the Interdepartment Radio Advisory Committee (IRAC) the plans for the New Frontier Wind Project, located in McHenry County, North Dakota.

After a 45+ day period of review, two federal agencies, the Department of Commerce (DOC) and the Department of Energy (DOE), identified concerns regarding this project having the potential to impact their radar systems. Please see the attached reports from DOC and DOE for further information.

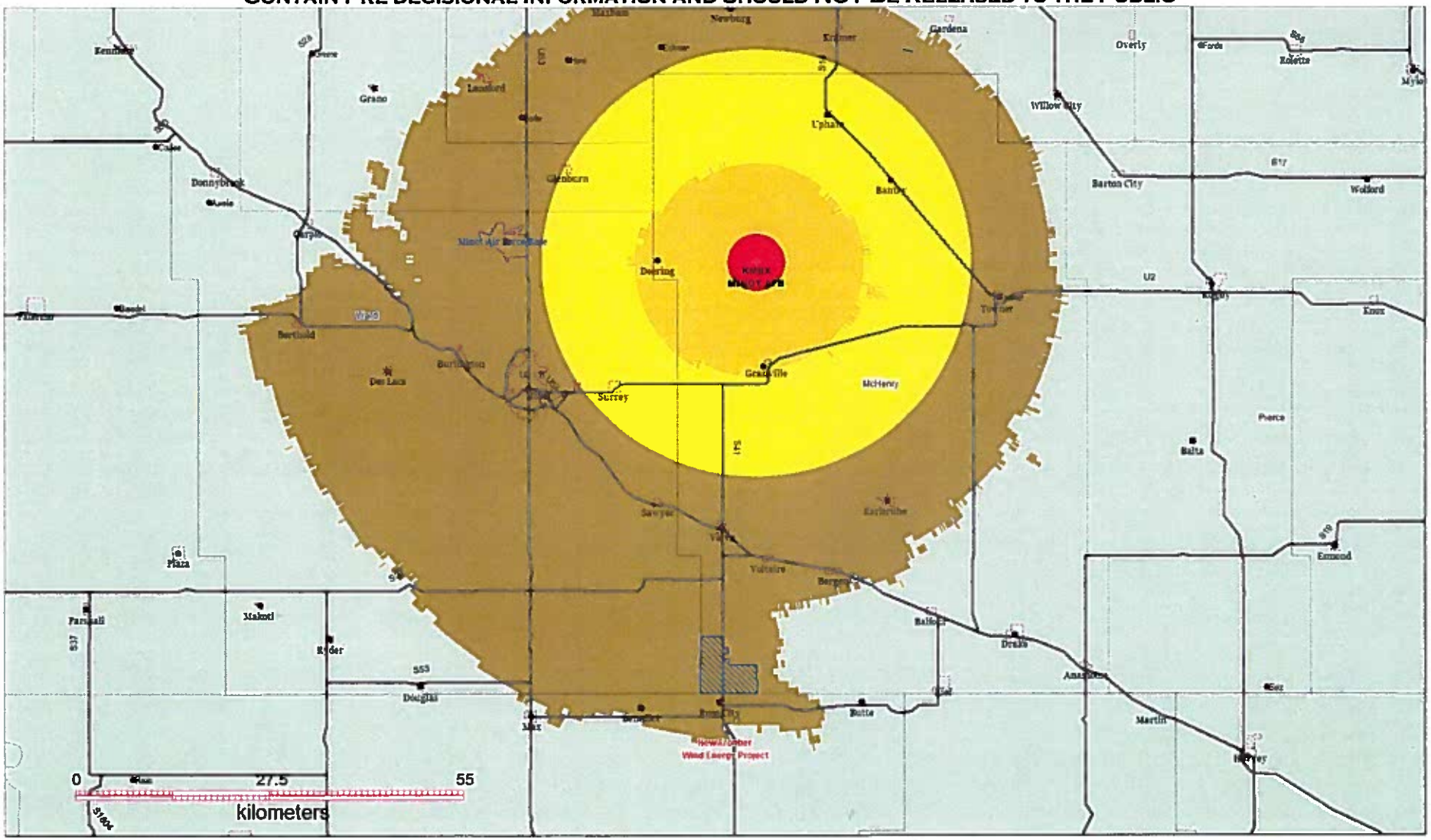
While the other IRAC agencies did not identify any concerns regarding radio frequency blockage, this does not eliminate the need for the wind energy facilities to meet any other requirements specified by law related to these agencies. For example, this review by the IRAC does not eliminate any need that may exist to coordinate with the Federal Aviation Administration concerning flight obstruction.

Thank you for the opportunity to review this proposal.

Sincerely,

Peter A. Tenhula
Deputy Associate Administrator
Office of Spectrum Management

Attachment



Commerce has completed our review of the New Frontier Project and find this project falls into the Notification Zone of the Minot AFB, ND nNEXRAD. Only the lowest elevation angle will be affected by turbines as such, we only request further contact with the developer if plans change.

This project is close to or within the operating area of the Department of Energy Western Area Power Administration. Exact turbine locations will be required to determine any potential impact.

The Western POC is:

Scott E. Johnson
Senior Telecom Engineer/Spectrum Program Manager
U.S. Department of Energy
Western Area Power Administration Headquarters
P.O. Box 281213
Lakewood, Colorado 80228-8213
Phone: (720) 962-7380
Fax: (720) 962-4080
sjohnson@wapa.gov

Pamela E. Main
Energy FAS Representative
Spectrum Management Team
Office of Technology and Innovation
Office of the Chief Information Officer
(301) 903-4261 Office
(240) 449-6207 Mobile
(301) 903-7045 Fax
pamela.main@hq.doe.gov

North Dakota Department of Health Coordination

NORTH DAKOTA
DEPARTMENT of HEALTH

ENVIRONMENTAL HEALTH SECTION
Gold Seal Center, 918 E. Divide Ave.
Bismarck, ND 58501-1947
701.328.5200 (fax)
www.ndhealth.gov

September 6, 2016

Mr. William R. Behling
Business Development Manager
Capital Power Corporation
155 Federal Street, Suite 1200
Boston, MA 02110

Re: New Frontier Wind Energy Project, McHenry County

Dear Mr. Behling:

This department has reviewed the information concerning the above-referenced project submitted under date of August 26, 2016, with respect to possible environmental impacts.

This department believes that environmental impacts from the proposed construction will be minor and can be controlled by proper construction methods. With respect to construction, we have the following comments:

1. All necessary measures must be taken to minimize fugitive dust emissions created during construction activities. Any complaints that may arise are to be dealt with in an efficient and effective manner.

2. Care is to be taken during construction activity near any water of the state to minimize adverse effects on a water body. This includes minimal disturbance of stream beds and banks to prevent excess siltation, and the replacement and revegetation of any disturbed area as soon as possible after work has been completed. Caution must also be taken to prevent spills of oil and grease that may reach the receiving water from equipment maintenance, and/or the handling of fuels on the site. Guidelines for minimizing degradation to waterways during construction are attached.

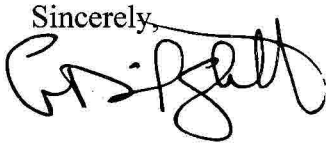
3. Projects disturbing one or more acres are required to have a permit to discharge storm water runoff until the site is stabilized by the reestablishment of vegetation or other permanent cover. Further information on the storm water permit may be obtained from the Department's website or by calling the Division of Water Quality (701-328-5210). Check with the local officials to be sure any local storm water management considerations are addressed. Storm water runoff from the project area discharges to a water body that has a total maximum daily load allocation and is listed as impaired under section 303(d) of the Federal CWA (Wintering River). Extra care should be taken to ensure construction activity does not affect the water body.

4. Noise from construction activities may have adverse effects on persons who live near the construction area. Noise levels can be minimized by ensuring that construction equipment is equipped with a recommended muffler in good working order. Noise effects can also be minimized by ensuring that construction activities are not conducted during early morning or late evening hours.

The department owns no land in or adjacent to the proposed improvements, nor does it have any projects scheduled in the area. In addition, we believe the proposed activities are consistent with the State Implementation Plan for the Control of Air Pollution for the State of North Dakota.

If you have any questions regarding our comments, please feel free to contact this office.

Sincerely,



L. David Glatt, P.E., Chief
Environmental Health Section

LDG:cc
Attach.

NORTH DAKOTA
DEPARTMENT of HEALTH

ENVIRONMENTAL HEALTH SECTION
Gold Seal Center, 918 E. Divide Ave.
Bismarck, ND 58501-1947
701.328.5200 (fax)
www.ndhealth.gov

Construction and Environmental Disturbance Requirements

These represent the minimum requirements of the North Dakota Department of Health. They ensure that minimal environmental degradation occurs as a result of construction or related work which has the potential to affect the waters of the State of North Dakota. All projects will be designed and implemented to restrict the losses or disturbances of soil, vegetative cover, and pollutants (chemical or biological) from a site.

Soils

Prevent the erosion of exposed soil surfaces and trapping sediments being transported. Examples include, but are not restricted to, sediment dams or berms, diversion dikes, hay bales as erosion checks, riprap, mesh or burlap blankets to hold soil during construction, and immediately establishing vegetative cover on disturbed areas after construction is completed. Fragile and sensitive areas such as wetlands, riparian zones, delicate flora, or land resources will be protected against compaction, vegetation loss, and unnecessary damage.

Surface Waters

All construction which directly or indirectly impacts aquatic systems will be managed to minimize impacts. All attempts will be made to prevent the contamination of water at construction sites from fuel spillage, lubricants, and chemicals, by following safe storage and handling procedures. Stream bank and stream bed disturbances will be controlled to minimize and/or prevent silt movement, nutrient upsurges, plant dislocation, and any physical, chemical, or biological disruption. The use of pesticides or herbicides in or near these systems is forbidden without approval from this Department.

Fill Material

Any fill material placed below the high water mark must be free of top soils, decomposable materials, and persistent synthetic organic compounds (in toxic concentrations). This includes, but is not limited to, asphalt, tires, treated lumber, and construction debris. The Department may require testing of fill materials. All temporary fills must be removed. Debris and solid wastes will be removed from the site and the impacted areas restored as nearly as possible to the original condition.

U.S. Department of Agriculture Farm Service Agency Coordination

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

September 8, 2016

Capital Power Corporation
C/O William R. Behling, Business Development Manager
155 Federal Street, Suite 1200
Boston, MA 02110

Dear Mr. Behling,

This letter is in response to your August 26, 2016 letter concerning the Meadowlark Wind I LLC ("Meadowlark") Project and the New Frontier Wind Energy Project ("Project") in McHenry County of North Dakota.

Based on the information in your August 26th 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 either Meadowlark or 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,

FOR Aaron Krauter
State Executive Director

Cc: McHenry FSA County Office
Leith, District Director

U.S. Department of Agriculture Natural Resources Conservation Service Coordination

Natural Resources
Conservation Service

Devils Lake Area Office
706 8th Ave SE, Ste 1
Devils Lake, ND 58301
TEL: 701.662.7967 ext 5

September 19, 2016

William R. Behling
Capital Power
155 Federal Street
Suite 1200
Boston, MA 02110

RE: New Frontier Wind Energy Project in McHenry, McLean, and Ward Counties in North Dakota.

Dear: Mr. Behling:

The Natural Resources Conservation Service (NRCS) has reviewed your letter dated August 26, 2016, concerning the above mentioned project and acknowledge your request to determine whether your project affects farmland as defined in Sec. (658.2 a) of the Code of Federal Regulations (CFR) dealing with the Farmland Protection Act (FPPA). NRCS has a major responsibility with the Farmland Protection Policy Act (FPPA) in documenting conversion of farmland (i.e. prime, statewide importance and local importance) to non-agricultural use when the project utilizes federal funds. Your proposal includes turbine locations, substation area, access roads, and underground electrical circuit. These types of activities may remove farmland from production; therefore may be subject to FPPA. Please complete the form NRCS-CPA-106 for all areas of the project which could remove agricultural lands from projection. (See instructions below).

Enclosed is a Farmland Conversion Impact Rating Form NRCS-CPA-106 or you may use the web based format http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/landuse/fppa/ to record the following: Please complete **Part I and III** and return to me. If applicable, you may email the above information to lance.duey@nd.usda.gov . If the farmland (i.e. Prime Farmland, Statewide Importance, Local Importance) is determined to be subject to FPPA, NRCS will then complete **Parts II and IV**. NRCS will measure the relative value of the site as farmland on a scale of 0 to 100 according to the information sources listed in CFR 658.S(a). If FPPA applies to this project, Form NRCS-CPA-106 will be returned to your agency for completion of Part VI, Site Assessment Criteria. Please send a copy of the completed NRCS-CP A-106 form back to NRCS for year-end reporting purposes.

Wetlands

The Wetlands Conservation Provisions of the 1985 Food Security Act, as amended,

provide that if a USDA participant converts a wetland for the purpose or to have the effect of making agricultural production possible, loss of USDA benefits could occur. The NRCS has developed the following guidelines for the installation of permanent structures where wetlands occur. If these guidelines are followed, the impacts to the wetland will be considered minimal allowing USDA participants to continue to receive USDA benefits. Following are the requirements:

- Disturbance to the wetland must be temporary.
- No drainage of wetland is allowed (temporary or permanent)
- Mechanized landscaping necessary for installation is kept to a minimum and preconstruction contours are maintained
- Temporary side cast material must be placed in such a manner not to be dispersed in the wetland.
- All trenches must backfilled to the original wetland bottom elevation.

NRCS recommends that impacts to wetlands be avoided. If the alignment of the project requires passage through a wetland, NRCS can complete a certified wetland determination if requested by the landowner/operator.

If you have additional questions pertaining to FPPA, please contact Steve Sieler, Liaison Soil Scientist, NRCS, Bismarck, ND, at (701) 530-2019. Thank you.

Sincerely,

Lance Duey
Area Resource Soil Scientist

North Dakota Geological Survey Coordination

From:	McCall, Sarah
To:	McCall, Sarah
Subject:	FW: N.D. Geological Survey - Proposed New Frontier Project - Study Area Information Letter
Date:	Monday, September 26, 2016 10:35:20 AM

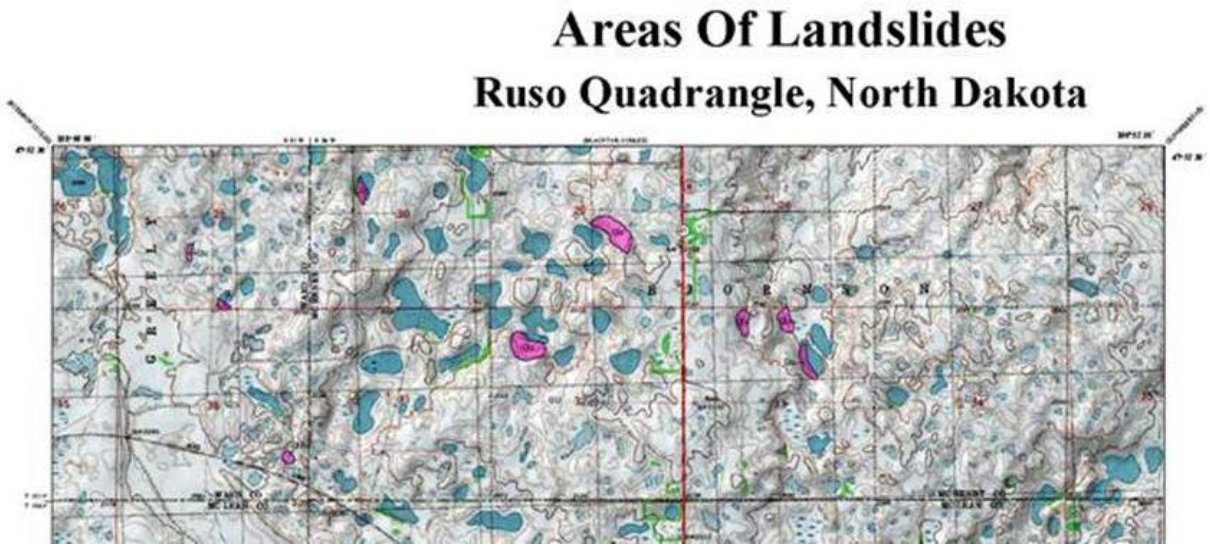
From: Anderson, Fred J. [mailto:fjanderson@nd.gov]
Sent: Thursday, September 08, 2016 12:37 PM
To: Bill Behling
Subject: N.D. Geological Survey - Proposed New Frontier Project - Study Area Information Letter

Mr. Behling-

In response to your comment solicitation letter of August 26, 2016, I would let you know that we have recently completed two 1:24,000 scale landslide inventory maps that cover the proposed project boundary that may be of interest regarding your project.

These maps, which depict areas where landslides have occurred in the past (as mapped from historical ca. 1960's aerial photos) and associated GIS data should be available for download, free of charge, on our new geological maps and data delivery service by the end of next week:
https://www.dmr.nd.gov/ndgs/landslides/

I have attached a graphic (below) which depicts landslide area mapped in the southern project area (shaded pink areas). No landslide areas were mapped in the northern project areas.



You may also find our recently completed LiDAR elevation maps to be of interest as well. These maps are being updated and posted to the web as they are completed so if the maps that you are interested in are not available, please check back often:

Please let us know if you have any questions or comments.

Regards,

Fred J. Anderson, Geologist
North Dakota Geological Survey
600 East Boulevard Ave
Bismarck, ND 58505-0840
(701) 328-8000
https://www.dmr.nd.gov/ndgs/

North Dakota Department of Transportation Coordination

North Dakota Department of Transportation

Grant Levi, P.E.
Director

Jack Dalrymple
Governor

September 13, 2016

William R. Behling
Business Development Manager
Capital Power Corporation
151 Federal Street, Suite 1200
Boston, MA 02110

CONTINUING DEVELOPMENT OF THE NEW FRONTIER WIND ENERGY PROJECT, MCHENRY COUNTY, NORTH DAKOTA

We have reviewed your August 26, 2016, letter.

This project should have no adverse effect on the North Dakota Department of Transportation (NDDOT) highways; however, historically with these type of projects the loads are very heavy and the road structures are not heavy duty. Therefore, both ND Highway 41 and ND Highway 53 have a seven ton seasonal restriction. As with any extreme loading situation, NDDOT reserves the right to make change to the seasonal restrictions or impose restrictions outside the typical spring thaw season. It will be necessary to make all requests regarding load and access points directly to the District.

Additionally, if because of this project any work needs to be done on highway right of way, appropriate permits and risk management documents will need to be obtained from the Department of Transportation District Engineer, Jim Redding, Minot at 701-837-7625.

Robert Fode

ROBERT A. FODE, P.E., DIRECTOR – OFFICE OF PROJECT DEVELOPMENT

57\raf\js
c: Jim Redding, Minot District Engineer

North Dakota Parks and Recreation Department Coordination

Jack Dalrymple, Governor
Mark A. Zimmerman, Director

1600 East Century Avenue, Suite 3
Bismarck, ND 58503-0649
Phone 701-328-5357
Fax 701-328-5363
E-mail parkrec@nd.gov
www.parkrec.nd.gov

September 15, 2016

William R. Behling
Capital Power Corporation
155 Federal Street, Suite 1200
Boston, MA 02110

Re: Meadowlark Wind I LLC New Frontier Wind Energy Project

Dear Mr. Behling,

The North Dakota Parks and Recreation Department as reviewed the above referenced project for the above proposed wind energy project in McHenry, Ward and McLean counties, North Dakota.

Our agency scope of authority and expertise covers recreation and biological resources (in particular rare plants and ecological communities). The project as defined does not affect state park lands that we manage or impact Land and Water Conservation Fund recreation projects that we coordinate.

The North Dakota Natural Heritage biological conservation database has been reviewed to determine if any plant or animal species of concern or other significant ecological communities are known to occur within an approximate one-mile radius of the project area. Based on this review, there are several documented plant, animal and significant ecological community occurrences in our database within or adjacent to project area. Because this information is not based on a comprehensive inventory, there may be species of concern or otherwise significant ecological communities in the area that are not represented in the database. The lack of data for any project area cannot be construed to mean that no significant features are present. The absence of data may indicate that the project area has not been surveyed, rather than confirm that the area lacks natural heritage resources. Please refer to attached maps and spreadsheet.

Given the potential for not only habitat disturbance and disruption but the threat to nesting, feeding and migratory bird and bats in the area we suggest that all efforts be made to avoid impacts to wildlife species and their habitats. In an effort to avoid or minimize impacts to wildlife and their habitats we encourage proper evaluation of all potential wind energy sites. To identify and assess adverse impacts to wildlife we suggest pre and post construction avian and bat monitoring studies be conducted.

The Department recommends that the project be accomplished with minimal impacts and that all efforts be made to ensure that critical habitats not be disturbed in the project area to help secure rare species conservation in North Dakota. Regarding any reclamation efforts, we recommend that any impacted areas be revegetated with species native to the project area.

It is our policy to charge requests for data services including data retrieval, data analysis, manual and computer searches, packaging and collection of data. An invoice for services provided has been enclosed.

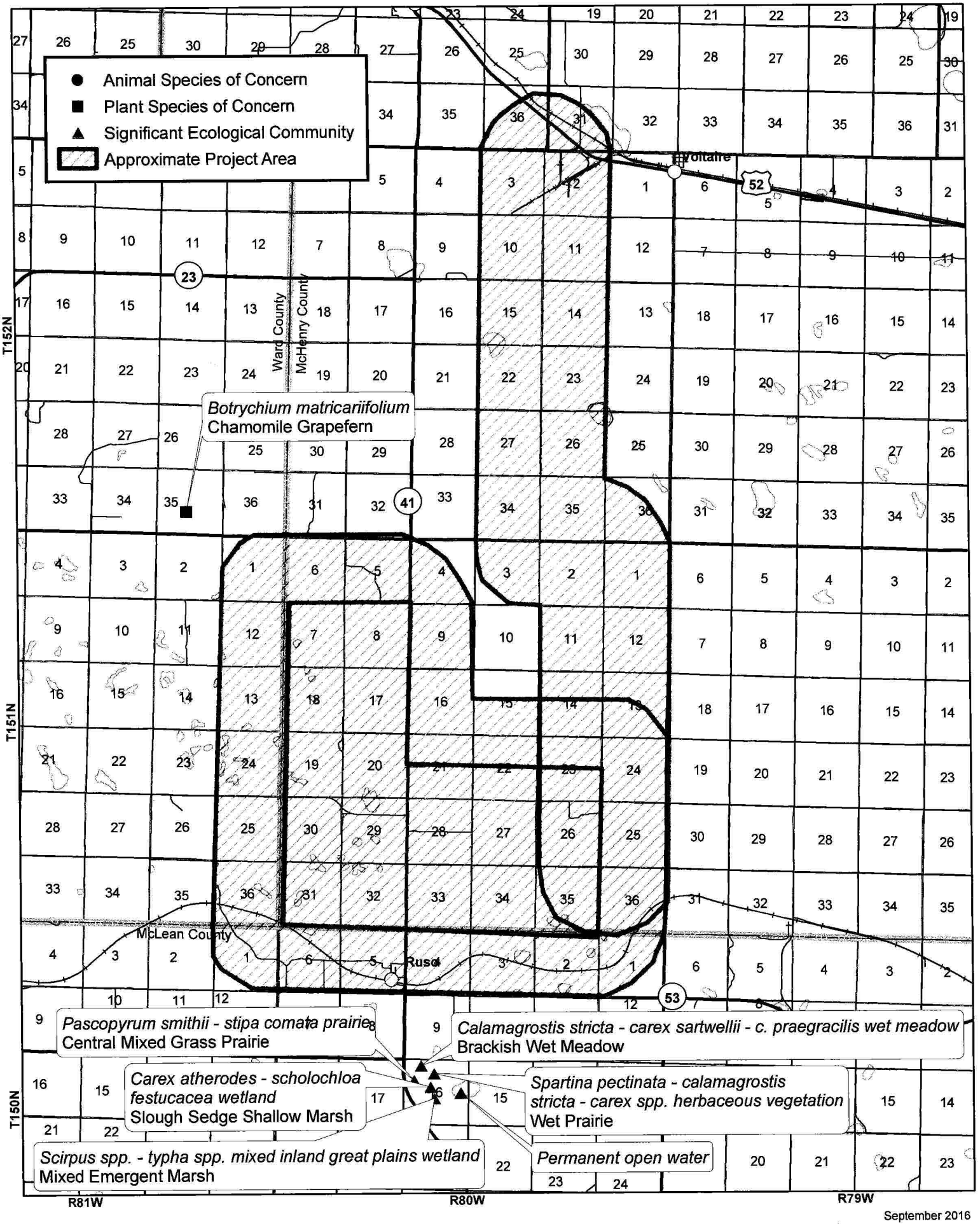
We appreciate your commitment to rare plant, animal and ecological community conservation, management and inter-agency cooperation to date. For additional information please contact me at (701-328-5370 or kgduttenhefner@nd.gov). Thank you for the opportunity to comment on this proposed project.

Sincerely,

Kathy Duttenhefner, Coordinator
Natural Resources Division

R.USNDNHI*2016_233KD9/15/2016DL9.15.2016

North Dakota Parks and Recreation Department
North Dakota Natural Heritage Inventory



September 2016

North Dakota Natural Heritage Inventory

Rare Animal and Plant Species and Significant Ecological Communities

State Scientific Name	State Common Name	State Rank	Global Rank	Federal Status	Township Range Section	County	Last Observation	Estimated Representation Accuracy	Precision
Botrychium matricariifolium	Chamomile Grapefern	S1	G5		152N081W - 35; 152N081W - 20; 152N082W - 24; 151N080W - 04; 152N081W - 30; 151N081W - 13; 151N080W - 05; 151N081W - 23; 151N081W - 12; 151N081W - 22; 151N080W - 03; 152N080W - 08; 151N081W - 14; 152N081W - 14; 151N081W - 24; 152N081W - 27; 152N080W - 19	McHenry, Ward	1974-06-18		G
Calamagrostis stricta - carex sartwellii - c. praegracilis wet meadow	Brackish Wet Meadow	S2S3	GNR		150N080W - 16; 150N080W - 31; 150N081W - 11; 150N080W - 30; 150N080W - 10; 150N079W - 08; 150N080W - 21; 149N081W - 01; 150N079W - 19; 150N079W - 18; 150N080W - 01; 151N081W - 26; 150N079W - 05; 149N080W - 05; 150N079W - 30; 151N080W - 31; 150N080W - 15	McHenry, McLean, Ward	1991-08-02		G
Carex atherodes - scholochloa festucacea wetland	Slough Sedge Shallow Marsh	S3	GNR		150N080W - 16; 150N081W - 01; 150N080W - 34; 150N081W - 22; 150N080W - 12; 149N080W - 02; 150N080W - 35; 150N081W - 25; 150N081W - 14; 149N080W - 03; 150N080W - 32; 150N081W - 24; 150N079W - 30; 149N080W - 05; 150N080W - 02; 150N081W - 12; 150N081W - 23	McHenry, McLean, Ward	1991-08-02		G
Pascopyrum smithii - stipa comata prairie	Central Mixed Grass Prairie	S2	GNR		150N080W - 23; 150N081W - 35; 150N079W - 06; 150N080W - 13; 150N080W - 22; 150N081W - 01; 150N079W - 07; 150N080W - 03; 150N081W - 15; 150N080W - 25; 150N079W - 30; 149N080W - 05; 150N080W - 02; 150N081W - 12; 150N081W - 23; 150N079W - 31; 150N080W - 11	McHenry, McLean, Ward	1991-08-02		G
Permanent open water		S2	GNR		150N080W - 16; 149N079W - 06; 151N080W - 26; 150N079W - 05; 151N080W - 19; 150N079W - 18; 150N079W - 19; 151N079W - 32; 149N081W - 01; 150N081W - 11; 150N080W - 21; 150N079W - 08; 150N080W - 10; 149N080W - 01; 150N080W - 30; 150N079W - 29; 149N080W - 11	McHenry, McLean, Ward	1991-08-02		G
Scirpus spp. - typha spp. mixed inland great plains wetland	Mixed Emergent Marsh	S3	GNR		150N080W - 16; 150N080W - 23; 150N081W - 35; 150N079W - 06; 150N080W - 13; 150N080W - 22; 150N081W - 01; 150N079W - 07; 150N080W - 03; 150N081W - 15; 150N080W - 25; 150N079W - 30; 149N080W - 05; 150N080W - 02; 150N081W - 12; 150N081W - 23; 150N079W - 31	McHenry, McLean, Ward	1991-08-02		G
Spartina pectinata - calamagrostis stricta - carex spp. herbaceous vegetation	Wet Prairie	S2S3	GNR		150N080W - 16; 151N080W - 28; 150N079W - 18; 150N079W - 19; 149N081W - 01; 150N079W - 29; 150N080W - 30; 150N080W - 10; 150N079W - 08; 150N080W - 21; 150N081W - 11; 150N080W - 31; 150N081W - 10; 150N080W - 01; 151N080W - 19; 151N080W - 29; 151N081W - 36	McHenry, McLean, Ward	1991-08-02		G

North Dakota Natural Heritage Inventory Biological and Conservation Data Disclaimer

The quantity and quality of data collected by the North Dakota Natural Heritage Inventory are dependent on the research and observations of many individuals and organizations. In most cases, this information is not the result of comprehensive or site-specific field surveys; many natural areas in North Dakota have never been thoroughly surveyed, and new species are still being discovered. For these reasons, the Natural Heritage Inventory cannot provide a definite statement on the presence, absence, or condition of biological elements in any part of North Dakota. Natural Heritage data summarize the existing information known at the time of the request. Our data are continually upgraded and information is continually being added to the database. This data should never be regarded as final statements on the elements or areas that are being considered, nor should they be substituted for on-site surveys.

Estimated Representation Accuracy

Value that indicates the approximate percentage of the Element Occurrence Representation (EO Rep) that was observed to be occupied by the species or community (versus buffer area added for locational uncertainty). Use of estimated representation accuracy provides a common index for the consistent comparison of EO reps, thus helping to ensure that aggregated data are correctly analyzed and interpreted.

Very high (>95%)
High (>80%, <= 95%)
Medium (>20%, <= 80%)
Low (>0%, <= 20%)
Unknown
(null) - Not assessed

Precision

A single-letter code for the precision used to map the Element Occurrence (EO) on a U.S. Geological Survey (USGS) 7.5' (or 15') topographic quadrangle map, based on the previous Heritage methodology in which EOs were located on paper maps using dots.

S - Seconds: accuracy of locality mappable within a three-second radius; 100 meters from the centerpoint
M - Minute: accuracy of locality mappable within a one-minute radius; 2 km from the centerpoint
G - General: accuracy of locality mappalbe to map or place name precision only; 8 km from centerpoint
U - Unmappable

Appendix O:
New Frontier Wind Energy Project Comparison of the Fall 2011 and the Spring and Summer 2016 Avian Surveys; Comparison of Total Acres of Native Prairie for the 2011 and 2016 Turbine Layout

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Memorandum

To:	Kevin Shelley, U.S. Fish and Wildlife Service
From:	Bill Behling and Jena Tufts, Capital Power Corporation Mark Martell, Tetra Tech, Inc.
Date:	November 3, 2016
Project:	New Frontier Wind Energy Project
Subject:	Comparison of the Fall 2011 and the Spring and Summer 2016 Avian Surveys; Comparison of Total Acres of Native Prairie for the 2011 and 2016 Turbine Layout

Introduction

On April 26, 2012, the North Dakota Public Service Commission (PSC or Commission) issued Certificate of Site Compatibility (CSC) Number 29 (PSC Order) to Meadowlark Wind I, LLC (Applicant) for the New Frontier Wind Energy Project (Project) in McHenry County, North Dakota. In December 2014, Capital Power Investments LLC, a subsidiary of Capital Power Corporation (Capital Power), completed the acquisition of Element Power US, LLC (Element Power), which included Meadowlark and the Project.

In February 2016, Tetra Tech, Inc. (Tetra Tech) was contracted by Capital Power to conduct avian surveys in the Project Area. The point-count surveys, initiated by Tetra Tech on March 30, 2016 with interim results reported here through August 2, 2016, are ongoing and scheduled to continue through mid-November 2016 (Tetra Tech 2016). Point-count surveys were first conducted in the Project Area by WEST from September 1 to November 15, 2011 (Derby et al. 2012). In September 2016 Tetra Tech was contracted by Capital Power to compare and analyze the avian species observed during the 2011 avian survey conducted by WEST with the current 2016 avian surveys being conducted by Tetra Tech. The avian surveys are needed to identify potential avian impacts associated with constructing and operating a wind energy facility. Birds have been identified as a group potentially at risk because of collisions with wind turbines and power lines, and displacement due to the presence of the associated structures.

In April 2016, Tetra Tech was also contracted by Capital Power to conduct a native prairie habitat assessment to map potential native prairie habitat for Dakota skipper (*Hesperia dacotae*). On October 23, 2014, subsequent to issuance of the PSC Order, the Dakota skipper was listed as a threatened species under the Endangered Species Act. The Dakota skipper is an obligate user of undisturbed high-quality native prairie. Preferred habitat includes prairie dominated by little bluestem (*Schizachyrium scoparium*) and needlegrasses (*Hesperostipa* spp.), with the presence of wood lily (*Lilium philadelphicum*), bluebell bellflower (*Campanula rotundifolia*), purple coneflower (*Echinacea angustifolia*), upright prairie coneflower (*Ratibida columnifera*), common gaillardia (*Gaillardia aristata*), and/or mountain deathcamas (*Zigadenus elegans*) (USFWS 2014).

Although its historic range once consisted of vast, unbroken native prairie in the north-central U.S. and south-central Canada, the Dakota skipper's current range is now limited to scattered remnants of high

quality native prairie in Minnesota, North Dakota, South Dakota, and southern Manitoba and Saskatchewan (USFWS 2015). The Dakota skipper population has declined due to sensitivity to disturbances, such as grazing and fire, and the loss of native prairie habitat. Construction and operation of the Project has the potential to impact the Dakota skipper and potential native prairie habitat.

This memorandum includes a comparison of the results of the Fall 2011 and the Spring and Summer 2016 avian surveys, as well as a comparison table of total acres of native prairie and grasslands potentially impacted by the 66 turbine layout proposed in 2011 versus the 49 turbine layout currently proposed (dated 9/28/2016).

Avian Surveys

Methods

The survey protocols used in these studies are designed to collect data on all bird species and to provide results that are comparable with other studies at wind energy facilities, rather than to target specific taxa (Tetra Tech 2016). Data collection at the Project Area was designed to be responsive to the level of effort recommended in the National Wind Coordinating Committee's Comprehensive Guide to Studying Wind Energy/Wildlife Interactions (Strickland et al. 2011) and the voluntary U.S. Fish and Wildlife Service Land-Based Wind Energy Guidelines (USFWS 2012).

In both studies an experienced field biologist conducted 20-minute (min) use surveys collecting data on all birds detected within the point-count area to evaluate avian use, behavior, and species richness (Tetra Tech 2016). Both WEST and Tetra Tech distributed the survey locations along publicly accessible roads and chose locations that maximized the 360-degree sight distance for the observer (Tetra Tech 2016).

Detectability varies among species and potentially not all individuals within the 800-m (0.50 mile) radius were counted. Birds not easily identifiable, such as those seen under low light conditions or small birds seen at a distance were identified to the lowest taxonomic level possible. Hence, unidentified birds are included in the results.

Both the WEST surveys conducted in 2011 and the 2016 surveys conducted by Tetra Tech used similar point-count methodologies. Point-count surveys were conducted by WEST from September 1 to November 15, 2011 (Derby et al. 2012). The point-count surveys by Tetra Tech began on March 30, 2016 with interim results reported here through August 2, 2016 (Tetra Tech 2016). Hence results from WEST cover the fall migration season and results from Tetra Tech cover the spring migration to summer breeding season. The point count locations are different with WEST using 10 locations in the fall 2011 and Tetra Tech using 9 locations in the spring/summer 2016 surveys. While the locations are different, there is considerable overlap in terms of coverage by the 2011 and 2016 surveys within the Project Area. Thus all of the habitat types found within the Project Area are accounted for in each survey.

2011 Point-count Surveys (Derby et al. 2012)

Surveys were conducted once per week at 10-point count locations during the fall 2011 migration, September 1 through November 15, 2011 for a total of 12 visits (Derby et al. 2012). Fixed-point bird

surveys (variable circular plots) were conducted using methods described by Reynolds et al. (1980). While the focus of the survey was on large birds, all species of birds observed during each 20-min fixed-point bird use survey were recorded (Derby et al. 2012). Observations of large birds beyond the 800 m (2,625ft) radius were recorded, but were not included in the statistical analyses; for small birds, observations beyond a 100 m (328ft) radius were excluded from analysis (Derby et al. 2012). Large birds include waterbirds, waterfowl, rails/coots, shorebirds, diurnal raptors, owls, vultures, upland game birds, doves/pigeons, and large corvids (e.g., ravens, magpies, and some crows). Passerines (excluding large corvids), swifts/hummingbirds, woodpeckers, and songbirds are considered small birds.

2016 Point-count Surveys (Tetra Tech 2016)
Point-count surveys were conducted two times a month at the Project from March 30 through August 2, 2016, which included spring migration and summer breeding seasons, for a total of 10 survey rounds (Tetra Tech 2016). Each round of avian use surveys was conducted over two days. Surveys were conducted at nine point-count locations (fixed 800-meter [m] or [0.50 mile] radius) distributed throughout the Project Area (Tetra Tech 2016).

Results

A total of 1,223 species were recorded during the course of the two surveys. WEST observed 36 species totaling 2,261 individual birds and four unidentified species totaling 21 individuals for a combined total of 2,282 individuals recorded during the fall 2011 fixed-point surveys (Attachment 1). Tetra Tech observed 118 species, totaling 10,129 individual birds and 10 individuals from unknown hawk species for a combined total of 10,139 individuals recorded during the 2016 spring and summer avian use surveys (Attachment 1). There were four species observed during the 2011 surveys: Brewer's blackbird (*Euphagus cyanocephalus*), bald eagle (*Haliaeetus leucocephalus*; 1 individual), rough-legged hawk (*Buteo lagopus*; 1 individual) and great-horned owl (*Bubo virginianus*; 2 individuals), that were not observed during the 2016 spring and summer avian use surveys. All of these species, except the great-horned owl, were observed during the fall 2016 avian use surveys; diurnal survey methods are not likely to detect this species. There were 85 species seen during the 2016 surveys that were not recorded during the 2011 surveys (Attachment 1).

Waterfowl was the most abundant species group observed during the fall 2011 surveys, accounting for 67.0% of all observations. This was primarily due to relatively high numbers of Canada goose (*Branta canadensis*; 966 individuals) and snow goose (*Chen caerulescens*; 434 individuals; Derby et al. 2011). Songbirds were the most abundant species group observed during the spring and summer 2016 surveys, accounting for 66.5% of all observations. The most common songbirds were red-winged blackbird (*Agelaius phoeniceus*; 3,211 individuals), and horned lark (*Eremophila alpestris*; 1,635 individuals). Waterfowl was the second most abundant group during the spring and summer 2016 surveys accounting for 11.9% of all observations with mallard (*Anas platyrhynchos*; 471 individuals) the most abundant waterfowl observed. Rails/coots (represented only by the American coot [*Fulica americana*]) was the second most commonly observed bird group (342 individuals; 15.0% of total observations) during the fall 2011 surveys. Gulls/terns was the third most abundant species group during the spring and summer 2016 surveys mostly due to 852 individual Franklin's gulls (*Leucophaeus pipixcan*; 8.4 percent of all

spring/summer 2016 observations). Songbirds were the third most abundant bird type observed in the study area, representing 10.6% of all observations during the fall 2011 surveys, mostly red-winged blackbirds (150 individuals).

A total of five raptor species (41 individuals) were observed, accounting for 1.8% of all individuals recorded during fall 2011 and eight raptor species (154 individuals) were observed, accounting for 1.5 percent of all individuals, during the spring and summer 2016 surveys. Red-tailed hawk (*Buteo jamaicensis*) and northern harrier (*Circus cyaneus*) were the most commonly observed raptor species for both surveys. There were three raptor species observed during the 2011 surveys: bald eagle (1 individual), rough-legged hawk (1 individual) and great-horned owl (2 individuals), that were not observed during the 2016 spring and summer avian surveys but were observed during the 2016 fall avian surveys (except for great-horned owl) and five raptor species: ferruginous hawk (1 individual), American kestrel (*Falco sparverius*; 6 individuals), sharp-shinned hawk (*Accipiter striatus*; 3 individuals), turkey vulture (*Cathartes aura*; 10 individuals) and short-eared owl (*Asio flammeus*; 1 individua) recorded in 2016 but not 2011 (Attachment 1). However, one adult and one immature bald eagle were observed during eagle use survey, both observations occurred separately on March 31, 2016. Additionally, three bald and one golden eagle and a rough-legged hawk were observed incidentally during the eagle use surveys.

No federally listed threatened or endangered species were detected during the 2011 or 2016 point-count surveys. North Dakota's State Wildlife Action Plan identifies Species of Conservation Priority (SCP) and categorizes these species into three levels based on decline (Dyke et al. 2015). The levels identify the species in decline in North Dakota receiving the most need for state wildlife grant funding to implement conservation actions with Level I species receiving the most state funding. Based on the 2015 State Wildlife Action Plan, 22 SCP listed species were observed during the two surveys. During fall 2011, six SCP were recorded during the avian surveys: Swainson's hawk (*Buteo swainsoni*; SCP Level I), sharp-tailed grouse (*Tympanuchus phasianellus*; SCP Level II), northern harrier (SCP Level II), bald eagle (SCP level II), lesser scaup (*Aythya affinis*; SCP Level II), western meadowlark (*Sturnella neglecta*; SCP Level II), and loggerhead shrike (*Lanius ludovicianus*; SCP Level II). Two of these species, lesser scaup and western meadow lark, were not SCP in 2011 and added to the SCP listing in 2015, while the redhead (*Aythya americana*) was a SCP in 2011 but removed under the new 2015 State Wildlife Action Plan (Dyke et al. 2015) after the fall 2011 surveys were completed. For the spring and summer 2016 surveys species observed include: American bittern (*Botaurus lentiginosus*), American white pelican (*Pelecanus erythrorhynchos*), chestnut-collard longspur (*Calcarius ornatus*), ferruginous hawk (*Buteo regalis*), Franklin's gull (*Leucophaeus pipixcan*), lark bunting (*Calamospiza melanocorys*), marbled godwit (*Limosa fedoa*), Swainson's hawk, upland sandpiper (*Bartramia longicauda*), and willet (*Tringa semipalmata*) are SCP Level I; American white pelican, canvasback (*Aythya valisineria*), northern pintail (*Anas acuta*), lesser scaup, American avocet (Recurvirostra americana), upland sandpiper, willet, northern harrier, short-eared owl, bobolink (*Dolichonyx oryzivorus*), dickcissel (*Spiza americana*), loggerheaded shrike (*Lanius ludovicianus*), and wester meadowlark (*Tyrannus verticalis*) are SCP Level II. There were no SCP Level III species observed on any of the surveys. The bald eagle and norther harrier observed during the fall 2011 surveys are also USFWS Birds of Conservation Concern (BCC) for Bird Conservation Region 11 (BCR 11, Prairie Pothole; USFWS 2008). The spring and summer 2016 surveys identified American

bittern, marbled godwit, solitary sandpiper (*Tringa solitaria*), upland sandpiper, black tern (*Chlidonias niger*), Swainson's hawk, short-eared owl, chestnut collared longspur (*Calcarius ornatus*), and dickcissel as BCR 11 BCC species.

Conclusion

Comparing the results from the 2011 and 2016 surveys is difficult because they occurred during different seasons of the year and had some differences in methodology. Nonetheless, there are no obvious patterns that would indicate a significant change in land use or habitat condition. Both the fall 2011 and spring and summer 2016 avian surveys have identified species typical of wetlands, agricultural lands and remnant grasslands in North Dakota. These habitats, as represented in the Project Area, are previously disturbed and fragmented, primarily due to the land use practices common in the area. Within previously disturbed and/or fragmented habitats, the greatest potential impact of wind facilities to avian species is risk of collisions with turbines rather than disturbance or displacement.

Birds that were recorded using the Project Area are protected and managed under a variety of state and federal laws and the health of their populations is of interest to the public as well as government agencies. Almost all of migratory birds (except for non-native species such as European starling [*Sturnus vulgaris*], rock pigeon [*Columba livia*], house sparrow [*Passer domesticus*], and most Gamebirds) are protected under Federal law by the Migratory Bird Treaty Act (MBTA). The bald eagle, protected under the Bald and Golden Eagle Protection Act, is the only protected species that has specific conservation guidelines for wind energy projects (USFWS 2013). State SCP and USFWS BCC species are not afforded any formal protection beyond that afforded native birds under the MBTA. There are no additional state permitting requirements for SCP species by the state of North Dakota and there are no additional permits required by the USFWS for BCC listed species. Only species protected by the Endangered Species Act are considered threatened or endangered in North Dakota and none were observed during any of the surveys. Having no Endangered or Threatened species, only one bald eagle, and only 22 SCP reveals a consistent lack of rare birds in the Project Area, typical of disturbed habitats in this part of North Dakota, and indicates a low probability that the Project will significantly impact avian resources.

Native Prairie

Methods

The 2016 native prairie habitat assessment conducted by Tetra Tech consisted of two phases: 1) desktop assessment and 2) preliminary field verification surveys. The desktop assessment, which was conducted in April 2016, classified areas of potential native prairie within the Project area using the following geographic information system (GIS) and spatial imagery data:

- National Land Cover Database (NLCD) 2011 land cover data (Homer et al. 2015),
- USDA (2013) cropland data,
- Google Earth Pro (2014).

Utilizing the above data sources, areas within the Project area that appeared to potentially contain native prairie vegetation were delineated in Google Earth Pro. These potential native prairie polygons were then digitized using ArcGIS software.

Following the desktop assessment, preliminary field-verification surveys were conducted by Tetra Tech in May 2016. During field verification surveys, areas delineated as potential native prairie during the desktop habitat assessment were visually assessed. Visual assessment was conducted from public rights of way, as well as by walking cross-country in areas where access was granted, and was intended to confirm, to the extent possible given the early timing of these surveys, the presence of native prairie vegetation and to rule out polygons delineated during the desktop assessment that consisted of grasslands dominated by non-native grasses, hayfields, and/or fallow fields. Encroachment by shrubs and trees into native prairie and grassland was also noted during field verification surveys.

In addition to the desktop assessment and field verification surveys conducted by Tetra Tech, HDR Engineering Inc. (HDR) was retained by Tetra Tech to conduct Dakota skipper flight surveys within the Project area during the mobile flight period of June 18 and July 14, 2016 (HDR 2016). Prior to conducting flight surveys, HDR evaluated grassland habitat and native plant assemblages present within areas of potential native habitat mapped by Tetra Tech during the desktop assessment and field verification surveys to determine if vegetation community quality and abundance was consistent with habitats used by the Dakota skipper. Because the property is not under a long-term lease, access was not granted for Polygon 20; therefore, the vegetation community and habitat quality of this polygon was not assessed. Similarly, the property associated with Polygon 19 is not under a long-term lease and access was not granted to this polygon; however, a portion of Polygon 19 was visible from a public right-of-way and existing vegetation and habitat quality for the visible portion of this polygon was assessed during field verification surveys (Figure 1).

Utilizing the data from Tetra Tech's desktop assessment and field-verification surveys, as well as the results from HDR's Dakota skipper flight surveys, habitat quality of native prairie and grassland polygons delineated within the Project area was assessed. Impacts to native prairie and grasslands was then evaluated for the 66-turbine layout proposed in 2011 versus the currently proposed 49-turbine layout (dated 9/28/2016).

Results

Twenty potential native prairie polygons, totaling 3,261.8 acres and ranging in size from 7.0 acres to 440.9 acres, were identified during the desktop assessment (Figure 1). Following field verification and Dakota skipper flight surveys, the majority (80%, representing 2,196.7 acres) of these polygons were determined to consist of poor quality grassland habitat due to the predominance of non-native grasses, lack of native grasses and forbs, and/or encroachment by trees and shrubs (Figure 1; Table 1). During flight surveys, HDR identified three areas that exhibited characteristics suitable for the presence of Dakota skipper; Dakota skipper butterflies were observed in one of these areas (HDR 2016). Capital Power subsequently revised the 49 turbine layout to completely avoid impacts to these areas from Project facilities. This included eliminating one wind turbine generator (WTG; WTG 20) and relocating one underground collection line near WTG 21 and WTG 22. These changes to the Project layout have been reviewed and approved by the U.S. Fish and Wildlife Service (USFWS). Table 1 summarizes the vegetation composition and habitat quality of the twenty native prairie and grassland polygons assessed during field verification and Dakota skipper flight surveys.

Table 1. Native Prairie and Grassland Polygons within the New Frontier Wind Energy Project Area

Polygon	Acres	Habitat Quality	Polygon Notes
1	440.9	Good	This area contains numerous pothole wetlands surrounded by uplands that are dominated by native grass species such as little bluestem, side-oats grama (*Bouteloua cirtipendula*), and needlegrass. However, native forbs were largely absent and when they were noted it was near areas dominated by trees and shrubs. ATV tracks crisscrossed the area and it appeared as though there was active management focused on trying to eliminate forb species on the site.
2	256.7	Poor	An intermittent stream flows through this area. Grasslands occur along the drainage and small patches of native grasses occur; however, the area is dominated by non-native grasses and is heavily encroached by shrubs.
3	385.0	Poor	This area was heavily grazed in June and July of 2016 and vegetation structure was obliterated by cattle and no native forbs were observed. Native grasses occur on northeast facing slopes and hilltop locations, but native forbs were absent. Valleys between slopes dominated by green ash (*Fraxinus pensylvanica*) and silverberry (*Elaeagnus commutata*).
4	8.4	Poor	Small patch of native prairie with little bluestem and purple coneflower in the center of the polygon; however, most of this polygon was a small wetland basin surrounded by cultivated lands.
5	7.0	Poor	Very small polygon located between cultivated lands; area being encroached upon by woody species.
6	246.2	Poor	Polygon is dominated by non-native grasses and forbs including Kentucky bluegrass (*Poa pratensis*), smooth brome (*Bromus inermis*), and alfalfa (*Medicago sativa*). Area lacks native grasses and fobs.
7a	151.6	Poor	This polygon contains heavy cover of smooth brome and lacks native grasses and forbs.
7b	213.6	Good	This polygon was pastured, but still retains abundant native grasses and forbs. Encroachment by silverberry was also observed in many areas of this polygon. Native grasses and forbs observed include little bluestem, purple coneflower, silverleaf scurfpea (*Pediomelum argophyllum*), wood lily, stiff sunflower (*Helianthus pauciflora*), and common gaillardia. Dakota skippers were observed in this area during flight surveys conducted by HDR.
8	213.1	Good	This polygon contained native grasses and forbs, but was heavily grazed. Grass species included native species (needlegrass, side-oats grama, and little bluestem) and non-native grasses (Kentucky bluegrass, smooth brome). Abundant native forbs were also observed, including purple coneflower, marbleseed (*Onosmodium molle*), Lambert's locoweed (*Oxytropis lambertii*), and upright prairie coneflower. Much of this polygon, especially in the valleys and on the hilltops, was overgrown with shrubby species and native prairie was limited to patches on the steepest slopes.
9	75.9	Good	This polygon contained native grasses and forbs, but was heavily grazed. Grass species included native species (porcupine grass, hairy grama [*Bouteloua hirsuta*], and little bluestem) and non-native grasses (Kentucky bluegrass, smooth brome). Forb composition in grassland

			dominated areas contained some native species including purple coneflower, Lambert's locoweed, and upright prairie coneflower, but also included invasive thistles such as nodding plumeless thistle (*Carduus nutans*). Grassland areas also showed other signs of over grazing such as soil compaction, lack of vegetative stratification, and exposed soil. Much of area overgrown with shrubby species in valleys and on hilltops and native prairie limited to patches on the steepest slopes.
10	14.6	Poor	Similar to Polygon 6; polygon lacks native grasses and forbs.
11	53.3	Poor	Similar to Polygon 6; polygon lacks native grasses and forbs.
12	70.5	Poor	Heavy cover of smooth brome; polygon lacks native grasses and forbs.
13	27.1	Poor	Similar to Polygon 6; polygon lacks native grasses and forbs.
14	33.7	Poor	Heavy cover of smooth brome; polygon lacks native grasses and forbs.
15	109.3	Poor	Similar to Polygon 6; polygon lacks native grasses and forbs.
16	440.8	Poor	This is a large pasture area characterized by rolling topography and a significant ridge along the eastern portion of the polygon. Areas lying below the ridge are cropped or dominated by non-native grasses and shrubs and trees. The rolling portions of this parcel are heavily overgrown with silverberry and are succumbing to successional vegetative changes that are eliminating prairie habitat. Some small pockets of prairie occur but are widely separated by shrubs, trees, or non-native grassland.
17	297.4	Poor	Heavy cover of smooth brome; polygon lacks native grasses and forbs.
18	74.3	Poor	Similar to Polygon 6; polygon lacks native grasses and forbs.
19a	20.6	Poor	Heavy cover of smooth brome was observed in this area (from a public right-of-way) during field verification surveys in May 2016. Access was not granted to this parcel; thus, this area was not assessed during Dakota skipper flight surveys conducted in June and July 2016.
19b	116.5	No Access	Access not granted; polygon not assessed due to property not under long term lease.
20	5.3	No Access	Access not granted; polygon not assessed due to property not under long term lease.
Total acres	**3,261.8**		

A total of 75.3 acres of native prairie and grassland would be impacted from construction of the currently proposed 49-turbine Project layout (Table 2). This includes 65.0 acres of temporary impacts and 10.3 acres of permanent impacts. Of these impacts, 49.5 acres of temporary impacts and 7.9 acres of permanent impacts would occur in poor quality habitat and 15.5 acres of temporary impacts and 2.3 acres of permanent impacts would occur in good quality habitat.

The 66-turbine Project layout proposed in 2011 would impact 87.0 acres of native prairie and grassland. This includes 75.2 acres of temporary impacts and 11.8 acres of permanent impacts. Of these impacts, 52.4 acres of temporary impacts and 8.7 acres of permanent impacts would occur in areas of poor quality habitat and 22.8 acres of temporary impacts and 3.2 acres of permanent impacts would occur in areas of good quality habitat (Table 2).

Table 2. Impacts to Native Prairie and Grassland Polygons within the New Frontier Project Area					
		2016 Project Layout (49 Turbines)		2011 Project Layout (66 Turbines)	
Polygon	Habitat Quality	Temporary Impacts[1] (Acres)	Permanent Impacts[2] (Acres)	Temporary Impacts[1] (Acres)	Permanent Impacts[2] (Acres)
1	Good	4.1	0.8	3.7	0.8
2	Poor	3.3	0.2	3.0	0.2
3	Poor	9.5	1.8	8.9	1.7
4	Poor	0.0	0.0	0.0	0.0
5	Poor	0.2	0.0	0.1	0.0
6	Poor	10.0	1.0	9.2	0.9
7a	Poor	0.2	0.0	0.1	0.0
7b	Good	3.2	0.5	11.7	1.3
8	Good	8.2	1.0	7.4	1.0
9	Good	0.0	0.0	0.0	0.0
10	Poor	0.5	0.0	0.6	0.0
11	Poor	0.1	0.0	0.1	0.0
12	Poor	2.0	0.1	1.7	0.1
13	Poor	0.0	0.0	0.0	0.0
14	Poor	0.0	0.0	0.0	0.0
15	Poor	1.1	0.3	1.4	0.3
16	Poor	10.4	1.9	9.7	1.9
17	Poor	11.7	2.6	17.0	3.5
18	Poor	0.6	0.0	0.6	0.0
19a	Poor	0.0	0.0	0.0	0.0
19b	No Access	0.0	0.0	0.0	0.0
20	No Access	0.0	0.0	0.0	0.0
Impacts to Poor Quality Polygons		**49.5**	**7.9**	**52.4**	**8.7**
Impacts to Good Quality Polygons		**15.5**	**2.3**	**22.8**	**3.2**
Impacts to "No Access" Polygons		**0.0**	**0.0**	**0.0**	**0.0**
Total Impacts		**65.0**	**10.3**	**75.2**	**11.8**

[1] Temporary impacts include areas temporarily impacted due to construction of turbines, temporary access roads and collector lines.
[2] Permanent impacts include permanent impacts from construction and operation of turbines, permanent access roads, substation, operation and maintenance building, and permanent met towers.

Conclusion

Very little of the 11,390-acre Project area (943.5 acres; 8 percent of Project area), consists of good quality native prairie habitat. The majority of the grassland areas observed in the Project area either lack native grasses and forbs, have a high cover of non-native grasses, and/or are being encroached by woody species such as silverberry and green ash. Overall, 75.3 acres of native prairie and grassland would be impacted under the currently proposed 49-turbine Project layout. However, only 17.8 acres of impacts (15.5 acres of temporary and 2.3 acres of permanent impacts) would occur in good quality prairie habitat. The 66-turbine Project layout proposed in 2011 would have impacted 87.0 acres of native prairie and grassland. This included 26 acres of impacts (22.8 acres of temporary and 3.2 acres of permanent impacts) to good quality prairie habitat. The reduction in turbine numbers along with the re-siting of WTG 20 and the underground collection system near WTG 21 and WTG 22 to avoid Dakota Skipper habitat has reduced the Project's overall impact on native prairie by 13% and its permanent impact by 28%. These reductions will benefit grassland birds and other wildlife in the area.

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Attachment 1. Number of individuals, by Species Groups, observed during the Fall 2011 and Spring/Summer 2016 avian surveys.

Species Groups/Species	Scientific Name	Number of Individuals (Fall 2011)	Number of Individuals (Spring/Summer 2016)	NDGF SCP Species[1]	BCC Region 11[2]
Loons/Grebes		**10**	**5**		
pied-billed grebe	*Podilymbus podiceps*	10	5		
Waterbirds		**6**	**162**		
American white pelican	*Pelecanus erythrorhynchos*	0	94	II	
double-crested cormorant	*Phalacrocorax auritus*	2	58		
American bittern	*Botaurus lentiginosus*	0	3	I	yes
black-crowned night-heron	*Nycticorax nycticorax*	0	3		
great blue heron	*Ardea herodias*	4	4		
Waterfowl		**1,528**	**1,211**		
mallard	*Anas platyrhynchos*	64	471		
Canada goose	*Branta canadensis*	966	183		
snow goose	*Chen caerulescens*	434	120		
lesser scaup	*Aythya affinis*	6	103	II	
gadwall	*Anas strepera*	28	59		
blue-winged teal	*Anas discors*	16	54		
American wigeon	*Anas americana*	0	52		
green-winged teal	*Anas carolinensis*	0	49		
northern pintail	*Anas acuta*	0	35	II	
redhead	*Aythya americana*	5	26		
ring-necked duck	*Aythya collaris*	0	19		
canvasback	*Aythya valisineria*	0	16	II	
northern shoveler	*Anas clypeata*	0	14		
ruddy duck	*Oxyura jamaicensis*	0	6		
bufflehead	*Bucephala albeola*	0	3		
wood duck	*Aix sponsa*	0	1		
unidentified duck		9	0		
Shorebirds		**4**	**245**		
killdeer	*Charadrius vociferus*	4	166		
Wilson's snipe	*Gallinago delicata*	0	28		
upland sandpiper	*Bartramia longicauda*	0	19	II	yes
lesser yellowlegs	*Tringa flavipes*	0	15		
willet	*Tringa semipalmata*	0	8	II	
spotted sandpiper	*Actitis macularius*	0	3		
American avocet	*Recurvirostra americana*	0	2	II	
greater yellowlegs	*Tringa melanoleuca*	0	2		
marbled godwit	*Limosa fedoa*	0	1	I	yes
solitary sandpiper	*Tringa solitaria*	0	1		yes
Gulls/Terns		**10**	**1,042**		
Franklin's gull	*Leucophaeus pipixcan*	0	852	I	

Species Groups/Species	Scientific Name	Number of Individuals (Fall 2011)	Number of Individuals (Spring/Summer 2016)	NDGF SCP Species[1]	BCC Region 11[2]
ring-billed gull	*Larus delawarensis*	0	156		
black tern	*Chlidonias niger*	0	28	I	yes
Bonaparte's gull	*Chroicocephalus philadelphia*	0	3		
California gull	*Larus californicus*	0	2		
herring gull	*Larus argentatus*	0	1		
unidentified gull		10	0		
Cranes			**177**		
sandhill crane	*Grus canadensis*	0	177		
Rails/Coots		**342**	**11**		
American coot	*Fulica americana*	342	10		
sora	*Porzana carolina*	0	1		
Raptors		**30**	**113**		
red-tailed hawk	*Buteo jamaicensis*	16	56		
northern harrier	*Circus cyaneus*	7	17	II	
Swainson's hawk	*Buteo swainsoni*	2	15	I	yes
unidentified hawk		1	10		
American kestrel	*Falco sparverius*	0	6		
turkey vulture	*Cathartes aura*	0	4		
sharp-shinned hawk	*Accipiter striatus*	0	3		
ferruginous hawk	*Buteo regalis*	0	1	I	
short-eared owl	*Asio flammeus*	0	1	II	yes
rough-legged hawk	*Buteo lagopus*	1	0[3]		
bald eagle	*Haliaeetus leucocephalus*	1	0[3]	II	yes
golden eagle	*Aquila chrysaetos*	0	0[3]		
great horned owl	*Bubo virginianus*	2	0		
Upland Game Birds		**85**	**82**		
ring-necked pheasant	*Phasianus colchicus*	32	76		
sharp-tailed grouse	*Tympanuchus phasianellus*	19	2		
wild turkey	*Meleagris gallopavo*	34	3		
gray partridge	*Perdix perdix*	0	1		
Doves/Pigeons		**7**	**81**		
mourning dove	*Zenaida macroura*	7	68		
rock pigeon	*Columba livia*	0	13		
Large Corvids		**17**	**223**		
American crow	*Corvus brachyrhynchos*	16	215		
common raven	*Corvus corax*	0	4		
black-billed magpie	*Pica pica*	1	4		
Woodpeckers		**2**	**18**		
northern flicker	*Colaptes auratus*	1	10		

Species Groups/Species	Scientific Name	Number of Individuals (Fall 2011)	Number of Individuals (Spring/Summer 2016)	NDGF SCP Species[1]	BCC Region 11[2]
downy woodpecker	*Picoides pubescens*	1	8		
Songbirds		**241**	**6,769**		
red-winged blackbird	*Agelaius phoeniceus*	150	3,211		
horned lark	*Eremophila alpestris*	23	1,635		
common grackle	*Quiscalus quiscula*	0	275		
American robin	*Turdus migratorius*	6	225		
brown-headed cowbird	*Molothrus ater*	0	162		
yellow-headed blackbird	*Xanthocephalus xanthocephalus*	0	152		
cliff swallow	*Petrochelidon pyrrhonota*	5	106		
European starling	*Sturnus vulgaris*	4	91		
tree swallow	*Tachycineta bicolor*	0	88		
song sparrow	*Melospiza melodia*	0	84		
Lapland longspur	*Calcarius lapponicus*	0	72		
western meadowlark	*Sturnella neglecta*	2	62	II	
cedar waxwing	*Bombycilla cedrorum*	0	61		
barn swallow	*Hirundo rustica*	32	56		
American goldfinch	*Carduelis tristis*	11	53		
clay-colored sparrow	*Spizella pallida*	0	48		
vesper sparrow	*Pooecetes gramineus*	0	39		
savannah sparrow	*Passerculus sandwichensis*	0	38		
northern rough-winged swallow	*Stelgidopteryx serripennis*	0	35		
eastern kingbird	*Tyrannus tyrannus*	0	34		
bobolink	*Dolichonyx oryzivorus*	0	25	II	
house sparrow	*Passer domesticus*	0	21		
snow bunting	*Plectrophenax nivalis*	0	20		
yellow warbler	*Setophaga petechia*	0	18		
common yellowthroat	*Geothlypis trichas*	0	16		
chestnut-collared longspur	*Calcarius ornatus*	0	15	I	yes
least flycatcher	*Empidonax minimus*	0	12		
western kingbird	*Tyrannus verticalis*	0	12		
chipping sparrow	*Spizella passerina*	0	11		
dark-eyed junco	*Junco hyemalis*	5	8		
house finch	*Haemorhous mexicanus*	0	8		
lark bunting	*Calamospiza melanocorys*	0	7	I	
purple martin	*Progne subis*	0	7		
dickcissel	*Spiza americana*	0	6	II	yes
American redstart	*Setophaga ruticilla*	0	5		

Species Groups/Species	Scientific Name	Number of Individuals (Fall 2011)	Number of Individuals (Spring/Summer 2016)	NDGF SCP Species[1]	BCC Region 11[2]
black-capped chickadee	*Poecile atricapillus*	0	5		
eastern bluebird	*Sialia sialis*	0	5		
warbling vireo	*Vireo gilvus*	0	5		
eastern phoebe	*Sayornis phoebe*	0	4		
eastern wood-pewee	*Contopus virens*	0	4		
American tree sparrow	*Spizella arborea*	0	3		
Baltimore oriole	*Icterus galbula*	0	3		
American pipit	*Anthus rubescens*	0	2		
black-and-white warbler	*Mniotilta varia*	0	2		
Harris's sparrow	*Zonotrichia querula*	0	2		
house wren	*Troglodytes aedon*	0	2		
marsh wren	*Cistothorus palustris*	0	2		
willow flycatcher	*Empidonax traillii*	0	2		
bank swallow	*Riparia riparia*	0	1		
blue jay	*Cyanocitta cristata*	0	1		
gray catbird	*Dumetella carolinensis*	0	1		
lark sparrow	*Chondestes grammacus*	0	1		
loggerhead shrike	*Lanius ludovicianus*	1	1	II	
orchard oriole	*Icterus spurius*	0	1		
ruby-throated hummingbird	*Archilochus colubris*	0	1		
rusty blackbird	*Euphagus carolinus*	0	1		
swamp sparrow	*Melospiza georgiana*	0	1		
Wilson's warbler	*Cardellina pusilla*	0	1		
Brewer's blackbird	*Euphagus cyanocephalus*	1	0		
unidentified sparrow		1	0		
Total Number of Individuals		**2,282**	**10,139**		
Total Number of Species		**36**	**118**		

1 = NDGF SCP Species = State Species of Conservation Priority, I = Level I, II = Level II (Dyke et al. 2015).

2 = BBC Region 11 = USFWS Bird of Conservation Concern Region 11, Prairie Pothole (USFWS 2008).

3 = Not seen during avian surveys, but seen during eagle use surveys.

NEW FRONTIER WIND ENERGY PROJECT
Native Prairie Habitat

0 0.25 0.5 Miles

Scale is 1:18,000 when printed at 22x34"

Legend

Project Area

Native Prairie Habitat Quality

Good

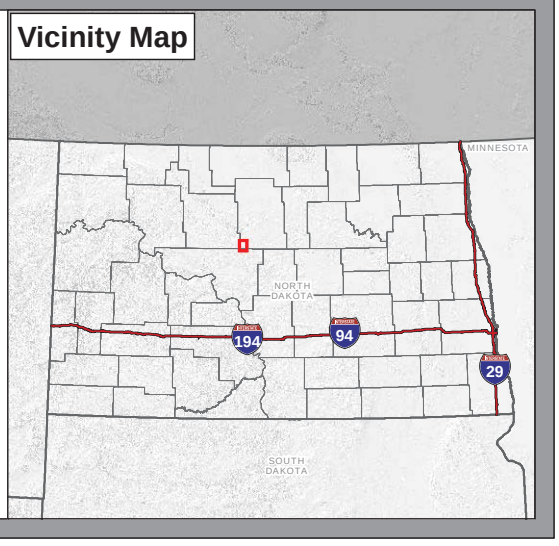
Poor

No Access

TETRA TECH

P:\5563_New_Frontier_Wind\GIS\Layouts\Native_Prairie\Native_Prairie.mxd Source: BTS, ESRI, NREL, FCC, DOD, and Ventyx Last Modified: 10/18/2016

Vicinity Map



Appendix P:
New Frontier Wind Energy Project Prairie Dog Town Locations

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Memorandum

To:	Kevin Shelley, U.S. Fish and Wildlife Service
From:	Bill Behling and Jena Tufts, Capital Power Corporation Mark Martell, Tetra Tech, Inc.
Date:	October 5, 2016
Project:	New Frontier Wind Energy Project
Subject:	Prairie Dog Town Locations

Introduction

On September 8, 2016, Capital Power Corporation (Capital Power) and our environmental consultant, Tetra Tech, Inc. (Tetra Tech) met with Kevin Shelley of the U.S. Fish and Wildlife Service (USFWS) for the New Frontier Wind Energy Project (Project) in McHenry County, North Dakota. During this meeting, Kevin Shelley asked if there are any prairie dog towns within the Project Area. This memorandum provides information regarding prairie dog data obtained from the North Dakota Game and Fish Department (NDGF) as well as the potential for eagles and other raptors to use the Project Area while foraging.

One species that has direct and indirect management and risk implications for wind energy projects are prairie dogs (*Cynomys spp*.). In North Dakota, black-tailed prairie dogs (*Cynomys ludovicianus*) are locally common in mixed grass to short grass well grazed grasslands and are mostly found south and west of the Missouri River (NDGF 2016). Black-tailed prairie dog habitat has been reduced to one percent of its historic amount due to the combination of grassland conversion and concentrated poisoning of the species as a nuisance to cattle ranching and agriculture (NDGF 2016). As a result, the black-tailed prairie dog is considered a State Species of Conservation Priority (SCP) in North Dakota (Dyke et al. 2015). Numerous grassland species depend on black-tailed prairie dogs for habitat and food, including other SCP species such as golden eagle (*Aquila chrysaetos*), burrowing owl (*Athene cunicularia*), and ferruginous hawk (*Buteo regalis)*, all of which may occur in the Project Area. Such species have major management and risk implications as federally protected species under the Bald and Golden Eagle Protection Act (BGEPA) and Migratory Bird Treaty Act (MBTA) as outlined in the USFWS Land-based Wind Energy Guidelines (USFWS 2012). In addition, black-tailed prairie dog colonies are essential for black footed ferret (*Mustela nigripes*), a federally designated endangered species protected by the Endangered Species Act.

In order to help determine if the presence of prairie dogs might serve as an attractant to eagles and other raptors, and better understand the potential risks and impacts to wildlife that may use the Project Area, Tetra Tech requested the location of any prairie dog town within two miles of the Project Area from NDGF.

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Results

There are no known prairie dog towns in or within 2 miles of the Project Area (Sandy Johnson, Conservation Biologist, NDGF pers. comm. 9/28/2016; see attached email). This reduces the potential for eagles and other raptors to use the Project Area while foraging.

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From:	Johnson, Sandra K.
To:	Martell, Mark
Cc:	McCall, Sarah; Bill Behling; Jena Tufts
Subject:	RE: Prairie Dog Towns at New Frontier Wind Project
Date:	Wednesday, September 28, 2016 1:28:35 PM

Hi Mark,
Sorry for the delay. There are no known prairie dog towns in or within 2 miles of the project area. Nearly all of the prairie dog towns in North Dakota are found south and west of the Missouri River. However, there may be Richardson's Ground Squirrel colonies in this area but our Department does not maintain those locations in our database.
Hope this helps,
Sandy

Sandy Johnson
Conservation Biologist
North Dakota Game and Fish Department
100 N. Bismarck Expwy.
Bismarck, ND 58501-5095
Phone: 701-328-6382
sajohnson@nd.gov
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From: Martell, Mark [mailto:Mark.Martell@tetratech.com]
Sent: Wednesday, September 14, 2016 2:06 PM
To: Johnson, Sandra K. <sajohnson@nd.gov>
Cc: McCall, Sarah <Sarah.McCall@tetratech.com>; Bill Behling <wbehling@capitalpower.com>; Jena Tufts <jtufts@capitalpower.com>
Subject: Prairie Dog Towns at New Frontier Wind Project

Sandy,

I hope all is going well.

During a meeting last week with Kevin Shelley –USFWS he asked that we evaluate the occurrence of prairie dog towns in and around the Capital Power's proposed New Frontier Wind project in McHenry County. Would you be able to supply us with any locations of prairie dog towns, preferably in a shape file, that occur in the project area and out to a 2-mile buffer? I have attached a shapefile of the project area.

Thank you very much.

Mark Martell | **Senior Ecologist**
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Exhibit 2:
New Frontier Wind Energy Project
Certification of Site Compatibility Chart

EXHIBIT 2

Meadowlark Wind I LLC
New Frontier Wind Energy Project
Certificate of Site Compatibility Chart

Order Paragraph	Order Text	Updated Information
Finding of Fact No. 1	Meadowlark is a Delaware limited liability company headquartered in Portland, Oregon.	Meadowlark continues to be a Delaware limited liability company, but is now headquartered in Boston, MA.
Finding of Fact No. 2	Meadowlark has been authorized to do business in the State of North Dakota since February 11, 2011, as evidenced by the Certificate of Good Standing issued by the North Dakota Secretary of State on February 22, 2011.	Meadowlark continues to be authorized to do business in the State of North Dakota (see updated Certificates of Good Standing from Delaware and North Dakota filed in Case No. PU-11-70).
Finding of Fact No. 3	Meadowlark proposes to construct and operate a wind energy conversion facility known as the New Frontier Wind Project to be located within an area comprised of approximately 11,352 acres of privately-owned land in McHenry County, North Dakota, just north of Ruso, North Dakota.	No change.
Finding of Fact No. 4	Meadowlark selected the proposed site for the New Frontier Wind Project based on a number of factors, including: the wind resource, landowner interest and support, suitable transmission interconnection capability, avoidance of environmental issues, compliance with the siting criteria set forth in the North Dakota Century Code, construction and other site-specific limitations, and economic considerations.	No change.
Finding of Fact No. 5	Section 49-22-16(4) of the North Dakota Century Code provides that a site shall not be designated that violates the rules of any state agency, and that compliance with an agency's rules shall be presumed if the agency	See discussion of updated agency/entity correspondence in Section 4.11 of the CSC Environmental Report, with copies of written correspondence provided in Appendix N.

Order Paragraph	Order Text	Updated Information
	fails to present its position with respect to the proposed facility at the public hearing. The federal, state and local departments, agencies and entities which were consulted and provided comment are as follows: a. Federal - Federal Aviation Administration (FAA); United States Army Corps of Engineers Omaha District, North Dakota Regulatory Office (USAGE); United States Fish and Wildlife Service, North Dakota Field Office (USFWS); United States Air Force (USAF); b. State - SHPO; North Dakota Parks and Recreation Department; North Dakota Game and Fish Department; North Dakota Department of Health; North Dakota Department of Transportation; North Dakota State Water Commission; Job Service North Dakota; North Dakota Aeronautics Commission; North Dakota Department of Commerce; c. Local- McHenry County; Bjornson Township; Brown Township.	
Finding of Fact No. 6	Agency consultations and comments are noted in Appendix E of the Application, as well as in the exhibits and the testimony presented at the public hearing. While comments and suggestions were provided, no objections to the proposed Project were raised by any state or federal agencies or any local governmental entities.	See discussion of updated agency/entity correspondence in Section 4.11 of the CSC Environmental Report, with copies of written correspondence provided in Appendix N. While comments and suggestions were provided, no objections to the proposed Project were raised by any state or federal agencies or any local governmental entities.
Finding of Fact No. 7	Section 49-22-16(2) of the North Dakota Century Code provides that no energy conversion facility site shall be designated that violates any local land use, zoning or building rules,	Meadowlark obtained a Conditional Use Permit (CUP) for the Project from McHenry County on January 3, 2012, but the permit subsequently expired. Meadowlark submitted an application

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	regulations or ordinances. At the hearing, Meadowlark testified that it is in the process of obtaining a conditional use permit and a building permit for the Project from McHenry County.	for a CUP for the Project to McHenry County on September 9, 2016, and a CUP for the Project was issued by McHenry County on November 14, 2016. See Sections 4.11 and 5 of the CCS Environmental Report
Finding of Fact No. 8	Meadowlark states that the Project will have a nameplate (gross) capacity of approximately 102 MW, with an average annual output of up to 484,000 megawatt hours (MWh) per year, assuming a net capacity factor of approximately 54 percent.	Based on data obtained to-date, Meadowlark estimates that the net capacity factor is likely to be closer to 47.5 percent. Depending on the turbine model selected, the nameplate capacity may be just under 100 MW.
Finding of Fact No. 9	Meadowlark is considering the following six turbine models or a turbine model similar to these turbine models: the GE 1.6-82.5; the Vestas V90-1.8; the Gamesa G90 2.0; the Gamesa G97 2.0; the Siemens SWT-2.3-101; and the Siemens SWT-2.3-113. The turbine selected will be between 1.6 and 2.3 MW in size, and will have a hub height of between 78 and 80 meters and a rotor diameter of up to 113 meters.	The turbine models under consideration at the time the Order was issued are either no longer available or are not the most up-to-date technology available. As a result, Meadowlark is currently considering the following turbine models: Acciona AW125/3150; GE 2.5-116; Vestas V100-2.0; and Vestas V126-3.45. These turbine models are between 2.0 and 3.45 MW in size, and will have a hub height of between 80 and 90 meters and a rotor diameter of between 100 and 126 meters. See Section 1.2.1 of the CCS Environmental Report.
Finding of Fact No. 10	If the GE turbine model is selected there will be up to 63 turbines used, if the Vestas turbine model is selected there will be up to 56 turbines used, if the Gamesa turbine model is selected there will be up to 49 turbines used, and if the Siemens turbine model is selected there will be up to 44 turbines used. Except for reducing the number of turbine locations utilized, the turbine locations identified in the final Project layout submitted by Meadowlark will remain the same	Meadowlark has eliminated some of the approved turbine locations from further consideration, and plans to install no more than 49 turbines. In addition, due to changes in the turbine models under consideration, Meadowlark needed to shift nine turbine locations slightly so all locations comply with applicable setback requirements (all shifts were within previously surveyed areas). The resulting proposed turbine locations are a subset of the locations

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	regardless of which of the proposed turbine models Meadowlark ultimately selects.	previously approved by the PSC (see Hearing Exhibit No. 4), with the nine minor turbine shifts noted above. The number of turbines will depend on the turbine model selected, as follows: Acciona AW125/3150 – up to 32; GE 2.5-116 – up to 40; Vestas V100-2.0 – up to 49; Vestas V126-3.45 – up to 29. See Section 1.2.2 of the CCS Environmental Report.
Finding of Fact No. 11	The turbines will have a Supervisory Control and Data Acquisition (SCADA) system, which will allow for local and remote control monitoring of all turbines, and will have lightning protection in accordance with the manufacturer's specifications. The type of foundation that will be used for the turbines will be determined by geotechnical surveys, turbine tower load specifications, and cost considerations. Meadowlark will develop a lighting and marking plan for the turbines and meteorological towers in accordance with FAA requirements.	No change. See Section 1.2 of the CCS Environmental Report.
Finding of Fact No. 12	In addition to turbines, associated facilities that would be constructed within the Project Area include: access roads, a Project collector substation, an operations and maintenance (O&M) building, permanent meteorological towers, pad-mounted transformers, and a system of underground electrical collection lines and communication cables.	No change. See Section 1.2 of the CCS Environmental Report.
Finding of Fact No. 13	Meadowlark will construct and operate the Project in compliance with the National Electric Safety Code.	No change. See Section 1.2 of the CCS Environmental Report.
Finding of Fact No. 14	Meadowlark anticipates construction of the proposed Project may begin as soon as the second quarter of 2012 or	On-site construction may begin as soon as the Second Quarter of 2017, or as late as the Second Quarter of

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	in 2013 depending on the status of federal production tax credits and the market for the electricity to be generated. Meadowlark does not currently have a customer to purchase the power produced from the New Frontier Wind Project.	2020, depending on when a power purchase agreement or similar arrangement for the sale of the Project's output is secured. See Section 1.2.3 of the CCS Environmental Report.
Finding of Fact No. 15	The estimated life of the Project is over 25 years. In accordance with the Commission's rules, Meadowlark will file a decommissioning plan with the Commission prior to the Project commencing operations, and decommissioning will be performed in accordance with all applicable rules and regulations.	No change. See Section 1.2 of the CCS Environmental Report.
Finding of Fact No. 16	The total cost for construction of Meadowlark's proposed New Frontier Wind Project is estimated to be approximately $200 million.	Currently, the total cost for construction of the Project is estimated to be approximately $155 million.
Finding of Fact No. 17	North Dakota Administrative Code Chapter 69-06-08 sets forth certain criteria to guide the Commission in evaluating the suitability of granting an application for a certificate of site compatibility. The criteria, as set forth in North Dakota Administrative Code Section 69-06-08-01 are classified as Exclusion Areas, Avoidance Areas, Selection Criteria and Policy Criteria. With the exception of prime farmland and unique farmland, an energy conversion facility shall not be sited within an Exclusion Area. The exception for prime and unique farmland is that if the Commission finds 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 production, then such exclusion shall not apply.	No change. Although the PSC's siting criteria have changed since issuance of the CSC, the Project continues to comply with all exclusion area, avoidance area, selection, and policy criteria. See Section 2 of the CCS Environmental Report.

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	An energy conversion facility must not be sited within an Avoidance Area unless the applicant shows that under the circumstances there is no reasonable alternative. In determining whether an Avoidance Area should be designated for a facility, the Commission may consider, among other things, the proposed management of adverse impacts; the orderly siting of facilities; system reliability and integrity; the efficient use of resources; and alternative sites. In accordance with the Commission's Section Criteria, a site shall be approved if it is demonstrated that any significant adverse effects resulting from the location, construction, and operation of the energy conversion facility will be at an acceptable minimum or that the effects will be managed and maintained at an acceptable minimum. In accordance with the Commission's Policy Criteria, preference may be given to an applicant demonstrating certain benefits of the proposed energy conversion facility.	
Finding of Fact No. 18	Prime and unique farmland is present within the Project area. However, prime and unique farmlands have been avoided to the maximum extent practicable and impacts are expected to affect less than one (1) acre; thus, the proposed Project will have a negligible impact on agricultural production.	No change, other than a correction to the total prime farmland acreage calculation. Although prime farmland is present within the Project site, less than one percent of the prime farmland will be impacted by the Project; thus, the Project will continue to have a negligible impact on agricultural production. See Section 2.1 of the CCS Environmental Report.
Finding of Fact No. 19	The proposed Project and its associated facilities will occupy and disturb up to approximately 65 acres	The current design has eliminated some turbine locations; as a result, the current Project design may disturb up

Order Paragraph	Order Text	Updated Information
	of land, or approximately 0.5 percent of the total Project area, during the life of the Project. Meadowlark will continue to work closely with landowners during the development phase of the Project to minimize land use disruptions from the siting of the facilities. No impacts to irrigation or the quality of the agricultural land are anticipated.	to 53.1 acres of land, or approximately 0.5 percent of the total Project area, during the life of the Project. Otherwise, no change. See Section 1.2.2 of the CCS Environmental Report.
Finding of Fact No. 20	Meadowlark submitted evidence to demonstrate that any significant adverse effects resulting from the location, construction, and operation of the Project as they relate to the Selection Criteria set forth in Section 69-06-08-01(3) of the North Dakota Administrative Code will be at an acceptable minimum or managed and maintained at an acceptable minimum.	No change. See Section 2.3 of the CCS Environmental Report.
Finding of Fact No. 21	Meadowlark submitted evidence to demonstrate its commitment to maximize the benefits of the proposed energy conversion facility as far as is possible to meet the Policy Criteria set forth in Section 69-06-08-01(4) of the North Dakota Administrative Code.	No change. See Section 2.4 of the CCS Environmental Report.
Finding of Fact No. 22	Meadowlark conducted a Class I literature search, a Class II historic structure survey, and a Class Ill cultural resource inventory within the Project area. Meadowlark identified three cultural resource sites within the Project area that have not been evaluated for National Register of Historic Places (NRHP) eligibility, and Meadowlark's Project layout avoids these three sites.	The Project layout continues to avoid the three unevaluated cultural resource sites previously identified. In 2016, Meadowlark completed a Class I site file search confirming no new inventories were conducted and no new cultural resources were identified since the inventory for the Project in 2011. In addition, Meadowlark completed a Class III architectural survey and a Class III archeological survey for wider turning radii and minor collection lines shifts, during which no resources eligible for NRHP-listing were identified.

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		Therefore, the Project continues to avoid impacts to cultural and architectural resources. See Sections 2.2 and 3.4 of the CCS Environmental Report.
Finding of Fact No. 23	By letter dated February 22, 2012, the SHPO concurred with the determination that no historic properties or significant sites will be affected by the Project so long as the Project avoids the three identified unevaluated cultural resource sites present within the Project area.	The SHPO concurrence letter remains applicable to the 2011 report. SHPO concurrence letters on 2016 survey reports will be provided to the Commission on receipt. See Sections 2.2, 3.4 and 4.11 of the CCS Environmental Report.
Finding of Fact No. 24	The woodlands present in the Project area generally consist of shelterbelts. Turbine locations will avoid woodlands, and less than one acre of woodlands will be impacted by construction of access roads and installation of underground cables.	No change. See Section 2.2 of the CCS Environmental Report.
Finding of Fact No. 25	A wetland delineation was conducted for the Project and the results were provided in the Wetland Delineation Report. The Project layout has avoided wetlands to the extent practicable. Meadowlark will obtain any permits required from the USACE.	No change. See Sections 2.2 and 3.6 of the CCS Environmental Report.
Finding of Fact No. 26	Meadowlark has conducted environmental studies of the Project area, including a Whooping Crane Habitat Review and a Raptor Nest and Lek Survey. No adverse impacts to federally-listed threatened or endangered species are anticipated. Meadowlark has developed an Avian and Bat Protection Plan that identifies measures Meadowlark will take to avoid impacts to avian and bat species.	Meadowlark has conducted updated wildlife studies to confirm that no adverse impacts to federally-listed threatened or endangered species are anticipated. Meadowlark is developing a Wildlife Conservation Strategy (formerly the Avian and Bat Projection Plan) that will identify measures Meadowlark will take to avoid impacts to avian and bat species. See Sections 3.7, 3.8 and 4.11 of the CCS Environmental Report.
Finding of Fact No. 27	Meadowlark has agreed to a number of steps to mitigate any potential	No change. See Paragraph No.7 of the Certification of Continuing Suitability.

Order Paragraph	Order Text	Updated Information
	Project impacts, as indicated by the December 8, 2011 Certification Relating to Order Provisions – Transmission Facility Siting, with accompanying Tree and Shrub Mitigation Specifications, which is attached hereto.	
Finding of Fact No. 28	Meadowlark has taken measures to avoid impacts with USAF facilities and operations.	No change. See Sections 2.1, 2.5, and 4.11 of the CCS Environmental Report.
Finding of Fact No. 29	No wind turbine will be placed within 1,400 feet of any occupied residence, measured from the center of the base of the turbine tower to the closest part of the residence.	No change. See Section 2.5 of the CCS Environmental Report.
Finding of Fact No. 30	No wind turbine will be placed within 1.1 times the turbine blade tip height from the edge of any improved road right-of-way maintained and currently being used by the state, county, or township; existing above ground distribution or transmission lines; or adjacent property not under lease by Meadowlark.	No change. See Section 2.5 of the CCS Environmental Report.
Finding of Fact No. 31	Per McHenry County zoning regulations, the wind turbines, substation and Project O&M building will be at least 150 feet away from all improved section lines.	McHenry County's current Zoning Regulations contain the following setback requirements for wind energy facilities: • A 1,300 foot setback from the occupied dwelling of a non-participating property owner, and a 500 foot setback from the occupied dwelling of a participating property owner; the setback distance may be reduced by written agreement with the property owner. • A turbine setback of not less than 1.1 times the turbine tip

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		height from interstate or state roadway right-of-way. • A turbine setback of not less than 1.1 times the turbine tip height from the edge of any improved county or township roadway. • A turbine setback of not less than 150 feet from the centerline of an unimproved county or township road. • A turbine setback of not less than 1.1 times the turbine tip height from railroad right-of-way or an overhead transmission line. Since these setbacks are equal to or less than the setbacks applied to the Project per the Order, the Project continues to comply with all McHenry County setback requirements. See Section 2.5 of the CCS Environmental Report.
Finding of Fact No. 32	An acoustic modeling analysis with conservative assumptions (full rotational speed, flat terrain, includes alternate turbines) was performed for the Project. The results of the acoustic modeling were compared to the US Environmental Protection Agency environmental noise guideline of 55 dBA. The expected operational sound levels at nearby residences will vary from less than 32.6 dBA to 48.5 dBA. The highest expected sound level for a non-participating residence is 42.1 dBA.	Using the current turbine models under consideration and the current Project layout, which consists of only 49 potential turbine locations, Meadowlark prepared an updated acoustic modeling analysis for the Project. The results of the acoustic assessment show that the Project will comply with the PSC's current sound limit of no more than 50 dBA within 100 feet of all occupied residences, with the exception of five participating landowner residences that may experience sound levels above the applicable noise limit under certain

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		circumstances. Meadowlark has obtained written waivers of the sound level avoidance area criteria from the affected landowners. See Sections 2.2 and 3.3 of the CCS Environmental Report.
Finding of Fact No. 33	A shadow flicker analysis was conducted for the Project using a "worst case" scenario. The analysis shows that most residences in the Project area are anticipated to have less than 30 hours per year of shadow flicker. Three residences owned by participating landowners may see shadow flicker levels of over 30 hours a year; however, Meadowlark testified that it has communicated this information to the landowners, and no concerns were raised. In the event that flicker mitigation is necessary, Meadowlark will work with individual landowners to address issues, and the mitigation measures employed may include adding vegetative screening or installing curtains or blinds on the windows facing the turbine casting shadows.	Using the current turbine models under consideration and the current Project layout, which consists of only 49 potential turbine locations, Meadowlark has prepared an updated shadow flicker analysis for the Project. The analysis shows that shadow flicker impacts are expected to be less than 30 hours per year at occupied residences, with the exception of five occupied residences owned by participating landowners. Meadowlark has communicated this information to the landowners, and the landowners have executed written acknowledgments. See Section 3.5 of the CCS Environmental Report.
Finding of Fact No. 34	Meadowlark will utilize best management practices (BMPs) to minimize impacts on ground and surface water, and to prevent soil erosion. Meadowlark will implement the erosion control measures required under the National Pollution Discharge Elimination System (NPDES) permit and the associated Storm Water Pollution Prevention Plan. Construction of the Project is not anticipated to have a significant adverse impact on surface or ground water resources or soils.	No change. See Sections 3.6 and 4.10 of the CCS Environmental Report.

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Finding of Fact No. 35	All electrical equipment associated with the turbines, with the exception of padmounted transformers, will be contained within the solid steel enclosed tubular towers on which the turbines are mounted. Access to the towers will be restricted to a single solid steel door that will be locked when not in use. The Project substation will be fenced and locked, and will have applicable warning signs.	No change. See Section 1.2 of the CCS Environmental Report.
Finding of Fact No. 36	Meadowlark will participate in the North Dakota One-Call Excavation Notice System.	No change.
Finding of Fact No. 37	Meadowlark will coordinate with local authorities and first responders regarding emergency response measures as part of the Project commissioning activities.	No change.
Conclusion of Law No. 1	The Commission has jurisdiction over this proceeding under Chapter 49-22 of the North Dakota Century Code.	No change.
Conclusion of Law No. 2	The wind energy conversion facility proposed by Meadowlark is an energy conversion facility as defined in North Dakota Century Code Section 49-22-03(5).	No change.
Conclusion of Law No. 3	The Application submitted by Meadowlark meets the site evaluation criteria required by North Dakota Century Code Chapter 49-22.	No change.
Conclusion of Law No. 4	The location, construction, and operation of the proposed energy conversion facility will produce minimal adverse effects on the environment and upon the welfare of the citizens of North Dakota.	No change.
Conclusion of Law No. 5	The proposed energy conversion facility is compatible with the environmental preservation and the efficient use of resources.	No change.

Order Paragraph	Order Text	Updated Information
Conclusion of Law No. 6	The proposed energy conversion facility location will minimize adverse human and environmental impact while ensuring continuing system reliability and integrity and ensuring that energy needs are met and fulfilled in an orderly and timely fashion.	No change.
Conclusion of Law No. 7	The Commission has jurisdiction to ensure compliance with National Electric Safety Code standards in the construction and operation of the proposed energy conversion facility.	No change.
Order No. 1	Certificate of Site Compatibility for an Energy Conversion Facility No. 29 is issued to Meadowlark Wind I LLC for the construction, operation and maintenance of a wind energy facility known as the New Frontier Wind Project.	No change.
Order No. 2	That the site described in the Application, located just north of Ruso, North Dakota, is designated as the site for construction of the New Frontier Wind Project.	No change.
Order No. 3	Within the permitted area, Meadowlark is authorized to site and construct up to 102 MW of wind turbines, electrical collection and communication lines, access roads, an operation and maintenance building, a Project substation, meteorological towers, and other associated facilities identified in the Application, at the hearing, in any supplemental filings and in any late-filed exhibits.	No change, except for the updated information provided in the Certification of Continuing Suitability and associated Exhibits.
Order No. 4	That the December 8, 2011 Certification Relating to Order Provisions - Transmission Facility Siting be incorporated by reference and attached to the Order issued by the Commission.	No change.