Southern Power

KLJ

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

Prepared for: Ruso Wind Partners, LLC, 3535 Colonnade Parkway, BIN S-855-EC, Birmingham, AL 35243

Prepared by: KLJ, 4585 Coleman Street, Bismarck, North Dakota 58503

Ruso Wind Project
Ward and McLean Counties, North Dakota

December 2018

Contents

1.0 Introduction....1

1.1 Compliance with the Energy Conversion and Transmission Facility Siting Act, North Dakota Century Code Chapter 49-22....1

1.2 Project Summary....4

1.2.1 Project Area....5

1.2.2 Project Layout....5

1.2.3 Selection of Project Area....6

1.2.4 Project Area Wind Characteristics....7

1.2.5 Projected Output....7

1.3 Project Schedule....8

1.4 Expansion or Addition....8

1.5 Project Cost....8

2.0 Need for Facility....8

2.1 Need Analysis....8

2.2 Alternatives....9

2.3 Ten Year Plan....10

3.0 Site Selection Criteria....10

3.1 Exclusion Areas....10

3.2 Avoidance Areas....12

3.3 Selection Criteria....13

3.4 Policy Criteria....16

3.5 Design and Construction Limitations....18

3.6 Economic Considerations....19

4.0 Description of the Proposed Facility....19

4.1 Project Components....19

4.1.1 Wind Turbines....19

4.1.2 Associated Facilities....21

4.1.3 Temporary Facilities....22

4.2 Project Layout....22

4.3 Estimated Project Facility Impacts....23

5.0 Project Construction, Operation and Decommissioning....25

5.1 Project Construction....25

5.1.1 Construction Activities....25

5.1.2 Construction Management....26

5.1.3 Commissioning....26

5.2 Project Operation and Maintenance 27
5.2.1 Maintenance Schedule 27
5.3 Decommissioning and Restoration 27
6.0 Environmental Analysis 28
6.1 Demographics 28
6.1.1 Demographic Impacts/Mitigation 29
6.2 Land Use 30
6.2.1 Land Use Impacts/Mitigation 31
6.3 Public Services 33
6.3.1 Public Service Impacts/Mitigation 35
6.4 Human Health and Safety 37
6.4.1 Human Health and Safety Impacts/Mitigation 38
6.5 Sound 39
6.5.1 Sound Impacts/Mitigation 39
6.6 Visual 40
6.6.1 Visual Impacts/Mitigation 40
6.7 Cultural and Archaeological Resources 40
6.7.1 Cultural and Archaeological Resources Impacts/Mitigation 42
6.8 Recreational Resources 42
6.8.1 Recreational Resources Impacts/Mitigation 43
6.9 Effects on Land-based Economics 43
6.9.1 Land-based Economics Impacts/Mitigation 43
6.10 Soils 43
6.10.1 Soils Impacts/Mitigation 44
6.11 Geologic and Groundwater Resources 45
6.11.1 Geologic and Groundwater Impacts/Mitigation 46
6.12 Surface Water and Floodplain Resources 46
6.12.1 Surface Water and Floodplain Resources Impacts/Mitigation 47
6.13 Wetlands 47
6.13.1 Wetland Impacts/Mitigation 48
6.14 Vegetation 48
6.14.1 Vegetation Impacts/Mitigation 49
6.15 Wildlife 49
6.15.1 Wildlife Impacts/Mitigation 52
6.16 Rare and Unique Natural Resources 53
6.16.1 Rare and Unique Natural Resources Impacts/Mitigation 57

6.17 Summary of Impacts 58
7.0 Identification of Potential Permits/Approvals 61
8.0 Factors Guiding the Commission 63
8.1 Available Research and Investigations pertaining to Public Health and Welfare, Natural Resources, and the Environment 64
8.2 New Energy Conversion Technologies and Systems 64
8.3 Potential for Beneficial Uses of Waste Energy 64
8.4 Unavoidable Adverse Direct and Indirect Environmental Effects 64
8.5 Alternatives to the Proposed Site 64
8.6 Irreversible and Irretrievable Commitment of Natural Resources 64
8.7 Direct and Indirect Economic Impacts 64
8.8 Existing Development Plans 65
8.9 Scenic Areas, Historic Sites and Structures, and Paleontological or Archaeological Sites 65
8.10 Areas of Unique Biological Wealth or Habitats for Rare and Endangered Species 65
8.11 Problems Raised by Federal, State and Local Entities 65
9.0 Agency Comments 65
9.1 U.S. Department of Defense – Minot Air Force Base 65
9.2 U.S. Department of Defense – Army Corps of Engineers, North Dakota Regulatory Office 66
9.3 U.S. Department of the Interior – U.S. Fish and Wildlife Service, Audubon National Wildlife Refuge Complex 66
9.4 U.S. Department of Commerce – National Telecommunications and Information Administration 66
9.5 North Dakota Aeronautics Commission 66
9.6 North Dakota Department of Health 66
9.7 North Dakota Department of Transportation 67
9.8 North Dakota Department of Trust Lands 67
9.9 North Dakota Game and Fish Department 67
9.10 North Dakota Geological Survey 68
9.11 North Dakota Industrial Commission – Oil and Gas Division 68
9.12 North Dakota State Water Commission 68
9.13 State Historical Society of North Dakota 68
10.0 Qualifications of Contributors to Siting Study 69
11.0 References 70
12.0 Acronyms, Abbreviations and Definitions 77

Tables

Table 1, Certificate Completion Checklist 2
Table 2, Site Location 5
Table 3, Summary of Exclusion Areas 10
Table 4, Summary of Avoidance Areas 13
Table 5, Summary of Selection Criteria 14
Table 6, Summary of Policy Criteria 17
Table 7, Representative Turbine Type Characteristics for the Project 20
Table 8, Setback Distances as Designated by the Commission 23
Table 9, Setback Distances as Designated by Local Zoning Ordinances 23
Table 10, Estimated Impacts from Project Facilities 24
Table 11, Demographic Trends 29
Table 12, Land Use 32
Table 13, Previously Recorded Sites within 1-mile of APE 41
Table 14, Previously Recorded Site Leads within 1-mile of APE 41
Table 15, Cultural Resources within APE 42
Table 16, Farmland Classification Summary 45
Table 17, Special Status Species Identified in Project Area 51
Table 18, Summary of Impacts and Mitigation 58
Table 19, Potential Permits/Approvals 61

Figures

Figure 1. Unsubsidized Levelized Cost of Energy Comparison 9

Appendices

Appendix A. Exhibits
- Exhibit 1. Project Location Map
- Exhibit 2. Exclusion Areas
- Exhibit 3. Avoidance Areas
- Exhibit 4. Facilities Layout
- Exhibit 5. Land Use
- Exhibit 6. Infrastructure
- Exhibit 7. Microwave Beam Paths
- Exhibit 8. Prime and Unique Farmland
- Exhibit 9. Geologic and Groundwater Resources
- Exhibit 10. Surface Waters and Wetlands
- Exhibit 11. Whooping Crane Migration Corridor

Appendix B. Black and White Project Location Map
Appendix C. Scoping Package and Responses
Appendix D. USFWS Resource List
Appendix E. Policies and Commitments Statement
Appendix F. Bat Monitoring Report
Appendix G. 2017-2018 Annual Pre-Construction Avian Survey Report
Appendix H. Grassland Assessment
Appendix I. 2018 Dakota Skipper Habitat Assessment and Survey Report
Appendix J. Communication Tower Study
Appendix K. AM and FM Radio Report
Appendix L. Off-Air TV Analysis
Appendix M. Land Mobile & Emergency Services Report
Appendix N. Microwave Study
Appendix O. Obstruction Evaluation & Airspace Analysis
Appendix P. Wetland Mapping Survey
Appendix Q. Shadow Flicker Analysis
Appendix R. Sound Study
Appendix S. Class III Cultural Resource Inventory (Redacted)

1.0 Introduction

Ruso Wind Partners, LLC (RWP) is submitting this application (Application) for a Certificate of Site Compatibility (Certificate) to the North Dakota Public Service Commission (Commission) for the proposed Ruso Wind Project (Project).

The Project would be located within an approximately 35,654-acre Project Area. The Project Area is located approximately one mile west of the City of Ruso, within Ward, and McLean Counties, North Dakota; however, no project facilities are planned for McLean County. The Project would generate up to 205 megawatts (MW) of electricity and would result in the construction of up to 66 wind turbines. Additional Project facilities include access roads, electrical collection and communication systems and cabling, an operation and maintenance (O&M) building, permanent meteorological evaluation towers (MET), and a substation. Please refer to ***Exhibit 1, Project Location Map,*** in ***Appendix A.***

RWP also plans to construct a 230 kilovolt (kV) generation tie line to facilitate the Project's interconnection, which would be approximately ten (10) miles in length. In accordance with Section 49-22-03 of the North Dakota Century Code (NDCC), the proposed line falls within the Commission's siting jurisdiction; therefore, RWP will submit a separate application for a Certificate of Corridor Compatibility and Route Permit. For this reason, the generation tie line is not discussed in detail in this Application.

RWP has not executed a power purchase agreement (PPA) to date. The Project would interconnect to the grid via the Ruso Wind Switching Station. The switching station would be constructed, owned, and operated by Great River Energy.

On December 21, 2017, Southern Power Company purchased the Project from White Wind Holdings, LLC. Southern Power Company and Ruso Wind Partners, LLC entered into a Development Services Agreement (DSA) with White Wind Ventures, LLC on December 21, 2017 to jointly develop the Project.

RWP owns the Project. RWP is a wholly owned subsidiary of Southern Power. Southern Power, as the owner of RWP would develop, construct and operate the Project. Southern Power is a leading U.S. wholesale energy provider and subsidiary of Southern Company, a nationally recognized energy company with more than 9 million customers. Southern Power and its subsidiaries own 48 facilities operating or under construction in 11 states with more than 11,300 MW of generating capacity in Alabama, California, Georgia, Kansas, Maine, Minnesota, Nevada, New Mexico, North Carolina, Oklahoma and Texas. These facilities help meet the electricity needs of municipalities, electric cooperatives, investor-owned utilities and commercial and industrial customers. The portfolio now includes over 3,200 MW of renewable generation.

1.1 Compliance with the Energy Conversion and Transmission Facility Siting Act, North Dakota Century Code Chapter 49-22

The North Dakota Energy Conversion and Transmission Facility Siting Act, NDCC 49-22 (Siting Act) requires the proponent of an energy conversion facility to obtain a Certificate from the Commission in order to locate, construct, and operate the facility in the state of North Dakota. An application for a Certificate must meet certain criteria set forth in the Siting Act, as well as in North Dakota Administrative Code (NDAC) Article 69-06 (Siting Rules). The siting of an energy conversion facility is to be made in an orderly manner

compatible with environmental preservation and the efficient use of resources (NDCC 49-22-02).

In this Application, RWP presents the information required by the Siting Act and the Siting Rules. RWP has considered the exclusion and avoidance areas, the selection criteria, and the policy criteria in the design of the Project, in accordance with NDCC 49-22 and NDAC 69-06-08. Information regarding Project design, wind resources and technical information has been included in this Application to allow a thorough understanding of the Project and to aid in review by the Commission, regulatory agencies and the public. The table below provides a summary of information included in this Application and the section of the document in which each siting requirement is addressed. Please refer to ***Table 1, Certificate Completion Checklist***.

Table 1, Certificate Completion Checklist

	Description	Section
State Authority	Certificate of Site Compatibility	
Section 2	Contents	
a. (1)	A description of the type of energy conversion facility proposed.	1.0, 4.1
a. (2)	A description of the gross design capacity.	1.2
a. (3)	A description of the net design capacity.	1.2.5
a. (4)	A description of the estimated thermal efficiency of the energy conversion process and the assumption upon which the estimate is based.	Not applicable (NA)
a. (5)	A description of the number of acres that the proposed facility will occupy.	1.0, 1.2.1
a. (6) a	A description of the anticipated time schedule for obtaining the certificate of site compatibility.	1.3
a. (6) b	A description of the anticipated time schedule for completing land acquisition.	1.3
a. (6) c	A description of the anticipated time schedule for starting construction.	1.3
a. (6) d	A description of the anticipated time schedule for completing construction.	1.3
a. (6) e	A description of the anticipated time schedule for testing operations.	1.3
a. (6) f	A description of the anticipated time schedule for commencing commercial production.	1.3
a. (6) g	A description of the anticipated time schedule for beginning any expansions or additions.	1.4
b.	Copies of any evaluative studies or assessments of the environmental impact of the proposed facility submitted to any federal, regional, state, or local agency.	Appendices F-S
c.	An analysis of the need for the proposed facility based on present and projected demand for the product or products to be produced by the proposed facility, including the most recent system studies supporting the analysis of the need.	2.1
d.	A description of any feasible alternative methods of serving the need.	2.2

	Description	Section
e.	A study area that includes the proposed facility site, of sufficient size to enable the commission to evaluate the factors addressed in North Dakota Century Code section 49-22-09.	1.0, 6.0
f.	A discussion of the utility's policies and commitments to limit the environmental impact of its facilities, including copies of board resolutions and management directives.	Appendix E
g.	A map identifying the criteria that provides the basis of the specific location of the proposed facility within the study area.	Appendix A
h.	A discussion of the criteria evaluated within the study area, including exclusion areas, avoidance areas, selection criteria, policy criteria, design and construction limitations, and economic considerations.	3.0-3.6
i.	A discussion of the mitigative measures that the applicant will take to minimize adverse impacts which result from the location, construction, and operation of the proposed facility.	6.0-6.17
j.	The qualifications of each person involved in the facility site location study.	10.0
k.	A map of the study area showing the location of the proposed facility and the criteria evaluated.	Appendix A
l.	An eight and one-half-inch by eleven-inch black and white map suitable for newspaper publication depicting the site area.	Appendix B
m.	A discussion of present and future natural resource development in the area.	6.11
n.	Map and GIS requirements. The applicant shall provide information that is complete, current, presented clearly and concisely, and supported by appropriate references to technical and other written material available to the commission.	Appendix A, DVD
NDCC 49-22-08	Description of Application Requirements	
Section 1	An application for a certificate shall be in such form as the commission may prescribe, containing the following information:	
a.	A description of the size and type of facility.	1.0, 4.0
b.	A summary of any studies which have been made of the environmental impact of the facility.	6.0-6.17
c.	A statement explaining the need for the facility.	2.1
d.	An identification of the location of the preferred site for any energy conversion facility.	1.2.1, Appendix A
e.	An identification of the location of the preferred corridor for any transmission facility.	NA
f.	A description of the merits and detriments of any location identified and a comprehensive analysis with supporting data showing the reasons why the preferred location is best suited for the facility.	1.1, 1.2, 2.0-3.6, 6.0-6.17

	Description	Section
g.	A description of mitigative measures that will be taken to minimize all foreseen adverse impacts resulting from the location, construction, and operation of the proposed facility.	6.0-6.17
h.	An evaluation of the proposed site or corridor with regard to the applicable considerations set out in section 49-22-09 and the criteria established pursuant to section 49-22-05.1.	3.0-3.6, 6.0-6.17
i.	Such other information as the applicant may consider relevant or the commission may require.	8.0-8.11
NDCC 49-22-09	Factors to be considered in evaluating applications and the designation of sites, corridors, and routes.	
1.	Available research and investigations relating to the effects of the location, construction, and operation of the proposed facility on public health and welfare, natural resources, and the environment.	8.1
2.	The effects of new energy conversion and transmission technologies and systems designed to minimize adverse environmental effects.	8.2
3.	The potential for beneficial uses of waste energy from a proposed energy conversion facility.	8.3
4.	Adverse direct and indirect environmental effects which cannot be avoided should the proposed site or route be designed.	8.4, 6.0
5.	Alternatives to the proposed site, corridor, or route which are developed during the hearing process and which minimize adverse effects.	8.5, 2.2
6.	Irreversible and irretrievable commitments of natural resources should the proposed site, corridor, or route be designed.	8.6
7.	The direct and indirect economic impacts of the proposed facility.	8.7, 6.1, 6.9
8.	Existing plans of the state, local government, and private entities for other developments at or in the vicinity of the proposed site, corridor, or route.	8.8, 6.2
9.	The effect of the proposed site or route on existing scenic areas, historic sites and structures, and paleontological or archaeological sites.	8.9, 6.6, 6.7, 6.11
10.	The effect of the proposed site or route on areas which are unique because of biological wealth or because they are habitats for rare and endangered species.	8.10, 6.16
11.	Problems raised by federal agencies, other state agencies, and local entities.	8.11, 9.0

1.2 Project Summary

The Project Area is located within southeastern Ward, and north-central McLean Counties, North Dakota; however, no project facilities are planned for McLean County. See ***Exhibit 1, Project Location Map,*** in ***Appendix A***. The planned nameplate (gross) capacity for the Project is up to 205 MW of wind energy capacity. RWP plans to utilize two turbine models, with an output range of 2.415 MW – 4.8 MW. The Project was designed with 4.2 MW as the highest rated turbine output; however, RWP may choose to uprate the turbines to have an output of 4.8 MW. The decision to uprate would result in fewer turbines to be

sited for the Project and smaller amount of disturbed acreage. Turbine dimensions would remain the same. The Project's facilities would include:

- Up to 66 wind turbines and related equipment;
- New gravel access roads and improvements to existing roads (as needed);
- Underground electrical collection and communication lines, with above-ground junction boxes;
- Substation;
- O&M building; and
- Up to three permanent MET towers (up to 108 meters tall).

1.2.1 Project Area

The Project Area includes all or part of 76 sections (containing approximately 35,654 acres) of agricultural land in north-central North Dakota, adjacent to the towns of Benedict, and Ruso. RWP currently holds wind energy leases with approximately 65 landowner partners. The leased area provides sufficient acreage to construct the anticipated 205 MW Project. Please refer to ***Table 2, Site Location,*** for a list of the townships, sections, and ranges that are included in the Project Area as well as ***Exhibit 1, Project Location Map,*** in ***Appendix A***.

Table 2, Site Location

County	Township	Range	Section(s)
Ward	151N	81W	1-12, 14-35
	151N	82W	1, 3, 4, 9-15, 21-28, 34-36
	152N	81W	31-34
McLean	150N	80W	6, 7
	150N	81W	1-4, 6, 9-14, 23
	150N	82W	1, 3

1.2.2 Project Layout

In this Application, RWP is providing a preliminary Project layout. See ***Exhibit 4, Facilities Layout, in Appendix A.*** The Project layout includes up to 53 primary turbine locations and 13 alternate turbine locations, should the primary turbine locations be determined unsuitable. Additionally, the Project layout includes primary access roads and collection lines. Primary access roads and collection lines are those connecting to primary turbine locations. The preliminary Project layout is designed to accommodate any of the two turbine models under consideration. (See ***Section 4.1.1*** for additional information regarding turbines under consideration.)

Based on the analyses completed to date, RWP's turbine layout optimizes electrical generation and efficiency, while avoiding or minimizing environmental, cultural, and

economic impacts. RWP has and would continue to thoroughly evaluate its preliminary turbine locations and ancillary facilities. Further, RWP would continue to coordinate with landowners and applicable agencies regarding the Project's design and layout. The Project's turbines and ancillary facilities would be sited so as to comply with the Commission's and county setback requirements. Prior to the public hearing regarding this Application, RWP will submit a final Project layout to the Commission.

Once the Project is constructed, RWP would file as-built surveys with the Commission, and other interested agencies at their request.

1.2.3 Selection of Project Area

The Project Area possesses a unique and favorable combination of traits which makes it ideally suited for wind development. Specifically, the Project Area has an extraordinary wind resource, electrical infrastructure near the facility for interconnection to the grid and landowner support. Further, the Project is compatible with the existing land use and environmental features within the Project Area.

White Wind Holdings, LLC began site selection for the project area in 2016 after considering various regional site options. After the initial assessment looking into wind resource, electrical interconnection, local support, environmental and other aspects of the options, White Wind Holdings, LLC entered into lease agreements with interested landowners in 2017 and began collecting wind data. The final site selection process considered the following criteria:

- Quality of the Wind Resource: Wind resource at the Project site is significantly better than an average site, making the Project competitive on a regional basis.

- Landowner and Community Support: RWP and White Wind Holdings, LLC value developing wind farms that benefit the landowners, minimizes farm/ranch disruption, and benefits the local community in which projects are located. RWP and White Wind Holdings, LLC support the community in a variety of ways. One such way is through a 'good neighbor agreement' on all leases in the Project Area. This 'good neighbor payment' provides monetary compensation to landowners even in the event that there is no infrastructure on their land. Since RWP purchased the Project from White Wind Holdings, LLC, the Applicant has fostered relationships with the community through landowner dinners/discussions and county meetings. On April 11, 2018, and November 8, 2018, the Applicant held landowner dinners to discuss the progress of the Project. On May 2, 2018, the Applicant met with Dana Larsen (County Engineer), Travis Schmidt (Assistant County Engineer), Nancy Simpson (Planning and Zoning Administrator), and Ryan Kamrowski (Tax Director) to discuss the Project and the positive impact it would have on the county. To further community support, the Applicant met with Shelly Weppler (Ward County Commissioner) and Cy Kittleson (Brillian Township Commissioner) on December 20, 2018. As a result, the Applicant has developed a strong relationship with the Project landowners as well as a positive perception in the community.

- Transmission Suitability: The availability of transmission capacity and interconnection suitability are ideal for an energy project for the region allowing the Project to economically deliver power to the transmission grid.

- Environmental and Cultural Considerations: Before selecting the Project Area, White Wind Holdings, LLC assessed multiple sites in the region from environmental and cultural perspectives. The Project Area was selected in part because it offered relatively low environmental impacts.

- Economics of the Project: A combination of the high-quality wind resource and economical transmission interconnection directly affects the economics of the Project favorably.

The Project is a competitive, cost effective renewable energy project. Once the site was selected and leases secured, RWP identified preliminary turbine locations based on wind resource analysis, efficient civil and site selection, site inspections, topography, known environmentally-sensitive areas, and communications with local, state and federal agencies. RWP reviewed the Project facilities expected to be on participating landowner's property in layout discussion meetings. Comments and suggestions made by participating landowners have been and will continue to be incorporated into the final layout to the extent practicable.

1.2.4 Project Area Wind Characteristics

The U.S. Department of Energy (USDOE) and the North Dakota Division of Community Services have conducted wind resource assessment studies in North Dakota. According to the USDOE, annual average wind speeds of 6.5 meters per second (mps) and above are suitable for wind power projects. The 2012 AWS Truepower wind map for the U.S. indicates that the wind resources within the Project Area average 7.5 to 9.0 mps at a height of 80 meters above the ground.

On-site data collection began in March of 2017 and continues to the present day. RWP has deployed a total of three temporary MET towers and one Sonic Detection And Ranging (SoDAR) unit on the Project site to date. Each tower is 60 meters tall with a number of sensors to measure wind speed, wind direction, temperature, air pressure, and relative humidity. The SoDAR device is a trailer-mounted unit approximately six (6) feet tall that measures wind speed, direction, and turbulence at up to 200 meters above the ground, as well as recording ambient air temperature and pressure at the unit.

Correlation of on-site data with long-term reference data from the National Aeronautics and Space Administration's (NASA) Modern-Era Retrospective for Research and Applications (MERRA-2) data set estimates annual average wind speeds at 8.3 to 8.5 mps at a height of 80 meters above the ground.

Wind data was analyzed using Windographer software from AWS TruePower. Various wind turbine layouts and wind turbine generators were tested in an iterative process using AWS's Openwind software to predict energy production and array efficiency. These results were used to select turbine technology and locations that best optimized the Project site.

1.2.5 Projected Output

The Project would have a nameplate capacity of up to 205 MW with projected average output of 840 gigawatt hours per year (GWh/y). Variations in the actual Project output would depend upon final design and layout of the facility.

1.3 Project Schedule

The proposed Project schedule is as follows:

- **Land Acquisition**: All land that is proposed to house Project facilities is under long-term lease agreements and/or transmission easement agreements allowing for construction of the Project.

- **Certificate of Site Compatibility**: RWP anticipates the Certificate would be issued by the Commission in Third Quarter 2019.

- **Other Permits**: RWP would acquire all other permits necessary for construction of the Project prior to conducting the work for which the permit is required. Please refer to ***Table 19, Potential Permits/Approvals,*** in ***Section 7.0***.

- **Construction**: Project construction is anticipated to begin as early as Third Quarter 2019 and be completed by the end of 2020.

- **Commercial Testing**: Turbine erection and commercial testing are anticipated to take place starting in July 2020 to ensure the Project is generating power by October 1, 2020.

- **Commercial Operations**: RWP plans to have the Project commercially operational by the end of 2020.

1.4 Expansion or Addition

RWP currently does not have any plans for addition or expansion at this time. However, should the opportunity arise for expansion or addition to the proposed Project, RWP would take action to develop additional adjacent areas that have been deemed suitable for expansion.

1.5 Project Cost

The estimated total cost to construct the Project is approximately $250 to $280 million.

2.0 Need for Facility

2.1 Need Analysis

The current need for additional electric generation sources in North Dakota is being driven by the energy intensive industrial boom taking place in the state. North Dakota's per capita energy consumption is currently among the highest in the country.

In 2010, The North Dakota Department of Commerce, EmPower ND Commission, published the Comprehensive State Energy Policy 2010-2025, which recommended a capacity of wind generation up to 5,000 MW by 2020 (North Dakota Department of Commerce, Undated). The state had a total of 2,996 MW of installed wind capacity at the end of 2017 (U.S. Department of Energy, 2018).

A need also exists for additional renewable resources to meet the national "25x25" initiative. In 2007, the North Dakota Legislature enacted a statutory provision adopting the 25x25 initiative, which establishes the goal of not less than 25 percent of the total energy consumed in the U.S. to come from renewable energy sources by January 1, 2025.

Thus, the renewable energy produced by RWP's proposed Project can be used to meet current electricity demands and the accompanying need for new generation.

2.2 Alternatives

Potential alternatives to wind generation include electricity generation using coal, natural gas, solar energy, hydropower or biomass.

Wind energy is currently among the most cost-effective generation resources. As demonstrated in Lazard's November 2017 *Levelized Cost of Energy Analysis* (Version 11.0), wind energy is cost competitive with long-term estimates of both renewable and conventional generation technologies. ***Figure 1*** below shows the results of Lazard's comparison of the unsubsidized "levelized cost of energy" for various renewable and conventional technologies on a $/MWh basis (Lazard, 2017).

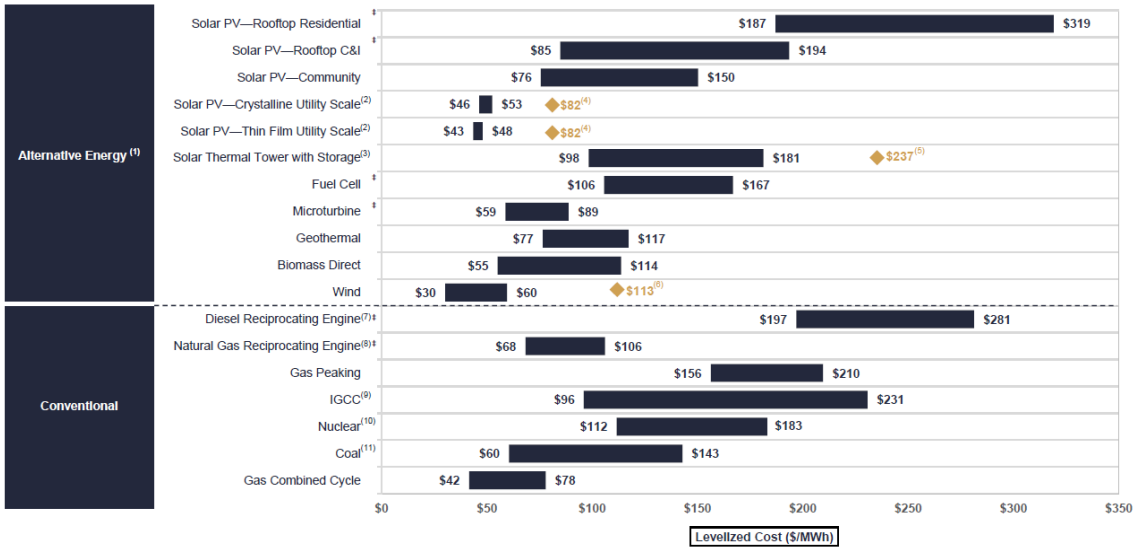


Figure 1. Unsubsidized Levelized Cost of Energy Comparison

Source: Lazard, 2017

Additionally, based on the size, type and timing of the Project, it is unlikely that an alternative source of energy would meet the same need. As discussed in ***Section 1.2.4*** above, the Project's location is optimal for wind generation. Further, as discussed in ***Section 1.2.1*** above, RWP has already leased sufficient acreage to construct the anticipated 205 MW Project and is in the process of obtaining permits required to commence construction. No alternative energy source project is in the same position to satisfy the need for a low-cost energy resource to meet the demand for forecasted regional load growth.

2.3 Ten Year Plan

In accordance with NDCC 49-22-04 and NDAC 69-06-02, RWP will submit a Ten-Year Plan for years 2019-2029. RWP's Ten-Year Plan will be consistent with this Application for a Certificate.

3.0 Site Selection Criteria

RWP selected the Project Area based on landowner support, as well as an assessment of area technical and environmental characteristics, and energy demand in the region. Site selection for the Project was also based upon the criteria described in NDAC 69-06-08. These criteria are discussed further below.

3.1 Exclusion Areas

Per NDAC 69-06-08-01(1), certain geographical areas shall be excluded from energy conversion facility siting consideration. NDAC 69-06-08-01(2) also lists geographic areas that "must be excluded in the consideration of a site for a wind energy conversion facility[1]." Please refer to ***Exhibit 2, Exclusion Areas,*** in ***Appendix A*** and ***Table 3, Summary of Exclusion Areas.***

Table 3, Summary of Exclusion Areas

General Exclusion Area	Present within Project Area	Description	Section Addressed
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.	Present	Two U.S. Fish and Wildlife Service (USFWS) Waterfowl Production Areas (WPAs) excluded.	6.2
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.	None	NA	6.2
County parks and recreation areas; municipal parks; parks owned or administered by other governmental subdivisions; hardwood draws; and enrolled woodlands.	None	NA	6.2

[1] As defined in NDAC 69-06-01-01, exclusion criteria are "criteria that remove areas from consideration for energy conversion facility sites and transmission facility routes." Exclusion areas are composed of these limiting criteria.

General Exclusion Area	Present within Project Area	Description	Section Addressed
Prime farmland and unique farmland, as defined by the land inventory and monitoring division of the soil conservation service, U.S. Department of Agriculture in 7 C.F.R. part 657; provided, however, that if the Commission finds that the prime farmland and unique farmland that will be removed from use for the life of the facility is of such small acreage as to be of negligible impact on agricultural productions, this exclusion does not apply.	Present	Small impact on prime farmland, prime farmland if drained, and farmland of statewide importance present; negligible impact on agricultural productions.	6.10
Irrigated land.	None	NA	6.3
Areas critical to the life stages of threatened or endangered animal or plant species.	None	NA	6.16
Areas where animal or plant species that are unique or rare to this state would be irreversibly damaged.	None	NA	6.16
Areas within one thousand two hundred feet of the geographic center of an intercontinental ballistic missile (ICBM) launch or launch control facility.	Present	Two ICBM facility areas excluded.	6.2
Wind Energy Exclusion Area	**Present within Project Area**	**Description**	**Section Addressed**
Areas less than one and one-tenth times the height of the turbine from interstate or state roadway right of way.	Present	One state roadway area excluded.	6.3
Areas less than one and one-tenth times the height of the turbine plus seventy-five feet from the centerline of any county or maintained township roadway.*	Present	Several county or township roadway areas excluded.	6.3
Areas less than one and one-tenth times the height of the turbine from any railroad right of way.	Present	One railroad area excluded.	6.3
Areas less than one and one-tenth times the height of the turbine from a one hundred fifteen kilovolt or higher transmission line.*	Present	Four transmission line areas excluded, including proposed Ruso Wind Transmission Project line.	6.3

General Exclusion Area	Present within Project Area	Description	Section Addressed
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.	Present	Several nonparticipating landowner areas excluded.	6.2

* These exclusion areas shown on ***Exhibit 2*** in ***Appendix A*** were created using the largest turbine height (i.e., 590.6 feet) except in areas adjacent to smaller turbines, whereby the exclusion area was reduced to correspond to the actual turbine height (i.e., 439.6 feet).

3.2 Avoidance Areas

Per NDAC 69-06-08-01(3), certain geographical areas may not be approved as sites for energy conservation facilities unless the applicant shows that, under the circumstances, there is no reasonable alternative[2]. In determining whether an avoidance area should be designated for a facility, the Commission may consider, among other things, the following: the proposed management of adverse impacts; the orderly siting of facilities; system reliability and integrity; the efficient use of resources; and alternative sites. Economic considerations alone would not justify approval of these areas. In addition, a buffer zone of a reasonable width to protect the integrity of the area must be included. An additional avoidance area for wind energy conversion facilities is set forth in NDAC 69-06-08-01(4). Please refer to ***Exhibit 3, Avoidance Areas,*** in ***Appendix A*** and ***Table 4, Summary of Avoidance Areas.***

[2] As defined in NDAC 69-06-01-01, avoidance criteria are "criteria that remove areas from consideration for energy conversion facility sites and transmission facility routes unless it is shown that under the circumstances there are no reasonable alternatives." Avoidance areas are composed of these limiting criteria.

Table 4, Summary of Avoidance Areas

General Avoidance Area	Present within Project Site	Description	Section Addressed
Historical resources which are not designated as exclusion areas.	Present	Three unevaluated archaeological stone feature sites would be avoided.	6.7
Areas within the city limits of a city or the boundaries of a military installation.	Present	One parcel associated with an ICBM facility would be avoided.	6.2
Areas within known floodplains as defined by the geographical boundaries of the 100-year flood.	None	Project Area occurs in an area mapped by the Federal Emergency Management Agency (FEMA); however, Floodplain Insurance Rate Maps (FIRMs) have not been printed for the Project Area. The unprinted areas are identified as Zone D or Zone X; therefore, areas within the 100-year floodplain have not been mapped.	6.12
Areas that are geologically unstable.	Present	Five historic landslide areas would be avoided.	6.11
Woodlands and wetlands.	Present	Woodlands and wetlands would be avoided to the extent practicable.	6.13, 6.14
Areas of recreational significance which are not designated as exclusion areas.	None	NA	6.8
Wind Energy Avoidance Area	**Present within Project Site**	**Description**	**Section Addressed**
A geographic area where, due to operation of the facility, the sound levels within one hundred feet of an inhabited residence or community building will exceed 50 A-weighted decibels (dBA). The sound level avoidance area criteria may be waived in writing by the owner of the occupied residence or the community building.	None	NA	6.5

3.3 Selection Criteria

Per NDAC 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 specified selection criteria, would be at an acceptable minimum, or that those effects would be

managed and maintained at an acceptable minimum[3]. Please refer to ***Table 5, Summary of Selection Criteria***.

Table 5, Summary of Selection Criteria

Selection Criteria	Potential Adverse Effects from Project	Section Addressed
The impact upon agriculture:		
(1) Agricultural production.	Out of approximately 35,654 acres in the Project Area, approximately 7.1 acres of prime farmland, 0.3 acres of prime farmland if drained, and 11.7 acres of farmland of statewide importance would be permanently impacted. Areas temporarily disturbed would be restored to either crop or native grassland pending original condition and landowner preference. Impacted landowners would be compensated.	6.2, 6.10
(2) Family farms and ranches.	The Project would comply would local and state setbacks. Siting would be compatible with existing farming and ranching practices. Impacted landowners would be compensated. Farm/ranch operations were considered during Project Area selection.	6.9
(3) Land which the owner demonstrates has soil, topography, drainage, and an available water supply that cause the land to be economically suitable for irrigation.	Landowners have not expressed concerns related to irrigation on their property, and no known irrigation is present within the Project Area.	6.3
(4) Surface drainage patterns and ground water flow patterns.	The Project would be constructed to avoid impacts on wetlands and water bodies to the extent practicable. Temporarily disturbed areas would be restored to pre-construction conditions. No adverse impacts are anticipated to surface drainage or groundwater flow patterns.	6.11, 6.12, 6.13
(5) The agricultural quality of the cropland.	No adverse impacts on agricultural quality of cropland are anticipated. Impacted landowners would be compensated.	6.2, 6.10
The impact upon the availability and adequacy of:		
(1) Law enforcement.	No adverse impacts are anticipated.	6.3

[3] As defined in NDAC Section 69-06-01-01, selection criteria is defined as “criteria” that guide and govern the selection of energy conversion facility sites and transmission facility corridors and routes in order to minimize adverse human and environmental impact after the exclusion and avoidance criteria have been applied.

Selection Criteria	Potential Adverse Effects from Project	Section Addressed
(2) School systems and education programs.	No adverse impacts on school systems and education programs are anticipated.	6.3
(3) Governmental services and facilities.	No adverse impacts on government services and facilities are anticipated.	6.3
(4) General and mental health care facilities.	No adverse impacts on general and mental health care facilities are anticipated.	6.3
(5) Recreational programs and facilities.	No adverse impacts on recreational programs and facilities are anticipated.	6.8
(6) Transportation facilities and networks.	There would be a temporary increase in truck traffic during construction activities. No adverse impacts are anticipated during operations.	6.3
(7) Retail service facilities.	No adverse impacts are anticipated to retail service facilities.	6.3
(8) Utility services.	No adverse impacts are anticipated to utility services. Energy produced from the Project would aid in meeting growing power demands in the region.	6.3
The impact upon:		
(1) Local institutions.	No adverse impacts on local institutions are anticipated.	6.3
(2) Noise-sensitive land uses.	Sound sensitive land uses within the Project Area include residences near turbine sites. RWP has maintained a minimum 1,600-foot setback distance between turbines and occupied residences. A sound study conducted for the Project determined that sound levels within 100 feet of all occupied residences would be below 50 dBA.	6.5
(3) Rural residences and businesses.	No turbines have been placed within 1,600 feet of occupied residences and businesses, and no adverse impacts are anticipated.	6.5, 6.6
(4) Aquifers.	No adverse impacts on aquifers are anticipated.	6.11
(5) Human health and safety.	No impacts on human health and safety are anticipated. Regular maintenance and inspections would be performed during the life of the Project to ensure its continued integrity.	6.4
(6) Animal health and safety.	Generally, no adverse impacts on domestic animal health or safety concerns are anticipated. Measures to keep livestock away from construction activities would	6.15, 6.16

Selection Criteria	Potential Adverse Effects from Project	Section Addressed
	be used as necessary. Coordination is ongoing with the USFWS regarding potential impacts on wildlife.	
(7) Plant life.	Temporary and permanent vegetation impacts would occur during construction. Following construction, temporarily disturbed non-cultivated areas would be re-vegetated with a seed mixture free of noxious weeds, in accordance with Commission requirements. If impacts on trees and shrubs cannot be avoided, they would be replaced according to the Commission's tree and shrub mitigation specifications.	6.14
(8) Temporary and permanent housing.	Temporary housing may be utilized in the form of motels, rental housing, and/or trailers during construction. Local housing facilities could experience short-term economic benefits; however, given currently low vacancy rates, non-local workers may be required to travel to the larger cities such as Minot or Bismarck to find temporary housing. No long-term adverse impacts are anticipated.	6.1
(9) Temporary and permanent skilled and unskilled labor.	Skilled and unskilled labor would receive short-term economic benefits during construction. No long-term adverse impacts are anticipated. Local contractors would be utilized if possible. The Project is expected to boost the local economy.	3.6, 6.1
The cumulative effects of the location of the facility in relation to existing and planned facilities and other industrial development.		
Cumulative effects	Minimal industrial development occurs in the Project Area. Efforts to minimize cumulative effects from the Project include use of existing public roadways to the extent possible.	5.1, 6.17

3.4 Policy Criteria

Per NDAC 69-06-08-01(6), the Commission may give preference to an applicant that would maximize benefits that result from the adoption of 13 specified criteria related to the applicant's policies and practices (the Commission may also require the adoption of such policies and practices) [4]. The table below identifies those 13 criteria and describes how RWP's policies and practices are consistent with these policy criteria. Please refer to

[4] As defined in NDAC 69-06-01-01, policy criteria are "criteria" that guide and govern the selection of energy conversion facility sits and transmission facility corridors and routes in order to maximize benefits during the construction and operation of a facility.

Table 6, Summary of Policy Criteria. In addition, the Commission may give preference to an applicant that would maximize interstate benefits.

Table 6, Summary of Policy Criteria

Policy Criteria	Applicant's Policies and Practices	Section Addressed
Recycling of the conversion byproducts and effluents	NA	NA
Energy conservation through location, process, and design	The proposed Project has been designed to maximize energy conversion where available.	1.2, 3.5
Training and utilization of available labor in this state for the general and specialized skills required	Local contractors, suppliers, and laborers would be utilized for the Project as applicable and feasible during construction and operations.	6.1
Use of a primary energy source or raw material located within the state	The energy generated would come from the available wind resources of the state. In addition, gravel would likely be obtained from a local source for road and pad construction, as well as for aggregate for concrete.	1.2.4
Not relocating residents	No relocation of residences would occur.	6.1
The dedication of an area adjacent to the facility to land uses such as recreation, agriculture, or wildlife management	The Project would not interfere with adjacent land uses. As such, RWP does not currently anticipate dedicating any adjacent areas for land uses such as recreation, agriculture, or wildlife management.	6.2, 6.8
Economies of construction and operation	As a 205 MW wind energy project, RWP would benefit from economies of scale related to the Project's construction and operation. Wind energy projects have one-time costs that remain relatively stable despite the scale of the project. Therefore, a larger project would have cost advantages in comparison to a smaller project because the fixed costs are spread out over more units of output. Some examples of wind energy project costs that remain similar despite the size of the project include: an on-site office space, crane mobilization, and substation procurement and construction.	3.6, 6.1
Secondary uses of appropriate associated facilities for recreation and the enhancement of wildlife	None. The Project has been sited on private property, which is not generally open to the public.	NA
Use of citizen coordinating committees	RWP has coordinated and would continue to coordinate with landowners and groups located within and near the Project Area.	1.2

Policy Criteria	Applicant's Policies and Practices	Section Addressed
A commitment of a portion of the energy produced for use in this state	The energy generated from the Project would interconnect with the electrical grid at the Ruso Wind Switching Station and would be used where the need is. The need analysis supports the fact that the energy would be used in North Dakota.	2.1
Labor relations	No impacts on labor relations are anticipated.	NA
The coordination of facilities	Existing facilities and facility corridors were considered in the location of the Project and its associated facilities.	3.5, 6.3, 6.4
Monitoring of impacts	RWP would monitor construction activities and use Best Management Practices (BMPs) throughout Project construction. During Project operation and restoration, RWP would monitor the Project and assess impacts as well as comply with all requirements set forth in the Certificate.	5.1, 5.2, 6.17

3.5 Design and Construction Limitations

When determining the location for the proposed Project, RWP considered the following design and construction limitations: wind resources, interconnection to the electrical transmission system, environmental constraints, and landowners and local support. As discussed in ***Section 1.2.4***, RWP has assessed the meteorological conditions of the Project Area to ensure that the site has an economically viable wind resource.

Site control was also critical to the Project. RWP secured voluntary lease agreements and/or transmission easement agreements with enough landowners in the Project Area to pursue development.

Several site-specific limitations also affected the Project's design and construction, including:

- Avoidance and minimization of permanent impacts on wetlands to the maximum extent practicable;
- Avoidance of wetland basins subject to USFWS wetland easements (boring underneath may occur);
- Avoidance of unbroken native grassland to the maximum extent practicable;
- Avoidance of potential Dakota skipper habitat to the maximum extent practicable;
- Avoidance or mitigation of impacts on cultural resources; and

- Adherence to setback requirements from features, including occupied residences, non-participating landowner property lines and existing roads, unless waived.

See ***Section 6.0*** for a more detailed discussion of the site-specific resources and mitigation measures utilized.

3.6 Economic Considerations

The economics of a wind farm are driven, first and foremost, by the value of the wind resource. Information on the wind resource at the site is discussed in ***Section 1.2.4*** above. Since first quarter 2017, RWP has compiled and assessed wind resource data in the Project Area. The data has indicated that the Project Area would provide an excellent resource for wind generation with high economic output.

The Project would harness and distribute the renewable energy resource for the economic benefit of local and regional area residents. Further, according to national averages provided by the American Wind Energy Association (AWEA), a 100 MW wind energy project would create approximately 200 temporary construction jobs and 8 to 12 long-term operation and maintenance jobs. The number of jobs created for a 100 MW wind energy project are similar in nature to a 200 MW wind energy project. These high-skilled, high-paying positions would contribute payroll dollars to the rural portions of North Dakota. Full-time personnel are likely to live in the immediate or surrounding communities near the Project. In addition, lease payments would be made to landowners for placement of wind turbines and associated facilities.

4.0 Description of the Proposed Facility

4.1 Project Components

4.1.1 Wind Turbines

Wind Turbine Technology

Wind turbines convert the kinetic energy of the wind into the rotational energy of a rotor and drivetrain. This energy is in turn converted into electrical power by industrial generators integrated within the wind turbine housing. An automated ‘pitch’ system controls the speed of the rotor by turning the face of each rotor blade into or away from the wind. Modern wind turbines typically produce energy in a wind-speed range of 3.1 to 25 meters per second or 7 to 56 miles per hour (mph). Power quality would be further accomplished through the use of power electronics, which converts generator output to achieve required output voltage and frequency control. An integrated wind speed and direction monitoring system works with a ‘yaw’ motion-control system to keep the face of the turbine presented into the wind.

Wind Turbine Characteristics

RWP has selected the most appropriate technology for the Project to ensure cost efficiency and optimization of wind and land resources. RWP is considering a combination of two turbine types for the Project. ***Table 7, Representative Turbine Type Characteristics for the Project,*** describes the characteristics of modern turbine types

that are typical of those under consideration. The turbine output ranges from 2.415 MW – 4.8 MW. The planned Project layout is designed to accommodate both of the turbine models under consideration. As previously stated, the Project was designed with turbines that output up to 4.2 MW; however, RWP may choose to uprate the turbines to an output of 4.8 MW. The turbine list included in ***Table 7*** is representative of the turbine options under consideration; however, the Project may opt to use a turbine not included in the list that has equal or lesser dimensions and impacts as those listed here.

Table 7, Representative Turbine Type Characteristics for the Project

Turbine Type	Rotor Diameter (meters - feet)	Rotor Swept Area (meters^2 – feet^2)	Cut-in Wind Speed (m/s)	Rated Power (MW)	Cut-out Wind Speed (m/s)	Blade Length (meters - feet)	Hub Height (meters - feet)	Blade Height (Highest) (meters - feet)	Blade Height (Lowest) (meters - feet)	Max # of Project Turbines
Siemens SWT-2.415-108	108 – 354.3	9,144 – 98,425.2	3.0	2.415	25.0	52.6 – 172.6	80 – 262.5	134 – 439.6	26 – 85.3	11
Siemens SG 4.2-145	145 – 475.7	16,506 – 177,669.1	3.0	4.2	27.0	71 – 232.9	107.5 – 352.7	180 – 590.6	35 – 114.8	42

Rotor Diameter

The maximum nominal rotor diameter under consideration is 145 meters. The rotor consists of three blades mounted to a rotor hub. The hub is attached to the nacelle, which houses the generator, step-up transformer, brake, cooling system, and other electrical and mechanical systems.

Towers

The towers, on which the nacelle is mounted, would be constructed of conical tubular steel, with a hub height range from 80 to 107.5 meters. All tower welds would be performed according to specifications established by the American National Standards Institute (ANSI). Surfaces of the tower components would be sandblasted and coated by the manufacturer to protect against corrosion. A secured door at the base of the tower would provide internal access to the turbine.

Lightning and Ground Protection

Lightning and ground protection for all wind farm equipment is designed and constructed to be compliant with all applicable National Electrical Code (NEC) and National Electric Safety Code (NESC) requirements. Grounding and shielding components are integrated into the foundation and structural elements of all equipment and conductor lines. Specifically, each wind turbine would include conductive elements in the blades and a complete grounding and shielding network within the turbine, tower, and foundation.

Lighting

Turbines would be lit so as to satisfy minimum Federal Aviation Administration (FAA) requirements. Steady burning lights would not be used and not all turbines would be continuously illuminated. Instead, turbines would be illuminated as needed.

Foundation

Each turbine would sit atop a concrete foundation. Foundation size and design would be finalized once geotechnical analyses have been completed and the turbine model selected, though it is estimated that the foundation could be approximately 62.3 meters (19 feet) in diameter and two (2) to three (3) meters (seven [7] to ten [10] feet) in depth.

Monitoring and Control

Monitoring and control of each wind turbine would be accomplished through the use of software typically provided by the wind-turbine supplier. Information would be transmitted on communication lines connected to each turbine. This would allow remote monitoring and control by turbine suppliers, O&M providers, and RWP.

4.1.2 Associated Facilities

Access Roads

Construction and service access to each turbine location would be facilitated by a compacted gravel road within the Project Area. Roads would be located in consultation with the landowner, but also based on Siting criteria, to avoid or minimize impacts on land use and the environment. The roads would be approximately 16 feet wide and constructed with locally-sourced gravel, if available. The Project roads would support the size and weight of construction and maintenance vehicles. Construction impacts from access roads were calculated using a 50-foot width for temporary impacts and a 16-foot width for permanent impacts. Following construction, the temporarily affected areas would be restored to pre-construction conditions, to the extent practicable.

Collection System

An electrical collection system consisting of buried cables would interconnect all turbines to the wind farm substation. Design of the electrical system and interconnection details would be finalized based on final turbine selection. Voltage from the turbine generator would be increased through the use of industrial step-up transformers for injection into the collection system. This system would operate at 34.5 kV and be sited to minimize cost and land impacts. A small number of cabling junction boxes may be located above ground and marked with bollards. Construction activities from collection lines were calculated using a 50-foot width for temporary impacts. The permanent impact resulting from above ground collection system components would be less than one (1) acre. Once construction is complete, the land would be returned to pre-construction conditions, to the extent practicable, following installation of the collection system.

Supervisory Control and Data Acquisition (SCADA) System

Each wind turbine would communicate directly with the SCADA system for remote performance monitoring, energy reporting and troubleshooting. The SCADA system provides data on turbine generation and production, availability, meteorology and communications. The SCADA system allows 24/7 monitoring of, and communications

with, the Project and relays alarms and communication errors. The SCADA lines are typically placed with the collection lines.

Meteorological Towers

The Project would include up to three permanent MET towers that would remain in place for the life of the Project. The permanent MET towers would be as tall as the hub height of selected wind turbines and would provide data critical to assessing the performance of the Project and aid in short-term forecasting for the Project. The locations of the MET towers are to be determined, as they are dependent on power performance tests.

Operations & Maintenance Building

An O&M building would be constructed on up to three (3) acres within the Project Area and enclosed by a chain-link fence to provide a year-round workspace, equipment storage yard, and to facilitate basic maintenance activities. The O&M building would be constructed near a year-round maintained public road and in close proximity to the Project's substation. The O&M building would be data-connected to the wind project via a buried fiber-optic line interconnected with the Project's overall communication system.

Substation

The Project's underground collection system would extend from the turbines to a Project substation. RWP would acquire up to four (4) acres for the substation. The substation would be designed to provide voltage step-up from the 34.5 kV collection system to the 230-kV transmission system voltage. This facility would house the production metering and various collection system and facility isolation and protective functions. The facility would be fenced to provide site security and safety.

4.1.3 Temporary Facilities

Other temporary facilities would be required for the construction phase of the Project, including a concrete batch plant, a laydown area for equipment, intersection improvements to facilitate over-length turning, crane paths, working pads and a staging area for turbine delivery.

4.2 Project Layout

RWP has designed a Project that optimizes the wind resource, minimizes impact on land resources and potentially sensitive areas, and follows the energy conversion facility siting criteria outlined in NDAC 69-06-08-01 and all local zoning ordinances.

The tables below identify Project setbacks, as designated by the Commission and local zoning ordinances that were incorporated into the Project layout. All setbacks have been applied measuring from the center of the base of the turbine tower to the applicable feature, and using the tallest and largest rotor diameter turbine model under consideration for that turbine site. Where setback distance requirements vary, RWP would use the largest setback for siting the Project's turbines. Please refer to ***Table 8, Setback Distances as Designated by the Commission,*** and ***Table 9, Setback Distances as Designated by Local Zoning Ordinances*****.**

Table 8, Setback Distances as Designated by the Commission

Setback Type	Distance
Interstate or state roadway right of way (ROW)	1.1 times the height of the turbine
The geographic center of an ICBM launch or launch control facility	1,200 feet
County or maintained township roadway	1.1 times the height of the turbine plus seventy-five (75) feet from the centerline of the roadway
Railroad ROW	1.1 times the height of the turbine
115 kV or higher transmission line	1.1 times the height of the turbine
Property line of a non-participating landowner	1.1 times the height of the turbine*
Inhabited residence or a community building	A wind energy conversion site must not include a geographic area where, due to the operation of the facility, the sound levels within 100 feet of an inhabited residence or a community building will exceed 50 dBA**

* 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 non-participating landowner is a landowner that has not signed a wind option agreement or a wind easement, as defined in NDCC 17-04, with the permittee of the wind energy conversion facility.
** The sound level avoidance area criteria may be waived in writing by the owner of the occupied residence or the community building.

Table 9, Setback Distances as Designated by Local Zoning Ordinances

Setback Type	Distance	County
Turbine from roadway ROW, farmsteads, and electrical transmission lines	At least equal to tower height	Ward

*A variance may be granted if an authorized representative or agent of the permittee and those affected parties of adjoining properties with associated wind rights sign a formal and binding agreement expressing all parties' support for a variance that may reduce the setback requirement.

4.3 Estimated Project Facility Impacts

For approximate acreage of temporary and permanent impacts, please refer to ***Table 10, Estimated Impacts from Project Facilities***.

Table 10, Estimated Impacts from Project Facilities

Project Facilities	Description of and Approximate Acreage of Temporary Impacts*	Description of and Approximate Acreage of Permanent Impacts*
Primary Turbines	Up to a four (4)-acre circular construction impact has been estimated for turbine construction, minus permanent impacts. Approximately 212 acres total.	Each turbine includes a concrete pedestal with a 19-foot diameter and a ten (10)-foot-wide gravel ring of ten (10) feet placed circumferentially around it, totaling approximately 1,200 square feet per turbine. Approximately 1.5 acres total.
Access Roads	A 50-foot construction impact corridor has been estimated for the construction of access roads, minus permanent impacts. Approximately 70 acres total.	16-foot-wide gravel surface. Approximately 32 acres total.
Collection Lines and SCADA System Cables	A 50-foot construction impact corridor has been estimated for the equipment used to install the collection lines. Approximately 254 acres total.	Impacts associated with collection line installation are all temporary in nature, with the exception of above ground junction boxes. Approximately one (1) acre total.
Meteorological Towers	3-point guy radius plus working area totaling 250 feet. Approximately one (1) acre total.	Assumes fenced in area of 50 feet by 50 feet. Approximately one (1) acre total.
Substation	Approximately four (4) acres, minus permanent impacts.	The substation would be constructed on a gravel pad up to three (3) acres.
O&M Building	Approximately three (3) acres, minus permanent impacts.	The O&M building would be constructed on a gravel pad up to 2.5 acres.
Laydown Yard and Concrete Batch Plant	The combination of these two facilities would be approximately ten (10) acres.	These facilities are temporary, and the associated land would be converted back to its pre-existing condition following completion of construction. No permanent impact.
Intersection Modifications	Intersection modifications total approximately ten (10) acres.	These facilities are temporary, and the associated land would be converted back to its pre-existing condition following completion of construction. No permanent impact.
Cross Country Crane Paths	A 50-foot construction impact corridor has been estimated for the cross-country crane paths. Approximately 175 acres total.	These paths are temporary, and the associated land would be converted back to its pre-existing condition following completion of construction. No permanent impact.

*Some impacted areas intersect; therefore, impact acreages presented here are greater than actual total impacts.

5.0 Project Construction, Operation and Decommissioning

5.1 Project Construction

5.1.1 Construction Activities

A variety of activities must be completed to carry the Project through construction. Below is a preliminary list of activities necessary to develop the Project. Pre-construction, construction, and post-construction activities for the Project include:

Pre-construction

- Land surveys and environmental studies;
- Geotechnical analysis;
- Design substation and medium voltage power collection system;
- Design turbine foundations, access roads, and O&M building;
- Underground utility discovery; and
- Procure all necessary turbine and associated facility components (towers, nacelles, blades, foundations and transformers).

Construction

- Construct temporary laydown yard, batch plant, staging area and construction operations compound;
- Construct temporary intersection modifications to facilitate turbine component delivery;
- Construct access roads and install collection and communication lines;
- Construct the Project substation;
- Construct an O&M building;
- Construct tower foundations;
- Place towers and set turbines.

Post-Construction

- Restore disturbed areas not intended for permanent above ground facilities;
- Test facility; and
- Begin commercial production.

Haul road permits would be acquired from the necessary townships, counties and the North Dakota Department of Transportation (NDDOT), as necessary. Furthermore, RWP would acquire all necessary permits to cross/bore state, county and township roads required for the installation of its collection lines. RWP would negotiate a road use and maintenance agreement with Ward County and applicable townships, if needed.

During construction, equipment and worker vehicles would travel to and from the site. Peak construction is anticipated to be summer and fall when most of the foundation construction, access road, electrical and substation work is taking place. Upon completion of construction, heavy equipment would be removed from the site.

In addition, culverts or other drainage methods would be installed as needed.

5.1.2 Construction Management

RWP would be responsible for hiring the engineering, procurement, and construction (EPC) contractor. The EPC contractor is responsible for balance of plant (BOP), scheduling, and coordinating the Project construction activities, including:

- Obtaining building, electrical, grading, road and utility permits and/or easements;
- Performing civil, structural and electrical engineering;
- Conducting surveying and geotechnical analysis;
- Forecasting Project labor needs;
- Facilitating subcontractor involvement;
- Securing construction materials;
- Overseeing construction tasks, including: site and access road development; foundation excavation and pouring; electrical and communications installation; turbine and meteorological tower erection; substation installation; and system testing; and
- Managing the Project budget.

During construction, coordination would be ongoing between RWP and construction teams. The construction manager would engage in ongoing correspondence with local officials, citizens groups, and landowners.

5.1.3 Commissioning

Upon completion of the construction phase, the Project would undergo detailed inspection and testing procedures before being commissioned. Inspection and testing would occur for each individual component of the wind turbines, as well as the associated communication, meteorological, collection and SCADA systems.

5.2 Project Operation and Maintenance

Before the Project becomes fully operational, O&M staff would be integrated into Project construction. The O&M staff would work cooperatively with the construction manager to ensure a smooth transition from construction through commissioning and operating the facility.

5.2.1 Maintenance Schedule

The following schedule is anticipated to be used for service activities, per wind industry standards; detailed service activities would be established in the long-term service agreement with the service provider:

- **First Service Inspection –** The first service inspection would take place one to three months after the turbines have been commissioned. Focus would be placed on bolt tightening, greasing and oil filtering.

- **Semi-Annual Service Inspection –** Semi-annual service inspections would commence six months after the first inspection. The semi-annual inspections would consist of lubrication and safety testing.

- **Annual Service Inspection –** The annual service inspection would include the same items as the semi-annual service inspection plus bolt tightening and a full component check.

- **Two-Year Service Inspection –** The two-year service inspection would include items checked during the annual inspection, as well as terminal connector tightening.

- **Five-Year Service Inspection –** The five-year service inspection would include items checked during the annual inspection, as well as braking system inspection, oil and grease testing, balance check and terminal connector tightening.

5.3 Decommissioning and Restoration

At the end of the Project's useful life, RWP would remove the wind facilities in accordance with North Dakota Wind Turbine Decommissioning Guidelines (NDAC 69-09-09) unless otherwise agreed to by the landowner. This includes:

- Dismantling and removal of all towers, turbine generators, transformers, and overhead cables;

- Removal of underground electrical cables to a depth of twenty-four inches (60.96 centimeters);

- Removal of foundations, buildings, and ancillary equipment to a depth of three (3) feet, at a minimum, below existing ground surface;

- Removal of surface road material and restoration of the roads and turbine sites to substantially the same physical condition that existed immediately before construction; and

- Grading, adding topsoil, and reseeding according to Natural Resources Conservation Service (NRCS) technical guide recommendations and other agency recommendations, unless the landowner requests in writing that the access roads or other land surface areas be retained.

In accordance with NDAC 69-09-09-06, RWP would file a decommissioning plan with the Commission prior to the commencement of operation of the Project. Pursuant to NDAC 69-09-09-08, after the tenth year of operation, if required by the Commission, RWP would secure a bond, letter of credit, corporate guarantee, or other form of financial assurance with the Commission to cover the anticipated costs of decommissioning the Project.

RWP also reserves the right to explore alternatives regarding Project decommissioning. Retrofitting the turbines and power system with upgrades based on new technology may allow the Project to produce electricity efficiently and successfully for many more years. Based on estimated costs of decommissioning and the salvage value of decommissioned equipment, it is anticipated that the salvage value of the Project would exceed the cost of decommissioning.

6.0 Environmental Analysis

This section describes the existing conditions within the Project Area. The existing conditions, or affected environment, are the baseline conditions that may be affected by the Project. This section discusses the potential direct environmental impacts of the Project. Potential indirect impacts are identified in the resource discussions where applicable. Measures to avoid, minimize, or mitigate impacts are discussed where appropriate.

Impacts discussed in the following sections are related to the placement of up to 66 wind turbines and associated facilities: access roads; collection lines and SCADA system cables; O&M building; permanent MET towers (locations to be determined); substation; crane paths; intersection modifications (locations to be determined); and laydown yard and concrete batch plant (location to be determined). The discussion assumes the greatest possible impacts associated with the Project. Impacts for features with known locations were calculated based on the parameters presented in ***Table 10, Estimated Impacts from Project Facilities***, with the addition of alternate turbine locations. This analysis is based on the best available information; additional environmental surveys would be conducted upon completion of final design for areas not previously surveyed.

6.1 Demographics

The Project Area is located in a rural area in central North Dakota within portions of Ward and McLean counties. In Ward County, the Project Area occurs within Brillian, Iota Flats, and Greely townships. In McLean County, the Project Area occurs within Andrews, Otis, and an unnamed township; however, no Project facilities would be located within McLean County. While there are no cities within the Project Area, the small incorporated cities of Benedict and Ruso occur within approximately 1 mile of the Project Area.

Please refer to ***Table 11, Demographic Trends,*** for population, income, and poverty information for Ward and McLean counties compared to North Dakota. Major employment industries within Ward and McLean counties include educational services, and healthcare and social assistance; retail trade; arts, entertainment, and recreation, and accommodation and food services; and agriculture, forestry, fishing and hunting, and mining (U.S. Census Bureau, 2018).

Table 11, Demographic Trends

Community	Population	Per Capita Income	People Below Poverty Level
Ward County	68,954	$32,395	7.3%
McLean County	9,576	$34,218	9.8%
North Dakota	736,162	$33,107	11.2%

6.1.1 Demographic Impacts/Mitigation

The Project is designed to be socioeconomically beneficial to landowners, local governments, and communities. The Project would result in increased income to landowners receiving lease payments and to landowner-investors receiving profits from the sale of electricity, which could raise the per capita income in Ward and McLean counties. There is a potential for residents within 60 miles or more to take advantage of employment opportunities during Project construction.

Construction of the Project could potentially provide temporary revenue increases in the vicinity of the Project due to increased demand for lodging, food services, fuel, and general supplies. Personal income could also be generated by circulation and recirculation of dollars paid out by the Project as business expenditures as well as state and local taxes.

According to national averages provided by the AWEA, a 100 MW wind energy project would create approximately 200 temporary construction jobs and 8 to 12 long-term operation and maintenance jobs. The number of jobs created for a 100 MW wind energy project are similar in nature to a 200 MW wind energy project. Specialty construction workers for the Project could make up upwards of 70 percent of the Project work force (approximately 140 jobs) and would likely come from out-of-state. Substation construction would require approximately 20 workers for 150 days. Following construction, approximately 15 people are estimated to be onsite for 90 days to complete site reclamation. O&M activities would require 8 to 12 full-time personnel; two to four of these individuals would be on-site at any given time.

Non-local construction workers and permanent personnel would need housing. The average rental vacancy rate within in Ward and McLean counties is 10.4 and 5.0 percent, respectively (U.S. Census Bureau, 2018). This indicates that non-local workers should be able to secure housing near the Project Area.

The Project could temporarily increase demand on the labor forces and local housing markets within the vicinity of Ward and McLean counties during construction. Overall, it is anticipated that the Project would be socioeconomically beneficial to the local population and would not impact long-term population trends. Turbines would be set back at least

1,600 feet from occupied residences and no relocation of residences would occur. Therefore, no mitigation measures are proposed.

6.2 Land Use

The Project Area is located in rural North Dakota in an area predominantly comprised of grasslands and cultivated land with an abundance of wetlands. As such, much of the Project Area is utilized for agricultural purposes. Several areas of public lands occur within the Project Area. Please refer to ***Exhibit 5, Land Use,*** in ***Appendix A.***

In Ward County, the Project Area occurs within Brillian, Iota Flats, and Greely townships. For Iota Flats and Greely townships in Ward County, zoning is the responsibility of the County. The portion of the Project Area within these townships is within the Rural Zone (Zoning District #2), which may be used for agricultural or single-family residential purposes. A special use permit and building permit are required for electrical wind generator towers in this area, with a tower setback at least equal to its height is required from roadway ROW, farmsteads, and electrical transmission lines (Ward County, 2003; Ward County, 2018). Coordination with Ward County is ongoing.

Brillian Township in Ward County has retained zoning authority. The portion of the Project Area within this township is zoned as an Agricultural District. Brillian Township requires a conditional use permit for new utilities, but does not specify setback requirements (Ward County, 2018; Brillian Township, 1993). Coordination with Brillian Township is ongoing.

In McLean County, the Project Area occurs within Andrews, Otis, and an unnamed township; however, no Project facilities would be located within McLean County.

Through coordination with the USFWS, several USFWS wetland and grassland easements have been identified within the Project Area. The USFWS also administers the National Wildlife Refuge System, which includes National Wildlife Refuges (NWR) and Waterfowl Production Areas (WPA). NWRs serve to preserve and protect land for fish and wildlife, and their habitat, while WPAs serve to protect land for waterfowl production. The nearest NWR to the Project Area is Lake Otis NWR, located approximately 1.5 miles east. There are two WPAs within the Project Area, Kohoutek WPA (Section 22, Township 151 N, Range 82 W) and Vendler Johnson WPA (Section 2, Township 151 N, Range 81 W), and Fox WPA is located immediately adjacent to the Project Area.

Private Land Opened to Sportsman (PLOTS) are areas administered through an agreement between the North Dakota Game and Fish Department (NDGFD) and individual landowners to provide hunting and bird watching opportunities to outdoor enthusiasts. There are four PLOTS areas within the Project Area (Sections 1, 11, 12, and 13, Township 150 N, Range 81 W) and several located immediately adjacent to the Project area. These areas are subject to change on an annual basis.

NDGFD Wildlife Management Areas (WMA) are typically available to the public for hunting, fishing, and trapping. The nearest WMA to the Project Area is the Audubon WMA, located approximately 9 miles south.

Lands held in trust by the North Dakota Department of Trust Lands (NDDTL) are utilized for various purposes such as grazing, agriculture, and mining to generate income for public education in the state. There are two Trust Lands parcels within the Project Area

(Section 16, Township 151 N, Range 81 W; and Section 36, Township 151 N, Range 82 W) and three located immediately adjacent to the Project Area. In their response to a scoping letter, the NDDTL indicated that impacts on Trust Lands would require ROW application submittals to obtain a Wind Energy Easement Agreement for 1) turbines and associated facilities, and 2) collector lines in the absence of turbines or associated facilities on Trust Lands. Please refer to ***Appendix C, Scoping Package and Responses***, for a copy of the correspondence.

The U.S. Department of Agriculture (USDA) Farm Service Agency (FSA) and USDA-NRCS administer the Conservation Reserve Program (CRP) and various easement programs, respectively, whereby landowners may enroll their land to receive payments for conserving and improving natural resources. Projects impacting CRP lands or USDA-NRCS easements are required to obtain authorization from the USDA-FSA or USDA-NRCS, respectively. Coordination regarding the location of CRP lands and USDA-NRCS easements within the Project Area is ongoing.

The U.S. Department of Defense (USDOD) maintains assets within the Project Area. In their response to a scoping letter, the USDOD indicated that these assets consist of launch facilities and associated cabling. Please refer to ***Appendix C, Scoping Package and Responses***, for a copy of the correspondence. There is one ICBM facility within the Project Area (Section 19, Township 151 N, Range 81 W) and one within 1,200 feet of the Project Area (Section 15, Township 150 N, Range 81W) in addition to associated cabling within the Project Area. Coordination with the USDOD regarding their assets is ongoing.

6.2.1 Land Use Impacts/Mitigation

The Project would result in temporary and permanent land use impacts. Please refer to ***Table 12, Land Use*****,** for land use impacts compared to existing lands use within the Project Area. Permanent impacts would occur where existing land uses are converted into a renewable energy resource. Temporary impacts would occur during construction as a result of ground disturbance, including staging and laydown areas. Temporarily disturbed areas would be reclaimed at the conclusion of construction activities and returned to existing land uses. Access roads have been sited to follow section line roads to the extent practicable to minimize land use fragmentation.

The Project is not anticipated to result in a trend toward modification of existing land use patterns. Coordination with Ward County and Brillian Township is on-going. All necessary county and township land use permits would be obtained prior to construction of the Project. While a portion of the Project Area occurs within McLean County, no Project facilities would occur within this county; therefore, no permits or setback requirements pertaining to McLean County would apply. Turbines would be set back at least 1.1 times the height of turbines from nonparticipating landowner property. Conflicts with the existing development plans of state, local, or private entities within the Project Area are not anticipated, as the Project generally avoids developed areas.

Table 12, Land Use

Land Classification	Existing Land Use in Project Area (Acres)	Temporary Impact (Acres)	Permanent Impact (Acres)
Barren	3	0.0	0
Cultivated	14,487	410.4	36.2
Developed	1433	17.1	2.3
Grasslands	12,809	95.5	6.6
Open Water	2,679	0.5	0
Wetlands	3,591	8.3	0.3
Woodlands	652	2.5	0.3
Total	35,654*	534.3	45.7

Source: U.S. Department of Agriculture, 2017

The Project would affect public lands as follows:

- The Project would avoid all wetland basins under USFWS easement. However, it may be necessary to directionally bore underneath some wetlands for installation of collection and/or communication lines. Coordination with the USFWS is ongoing regarding avoidance of USFWS wetland easement basins.

- The Project would avoid all USFWS grassland easements.

- The Project would avoid all USFWS NWRs and WPAs.

- The Project would avoid all current PLOTS areas.

- The Project would avoid all NDGFD WMAs.

- The Project would avoid all Trust Lands parcels.

- Coordination regarding CRP lands and USDA-NRCS easements is ongoing. If such lands would be impacted, coordination with the affected landowners and applicable USDA offices would occur (e.g., local and state USDA-NRCS offices, USDA-FSA office). CRP lands and USDA-NRCS easements would be avoided to the extent practicable. Temporarily impacted areas would be reclaimed with appropriate seed mixtures and payments would be made for disturbed land if necessary.

- The USDOD indicated in their scoping responses that further coordination was required to avoid their assets and provided construction requirements. Please refer to ***Appendix C, Scoping Package and Responses,*** for a copy of the correspondence. Coordination with the USDOD is ongoing to ensure that the Project would not encroach upon U.S. Air Force assets and construction requirements would be met. Turbines would be set back at least 1,200 feet from the geographic center of ICBM launch or launch control facilities.

6.3 Public Services

Please refer to ***Exhibit 6, Infrastructure***, in ***Appendix A*** for public services in the Project Area.

Local Services

Due to the rural nature of the Project Area, there are few local services within the Project Area. The city of Benedict, located approximately 1 mile from the southern portion of the Project Area, offers a post office, church, elevator, and bar. The city of Ruso, located approximately 1 mile east of the Project Area offers a bar. The city of Voltaire, located approximately 8.5 miles northeast of the Project Area, offers a post office. The city of Max, located approximately 6 miles west of the Project Area, offers a public school, post office, gas station, elevator, lumber yard, hair salon, two bars/cafes, and two churches. The nearest urban area, the city of Minot, is located approximately 18.5 miles northwest of the Project Area. Minot offers a variety of services, including emergency services, a hospital, public schools, a university, an international airport, churches, hotels, restaurants, a zoo, museums, and stores (Google, 2018).

Electrical Service

Electrical service within the Project Area is provided by Central Power Electric Cooperative, McLean Electric Cooperative, and Verendrye Electric Cooperative. Approximately 16 miles of overhead transmission line occur within the Project Area. In addition, a portion of the proposed Ruso Wind Transmission Project line is planned within the Project Area. There are also numerous distribution lines serving local residences and businesses.

Requirements pertaining to electrical service include obtaining a Certificate of Site Compatibility from the Commission pursuant to the North Dakota Siting Act for new energy conversion facilities and certification of electrical wiring by a master or class B electrician for all electrical installations. In addition, notification of any excavation is required at least 48 hours prior (excluding weekends and holidays) through the North Dakota One Call (NDOC), the statewide underground utility notification system for underground facilities.

Transportation

Roadways within the Project Area include Ward County Road 23 (paved), and several gravel roads, unimproved roadways, and trails. AADT volumes for these roadways are not available. Several state and U.S. highways occur near the Project Area:

- ND Highway 53 borders a portion of the southern boundary of the Project Area and occurs within a portion of the Project Area. The average annual daily traffic (AADT) volume for ND Highway 53 near the Project Area is 160 vehicles (including 20 trucks).

- ND Highway 41 is located approximately 1 to 4 miles east of the Project Area. The AADT for ND Highway 41 near the Project Area is 475 vehicles (including 140 trucks).

- ND Highway 23 is located approximately 2.5 to 4 miles north of the Project Area. The AADT for ND Highway 23 near the Project Area is 250 vehicles (including 55 trucks).

- U.S. Highway 83 is located approximately 5 to 6.5 miles west of the Project Area. The AADT for U.S. Highway 83 near the Project Area ranges from 4,625 to 6,380 vehicles (including 945 to 1,100 trucks).

- U.S. Highway 52 is located approximately 8 miles northeast of the Project Area. The AADT for U.S. Highway 52 near the Project Area is 2,200 vehicles (including 700 trucks) (NDDOT, 2016).

Oversize/overweight loads require permits from the North Dakota Highway Patrol (NDHP) on state-maintained roads. Counties, townships, and/or the NDDOT also require approach, haul road, oversize/overweight, utility and/or ROW permits for work associated with their respective roadways.

In addition to roadways, a Canadian Pacific railroad occurs within the southern portion of the Project Area. There are no airports or landing strips within the Project Area. Airports and airstrips are discussed further in ***Section 6.4***.

Water Supply

Rural water is supplied to the Project Area by Northern Prairie Rural Water District. In addition, it is common for rural residences in the area to utilize private wells. There are approximately 24 water wells located within the Project Area. The Snake Creek aquifer occurs within the southwest portion of the Project Area, and the Strawberry Lake aquifer occurs within the southeastern portion of the Project Area. There are no sole source aquifers within or near the Project Area. Based on review of aerial photography and water well purposes within the Project Area, agricultural irrigation does not appear to occur within the Project Area (North Dakota State Water Commission [NDSWC], 2018; U.S. Environmental Protection Agency [USEPA], 2018a). Pursuant to NDCC 49-23, the NDOC must be notified of any excavation at least 48 hours prior (excluding weekends and holidays).

Communications

Telephone and fiber optic providers within the Project Area include Dakota Carrier Network, Midco, Reservation Cooperative, and SRT Communications. Pursuant to NDCC 49-23, the NDOC must be notified of any excavation at least 48 hours prior (excluding weekends and holidays).

There are three tower structures within the Project Area, two of which contain a microwave antenna and at least one contains a land mobile antenna. There are three AM radio stations within approximately 18.6 miles (30 km) of the Project Area, each licensed for daytime and nighttime operations. In addition, there are 14 FM radio stations within 18.6 miles of the Project Area, two of which are low-power stations broadcasting with limited range. There are 15 licensed, operating off-air television stations within 93.2 miles (150 km) of the Project Area, four of which are low-power stations with limited range. There is one land mobile and emergency services fixed-site license within the Project Area, 17 area-wide licenses for mobile use only, and ten mobile phone carriers with E911

capabilities within the Project Area. There are four microwave paths that intersect the Project Area (Comsearch, 2018a; Comsearch, 2018b; Comsearch, 2018c; Comsearch 2018d; Comsearch 2018e). Please refer to ***Exhibit 7, Microwave Beam Paths***, in ***Appendix A*** for microwave beams and towers in the Project Area. Please refer to ***Appendix J, Communication Tower Study***; ***Appendix K, AM and FM Radio Report***; ***Appendix L, Off-Air TV Analysis***; ***Appendix M, Land Mobile & Emergency Services Report***; and ***Appendix N, Microwave Study.***

An informational request was submitted to the National Telecommunications and Information Administration (NTIA) for the Project, whereby the NTIA provided a comment from the USDOE that additional coordination with the Western Area Power Administration should occur. Please refer to ***Appendix C, Scoping Package and Responses***, for a copy of the correspondence. Coordination with the Western Area Power Administration is ongoing

6.3.1 Public Service Impacts/Mitigation

Local Services

The Project is not anticipated to have direct impacts on local services. The Project may indirectly impact local services via increased business associated with the Project's workforce; however, impacts are not anticipated to exceed capacity and are anticipated to be economically beneficial.

Electrical Service

Impacts on existing electrical infrastructure would be avoided, minimized and/or mitigated in coordination with the applicable utility company. Turbines would be set back at least 1.1 times the height of turbines from transmission lines greater than 115 kV, including proposed Ruso Wind Transmission Project line. The Project would increase renewable energy generation in the region.

With this Application, a Certificate of Site Compatibility is requested from the Commission. An electrical wiring certificate would be obtained from a master or class B electrician prior to construction. Notification prior to excavation would be provided to NDOC.

Transportation

Turbines would be set back at least 1.1 times the height of turbines from U.S., state, county and township roadways, plus 75 feet from the roadway centerline for county and township roadways. The Project would utilize existing roadways within the Project Area to the extent practicable; however, construction of new access roads would be required to provide access to wind turbines, whereby a single access road may service multiple turbines in sequence. The access roads would be approximately 12 to 16 feet wide, situated to avoid or minimize environmental impacts to the extent practicable.

Construction activities would result in a temporary increase in AADT due to workers' passenger vehicles and truck traffic transporting materials to the and from the Project Area. An oversize/overweight load permit would be obtained from the NDHP prior to construction. In addition, approach, haul road, oversize/overweight, utility and/or ROW permits would be obtained, as necessary from counties, townships, and/or the NDDOT for

work associated with their respective roadways. Construction traffic plans, road use and maintenance agreements, and mitigation measures would be developed in coordination with the applicable permitting entities. Following construction, traffic generated by O&M activities would be minor.

In accordance with their response to a scoping letter, coordination with the NDDOT would occur with regard to load restrictions on state-maintained roadways, access points, and work within NDDOT ROW. The NDDOT indicated that haul restrictions may need to be extended and hauling loads on ND Highway 41 from the north would be favorable compared to ND Highway 53 and ND Highway 41. In addition, access points on state-maintained roadways may not be available; any access points developed or modified would be designed to NDDOT standards. Please refer to ***Appendix C, Scoping Package and Responses***, for a copy of the correspondence.

Turbines would be set back at least 1.1 times the height of turbines from railroads. The Project is not anticipated to impact the Canadian Pacific railroad.

Impacts and mitigation pertaining to airports and airstrips are discussed in ***Section 6.4***.

Water Supply

The Project is not anticipated to adversely impact rural water supply or wells. Notification prior to excavation would be provided to NDOC. Water resources necessary during construction or maintenance activities would be obtained through coordination with Northern Prairie Rural Water District and/or landowners. The Project is not anticipated to impact any aquifers.

Communications

Coordination with utility companies is ongoing to determine locations and potential for direct impacts. Impacts would be avoided and minimized to the extent practicable, with relocations coordinated as needed. Notification prior to excavation would be provided to NDOC. The Project would not directly impact any tower structures. Turbines would be setback from existing infrastructure in accordance with applicable zoning ordinances as discussed in ***Section 6.2***.

Because the Project Area is outside of the exclusion distances of all AM radio stations identified, impacts on their coverage are not anticipated to occur. Radiation pattern distortion of FM stations are not anticipated due to the distance from the FM stations identified. Based on a contour analysis, the Project has the potential to disrupt reception for five off-air television stations in and around the Project Area. In the event signal is disrupted, mitigation would occur, such as installation of high-gain directional antennas or offering alternate services (e.g., cable, satellite). First responder, land mobile sites, area-wide public safety, and commercial E911 communication are generally not affected by wind energy facilities. Based on FAA interference emissions from electrical devices in the land mobile frequency bands, turbines would be set back at least 77.5 meters from land mobile fixed-base stations. Turbines would not be sited within the Fresnel Zones (i.e., narrow band of signal swath) of microwave paths intersecting the Project Area. (Comsearch, 2018a; Comsearch, 2018b; Comsearch, 2018c; Comsearch 2018d; Comsearch 2018e). Coordination with the Western Area Power Administration regarding impacts on their operations is ongoing.

6.4 Human Health and Safety

Air Traffic

The nearest public airport to the Project Area is the Garrison Municipal Airport (D05) located approximately 20 miles southwest. The Minot International Airport (MOT) is located approximately 23.5 miles northwest, and the Turtle Lake Municipal Airport (91N) is located approximately 20.5 miles south. There are no private landing strips within the Project Area; however, there are several private landing strips within the vicinity of the Project Area, including two within 3 miles (FAA, 2018).

An Obstruction Evaluation & Airspace Analysis was completed for the Project to identify obstacle clearance surfaces established by the FAA that could limit the placement of 591-foot above ground level (AGL) wind turbines. The analysis identified considerations with regard to obstacle clearance surfaces, instrument approach procedures, military training routes, radar surveillance systems, and AGL clearance associated with the Project (Capitol Airspace Group, 2018). Please refer to ***Appendix O, Obstruction Evaluation & Airspace Analysis.***

The FAA regulates federal airspace and evaluates projects on aeronautical compatibility. The FAA requires the submittal of a Notice of Proposed Construction (Form 7460-1) for any object that will extend more than 200 feet AGL and a Notice of Actual Construction or Alteration (Form 7460-2) within five days of structures reaching their final height. In addition, FAA Advisory Circulars (AC) define the standards for marking and lighting structures to promote aviation safety. Chapter 13: Marking and Lighting Wind Turbine Farms in AC 70/7460-1K: Obstruction Marking and Lighting provides guidelines to mark and light wind farms. Marking and lighting is intended to assist pilots in identifying and avoiding obstacles.

Electromagnetic Fields

Collection lines, wind turbines, and transformers can generate electromagnetic fields (EMFs). EMFs are a combination of electric and magnetic fields. Electric fields arise from stationary charges, while magnetic fields arise from moving charges. The intensity of the electric field is related to the voltage of the line and the intensity of the magnetic field is related to the flow of current. High levels of exposure to EMFs can be harmful to human health (Fortin et al., 2013; World Health Organization, Undated).

Hazardous Materials/Hazardous Waste

There are no known USEPA-regulated hazardous waste facilities within the Project Area. The nearest facility to the Project Area is located approximately 2 miles north. There are no recent general environmental incidents within the Project Area; however, there is an historical incident recorded in 2009 that was cleaned up (Section 35, Township 151 N, Range 81 W). There are no recent or historical oilfield incidents within the Project Area. There are two known underground storage tanks (USTs) present within the Project Area: one active site (SE ¼ of NE ¼ Section 19, Township 151 N, Range 81 W) and one inactive site (SE ¼ of SE ¼ Section 6, Township 151 N, Range 81 W). There are no landfills within the Project Area (USEPA, 2018b; North Dakota Department of Health [NDDH], 2018a; NDDH, 2018b; NDDH, 2018c).

Construction projects disturbing more than one (1) acre of land are required to obtain a North Dakota Pollutant Discharge Elimination System (NDPDES) permit from the NDDH, including a storm water pollution prevention plan (SWPPP). Projects storing more than 1,320 gallons of petroleum products on site are required to prepare and implement a Spill Prevention, Control, and Countermeasure (SPCC) plan.

Security

There are no cities within the Project Area; however, the small incorporated cities of Benedict and Ruso occur within approximately 1 mile of the Project Area. There are numerous residences within the Project Area.

6.4.1 Human Health and Safety Impacts/Mitigation

Air Traffic

Construction of wind turbines may impact aircraft operations within the Project Area. Any turbines above the 499-foot AGL threshold identified in 14 CFR 77.17(a)(1) would be identified by the FAA as obstructions regardless of location. Project facilities within the obstacle clearance surfaces within the Project Area (i.e., 2,549 to 2,949 feet above mean sea level [AMSL]) would require modification of instrument approach procedure minimum altitudes and minimum vectoring/ instrument flight rules altitudes. Based on U.S. Geological Survey (USGS) elevation data, these surfaces could limit 591-foot AGL wind turbines in portions of the Project Area. The project could impact a military training route overlying the Project Area. Additional FAA analysis may be required to identify safety hazards and the associated risks to the National Airspace System pertaining to potential impacts on Minot Airforce Base radar surveillance systems caused by turbines within the line of site of the systems. Structure heights ranging from 2,549 to 2,949 feet AMSL (depending on location in Project Area) are anticipated to avoid determinations of hazard. Determinations of No Hazard have been received from the FAA for test turbine locations across the Project Area. Coordination with the FAA and USDOD is ongoing (Capitol Airspace Group, 2018).

A Notice of Proposed Construction (Form 7460-1) and Notice of Actual Construction or Alteration (Form 7460-2) would be submitted to the FAA for all project components that would extend more than 200 feet AGL and completed structures, respectively. Lighting would be installed on wind turbines in accordance with FAA requirements; however, depending on comments received on Form 7460-1, the wind turbines may need to be marked and lighted above the minimum FAA requirements to enhance aircraft safety. Coordination with the FAA is ongoing.

In their response to a scoping letter and follow-up correspondence, the North Dakota Aeronautics Commission indicated that landowners of the Poleschook and Semchenko Airstrips should be contacted regarding the Project. Please refer to ***Appendix C, Scoping Package and Responses***, for a copy of the correspondence. Coordination with airstrip landowners is ongoing.

Electromagnetic Fields

The Project is not anticipated to result in significant sources of EMF exposure. Connection lines, like other powerlines, generate low levels of EMFs compared to typical household

appliances. With turbine generators elevated to at least approximately 260 feet, little or no EMF exposure would be expected at ground level. In addition, turbines would be setback from residences (Fortin et al., 2013).

Hazardous Materials/Hazardous Waste

The Project is not anticipated to impact any landfills or hazardous waste, environmental incident or oilfield incident sites, as no active sites are known to occur within the Project Area. In addition, the Project is not anticipated to impact the known UST sites due to their association with existing above-ground infrastructure that would not be impacted by the Project. A Phase I Environmental Site Assessment will be conducted for the Project prior to construction to further evaluate the potential for contamination within the Project Area. If unknown hazardous waste sites are encountered during construction, construction activities would be suspended and coordination with the NDDH would occur to determine the proper course of action.

Construction and O&M activities may utilize a small amount of hazardous materials. Any hazardous materials used for the construction of the Project would be contained in accordance with conditions of an NDPDES permit that would be obtained prior to construction. In addition, a SWPPP would be developed as part of the NDPDES permit to minimize the transport of potentially contaminated stormwater from construction areas to nearby waters. If the Project would store over 1,320 gallons of petroleum products on site, a construction and/or operational SPCC plan would be prepared and implemented. Hazardous materials used for O&M activities would be stored inside the O&M facility.

Security

The Project is not anticipated to impact the security of surrounding residents or communities due to the rural setting and setback of turbines from residences. All facilities, including turbine access doors, substation, and O&M facility, would be locked and include appropriate warning signage. In addition, the substation and the outdoor storage yard at the O&M facility would be enclosed by a chain-link fence.

6.5 Sound

Existing sound contributors in the Project Area include farm machinery, roadway traffic, aircraft, and trains. Existing sound levels in the Project Area are approximately 35 to 41 dBA (National Park Service, 2017).

6.5.1 Sound Impacts/Mitigation

The Project would introduce more sound to the Project Area; however, due to setbacks, it is anticipated that sound levels at residences would be consistent with existing conditions. Wind turbines generate sound due to turbulence at the blade tips, mechanical systems in the hub or nacelle (which radiates throughout the structure), and from transformers at the base of the turbine mast. Sound increases with wind speed until maximum blade rotational speed is reached, which usually occurs when wind speeds reach 8 to 10 mps at the turbine hub. A sound study conducted for the Project in 2018 determined that sound levels within 100 feet of all occupied residences would be below 50 dBA (Burns & McDonnell Engineering Company, 2018b). Please refer to ***Appendix R, Sound Study***.

6.6 Visual

Visual resources within the Project Area include relatively flat, gentle rolling topography; agricultural fields; grasslands; numerous wetlands; tree rows and small, scattered wooded areas; drainages; roadways; farmsteads; three towers; and overhead electricity transmission and distribution lines. An existing wind farm is visible from the Project Area to the northeast. These visual resources contribute to a visual character typical of rural North Dakota. Assessing visual quality is a subjective exercise, whereby it can be assumed that some viewers perceive this relatively natural setting as having high visual quality, while others may perceive the area to have low visual quality. There are no protected visual resources (e.g., National Parks, Wilderness Areas) within or adjacent to the Project Area.

Wind turbines create a phenomenon known as shadow flicker, whereby rotating turbine blades cast recurring shadows as they block sunlight. Shadow flicker can be a nuisance if it occurs at residences. There are no local, state, or federal guidelines that determine the threshold for shadow flicker; however, 30 hours of shadow flicker per year is a commonly cited target for wind projects (Stanton, 2012).

6.6.1 Visual Impacts/Mitigation

The Project would introduce additional visual resources into the Project Area in the form of wind turbines and associated facilities, including lighting at night, into the Project Area. These features may impact the visual character of this rural area to a more developed setting. The extent to which the visual character would be impacted would depend on the vantage points of individual viewers. This change may be perceived by some viewers as a reduction in visual quality; however, other viewers may perceive the change as an improvement on visual quality. The extent to which the visual quality would be impacted would depend on the preferences of the viewers.

According to the shadow flicker analysis conducted for the Project in 2018, four residences would experience greater than 30 hours of shadow flicker per year (Burns & McDonnell Engineering Company, 2018a). Mitigation measures would be employed to ensure that no residences experience more than 30 hours of expected shadow flicker per year due to the Project. Reductions in shadow flicker would be achieved by one or more of the following measures, as necessary: careful selection of final layout, physical measures such as tree planting or awning installation, and/or curtailment of turbines that would otherwise cause unacceptable levels of shadow flicker. Please refer to ***Appendix Q, Shadow Flicker Analysis***.

6.7 Cultural and Archaeological Resources

In their response to a scoping letter, the State Historical Society of North Dakota (SHSND) recommended a Class I file search and Class III pedestrian surveys for the project. Please refer to ***Appendix C, Scoping Package and Responses***, for a copy of the correspondence. A Class I and Class III cultural resource investigation for the Project were conducted in 2018 for an area of potential effect (APE) pertaining to turbines, access roads, and the Ruso Wind Transmission Project. Please refer to ***Appendix S, Class III Cultural Resource Inventory (Redacted)***. An architectural visual impact inventory will also be conducted for the Project.

The Class I record search involved a review of site files and survey reports maintained by the North Dakota State Historic Preservation Office for a one (1)-mile radius centered around the survey area. The file search revealed seven sites, 13 site leads, and no isolated finds. These resources are either *Not Eligible* or *Unevaluated* for listing on the National Register of Historic Places (NRHP) (Beaver Creek Archaeology, 2018). Please refer to ***Table 13, Previously Recorded Sites within 1-mile of APE***, and ***Table 14, Previously Recorded Site Leads within 1-mile of APE***.

Table 13, Previously Recorded Sites within 1-mile of APE

Resource	Affiliation	Resource Type	NRHP Status
32MH407	Historical	Stone Wall Built into Hillside	Not Eligible
32WD13	Period Unknown	17 Stone Circles	Unevaluated
32WD46	Period Unknown	4 Stone Circles, 5 Cairns	Unevaluated
32WD47	Period Unknown	Cairn	Unevaluated
32WD48	Period Unknown	Stone Circle	Unevaluated
32WD1743	Historical	Depression, Foundation: Remnants of a township school/hall	Not Eligible
32WD2159	Architectural	Shed, Possible Granary, Depression, Masonry, Wood	Not Eligible

Table 14, Previously Recorded Site Leads within 1-mile of APE

Resource	Affiliation	Resource Type	NRHP Status
32MHx62	Period Unknown	Site Lead: Cultural Material Scatter	Unevaluated
32WDx2	Historical	Site Lead: Bartoshivich Coal Mine	Unevaluated
32WDx9	Historical	Site Lead: Leeson Coal Mine	Unevaluated
32WDx10	Historical	Site Lead: Caflisch Mine	Unevaluated
32WDx13	Historical	Site Lead: Tree-Bosch Mine	Unevaluated
32WDx15	Historical	Site Lead: Red Flag Coal Mine	Unevaluated
32WDx16	Historical	Site Lead: Red Flag Coal Mine	Unevaluated
32WDx588	Historical	Site Lead: Truax-Traer Coal	Unevaluated
32WDx589	Historical	Site Lead: Quist Mine	Unevaluated
32WDx594	Historical	Site Lead: Faul Mine	Unevaluated
32WDx597	Historical	Site Lead: Hanchette Mine	Unevaluated
32WDx606	Historical	Site Lead: Triebwasser; Vix Coal Mine	Unevaluated
32WDx769	Architectural	Site Lead: Windmill Possible Farmstead	Unevaluated

The Class III inventory involved an intensive pedestrian survey of the APE. During the cultural resource inventory, five new cultural resources were identified within the survey area. These new cultural resources include three archaeological sites and two isolated finds. In addition, four of the previously recorded site leads were potentially located within the APE. The three archaeological sites are represented by stone features (i.e., cairn or effigy). The four previously recorded site leads are potential coal mines; however, fieldwork has determined that no cultural material or features associated with coal mining exist within the survey area. These site leads and archaeological sites are *Unevaluated*

for listing on the NRHP. The two historical archaeological isolated finds are represented by cultural material (i.e., whiteware). Isolated finds, by definition, are *Not Eligible* for listing on the NRHP (Beaver Creek Archaeology, 2018). Please refer to ***Table 15, Cultural Resources within APE.***

Table 15, Cultural Resources within APE

Resource	Description	NRHP Status	Avoidance Recommendation
BCA18-1306-Site1	Cairn	Unevaluated	100-foot avoidance, temporary fencing, monitoring
BCA18-1306-Site2	Possible Effigy	Unevaluated	100-foot avoidance, temporary fencing, monitoring
BCA18-1306-Site3	Cairn	Unevaluated	100-foot avoidance, temporary fencing, monitoring
32WDx2	Site Lead: Bartoshivich Coal Mine	Unevaluated	No avoidance
32WDx15	Site Lead: Red Flag Coal Mine	Unevaluated	No avoidance
32WDx588	Site Lead: Truax-Traer Coal	Unevaluated	No avoidance
32WDx589	Site Lead: Quist Mine	Unevaluated	No avoidance
BCA18-1306-IF1	Isolated Find: Two Pieces of Ceramics	Not Eligible	No avoidance
BCA18-1306-IF2	Isolated Find: White Ware Sherd	Not Eligible	No avoidance

6.7.1 Cultural and Archaeological Resources Impacts/Mitigation

The Project would avoid the three unevaluated archaeological stone feature sites. Temporary fencing would be installed prior to construction near these sites to create a 100-foot buffer where practicable. Should construction activities occur within 100 feet of these sites or any other sites identified during construction, archaeological monitoring would occur during ground disturbing activities. Avoidance of the two isolated finds is not proposed. An unanticipated discovery plan has been prepared to guide activities in the event that cultural resources are identified during construction activities. Additional cultural resource investigations would be conducted prior to construction to minimize and avoid impacts on previously surveyed areas that could be impacted by the Project. Coordination with the SHSND is ongoing regarding impacts on cultural and archaeological resources.

6.8 Recreational Resources

There are unimproved lands within the Project Area available for public and private recreational activities such as hunting, fishing, and wildlife viewing. Areas open to the public within the Project Area include USFWS WPAs, PLOTS areas, and NDDTL. The nearest recreational facilities to the Project Area consist of a boat ramp and fishing piers at the Velva Sportsmans Pond located adjacent to the Project Area, approximately 0.10 miles north (NDGFD, 2018b).

6.8.1 Recreational Resources Impacts/Mitigation

The Project would not directly impact areas open to the public for recreation within the Project Area or any recreation areas outside the Project Area. Recreationists within the vicinity of the Project Area would be subject to the sound and visual impacts discussed in ***Section 6.5*** and ***Section 6.6***, respectively.

6.9 Effects on Land-based Economics

Agriculture

There are approximately 868 farms in McLean County and 961 farms in Ward County. Crop sales (e.g., wheat, canola, durum, corn) make up most of the market value in these counties (92 and 93 percent, respectively), with the remainder from livestock (e.g., cattle, bees, sheep, horses, deer) sales (8 and 7 percent, respectively). The market value of products sold in McLean County is $293.4 million and in Ward County is $274.5 million, with averages per being approximately $338,000 and $286,000, respectively (USDA, 2012).

Woodlands

Wooded areas within the Project Area consist of tree rows and small, scattered woodlands. As such, there are no economically significant forestry resources within the Project Area.

6.9.1 Land-based Economics Impacts/Mitigation

Agriculture

The Project would result in temporary and permanent conversion of agricultural lands. The Project would permanently convert a total of approximately 45.7 acres of existing land uses and would temporarily convert a total of 534.3 acres of existing land uses, whereby most existing land use in the Project Area is classified as cultivated or grasslands. Permanent impacts would occur where existing agricultural land is converted into a renewable energy resource. Temporary impacts would occur during construction as a result of ground disturbance, including staging and laydown areas. Temporarily disturbed areas would be reclaimed at the conclusion of construction activities and returned to agricultural land. Impacted landowners would be compensated.

Woodlands

Because there are no economically significant forestry resources within the Project Area, economic impacts on these resources are not anticipated.

6.10 Soils

There are 76 soil map units within the Project Area. Most of these soil map units are loamy textured soils ranging from sandy loam to silty clay loam, with the remaining map units ranging from sand to silty clay textures. Most of the soil map units are well drained with low hydric ratings, with the remaining map units ranging from very poorly drained to excessively drained with higher hydric ratings. Depth to the water table for most soil map

units within the Project Area is greater than approximately 79 inches, with some map units having a shallower water table ranging from 60 to 0 inches from the ground surface. Flooding is not probable within the Project Area except for a few map units where flooding is frequent or occasional. Ponding does not occur or is rare throughout much of the Project Area, except some map units characterized by frequent ponding (USDA, 2018).

Approximately half of the Project Area is considered "very limited" for use with septic tank absorption fields, while the other half is "somewhat limited." New septic systems within Ward and McClean counties and surrounding counties are required to obtain a Septic System Permit from the First District Health Unit, Environmental Health Division, in Minot, North Dakota. Permittees in McClean County must also coordinate with the County Land Use Administrator regarding soil limitations. In Ward County, sewage disposal considerations are required as part of zoning permitting (USDA, 2018; McLean County, 2013; Ward County, 2003).

The Farmland Protection Policy Act protects prime and unique farmland. Prime farmland is "land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is also available for these uses." Unique farmland is "land other than prime farmland that is used for the production of specific high-value food and fiber crops." Farmland of statewide importance generally "include those that are nearly prime farmland and that economically produce high yields of crops." Similarly, farmland of local importance is designated by a local agency where "there is concern for certain additional farmlands for the production of food, feed, fiber, forage, and oilseed crops" (USDA, 2006). A total of 22 map units within the Project Area are classified as prime farmland or prime farmland if drained. In addition, 12 map units within Project Area are classified as farmland of statewide importance. The remaining 42 map units are not classified as prime farmland or farmland of statewide importance. Please refer to ***Exhibit 8, Prime and Unique Farmland,*** in ***Appendix A***. Federal undertakings for non-corridor projects impacting prime and/or unique farmland are required to submit a Farmland Impact Conversion Rating (Form AD-1006) to the USDA-NRCS. According to NDAC 69-06-08-01(1)(d), prime and unique farmland must be excluded from energy conversion facility citing unless the Commission finds that the farmland area that would be removed "is of such small acreage as to be of negligible impact on agricultural productions."

6.10.1 Soils Impacts/Mitigation

The Project would impact soils during construction activities. Soils disturbed by construction would be prone to erosion, and operation of heavy equipment would compact soils. BMPs would be implemented to minimize impacts on soils, such as implementation of erosion and sediment control measures, segregating topsoil from subsurface materials, reseeding of disturbed areas, use of construction equipment appropriately sized to the scope and scale of the Project, ensuring access road grades fit closely with the natural terrain, proper on-site disposal of excess soil, and maintaining proper drainage.

A septic system may be required for the O&M building. The septic system would be situated on soils suitable for such use. A Septic System Permit would be acquired from the Fist District Health Unit and all necessary county coordination regarding septic systems would occur.

The Project would result in temporary and permanent impacts on prime farmland and farmland of statewide importance. Please refer to ***Table 16, Farmland Classification Summary,*** for farmland impacts compared to existing farmland within the Project Area. Because the Project is not a federal undertaking, a Farmland Impact Conversion Rating (Form AD-1006) would not be required. Additionally, because the Project would permanently impact less than one (1) percent of farmland classified as prime farmland or farmland of statewide importance within the Project Area, it is anticipated that the Project would have a negligible impact on agricultural production. As such, it is requested that the Commission determine that prime and unique farmlands do not need to be excluded from Project siting.

Table 16, Farmland Classification Summary

Farmland Classification	Existing Area within Project Acres (Acres)	Temporary Impact (Acres)	Permanent Impact (Acres)
Prime Farmland	4,909	100	7.1
Prime Farmland if Drained	303	7	0.3
Farmland of Statewide Importance	7,980	177	11.7
Not Prime Farmland or Farmland of Statewide Importance	22,458	250	26.7
Total	35,650*	534	45.8

Source: USDA. 2018
* Total differs from 35,654-acre Project Area due to rounding.

6.11 Geologic and Groundwater Resources

Surface geology within the Project Area is considered part of the Coleharbor Group, a Pleistocene sediment up to 450 feet thick. The Coleharbor Group consists of various formations deposited by glaciers and associated water, whereby sediments in the region consist of till, sand and gravel, or silt and clay. Many of the landforms, including the "pothole" topography of the Project Area, were formed by the collapse of glacial sediment as glaciers melted approximately 12,000 years ago (Bluemle, 1971; Bluemle 1989).

The Coleharbor Group is classified by the Bureau of Land Management (BLM) Potential Fossil Yield Classification system as having a moderate potential to contain fossils, whereby the potential for impacting significant paleontological resources is considered low-to-moderate. Paleontological resources (i.e., fossils) are protected by the Paleontological Resources Preservation Act and state law on federal and state lands, respectively (BLM, 2016; BLM, 2015).

In their response to a scoping letter, the North Dakota Geological Survey (NDGS) indicated that the Project Area is generally free of landslides apart from a few localized slides associated with drainages on the Ward-McHenry county line. Please refer to ***Appendix C, Scoping Package and Responses***, for a copy of the correspondence. Five mapped landslide areas occur within the Project Area (NDGS, 2018).

While the Project Area is situated atop the Bakken and Three Forks Formations, geologic formations rich in oil and gas deposits, there are no active oil and gas wells within the

Project Area (North Dakota Industrial Commission [NDIC], 2018). In their response to a scoping letter, the NDIC indicated that there are three plugged wells within the Project Area, whereby surface casing was cut off three (3) feet below ground (SW ¼ of SE ¼, Section 19, Township 151 N, Range 81 W; NE ¼ of SW ¼, Section 9, Township 151 N, Range 81 W; and NE ¼ of NE ¼, Section 7, Township 151 N, Range 81 W). Please refer to ***Appendix C, Scoping Package and Responses***, for a copy of the correspondence.

The Snake Creek aquifer occurs within the southwest portion of the Project Area, and the Strawberry Lake aquifer occurs within the southeastern portion of the Project Area. There are approximately 24 water wells located within the Project Area. There are no sole source aquifers within or near the Project Area (NDSWC, 2018; USEPA, 2018a). Construction projects disturbing more than one (1) acre of land are required to obtain an NDPDES permit from the NDDH, including a SWPPP. Projects storing more than 1,320 gallons of petroleum products on site are required to prepare and implement an SPCC plan.

Please refer to ***Exhibit 9, Geologic and Groundwater Resources,*** in ***Appendix A.***

6.11.1 Geologic and Groundwater Impacts/Mitigation

The Project would result in the permanent modification of terrain to construct the turbines and associated facilities; however, impacts on the overall nature of geological resources is not anticipated. The Project would have a low-to-moderate potential to impact significant paleontological resources. The Project is not anticipated to impact or exacerbate landslides, as mapped landslide areas would be avoided.

Plugged oil and gas wells within the Project area would also be avoided. The Project is not anticipated to adversely impact water wells. Should access to or impacts on wells become necessary during construction or O&M activities, coordination with the respective owner (e.g., private individuals, NDSWC) would occur.

The Project is not anticipated to impact groundwater. An NDPDES permit, including a SWPPP, would be obtained prior to construction. Conditions of the NPDES and SWPPP would minimize the transport of stormwater from construction areas to nearby waters. If the Project would store over 1,320 gallons of petroleum products on site, a construction and/or operational SPCC plan would be prepared and implemented. Impacts and mitigation pertaining to hazardous materials/hazardous waste are discussed in ***Section 6.4***.

6.12 Surface Water and Floodplain Resources

The Project Area occurs within the Souris, Lake Sakakawea, and Lake Oahe Basins, whereby surface water flows toward the Souris River, Lake Sakakawea, or Lake Oahe, respectively. The Project Area is situated within the Prairie Pothole Region, which is characterized by grasslands and cropland punctuated by a multitude of shallow depressional wetlands. There are limited drainages in the within the Project Area (NDSWC, 2018; USEPA, 2018c). Please refer to ***Exhibit 10, Surface Waters and Wetlands,*** in ***Appendix A***.

Draining waterbodies with a watershed area equal to or greater than 80 acres requires a permit from the NDSWC. Appropriation of waters of the state for industrial use also requires a water permit from the NDSWC. Construction projects disturbing more than one

(1) acre of land are required to obtain an NDPDES permit from the NDDH, including a SWPPP. Projects storing more than 1,320 gallons of petroleum products on site are required to prepare and implement an SPCC plan. Requirements pertaining to wetlands are discussed in ***Section 6.13***.

In their response to a scoping letter, the NDSWC indicated that are there two dams within the Project Area (NE ¼, Section 10 and SW ¼, Section 25, Township 151 N, Range 82 W). Please refer to ***Appendix C, Scoping Package and Responses***, for a copy of the correspondence.

The Project Area occurs in an area mapped by FEMA; however, FIRMs have not been printed for the Project Area. The unprinted areas within the Project Area occurring within Ward County are all Zone D, and the unprinted areas within the Project Area occurring within McLean County are all Zone X. Zone D indicates an "area of undermined but possible flood hazards," and Zone X (unshaded) indicates an "area of minimal flood hazard, usually depicted…as above the 500-year flood level." A permit from local (i.e., county) floodplain administrators is required for development within special Flood Hazard Areas; however, Zones D and X are not considered special Flood Hazard Areas (FEMA, 2002; FEMA, 2011; French & Associates, Ltd., 1998). In their response to a scoping letter, the NDSWC indicated that local floodplain administrators should be consulted regarding additional information and permit requirements. Please refer to ***Appendix C, Scoping Package and Responses***, for a copy of the correspondence.

6.12.1 Surface Water and Floodplain Resources Impacts/Mitigation

The Project would avoid and minimize impacts on surface water to the maximum extent practicable. Existing drainage patterns would be maintained. Impacts and mitigation pertaining to wetlands are discussed in ***Section 6.13.*** It is not anticipated that waterbodies would be drained or that waters of the state would be appropriated. Should these activities become necessary during construction or O&M activities, the applicable permit(s) from the NDSWC would be obtained.

Indirect impacts on water quality are possible due to ground disturbance and use of hazardous materials. An NDPDES permit, including a SWPPP, would be obtained prior to construction. Conditions of the NPDES and SWPPP would minimize the transport of stormwater from construction areas to nearby waters. If the Project would store over 1,320 gallons of petroleum products on site, a construction and/or operational SPCC plan would be prepared and implemented. Impacts and mitigation pertaining to hazardous materials/hazardous waste are discussed in ***Section 6.4***.

The Project is not anticipated to adversely impact dams. Should impacts on dams become necessary during construction or O&M activities, coordination with the NDSWC and affected landowners would occur. The floodplain administrators for Ward and McLean, counties indicated that floodplain permits are not required for the Project (Korgel, 2018; Simpson, 2018).

6.13 Wetlands

Wetlands are defined in Executive Order 11990 – Protection of Wetlands as "areas that are inundated by surface or groundwater with a frequency sufficient to support and under normal circumstances does or would support a prevalence of vegetative or aquatic life

that requires saturated or seasonally saturated soil conditions for growth and reproduction." The Project Area is situated within the Prairie Pothole Region, which is characterized by grasslands and cropland punctuated by a multitude of shallow depressional wetlands. These pothole wetlands provide habitat for over half of North American waterfowl during migration, provide hunting and wildlife viewing opportunities, and regulate flooding by storing runoff water. Wetlands identified on the USFWS National Wetland Inventory (NWI) and wetland mapping survey conducted for the project in 2018 are shown on ***Exhibit 10, Surface Waters and Wetlands,*** in ***Appendix A*** (USEPA, 2018c; Western EcoSystems Technology, Inc. 2018b). Additional wetland mapping would be conducted in the spring at all proposed temporary and permanently disturbed areas, prior to construction, to minimize and avoid impacts wetlands that could be impacted by the Project. Please refer to ***Appendix P, Wetland Mapping Survey.***

Several wetland basins within the Project Area are protected by USFWS wetland easements as discussed in ***Section 6.2***. In addition, Section 404 of the Clean Water Act (CWA) regulates discharges into waters of the U.S. (i.e., wetlands and other waters under the jurisdiction of the U.S. Army Corps of Engineers [USACE]), with Section 401 regulating water quality. In their response to a scoping letter, the USACE indicated that Nationwide Permit 12, Utility Line Activities, authorizes placement of utility lines, "provided the utility line can be placed without any change to pre-construction contours and all other proposed construction activities and facilities are in compliance with the Nationwide's permit conditions and 401 Water Quality Certification." The Project may or may not require notification to the USACE for the Nationwide Permit. Should the Project fall outside the Nationwide Permit conditions, a standard or Individual Permit would be required. Please refer to ***Appendix C, Scoping Package and Responses***, for a copy of the correspondence.

6.13.1 Wetland Impacts/Mitigation

The Project will avoid and minimize impacts on wetlands to the maximum extent practicable. Wind turbines will be situated in upland areas to avoid wetlands, including those under USFWS wetland easement and USACE jurisdiction. Coordination with the USFWS is ongoing regarding avoidance of USFWS wetland easement basins. To minimize impacts on wetlands, directional boring of some collection lines could be required underneath the wetland basins. Should any impacts on waters of the U.S. occur, impacts would be permitted and mitigated pursuant to Section 404 of the CWA. In addition, Section 401 water quality certification would be obtained, unless waived. Indirect water quality impacts would be avoided and minimized as described in ***Section 6.12.***

6.14 Vegetation

Much of the Project Area occurs within the Missouri Coteau Level IV Ecoregion within the Northwestern Glaciated Plains Level III Ecoregion; however, the northern portion of the Project Area occurs within the Drift Plains Level IV Ecoregion of the Northern Glaciated Plains Level III Ecoregion. Both level III ecoregions are characterized by grasslands with a high concentration of wetlands. Grassland species typical of the Missouri Coteau include western wheatgrass, bluestem, needle and thread, green needlegrass, prairie cordgrass, and northern reedgrass. Some native prairie remains on rangeland; however, agricultural practices have replaced most native areas with hay and spring wheat. Grassland species typical of the Drift Plains include western wheatgrass, big bluestem, little bluestem,

switchgrass, and Indian grass. Most native areas have been converted to small grains, sunflowers, and alfalfa (Bryce et al., Undated).

As discussed in ***Section 6.2***, most of the Project Area is classified as cultivated, followed by grasslands, with smaller areas of vegetation characterized by woodlands and wetlands. Wooded areas consist of tree rows and small, scattered woodlands. The USFWS grassland easements occur within the Project Area. In a grassland assessment completed for the Project in 2018, approximately 12,200 acres of unbroken native prairie and 4,800 acres of previously broken grasslands were identified, for a total of approximately 17,000 acres of total grasslands (Western EcoSystems Technology, Inc., 2018a). Please refer to ***Appendix H, Grassland Assessment.***

According to NDCC 4.1-47-02, all individuals are responsible for controlling the spread of noxious weeds. The North Dakota Department of Agriculture (NDDA) has identified 11 plant species that are included on the state's noxious weed list (NDDA, 2018a). Counties and cities have the option to add noxious weeds to the list to be regulated in their jurisdiction. Ward County has opted to include three additional species to be regulated within their jurisdictions, while McLean County has not added any additional species (NDDA, 2017).

6.14.1 Vegetation Impacts/Mitigation

As discussed in ***Section 6.2***, the Project would permanently and temporarily impact cropland, grassland, and developed lands, and would also temporarily impact small amounts of areas classified as open water, wetlands, and woodlands. The Project will avoid and minimize impacts on unbroken native grassland and woodland vegetation to the maximum extent practicable.

Access roads have been sited to follow section line roads to the extent practicable to minimize grassland fragmentation. Turbines have been sited on cropland to the extent practicable in an effort to minimize impacts on grasslands and wooded areas. Temporarily disturbed areas will be re-vegetated with a grassland seed mixture consistent with surrounding vegetation and free of noxious weeds. Tree removal and replacement would be coordinated with landowners and conducted in accordance with the Commission's tree and shrub mitigation specifications. Coordination with the NDGFD and USFWS is ongoing regarding avoidance, minimization and mitigation for impacts on unbroken native grasslands and other habitats.

6.15 Wildlife

<u>Avian Species</u>

The Project Area occurs within the Central Flyway, a migration route for over 400 species birds as they travel between wintering and breeding areas across the Great Plains of North America. Birds utilizing the Central Flyway depend on abundant grasslands and wetlands for resting and foraging as they migrate (Johnsgard, 2012). Migratory birds and eagles are protected by the Migratory Bird Treaty Act (MBTA) and Bald and Golden Eagle Protection Act (BGEPA), respectively. Both laws prohibit, without a permit, causing harm to protected species, including their nests and eggs. Species protected by the Endangered Species Act (ESA) are discussed in ***Section 6.16***. Resource agencies have assigned various special statuses to numerous avian species. While these designations lack legal

protection, many of these species are also designated as migratory birds that are protected by the MBTA. These special statuses include:

- Species of habitat fragmentation concern (SHFC) are species that a relevant resource agency "has found that separation of their habitats into smaller blocks reduces connectivity such that the individuals in the remaining habitat segments may suffer from effects such as decreased survival, reproduction, distribution, or use of the area" (USFWS, 2012a).

- Birds of Conservation Concern (BCC) are identified pursuant to the Fish and Wildlife Conservation Act as those that may become candidates for listing under the ESA (USFWS, 2018a).

- NDGFD species of conservation priority (SCP) are those that may exhibit low or declining populations within North Dakota (Dyke et al., 2015).

The North American Bird Survey is a joint venture by the USGS and Canadian Wildlife Service (CWS) to collect ongoing roadside avian breeding population data across the U.S. and Canada. The nearest survey route to the Project Area is the Douglas Creek route, approximately 18 miles southwest. Between 1982 and 2016, a total of 128 avian species have been identified along this survey route, whereby 731 to 2,715 individuals have been counted each year. Observations include a bald eagle, MBTA-protected species, and special status species (USGS and CWS, 2018).

Pre-construction avian surveys were conducted for the Project in 2017 and 2018 in accordance with National Wind Coordinating Committee's Comprehensive Guide to Studying Wind Energy/Wildlife Interactions, USFWS Land-Based Wind Energy Guidelines, and USFWS Eagle Conservation Plan Guidance. The surveys included general avian point count surveys, eagle point count surveys, aerial raptor nest surveys, and aerial and ground sharp-tailed grouse lek surveys. A total of 91 species of birds were identified within the Project Area during spring, summer, fall, and winter general avian point count surveys, 24 of which are considered special-status avian species. Please refer to ***Table 17, Special Status Species Identified in Project Area.*** In addition, two SHFC species that were not identified during the surveys have primary habitat within the Project Area: Baird's sparrow and Sprague's pipit. Four active sharp-tailed grouse leks were identified within the Project Area and an additional lek was identified immediately adjacent to the Project Area (Johnson, 2018; USGS and CWS, 2018; Westwood Professional Services, 2018). Please refer to ***Appendix G, 2017-2018 Annual Pre-Construction Avian Survey Report.***

One bald eagle was observed within the Project Area during the general avian point count surveys and two bald eagles were observed during the eagle point count surveys. Second year eagle surveys are anticipated to be completed in May 2019. A total of 13 raptor nests were identified within ten (10) miles of the Project Area during the aerial raptor nest survey. Eight of the nests identified were occupied: five by red-tailed hawks within the Project Area, two by great horned owls immediately adjacent to the Project Area, and one by a bald eagle approximately nine (9) miles from the Project Area (Westwood Professional Services, 2018). Please refer to ***Appendix G, 2017-2018 Annual Pre-Construction Avian Survey Report.***

Table 17, Special Status Species Identified in Project Area

Species (in order of abundance)	SFHC	BCC	SCP
Lesser Scaup			X
American White Pelican			X
Western Meadowlark			X
Northern Pintail			X
Canvasback			X
Upland Sandpiper	X	X	X
Northern Harrier	X		X
Wilson's Phalarope			X
Bobolink	X		X
Grasshopper Sparrow	X	X	X
Black Tern		X	X
Solitary Sandpiper		X	
Swainson's Hawk		X	X
Franklin's Gull			X
Willet			X
American Kestrel			X
Sharp-tailed Grouse	X		X
Marbled Godwit		X	X
Chestnut-collared Longspur	X	X	X
Horned Grebe		X	X
American Avocet			X
Bald Eagle		X	X
Prairie Falcon			
Sedge Wren	X		

Mammalian Species

The Project Area contains wildlife habitat in the form of cropland; grassland; tree rows and small, scattered woodlands; prairie pothole wetlands, and drainages. Common mammals that may occur within the Project Area include several species of bats; carnivores such as badgers, coyotes, long-tailed weasels, racoons, and red fox; various rodents and shrews; and ungulates such as white-tailed deer. In addition, the Project Area occurs within primary, secondary, or potential ranges for several non-volant (i.e., not able to fly or glide) mammalian SCP: arctic shrew, plains pocket mouse, Richardson's ground squirrel, swift fox, and river otter (NDGFD, 2018a; Dyke et al., 2015).

A pre-construction acoustic bat survey was conducted for the Project in 2017. Six bat species were identified: big brown bat, silver-haired bat, eastern red bat, hoary bat, little brown bat, and the northern long-eared bat. The big brown bat, little brown bat, and northern long-eared bat are listed as SCP, and the northern long-eared bat is also listed as threatened under the ESA (Zotz Ecological Solutions, 2017; Dyke et al., 2015). Please refer to ***Appendix F, Bat Monitoring Report.***

6.15.1 Wildlife Impacts/Mitigation

The Project has the potential to impact wildlife species within the Project Area as a result of habitat loss and degradation, habitat fragmentation, displacement and behavioral changes, increased predator populations, and/or introduction of invasive vegetation. In addition, the Project has the potential to impact avian and bat species as a result of collisions with wind turbines. Bat species are also susceptible to injuries due to barotrauma, or internal bleeding caused by changes in atmospheric pressure near turbine blades (USFWS, 2012a; American Wind Wildlife Institute [AWWI], 2018).

As discussed in ***Section 6.13*** and ***Section 6.14***, the Project would permanently and temporarily impact wetland and upland habitats; applicable avoidance, minimization, and mitigation measures for these impacts are also discussed. In addition to other habitat avoidance, minimization, and mitigation measures, all collection lines would be buried to avoid the potential of bird and bat strikes. A Bird and Bat Conservation Strategy (BBCS) will be developed for the Project prior to operation. Coordination with the NDGFD and local USFWS Field Office is ongoing regarding avoidance and minimization of impacts on wildlife.

Avian Species

The Project would avoid direct impacts on known raptor nests and grouse leks. Any previously unknown leks or raptor nests discovered during construction activities would also be avoided. While some of the most commonly observed avian species within the Project Area have been documented as fatalities due to wind energy projects, fatalities caused by the Project are not anticipated to result in population-level impacts due to large population sizes and wide distributions across North America. Waterfowl species observed are considered to have a low risk of striking turbines due to avoidance of facilities or lack of documented fatalities at other wind energy projects. Special status species observed are considered to have a low risk for turbine collision due to relatively low mean use rates, infrequent flight at rotor blade height, and lack of documented fatalities at other wind energy projects (Westwood Professional Services, 2018).

Because raptor use of the Project Area was observed to be low, raptor fatalities as a result of the Project are anticipated to be low. Raptors other than eagles are considered to have a low risk for turbine collision due to the limited and discontinuous nature of topographic features within the Project Area that would allow risk-taking flight patterns. In addition, the most prevalent raptors in the Project Area commonly occur across North America. Eagles are considered to have a low risk for turbine collision due to relatively low mean use rates, infrequent flight at rotor blade height, and paucity of trees suitable for nesting, roosting and perching within the Project Area (Westwood Professional Services, 2018).

Mammalian Species

It is anticipated that non-volant mammalian species would be temporarily or permanently displaced during construction activities as a result of ground disturbance, operation of heavy machinery, and human presence. Due to the abundance of habitat in the region and lack of specialized habitat within the Project Area, this displacement is not anticipated to result in population-level impacts on non-volant wildlife. Studies regarding impacts of wind energy development on non-volant mammals are limited, but generally indicate that big game is not adversely impacted (AWWI, 2018).

The most commonly detected bat species within the Project Area have been documented as fatalities due to wind energy projects, particularly during migration periods. Due to the lack of publicly available data relating pre-construction acoustic detection and post-construction fatalities in the region, it is not plausible to predict whether the species detected would correspond to fatalities resulting from the Project. If bat fatalities are observed during operation of the Project, the implementation of minimization measures would be evaluated. It is not anticipated that barotrauma caused by turbine blades in motion would adversely affect bat species due to the general consensus that barotrauma is not a major source of mortality. Due to the poor understanding of bat populations and the introduction of white-nose syndrome, it is unclear how bat mortality at wind energy facilities will affect bat populations (Zotz Ecological Solutions, 2017; AWWI, 2018).

6.16 Rare and Unique Natural Resources

Natural Heritage Inventory

The North Dakota Parks and Recreation Department (NDPRD) Natural Heritage Inventory (NHI) program was established pursuant to North Dakota's Nature Preserves Act, which is intended to protect nature preserves and natural areas in the state. The purpose of the NHI is to identity and establish priorities for the protection of important species and habitats within North Dakota. The Project Area does not contain any NHI data (NDPRD, 2018a; NDPRD, 2018b). Note that the lack of data may be a function of inadequate survey data and does not necessarily indicate that there are no important species or habitats present.

Endangered Species Act

Section 10 of the ESA prohibits activities by non-federal entities that affect species and critical habitats listed under the ESA unless a permit is granted by the USFWS. Under the ESA, an endangered species is in danger of extinction throughout all or a portion of its range. A threatened species is likely to become endangered in the foreseeable future. A candidate species is warranted for listing as endangered or threatened, but has not been listed due to other, higher priority listings. While candidate species are not legally protected under the ESA, efforts should be made to protect or minimize impacts on candidate species. A proposed species is both warranted for listing as endangered or threatened and has been officially proposed as such in the Federal Register. Finally, critical habitats may be designed for protected species in areas that are considered essential to the conservation of a species. Critical habitat must contain the primary constituent elements, or the physical or biological features essential to conservation, and may require special management considerations or protection.

The USFWS Environmental Conservation Online System – Information for Planning and Conservation (ECOS-IPaC) identified the following federally protected resources that may occur within the Project Area: gray wolf (endangered), northern long-eared bat (threatened), whooping crane (endangered), interior least tern (endangered), piping plover (threatened), piping plover critical habitat, rufa red knot (threatened), Dakota skipper (threatened), Dakota skipper critical habitat, and pallid sturgeon (endangered). These resources are addressed individually in the subsections below. Please refer to ***Appendix D, USFWS Resource List***.

Gray Wolf (*Canis lupus*)

While the gray wolf is not common in North Dakota, occasionally individual wolves do pass through the state. Gray wolves utilize a variety of habitat types, including forest, grassland, and waterbodies. Potential dispersal habitat for the gray wolf of various types is present within the Project Area, such as grasslands and wetlands; however, the Project Area is far from known gray wolf populations. Between 1952 and 2017, there has been one gray wolf sighting (unverified, but probable) within Ward County, which was observed in 2008; no sightings have been recorded within McLean County within the same time period. The nearest record occurred approximately 11 miles north of the Project Area (USFWS, 2013a; Tucker, 2018).

Northern Long-eared Bat (*Myotis septentrionalis*)

The western extent of the northern long-eared bat's range spans most of North Dakota. During summer months, the species roosts in the trees of forested areas, and to a lesser extent in caves, mines and the built environment. Foraging for insects occurs at night near forested areas. The home range is typically within 1.5 miles of a known suitable roost tree or within three (3) miles of a known occurrence of the species. From mid-summer to fall, bats move to hibernacula (i.e., overwintering sites such as caves, abandoned mines, or similar constructions) to breed and hibernate. The distance between roosts and hibernacula can range from 5 to 168 miles. There are no known hibernacula or maternity roost trees within the Project Area. The main factor affecting recovery of the species is dramatic population decline due to the fungal disease, white-nose syndrome (Duttenhefner, 2018; Isakson, 2018; Larson, 2018; USFWS, 2013c; USFWS, 2014a).

The USFWS published a final 4(d) rule for the northern long-eared bat that went into effect on February 16, 2016. The rule identifies prohibitions that aim to protect the bat's sensitive life stages in areas affected by white-nose syndrome. The 4(d) rule focuses on protecting bats when and where they are most vulnerable: maternity roost trees during pup-rearing in June and July pup-rearing, and at hibernation sites, within the White-nose Syndrome Zone. As of August 1, 2018, Ward and McLean counties are not within the White-nose Syndrome Zone; therefore, incidental take is not prohibited. However, the zone has the potential to expand as white-nose syndrome spreads and is detected (USFWS, 2016a; USFWS, 2018b).

Potential habitat for the northern long-eared bat occurs within the Project Area in the form of woodlands, scattered trees, and various structures. In a statewide survey of bat distribution, the species was recorded in the Missouri River Valley, Turtle Mountains and Badlands. The species was detected within the Project Area during the pre-construction acoustic bat survey that was conducted for the Project; however, due to potential of false identification of the northern-long eared bat during acoustic bat surveys, a mist netting survey will be conducted in the summer to positively identify whether the species is present within the Project Area. (Gillam and Barnhart, 2012; Zotz Ecological Solutions, 2017). Please refer to ***Appendix F, Bat Monitoring Report***.

Whooping Crane (*Grus americana*)

Whooping cranes are documented annually in North Dakota during spring and fall migrations. Migration stopover habitat consists of palustrine wetlands for roosting and croplands for feeding. In addition, whooping cranes are often recorded in riverine habitats.

Suitable migratory stopover habitat for whooping cranes includes areas of shallow water without visual obstructions (e.g., high or dense vegetation). Feeding and roosting sites are typically less than 0.6 mile apart, but can occasionally be separated by more than five (5) miles. On average, migrating whooping cranes avoid roads by approximately 0.3 mile and avoid human habitation by approximately 0.8 mile (USFWS, 2013d; USFWS, 2012b; USFWS, 2016b; Lewis and Slack, 2008).

The Project Area occurs within the whooping crane migration corridor, whereby 75 percent of observations occur and within the Priority 1 whooping crane migration corridor, where "the top 30 percent relative probability of use whooping crane migration habitat throughout North and South Dakota" occurs (USFWS, 2018d). Suitable migration stopover habitat for the whooping crane occurs within the Project Area in the form of wetlands and cropland. Between 1955 and 2009, no whooping cranes have been recorded within the Project Area; however, one sighting (four adults) was recorded in 2004 within one (1) mile of the Project Area (USFWS, 2009). Please refer to ***Exhibit 11, Whooping Crane Migration Corridor,*** in ***Appendix A.***

Interior Least Tern (*Sterna antillarum*)

In North Dakota, the interior least tern breeds on sparsely vegetated areas along the Yellowstone and Missouri River systems. Nesting territory can range from 27.2 to over 2,720 acres in size. The nearest recorded data for the species is located approximately 16 miles south of the Project Area at Lake Sakakawea (USFWS, 2013b; USFWS, 1990; USACE, 2017).

Piping Plover (*Charadrius melodus*)

In North Dakota, piping plovers breed on vegetated sandbars, gravel beaches, and alkali lakes and wetlands. During the breeding season, piping plovers typically remain in close proximity to the nesting site for feeding. The piping plover commonly nests along Lake Sakakawea, approximately 16 miles south of the Project Area (USFWS, 1988; USFWS, 2016c; USACE, 2017).

Piping Plover Critical Habitat

Critical habitat for the northern Great Plains population of piping plovers has been designated on alkali lakes and wetlands, as well as along the Missouri River and Lake Sakakawea in North Dakota. The physical and biological features that are essential to the conservation of the species, referred to as the primary constituent elements, require special consideration for protection. Primary constituent elements for piping plover critical habitat include both "the dynamic ecological processes that create and maintain piping plover habitat," as well as, for reservoir systems, "sparsely vegetated shoreline beaches, peninsulas, islands composed of sand, gravel, or shale, and their interface with the water bodies." Critical habitat does not include "existing developed areas such as mainstem dam structures, buildings, marinas, boat ramps, bank stabilization and breakwater structures, row cropped or plowed agricultural areas, roads and other lands (e.g., high bank bluffs along Missouri River) unlikely to contain primary constituent elements." There is no designated critical habitat for the piping plover within the Project Area. The nearest designated critical habitat is located approximately ten (10) miles west of the Project Area (USFWS, 2002a; USFWS, 2002b).

Rufa Red Knot (*Calidris canutus rufa*)

While most red knots follow migration routes along the east or west coasts of North America, small numbers of the species follow an inland migration route, which may include stopovers in the Great Plains, including North Dakota. Preferred stopover habitat includes sandy or gravely beaches, tidal mudflats, salt marshes, shallow coastal impoundments and peat banks. The nearest recorded data for the species is located approximately 18 miles south of the Project Area (USFWS, 2014b; eBird, 2018).

Dakota Skipper (*Hesperia dacotae*)

In North Dakota, the most significant Dakota skipper populations occur in the north-central portion of the state. Preferred habitat includes two grassland types comprised of specific plant species: Type A, low (i.e., wet) grassland, and Type B, upland (i.e., dry) grassland on ridges and hillsides. The Dakota skipper remains in the larval stage throughout most of its life cycle, including overwintering. They are most visible during the brief adult flight stage occurring from mid-June to early July, which is also the only time during their lifecycle in which the species can reproduce and disperse. The Dakota skipper can migrate over 0.62 mile (one [1] km) per year between suitable habitat patches that are connected by structurally similar, though not necessarily suitable, habitat. Suitable and structurally similar habitat for the Dakota skipper is present within the Project Area; however, the species was not observed during the Dakota skipper survey conducted for the Project in 2018. The species is known to occur in Ward and McLean counties (USFWS, 2014d; USFWS, 2014e; Cochrane and Delphey, 2002; HDR, 2018). Please refer to ***Appendix I, 2018 Dakota Skipper Habitat Assessment and Survey Report.***

Dakota Skipper Critical Habitat

In North Dakota, critical habitat for the Dakota skipper has been designated in 11 areas, none of which occur within Ward or McLean counties. Primary constituent elements for Dakota skipper critical habitat include “wet-mesic tallgrass or mixed-grass remnant untilled prairie that occurs on near-shore glacial lake soil deposits or high-quality dry-mesic remnant untilled prairie on rolling terrain consisting of gravelly glacial moraine soil deposits,” “native grasses and native flowering forbs for larval and adult food and shelter,” and “dispersal grassland habitat that is within one (1) km (0.6 miles) of native high quality remnant prairie…that connects high-quality wet-mesic to dry tallgrass prairies or moist meadow habitats.” There is no designated critical habitat for the Dakota skipper within the Project Area. The nearest designated critical habitat areas are located approximately 27 miles northeast of the Project Area (USFWS, 2018c; USFWS, 2015b).

Pallid Sturgeon (*Scaphirhynchus albus*)

In North Dakota, the pallid sturgeon has been documented both upstream and downstream of Lake Sakakawea, and in the Yellowstone River. The species is well adapted to living close to the bottom of large, silty rivers with a natural rate of flow over time, and it occurs at a diversity of depths and flow velocities related to braided channels, sand bars, sand flats and gravel bars. Suitable habitat for the pallid sturgeon is not present within the Project Area. The nearest suitable habitat for the species is located approximately 16 miles south of the Project Area in Lake Sakakawea (USFWS, 2014c; USFWS, 2015a).

6.16.1 Rare and Unique Natural Resources Impacts/Mitigation

Natural Heritage Inventory

Because there are no known NHI resources within the Project Area, impacts on known species and habitats are not anticipated. However, the Project has the potential to impact unknown species and habitats that are not presently included in NHI data as discussed in ***Section 6.15***; applicable avoidance, minimization, and mitigation measures for these impacts are also discussed.

Endangered Species Act

The USFWS was consulted upon completion of the Site Characterization Study that was prepared for the Project and subsequently participated in Project meetings. Discussion pertaining to the ESA focused on the Dakota skipper and whooping crane. There was no indication from the USFWS that an ESA Section 10 permit would be required for the Project, provided that impacts on the Dakota skipper could be avoided. Coordination with the local USFWS Field Office is ongoing.

Gray Wolf

Given the rare occurrence of gray wolves within North Dakota, their tolerance for human development, and ability to utilize a wide range of habitat types, the Project is not anticipated to impact the species.

Northern Long-eared Bat

As discussed in ***Section 6.15***, the Project has the potential to impact bats and their habitat, including the northern long-eared bat; applicable avoidance, minimization, and mitigation measures for these impacts are also discussed. Pursuant to the final Section 4(d) rule for the northern long-eared bat, incidental take of the species is not currently prohibited within the Project Area.

Whooping Crane

As discussed in ***Section 6.15***, the Project has the potential to impact birds and their habitat, including the whooping crane; applicable avoidance, minimization, and mitigation measures for these impacts are also discussed.

Interior Least Tern

As discussed in ***Section 6.15***, the Project has the potential to impact birds and their habitat, including interior least terns that may be migrating through the Project Area; applicable avoidance, minimization, and mitigation measures for these impacts are also discussed.

Piping Plover

As discussed in ***Section 6.15***, the Project has the potential to impact birds and their habitat, including piping plovers that may be migrating through the Project Area; applicable avoidance, minimization, and mitigation measures for these impacts are also discussed.

Piping Plover Critical Habitat

Given that designated critical habitat for the piping plover does not occur within the Project Area, the Project is not anticipated to impact piping plover critical habitat.

Rufa Red Knot

As discussed in ***Section 6.15***, the Project has the potential to impact birds and their habitat, including rufa red knots that may be migrating through the Project Area; applicable avoidance, minimization, and mitigation measures for these impacts are also discussed.

Dakota Skipper

While suitable and structurally similar habitat for the Dakota skipper is present within the Project Area, individuals were not observed during the field survey of suitable habitat for the Project. Based on the absence of the Dakota skipper during the survey, it is assumed that the Dakota skipper is not present within the Project Area. However, structures have been sited to avoid the potential suitable habitat. Therefore, it is not anticipated that the Dakota skipper would be impacted by the Project.

Dakota Skipper Critical Habitat

Given that designated critical habitat for the Dakota skipper does not occur within the Project Area, the Project is not anticipated to impact Dakota skipper critical habitat.

Pallid Sturgeon

Given that suitable habitat for the pallid sturgeon is not present within the Project Area, the Project is not anticipated to impact the species or its habitat.

6.17 Summary of Impacts

Please refer to ***Table 18, Summary of Impacts and Mitigation.***

Table 18, Summary of Impacts and Mitigation

Resource Category	Potential Impact	Proposed Mitigation
Demographics	Socioeconomically beneficial to landowners, local governments, and communities: increased income to landowners receiving lease payments and to landowner-investors receiving profits from the sale of electricity, employment opportunities, temporary revenue increases in the vicinity of the Project, temporary increased demand on the labor forces and local housing markets.	No mitigation is proposed.

Resource Category	Potential Impact	Proposed Mitigation
Land Use	Temporary conversion of approximately 534.3 acres and permanent conversion of approximately 45.7 acres of existing land uses into a renewable energy resource; potential impacts on CRP lands and/or USDA-NRCS easements.	Reclamation of temporarily disturbed areas and payments to affected landowners; setback from nonparticipating landowner property; county/township setbacks; coordination regarding CRP lands and/or USDA-NRCS easements ongoing.
Public Services	Potential indirect beneficial impact on local services via increased business associated with the Project's workforce; increased renewable energy generation; construction of new access road; temporary increase in AADT during construction activities; potential impacts on utilities; potential impacts on five television stations.	Mitigation for impacts on utility infrastructure in coordination with utility companies, if necessary; NDOC notification prior to excavation; setback from transmission lines, roadways, and railroads; construction traffic plans, road use and maintenance agreements, and mitigation measures would be developed in coordination with the applicable permitting entities; coordination with the NDDOT would occur with regard to load restrictions on state-maintained roadways, access points, and work within NDDOT ROW; mitigation for television signal disruption, if necessary; avoidance of microwave path Fresnel Zones.
Human Health and Safety	Potential impact on aircraft operations; utilization of a small amount of hazardous materials.	Forms would be filed with the FAA; setback from residences; lighting would be installed on wind turbines; construction would be suspended and coordination with the NDDH would occur if unanticipated hazardous materials are discovered; proper containment of hazardous materials; locked, fenced facilities with appropriate warning signage.
Sound	Sound levels within 100 feet of all occupied residences would be below 50 dBA.	No mitigation is proposed.
Visual	Introduction of additional visual resources creating a more developed visual character, which may reduce visual quality depending on viewer preference; greater than 30 hours of shadow flicker per year at four occupied residences.	No mitigation proposed for visual quality; mitigation to ensure that no residences experience more than 30 hours of expected shadow flicker per year due to the Project.
Cultural and Archaeological	No impacts anticipated.	100-foot buffer with fencing from three unevaluated archaeological stone feature sites;

Resource Category	Potential Impact	Proposed Mitigation
Resources		archaeological monitoring for construction within 100-foot buffer from three unevaluated archaeological stone feature sites and sites discovered during construction; implementation of unanticipated discovery plan.
Recreational Resources	Potential sound and visual impacts for recreationists as described in *Sound* and *Visual*, above.	No mitigation is proposed.
Land Based Economics	Temporary conversion of approximately 45.8 acres and permanent conversion of approximately 534.3 acres of existing land uses into a renewable energy resource, whereby most of the land uses converted are cultivated or grasslands.	Compensation to impacted landowners; reclamation of temporarily disturbed areas.
Soils	Soils disturbed by construction prone to erosion; soil compaction due to operation of heavy equipment; temporary and permanent impacts on soils classified as prime farmland and farmland of statewide importance.	BMPs such as erosion and sediment control, segregating topsoil, reseeding of disturbed areas, use of appropriately sized construction equipment, ensuring access road grades fit closely with the natural terrain, proper on-site disposal of excess soil, and maintaining proper drainage.
Geologic and Groundwater Impacts	Permanent modification of terrain to construct; low-to-moderate potential to impact significant paleontological resources.	No mitigation is proposed.
Surface Water and Floodplain Resources	Potential indirect impacts on water quality due to ground disturbance and use of hazardous materials.	Conditions of the NPDES and SWPPP would minimize the transport of stormwater from construction areas; implementation of a construction and/or operational SPCC plan if over 1,320 gallons of petroleum products would be stored on site.
Wetlands	Potential wetland impacts.	Directional boring under wetlands that cannot be entirely avoided; mitigation for impacts on waters of the U.S. in accordance with Section 404; minimization of indirect water quality impacts as described in *Surface Water and Floodplain Resources*, above.

Resource Category	Potential Impact	Proposed Mitigation
Vegetation	Temporary and permanent conversion cropland, grassland, and woodlands.	Re-vegetation of temporarily disturbed areas; tree replacement.
Wildlife	Potential impacts due to habitat loss and degradation, habitat fragmentation, displacement and behavioral changes, increased predator populations, and/or introduction of invasive vegetation; potential collision of avian and bat species with wind turbines; potential impacts on bat species due to barotrauma.	Habitat avoidance, minimization; mitigation measures as described in *Vegetation*, *Surface Water and Floodplain Resources*, and *Wetlands*, above; implementation of BBCS.
Rare and Unique Natural Resources	NHI: Potential impacts on unknown species and habitats, as described in *Wildlife*, above. ESA: Potential impacts as described in *Wildlife*, above.	NHI and ESA: Mitigation measures as described in *Wildlife*, above.

7.0 Identification of Potential Permits/Approvals

Please refer to ***Table 19, Potential Permits/Approvals***, for a list of potential federal, state, and local permits associated with construction and operation of the Project.

Table 19, Potential Permits/Approvals

Agency	Permit/Approval	Applicability	Status and Timing
FAA	Notice of Proposed Construction or Alteration (Form 7460-1)	Construction or alteration of structures standing higher than 200 feet above ground level. Construction or alteration of structures near airports; 14 CFR 77.13 provides details. Siting within radar line-of-sight of an air defense facility.	A Form 7460-1 Notice of Proposed Construction would be filed prior to construction. Once Project design is finalized, additional Forms 7460-1 would be filed, as necessary.

Agency	Permit/Approval	Applicability	Status and Timing
	Notice of Actual Construction or Alteration (Form 7460-2)	Supplemental notice provided to FAA within five days of structures reaching final height.	Notice would be submitted within five days of turbines reaching final height.
USACE	Section 404 Permit	Required if dredging or filling of jurisdictional waters of the U.S.	To be obtained prior to construction, if necessary.
USEPA	SPCC Plan	Required if petroleum product storage is greater than 1,320 gallons.	SPCC for construction to be completed prior to construction; operational SPCC to be completed before operation, if necessary.
USFWS	Coordination and/or permitting pursuant to ESA Section 10	Non-federal activities affecting resources protected under the ESA.	Coordination ongoing; no permits anticipated.
USDA-NRCS	Farmland Impact Conversion Rating (Form AD-1006) Authorization for wind turbines	Federal non-corridor undertakings that convert of prime or unique farmland. Project features on USDA-NRCS easements.	Submittal of Farmland Impact Conversion Rating (Form AD-1006) not anticipated. Authorization be obtained prior to construction, if necessary.
USDA-FSA	Authorization for wind turbines	Project features on CRP land.	To be obtained prior to construction, if necessary.
ND Public Service Commission	Certificate of Site Compatibility	Construction of energy conversion facility.	To be obtained prior to construction.
NDDH	NDPDES General Permit for Stormwater Discharge Related to Construction (including SWPPP)	Construction activities with disturbances greater than one (1) acre.	To be obtained prior to construction.
	Section 401 Water Quality Certification	Discharge into waters of the U.S.	To be obtained prior to construction, if necessary, unless waived.
NDSWC	Surface Drainage Permit	Draining waterbodies with a with a watershed of 80 acres or more.	Not anticipated at this time.
	Water Permit	Appropriating waters of the state.	To be obtained prior to construction, if necessary.

Agency	Permit/Approval	Applicability	Status and Timing
NDHP	Oversize/Overweight Permit	Oversize or overweight loads on state-maintained roads.	To be obtained prior to construction.
ND State Electrical Board	Electrical Wiring Certificate	Electrical installations.	To be obtained prior to construction.
ND Department of Trust Lands	Wind Energy Easement Agreement	Turbines and associated facilities on Trust Lands. Project facilities in the absence of turbines on Trust Lands.	Not anticipated at this time.
First District Health Unit	Septic System Permit and associated County coordination	Installation of onsite sewage treatment systems in McLean or Ward counties (among others).	To be obtained prior to construction, if necessary.
Ward County (Iota Flats and Greely townships)	Special Use Permit	Land use and structures not provided for in definition of Rural Zone (Zoning District #2).	To be obtained prior to construction.
	Building Permit	Construction and erection of buildings/structures.	To be obtained prior to construction.
Brillian Township (Ward County)	Conditional Use Permit	Utility lines and substations.	To be obtained prior to construction.
NDDOT/ Counties/ Townships	Approach Permits	Installation of approaches.	To be obtained as necessary prior to construction.
	Haul Road Permits	Hauling on roadways.	To be obtained as necessary prior to construction.
	Oversize/Overweight Permits	Oversize or overweight loads.	To be obtained as necessary prior to construction.
	Utility Permits	Utilities along/across roadways.	To be obtained as necessary prior to construction.
	ROW Permits	Work with in roadway ROW.	To be obtained as necessary prior to construction.

8.0 Factors Guiding the Commission

The Siting Act (see NDCC 49-22-09) lists the factors in the following subsections as those that guide the Commission in evaluating applications and designations of sites.

8.1 Available Research and Investigations pertaining to Public Health and Welfare, Natural Resources, and the Environment

Available research and investigation were utilized throughout ***Section 6.0*** to assess the effects of the Project on public health and welfare, natural resources, and the environment. Project-specific research and investigation reports include: Critical Issues Analysis, Site Characterization Study, 2017-2018 Annual Pre-Construction Avian Survey Report, Bat Monitoring Report, Dakota Skipper Habitat Assessment and Survey Report, Grassland Assessment Report, Communication Tower Study, AM and FM Radio Report, Off-Air TV Analysis, Land Mobile & Emergency Services Report, Microwave Study, Obstruction Evaluation & Airspace Analysis, Wetland Mapping Survey, Shadow Flicker Analysis, Sound Study, and Class III Cultural Resource Inventory.

8.2 New Energy Conversion Technologies and Systems

The Project has utilized or will utilize the most current technologies and systems available to site, construct, and operate the Project to optimize wind resources while minimizing potential adverse environmental effects.

8.3 Potential for Beneficial Uses of Waste Energy

The Project is not anticipated to generate waste energy. As such, there would be no use of waste energy, beneficial or otherwise, associated with the Project.

8.4 Unavoidable Adverse Direct and Indirect Environmental Effects

Unavoidable adverse direct and indirect environmental effects are discussed throughout ***Section 6.0***, with a summary of impacts and associated mitigation measures provided in ***Section 6.17***.

8.5 Alternatives to the Proposed Site

Alternatives to the Project are discussed in ***Section 2.2***.

8.6 Irreversible and Irretrievable Commitment of Natural Resources

The Project would result in the irreversible and irretrievable commitment of resources due to utilization of construction materials (e.g., concrete, steel, aggregate) as well as hydrocarbon fuel consumed by construction equipment and vehicles transporting workers and materials to and from the Project Area. Consumption of materials and fuel during operation and maintenance of the Project would be minor. Some of the resources utilized during construction may be reclaimed upon decommissioning of the Project (e.g., steel); however, consumption of most of these resources would be irreversible and irretrievable. The resources that would be utilized are not in short supply and their use would not have an adverse effect on their overall availability. Unlike non-renewable energy sources, wind energy produces electricity without consumption of irretrievable natural resources.

8.7 Direct and Indirect Economic Impacts

Direct and indirect impacts and mitigation associated with demographics and land-based economics are discussed in ***Section 6.1*** and ***Section 6.9***, respectively.

8.8 Existing Development Plans

Known land use plans and considerations applicable to development within and adjacent to the Project Area are discussed in ***Section 6.2***.

8.9 Scenic Areas, Historic Sites and Structures, and Paleontological or Archaeological Sites

The effect of the Project on visual (including scenic areas), cultural and archaeological (including historical sites and structures), and paleontological resources are discussed in ***Section 6.6***, ***Section 6.7***, and ***Section 6.11***, respectively.

8.10 Areas of Unique Biological Wealth or Habitats for Rare and Endangered Species

The effect of the Project on rare and unique natural resources is discussed in ***Section 6.16***.

8.11 Problems Raised by Federal, State and Local Entities

Comments from Federal, State and Local Entities are summarized in ***Section 9.0*** and have been referenced and incorporated throughout this Application where appropriate.

9.0 Agency Comments

On August 24, 2018, a scoping package was distributed, in conjunction with the Ruso Transmission Line Project application, to 32 local, state, and federal agencies pursuant to NDAC 69-06-01-05. This scoping package included information on the Project and a project location map. On August 31 and November 20, 2018, follow-up scoping packages were distributed that provided revised study areas. To date, 12 agencies have provided responses. These comments, which are summarized below, have been referenced and incorporated where appropriate within the document. Please refer to ***Appendix C, Scoping Package and Responses,*** for the scoping letters, mailing list, and responses.

9.1 U.S. Department of Defense – Minot Air Force Base

In an email dated September 10, 2018, Minot Air Force Base identified some concerns regarding turbines being within 1,200 feet of launch facilities, as shown in a preliminary layout. They also identified concerns with turbine locations regarding the hardened intersite cable system cables. The Air Force Base suggested the project be submitted to the Department of Defense Clearing House.

In an email dated September 13, 2018, Minot Air Force Base noted assets within the study area. Requirements for pertaining to the Ruso Wind Transmission Project were also provided.

In an email dated December 20, 2018, upon receipt of the project layout, Minot Air Force Base reiterated previous comments and indicated that a few access roads and collector line crossings would need to be modified.

9.2 U.S. Department of Defense – Army Corps of Engineers, North Dakota Regulatory Office

In a letter dated September 13, 2018, the USACE noted that if the Project results in the discharge of dredged or fill materials into waters of the U.S. (Section 404 Clean Water Act), a Section 404 permit would need to be acquired from the North Dakota Regulatory Office. If applicable, utility lines are authorized under Nationwide Permit 12 provided the utility line can be placed without any change to pre-construction contours and all other proposed construction activities and facilities are in compliance with the Nationwide's permit conditions and 401 Water Quality Certification.

9.3 U.S. Department of the Interior – U.S. Fish and Wildlife Service, Audubon National Wildlife Refuge Complex

In an email dated November 27, 2018, a request was made from the Audubon National Wildlife Refuge to send a shapefile for the new study area. A follow-up email indicated there are no additional USFWS easements associated with the new boundary and they would like to work with the applicant early in the siting process to avoid impacts on easements.

9.4 U.S. Department of Commerce – National Telecommunications and Information Administration

In a letter dated December 11, 2018, the NTIA indicated that they provided Project information to federal agencies represented by the Interdependent Radio Advisory Committee, whereby the USDOE identified concerns. The USDOE concern pertained to potential impacts on Western Area Power Administration operations and recommended further coordination. The NTIA also indicated that, while no radio frequency blockage concerns were identified, other requirements specified by law would also need to be met (e.g., FAA flight obstruction).

9.5 North Dakota Aeronautics Commission

The North Dakota Aeronautics Commission provided feedback on a preliminary study area via an email dated August 27, 2018. The North Dakota Aeronautics Commission identified four potential private use airstrips within or close proximity of the projects' boundary and recommended contacting the landowners of these private airstrips. Additional coordination found that one of the private airstrips is no longer registered. The North Dakota Aeronautics Commission also recommended submitting FAA Form 7460-1s for the Project.

A follow-up email, dated September 5, 2018, indicated the North Dakota Aeronautics Commission had no additional comments regarding the revised study area.

9.6 North Dakota Department of Health

In letters dated September 6, 2018, and December 4, 2018, the NDDH stated that they believed the environmental impacts from the proposed construction would be minor and can be controlled by proper construction methods. These methods included minimizing adverse effects to water bodies and obtaining an NDPDES permit. A portion of the study area overlies a sensitive groundwater area and care should be taken to avoid spills of any

materials. Included in the letter were the NDDH's construction and environmental disturbance requirements. The NDDH further stated that it owns no land in or adjacent to the study area and that the Project is consistent with the State Implementation Plan for the Control of Air Pollution for the State of North Dakota.

9.7 North Dakota Department of Transportation

In letters dated September 10, 2018, and November 26, 2018, the NDDOT indicated load restrictions on ND highways may need to be extended to mid-May or June. The NDDOT would like to discuss how RWP plans to move the loads to the study area. The NDDOT suggested use of ND Highway 41 from the north but mentioned that ND Highway 53 east and west and ND Highway 41 to the south are not options for continuous loads any time of the year. Additionally, the NDDOT is concerned about access points and returning them to NDDOT original configuration when the project is complete. If any work is needed on highway ROW, appropriate permits and risk management documents would be needed from the District Engineer.

9.8 North Dakota Department of Trust Lands

In letters dated August 29, 2018, September 5, 2018 and November 28, 2018, the NDDTL indicated there are surface interest tracts located within and adjacent to the study area. Should any of these areas be included in the project, separate ROW applications would need to be submitted for the applicable facilities.

The NDDTL also advised that any surface interest tracts within the study area would need to be evaluated for inclusion in the Project. Any proposed wind tower locations and associated collection lines and access roads would be subject to review and approval. Prior to considering Wind Energy Easement Agreements, an onsite inspection with NDDTL would be required.

9.9 North Dakota Game and Fish Department

In a letter dated September 25, 2018, the NDGFD indicated there is still a notable amount of undisturbed native prairie and wetlands within the study area. The NDGFD has emphasized the importance of careful placement of facilities to address the increase in disturbance, fragmentation, and loss of the remaining high value habitats essential for the state's SPC. Several species-specific concerns were noted, including;

- Sharp-tailed grouse are a high valued upland game bird, and because research indicated that prairie grouse may be adversely affect by energy development, careful consideration of turbine placement around active leks is imperative;

- Acoustic surveys for bats should begin one to two years pre-construction to assess the risk the project poses to local bat populations,

- The project falls within the 75 percent core migration corridor and the risk of whooping cranes striking a turbine or transmission line would be elevated in this area. Contact the USFWS Habitat and Population Evaluation Team (HAPET) in Bismarck to request the whooping crane model of predicted use of landscapes;

- Breeding ducks are territorial; as such, they won't reliably find a breeding territory that is as suitable as that found in the proposed study area, and other surrounding areas would likely not be able to support additional breeding pairs. Contact HAPET office to request the Decision Support Tool to better analyze the risk and impacts of the project to waterfowl;

- It is necessary to conduct searches for raptor nests during the breeding season to understand the risk associated with development.

In a letter dated December 20, 2018, the NDGFD reiterated comments from their September letter and recommended quantifying direct impacts due to turbine, road, and associated infrastructure placement and the indirect impacts due to displacement and avoidance. The NDGFD noted that any amount of native habitat that is disturbed, whether temporary or permanent, is a direct impact and should be quantified as such. To assess indirect impacts, the best available science conducted in North Dakota on avoidance and displacement due to wind development can be found in Loesch et al. 2013 and Shaffer and Buhl 2016. By using the parameters in these studies, RWP can estimate impacts for both grassland birds and breeding ducks, indicator species that reflect the use of habitats for a variety of other species.

9.10 North Dakota Geological Survey

In an email dated September 11, 2018, the NDGS identified the study area being located on the Missouri Coteau in kettle moraine. The study area is generally free of landslides, except along the eastern edge of the study area along the Ward-McHenry County line where a few localized slide areas were mapped along drainage features.

9.11 North Dakota Industrial Commission – Oil and Gas Division

In an email dated September 10, 2018, the NDIC – Oil and Gas Division identified three oil and gas wells within the study area that have been plugged and abandoned. No producing oil or gas wells currently exist within the study area.

9.12 North Dakota State Water Commission

In a letter dated September 13, 2018, the NDSWC noted that the Project does not require a conditional or temporary permit for water appropriation; however, if surface water or groundwater would be diverted for construction, a water permit would be required. The Project is located in an identified floodplain and the NDSWC indicated that coordination with local floodplain administrators should occur. Furthermore, the NDSWC recommended obtaining water well and dam location information within the study area.

A follow-up letter, dated December 12, 2018, indicated the NDSWC had no additional comments regarding the revised study area.

9.13 State Historical Society of North Dakota

In letters dated August 28, 2018, September 5, 2018, and November 30, 2018, the SHSND recommended that a Class I Cultural Resource Inventory and a Class III architectural and archaeological survey be completed for the Project.

10.0 Qualifications of Contributors to Siting Study

Ashley Ross

Ashley is an environmental planner with KLJ that holds a B.S. in Natural Resources Management from Dickinson State University. She has 10 years of experience in conservation and environmental planning which has allowed her to work in coordination with private landowners and entities, local, state, federal and tribal agencies. Ashley has experience in identifying and completing impact assessments, public and agency coordination, permitting, and biological and botanical surveys. She has authored numerous technical reports including National Environmental Policy Act (NEPA) documents such as Environmental Assessments, Categorical Exclusions and Environmental Impact Statements. Ashley has extensive experience with the renewable and non-renewable fields.

Mikayla Boche

Mikayla is an environmental planner with KLJ and Certified Professional Wetland Delineator (Minnesota Wetland Delineator Certification Program) with more than six years of natural resources experience ranging from field data collection to obtaining final approvals. She has completed NEPA documentation, agency coordination, public involvement, wetland delineation, biological/botanical reporting, and permitting for a multitude of projects. This experience has included extensive coordination with and on behalf of various federal, state, local and private entities across Minnesota, North Dakota, and South Dakota. She holds a B.A. in Anthropology with minors in Biology and Astronomy from Minnesota State University Moorhead and M.S. in Natural Resources Management from North Dakota State University.

Jeff Price

Jeff is a GIS Analyst with KLJ with more than 18 years of experience. He received his B.S. in Geography from the University of North Dakota in 1993. He is responsible for GIS analysis, impact quantification and map production for a variety of clients. Jeff is also responsible for maintaining and updating geodatabases and other GIS raster and vector datasets used companywide.

Alex Bowker

Alex is an Engineering Analyst in Siting and Corporate Real Estate for Southern Power Company. She has two years of experience. She obtained a Bachelor of Social Work from University of Alabama in May 2013. Alex holds a Juris Doctor from Cumberland School of Law and is admitted to the Alabama State Bar.

Morgan Berry

Morgan is a Project Manager for Southern Power Company. He has 18 years of experience and is a certified Professional Engineer in Alabama (#30020). Morgan obtained a Bachelor of Chemical Engineering degree (Environmental Specialization) from Auburn University in 2001.

Haile Henry

Haile is a Project Manager for Southern Power Company. He has 13 years of experience. Haile obtained a Bachelor of Civil Engineering from Rutgers University in 2001, Masters in Project Management from Villanova University in 2008, and Masters of Business from University of Massachusetts in 2011.

11.0 References

American Wind Wildlife Institute. 2018. Wind Turbine Interactions with Wildlife and Their Habitats: A Summary of Research Results and Priority Questions. Accessed online September 13, 2018. Retrieved from https://www.nationalwind.org/publications/

Beaver Creek Archaeology. 2018. Class III Cultural Resource Inventory – Ruso Wind Project.

Bluemle, J. P. 1971. Geology of McLean County, North Dakota. Accessed online September 6, 2018. Retrieved from https://www.dmr.nd.gov/ndgs/Publication_List/bulletin.asp

Bluemle, J. P. 1989. Geology of Renville and Ward Counties, North Dakota. Accessed online September 6, 2018. Retrieved from https://www.dmr.nd.gov/ndgs/Publication_List/bulletin.asp

Brillian Township. 1993. Brillian Township Zoning Ordinance. Accessed online August 29, 2018. Retrieved from https://www.co.ward.nd.us/494/Township-Zoning-Ordinances

Bryce, S. A., J. M. Omernik, D. E. Pater, M. Ulmer, J. Schaar, J. Freeouf R. Johnson, P. Kuck, and S. H. Azevedo. Undated. Level IV Ecoregions of North Dakota and South Dakota. Accessed online September 11, 2018. Retrieved from https://www.epa.gov/eco-research/ecoregions

Bureau of Land Management. 2015. Official Bureau of Land Management Potential Fossil Yield Classification for the geologic formations of Montana, North Dakota, and South Dakota.

Bureau of Land Management. 2016. Potential Fossil Yield Classification System. Accessed online September 19, 2018. Retrieved from https://www.blm.gov/policy/im-2016-124

Burns & McDonnell Engineering Company. 2018a. Shadow Flicker Analysis – Ruso Wind Project.

Burns & McDonnell Engineering Company. 2018b. Sound Study– Ruso Wind Project.

Comsearch. 2018a. Communication Tower Study – Ruso Wind Project.

Comsearch. 2018b. AM and FM Radio Report – Ruso Wind Project.

Comsearch. 2018c. Off-Air TV Analysis – Ruso Wind Project.

Comsearch. 2018d. Land Mobile & Emergency Services Report – Ruso Wind Project.

Comsearch. 2018e. Microwave Study – Ruso Wind Project.

Capitol Airspace Group. 2018. Obstruction Evaluation & Airspace Analysis – Ruso Wind Project.

Duttenhefner, K. 2018. Personal communication with Ms. Kathy Duttenhefner, Natural Resources Management Coordinator, Planning and Natural Resources Division, North Dakota Parks and Recreation Department.

Dyke, S. R., S. K. Johnson, and P. T. Isakson. 2015. North Dakota State Wildlife Action Plan. Accessed online September 12, 2018. Retrieved from https://gf.nd.gov/wildlife/swap

eBird. 2018. Range Map – Red Knot. Accessed online September 13, 2018. Retrieved from https://ebird.org/map/

Federal Aviation Administration. 2018. Billings Sectional Aeronautical Chart. Accessed online September 5, 2018. Retrieved from https://www.faa.gov/air_traffic/flight_info/aeronav/

Federal Emergency Management Agency. 2002. Flood Insurance Rate Map - Map Index for Ward County, North Dakota and Incorporated Areas. Accessed online September 11, 2018. Retrieved from https://msc.fema.gov/portal/home

Federal Emergency Management Agency. 2011a. Flood Insurance Rate Map - Map Index for McLean County, North Dakota and Incorporated Areas. Accessed online September 11, 2018. Retrieved from https://msc.fema.gov/portal/home

French & Associates, Ltd. 1998. Managing Floodplain Development Through the National Flood Insurance Program. Accessed online September 11, 2018. Retrieved from https://www.fema.gov/media-library/assets/documents/6029

Fortin, P., K. Rideout, R. Copes, and C. Bos. 2013. Wind Turbines and Health. Accessed online September 5, 2018. Retrieved from http://www.ncceh.ca/sites/default/files/Wind_Turbines_Feb_2013.pdf

Gillam, E. and P. Barnhart. 2012. Distribution and Habitat Use of the Bats of North Dakota. Accessed online September 13, 2018. Retrieved from https://gf.nd.gov/publications/543

Google. 2018. Google Maps. Accessed online August 31, 2018. Retrieved from https://www.google.com/maps/

HDR. 2018. 2018 Dakota Skipper (*Hesperia dakotae*) Habitat Assessment and Survey Report – Ruso Wind Energy Project.

Isakson, P. 2018. Personal communication with Mr. Patrick Isakson, Conservation Biologist, North Dakota Game and Fish Department.

Johnsgard, P.A. 2012. Wings over the Great Plains: Bird Migrations in the Central Flyway. Zea E-Books. Accessed online September 11, 2018. Retrieved from http://digitalcommons.unl.edu/zeabook/13

Johnson, J. 2018. Personal communication with Ms. Jessica Johnson, Environmental Contaminants Specialist, U.S. Fish and Wildlife Service.

KLJ. 2012. Power Forecast 2012: Williston Basin Oil and Gas Related Electrical Load Growth Forecast.

Korgel, L.D. 2018. Personal communication with Ms. Leslie Korgel, Auditor, McLean County.

Larson, S. 2018. Personal communication with Mr. Scott Larson, North and South Dakota Field Supervisor, Ecological Services, U.S. Fish and Wildlife Service.

Lazard. 2017. Levelized Cost of Energy Analysis Version 11.0. November 2017. Accessed online November 9, 2018. Retrieved from https://www.lazard.com/media/450337/lazard-levelized-cost-of-energy-version-110.pdf.

Lewis, T.E. and R.D. Slack. 2008. Whooping Cranes and Human Disturbance: An Historical Perspective and Literature Review. North American Crane Workshop Proceedings. Paper 182. Accessed online September 13, 2018. Retrieved from http://digitalcommons.unl.edu/nacwgproc/182

McLean County. 2013. Revised McLean County Zoning Ordinance. Accessed online August 29, 2018. Retrieved from https://www.mcleancountynd.gov/departments/planning-zoning/

McLean County. 2018. GIS Parcel Mapping. Accessed online August 29, 2018. Retrieved from https://portico.mygisonline.com/html5/?viewer=mcleannd.bv1-p1

National Park Service. 2017. Mapping Sound. Accessed online September 5, 2018. Retrieved from https://www.nps.gov/subjects/sound/soundmap.htm

North Dakota Department of Agriculture. 2017. North Dakota County and City Listed Noxious Weeds. Accessed online December 3, 2018. Retrieved from https://www.nd.gov/ndda/plant-industries/noxious-weeds

North Dakota Department of Agriculture. 2018. Noxious Weeds. Accessed online December 3, 2018. Retrieved from https://www.nd.gov/ndda/plant-industries/noxious-weeds

North Dakota Department of Commerce. Undated. EmPower North Dakota; Comprehensive State Energy Policy 2010-2025. Accessed online December 13, 2018. Retrieved from https://commerce.nd.gov/

North Dakota Department of Health. 2018a. UST Facility List. Accessed online September 5, 2018. Retrieved from https://deq.nd.gov/WM/UndergroundStorageTankProgram/

North Dakota Department of Health. 2018b. All Solid Waste Facilities. Accessed online September 5, 2018. Retrieved from https://deq.nd.gov/WM/Publications.aspx

North Dakota Department of Health. 2018c. Environmental Incident Reports. Accessed online September 5, 2018. Retrieved from https://deq.nd.gov/WQ/4_Spill_Investigations/Reports.aspx

North Dakota Department of Transportation. 2016. Traffic Volume Map for the State of North Dakota. Accessed online August 31, 2018. Retrieved from https://www.dot.nd.gov/business/maps-portal.htm

North Dakota Game and Fish Department. 2018a. Species Identification. Accessed online September 12, 2018. Retrieved from https://gf.nd.gov/wildlife/id

North Dakota Game and Fish Department. 2018b. Velva Sportsmans Pond. Accessed online September 25, 2018. Retrieved from https://gf.nd.gov/gnf/maps/fishing/lakecontours/velvasportsmans2003.pdf

North Dakota Geological Survey. 2018. Areas of Landslides – Blacktail Coulee, Ruso, Benedict, SW Benedict, NW Benedict, and Robinson Coulee Quadrangles, North Dakota. Accessed online December 10, 2018. Retrieved from https://www.dmr.nd.gov/ndgs/landslides/

North Dakota Industrial Commission. 2018. Oil and Gas: ArcIMS Viewer. Accessed online September 6, 2018. Retrieved from https://www.dmr.nd.gov/OaGIMS/viewer.htm

North Dakota Parks and Recreation Department. 2018a. North Dakota's natural heritage. Accessed online September 13, 2018. Retrieved from http://www.parkrec.nd.gov/nature/heritage.html

North Dakota Parks and Recreation Department. 2018b. North Dakota Natural Heritage biological and conservation database digital data.

North Dakota State Water Commission. 2018. North Dakota State Water Commission Mapservice. Accessed online September 4, 2018. Retrieved from http://mapservice.swc.nd.gov/

Simpson, N. 2018. Personal communication with Ms. Nancy Simpson, Planning & Zoning Administrator, Ward County.

Stanton, T. 2012. Wind Energy & Wind Park Siting and Zoning Best Practices and Guidance for States. Accessed online September 19, 2018. Retrieved from https://pubs.naruc.org/resources/library/index.cfm

Tucker, S. 2018. Personal communication with Ms. Stephanie Tucker, Game Management Section, Section Leader and Furbearer Biologist, North Dakota Game and Fish Department.

U.S. Army Corps of Engineers. 2017. Missouri River Recovery Least Tern and Piping Plover Data Management System. Accessed online March 21, 2017. Retrieved from https://rsgisias.crrel.usace.army.mil/intro/dms.dmsintro.main

U.S. Census Bureau. 2018. 2012-2016 American Community Survey. Accessed online August 29, 2018. Retrieved from https://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml

U.S. Department of Agriculture. 2006. Farmland Protection Policy Act Manual. Accessed online September 6, 2018. Retrieved from https://directives.sc.egov.usda.gov/

U.S. Department of Agriculture. 2012. Census of Agriculture County Profiles. Accessed online September 5, 2018. Retrieved from https://www.agcensus.usda.gov/Publications/2012/

U.S. Department of Agriculture. 2017. 2017 North Dakota Cropland Data Layer. Accessed online July 27, 2018. Retrieved from http://nassgeodata.gmu.edu/CropScape/ND

U.S. Department of Agriculture. 2018. Web Soil Survey. Accessed online September 6, 2018. Retrieved from https://websoilsurvey.sc.egov.usda.gov/

U.S. Department of Energy. 2018. 2017 Wind Technologies Market Report. Accessed online December 13, 2018. Retrieved from https://www.energy.gov/eere/wind/downloads/2017-wind-technologies-market-report

U.S. Environmental Protection Agency. 2018a. Interactive Map of Sole Source Aquifers. Accessed online September 4, 2018. Retrieved from https://www.epa.gov/dwssa

U.S. Environmental Protection Agency. 2018b. NEPAssist. Accessed online September 5, 2018. Retrieved from https://nepassisttool.epa.gov/nepassist/nepamap.aspx

U.S. Environmental Protection Agency. 2018c. Prairie Potholes. Accessed online September 7, 2018. Retrieved from https://www.epa.gov/wetlands/prairie-potholes

U.S. Fish and Wildlife Service. 1988. Lakes & Northern Great Plains Piping Plover Recovery Plan. Accessed online September 13, 2018. Retrieved from http://ecos.fws.gov/docs/recovery_plan/880512.pdf

U.S. Fish and Wildlife Service. 1990. Interior Population of the Least Tern Recovery Plan. Accessed online September 13, 2018. Retrieved from http://ecos.fws.gov/docs/recovery_plan/900919a.pdf

U.S. Fish and Wildlife Service. 2002a. Designation of Critical Habitat for the Northern Great Plains Breeding Population of the Piping Plover; Final Rule. Accessed online September 13, 2018. Retrieved from http://ecos.fws.gov

U.S. Fish and Wildlife Service. 2002b. Piping Plover Critical Habitat. Accessed online September 13, 2018. Retrieved from https://www.fws.gov/mountain-prairie/es/northDakota/species/piping_plover.php

U.S. Fish and Wildlife Service. 2002c. Current Dakota Skipper Range. Accessed online September 14, 2018. Retrieved from http://www.fws.gov/northdakotafieldoffice/gis/gis_dkskip.htm

U.S. Fish and Wildlife Service. 2009. Whooping crane migration shapefiles 1955 to 2009.

U.S. Fish and Wildlife Service. 2012a. USFWS Land-based Wind Energy Guidelines. Accessed online September 12, 2018. Retrieved from https://www.fws.gov/ecological-services/energy-development/wind.html

U.S. Fish and Wildlife Service. 2012b. Whooping Crane (*Grus americana*) 5-Year Review: Summary and Evaluation. Accessed online September 13, 2018. Retrieved from http://www.fws.gov/southwest/es/Documents/R2ES/Whooping_Crane_5-yr_Review_Feb2012.pdf

U.S. Fish and Wildlife Service. 2013a. Gray Wolf (*Canis lupus*). Accessed online April 7, 2016. Retrieved from http://www.fws.gov/northdakotafieldoffice/endspecies/species/gray_wolf.htm

U.S. Fish and Wildlife Service. 2013b. Least Tern (*Sterna antillarum*). Accessed online April 25, 2016. Retrieved from http://www.fws.gov/northdakotafieldoffice/endspecies/species/least_tern.htm

U.S. Fish and Wildlife Service. 2013c. Northern long-eared bat (*Myotis septentrionalis*). Accessed online September 13, 2018. Retrieved from https://www.fws.gov/Midwest/Endangered/mammals/nleb/nlebFactSheet.html

U.S. Fish and Wildlife Service. 2013d. Whooping Crane (*Grus americana*). Accessed online September 13, 2018. Retrieved from http://www.fws.gov/northdakotafieldoffice/endspecies/species/whooping_crane.htm

U.S. Fish and Wildlife Service. 2014a. Northern Long-Eared Bat Interim Conference and Planning Guidance. Accessed online September 13, 2018. Retrieved from https://www.fws.gov/midwest/endangered/mammals/nleb/archives.html

U.S. Fish and Wildlife Service. 2014b. Rufa Red Knot Background Information and Threats Assessment. Supplement to Endangered and Threatened Wildlife and Plants; Final Threatened Status for the Rufa Red Knot (*Calidris canutus rufa*). Accessed online September 13, 2018. Retrieved from www.regulations.gov

U.S. Fish and Wildlife Service. 2014c. Revised Recovery Plan for the Pallid Sturgeon (*Scaphirhynchus albus*). Accessed online September 13, 2018. Retrieved from https://www.fws.gov/mountain-prairie/es/pallidSturgeon.php

U.S. Fish and Wildlife Service. 2014d. Dakota skipper (*Hesperia dacotae*). Accessed online April 26, 2016. Retrieved from http://www.fws.gov/northdakotafieldoffice/endspecies/species/dakota_skipper.html

U.S. Fish and Wildlife Service. 2014e. Dakota skipper (*Hesperia dacotae*). Accessed online September 14, 2018. Retrieved from http://www.fws.gov/midwest/endangered/insects/dask/daskFactSheet.html

U.S. Fish and Wildlife Service. 2015a. Fact Sheet: Pallid Sturgeon (Scaphiryhynchus albus). Accessed online April 7, 2016. Retrieved from http://www.fws.gov/midwest/endangered/fishes/PallidSturgeon/palld_fc.html

U.S. Fish and Wildlife Service. 2015b. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Dakota Skipper and Poweshiek Skipperling; Final Rule. 80 Federal Register: 59248-59384. Accessed online September 14, 2018. Retrieved from: https://www.federalregister.gov/

U.S. Fish and Wildlife Service. 2016a. Endangered and threatened wildlife and plants; 4(d) rule for the northern long-eared bat. 81 Federal Register: 1900-1922. Accessed online September 13, 2018. Retrieved from: https://www.federalregister.gov/

U.S. Fish and Wildlife Service. 2016b. Species Profile for Whooping crane (*Grus americana*). Accessed online April 25, 2016. Retrieved from http://ecos.fws.gov/

U.S. Fish and Wildlife Service. 2016c. Piping Plover. Accessed online April 25, 2016. Retrieved from http://www.fws.gov/mountain-prairie/species/birds/pipingplover/

U.S. Fish and Wildlife Service. 2018a. Birds of Conservation Concern. Accessed online September 12, 2018. Retrieved from https://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php

U.S. Fish and Wildlife Service. 2018b. Northern Long-eared Bat Final 4(d) Rule – White-nose Syndrome Zone around WNS/Pd Positive Counties/Districts. Accessed online September 13, 2018. Retrieved from https://www.fws.gov/midwest/endangered/mammals/nleb/

U.S. Fish and Wildlife Service. 2018c. Species Profile for Dakota Skipper (*Hesperia dacotae*). Accessed online September 14, 2018. Retrieved from https://ecos.fws.gov

U.S. Fish and Wildlife Service. 2018d. Whooping Crane Migration Habitat in North Dakota – Southern Power Proposed Wind Project Area.

U.S. Geological Survey and Canadian Wildlife Service. 2018. North American Breeding Bird Survey. Accessed online September 11, 2018. Retrieved from https://www.pwrc.usgs.gov/

Ward County. 2018. Area Maps. Accessed online August 29, 2018. Retrieved from http://www.co.ward.nd.us/372/Area-Maps

Western EcoSystems Technology, Inc. 2018a. Grassland Assessment – Ruso Wind Project.

Western EcoSystems Technology, Inc. 2018b. Wetland Mapping Survey – Ruso Wind Project.

Westwood Professional Services. 2018. 2017-2018 Annual Pre-Construction Avian Survey Report – Ruso Wind Project.

World Health Organization. Undated. What are electromagnetic fields? Accessed online September 5, 2018. Retrieved from http://www.who.int/peh-emf/about/WhatisEMF/en/

Zotz Ecological Solutions. 2017. Bat Monitoring at the Proposed Ruso Wind Energy Project.

12.0 Acronyms, Abbreviations and Definitions

A-weighted decibel (dBA)

Above ground level (AGL)

Above mean sea level (AMSL)

Advisory Circular (AC)

American National Standards Institute (ANSI)

American Wind Energy Association (AWEA)

American Wind Wildlife Institute (AWWI)

Area of potential effect (APE)

Average annual daily traffic (AADT)

Balance of plant (BOP)

Bald and Golden Eagle Protection Act (BGEPA)

Best Management Practices (BMPs)

Bird and Bat Conservation Strategy (BBCS)

Birds of Conservation Concern (BCC)

Bureau of Land Management (BLM)

Canadian Wildlife Service (CWS)

Clean Water Act (CWA)

Conservation Reserve Program (CRP)

Development Services Agreement (DSA)

Electromagnetic field (EMF)

Endangered Species Act (ESA)

Engineering, procurement, and construction (EPC)

Farm Service Agency (FSA)

Federal Aviation Administration (FAA)

Federal Emergency Management Agency (FEMA)

Floodplain Insurance Rate Maps (FIRMs)

Gigawatt hours per year (GWh/y)

Habitat and Population Evaluation Team (HAPET)

Kilovolt (kV)

Megawatt (MW)

Meteorological evaluation tower (MET)

Meters per second (mps)

Migratory Bird Treaty Act (MBTA)

Modern-Era Retrospective for Research and Applications (MERRA-2)

National Aeronautics and Space Administration (NASA)

National Electric Safety Code (NESC)

National Electrical Code (NEC)

National Register of Historic Places (NRHP)

National Telecommunications and Information Administration (NTIA)

National Wetland Inventory (NWI)

National Wildlife Refuge (NWR)

Natural Heritage Inventory (NHI)

Natural Resources Conservation Service (NRCS)

North Dakota Administrative Code (NDAC)

North Dakota Century Code (NDCC)

North Dakota Department of Agriculture (NDDA)

North Dakota Department of Health (NDDH)

North Dakota Department of Transportation (NDDOT)

North Dakota Department of Trust Lands (NDDTL)

North Dakota Game and Fish Department (NDGFD)

North Dakota Geological Survey (NDGS)

North Dakota Highway Patrol (NDHP)

North Dakota Industrial Commission (NDIC)

North Dakota One Call (NDOC)

North Dakota Parks and Recreation Department (NDPRD)

North Dakota Pollutant Discharge Elimination System (NDPDES)

North Dakota State Water Commission (NDSWC)

Not applicable (NA)

Operation and maintenance (O&M)

Private Land Opened to Sportsman (PLOTS)

Power purchase agreement (PPA)

Ruso Wind Partners, LLC (RWP)

Sonic Detection And Ranging (SoDAR)

Species of conservation priority (SCP)

Species of habitat fragmentation concern (SHFC)

Spill Prevention, Control, and Countermeasure (SPCC)

State Historical Society of North Dakota (SHSND)

Storm water pollution prevention plan (SWPPP)

Supervisory Control and Data Acquisition (SCADA)

Underground storage tank (UST)

U.S. Army Corps of Engineers (USACE)

U.S. Department of Agriculture (USDA)

U.S. Department of Defense (USDOD)

U.S. Department of Energy (USDOE)

U.S. Environmental Protection Agency (USEPA)

U.S. Geological Survey (USGS)

Waterfowl Production Area (WPA)

Wildlife Management Area (WMA)

Appendix A. Exhibits

R83W R82W R81W R80W R79W

T152N T151N T150N

Ward County

McHenry County

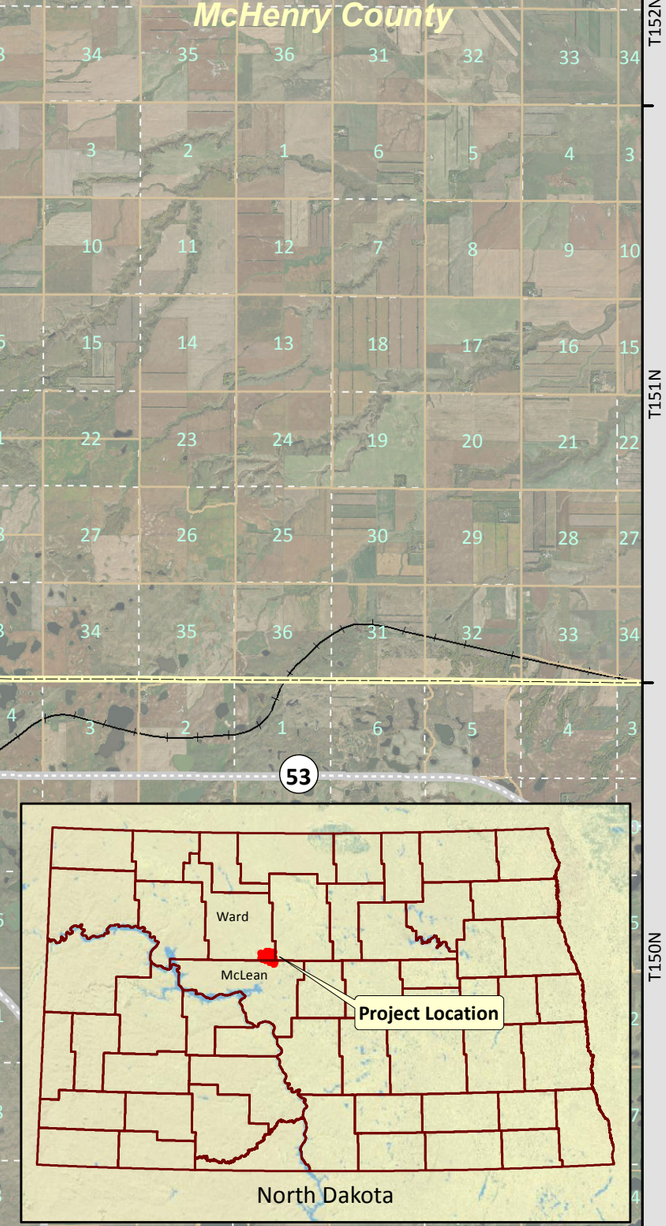
McLean County

Benedict

Max

Ruso

83 41 53 53



KLJ

Southern Power

0 0.5 1 2 Miles

N W E S

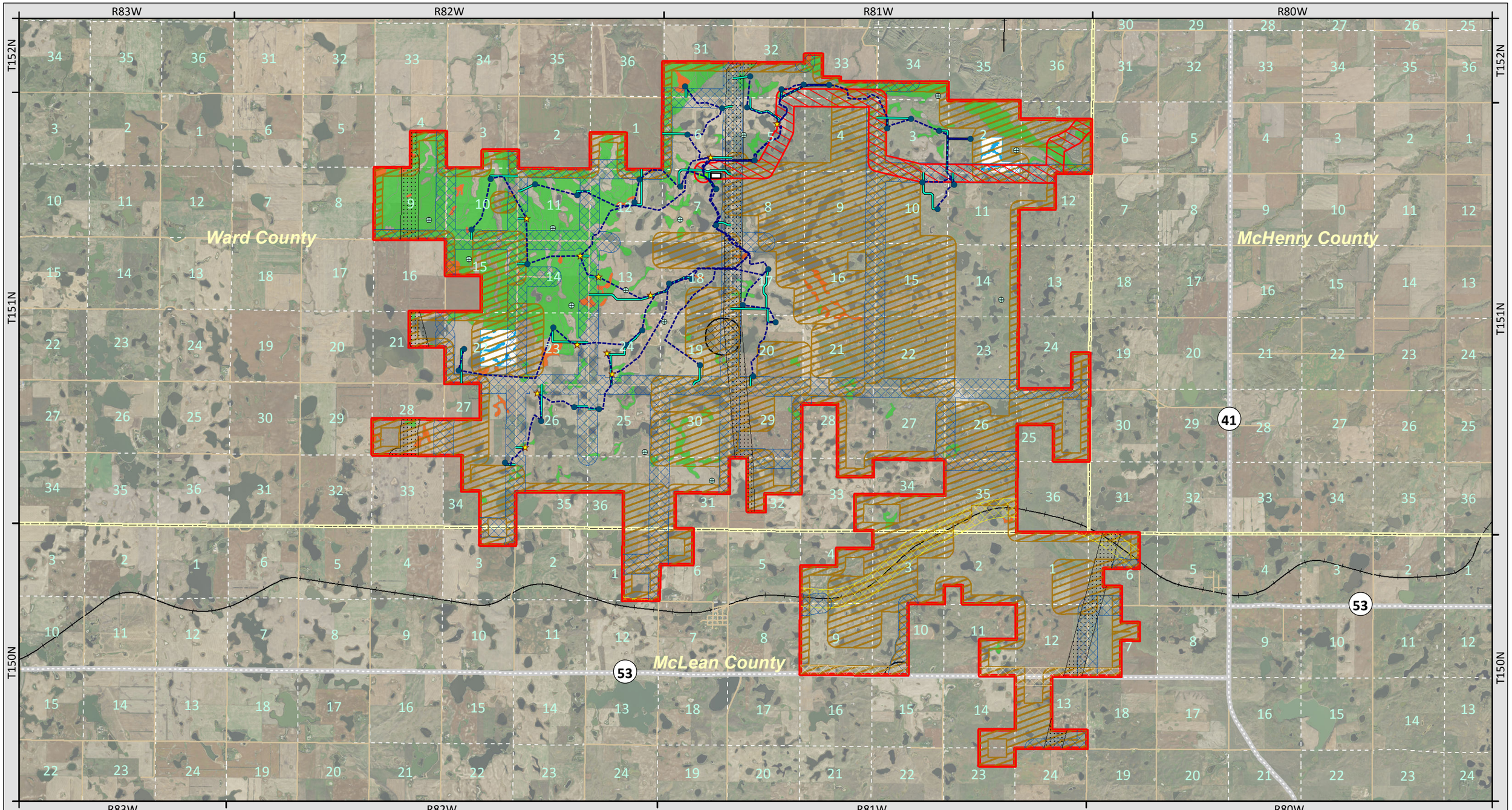
KLJ Project Number: 1809-00886	
Date Created: 12/20/2018	Created By: JDP

Exhibit 1: Project Location Map
Ruso Wind Project

Counties of Ward & McLean, ND

Project Area
State Highway
US Highway
Railroads
Sections
County Boundary

Document Location: \\bsmk-files01\P\Power\Southern Power\1809-00886\GIS\1809_00886_Exh1_Project_Location.mxd



KLJ

Southern Power

0 0.5 1 2 Miles

KLJ Project Number: 1809-00886	
Date Created: 12/21/2018	Created By: JDP

Exhibit 2: Exclusion Areas
Ruso Wind Project

Counties of Ward & McLean, ND

- Project Area
- State Highway
- County/City Roads
- Sections
- County Boundary

Exclusion Areas
- ICBM Facility Area
- Electric Transmission Line

Exclusion Areas (continued)
- County/Township Road
- State Highway
- Railroad
- USFWS WPA
- Non-Participating Landowner
- All areas are prime farmland
- Prime farmland if drained
- Proposed Ruso Wind Transmission Project

- Primary Turbine-Siemens SG 4.2-145 (Layout 21)
- Primary Turbine-Siemens SWT 2.415-108 (Layout 21)
- Alternate Turbine (Layout 21)
- Collector Line
- Access Roads
- O&M Facility
- Substation

Document Location: \\bsmk-files01\P\Power\Southern Power\1809-00886\GIS\1809_00886_Exh2_ExclusionAreas.mxd

R83W R82W R81W R80W

T152N T151N T150N

Ward County

McHenry County

McLean County

Due to the sensitive nature of cultural resources,
cultural resource avoidance areas are not identified in this exhibit

KLJ Southern Power

0 0.5 1 2 Miles

N W E S

KLJ Project Number: 1809-00886	
Date Created: 12/21/2018	Created By: JDP

Exhibit 3: Avoidance Areas
Ruso Wind Project

Counties of Ward & McLean, ND

- Project Area
- Sections
- County Boundary

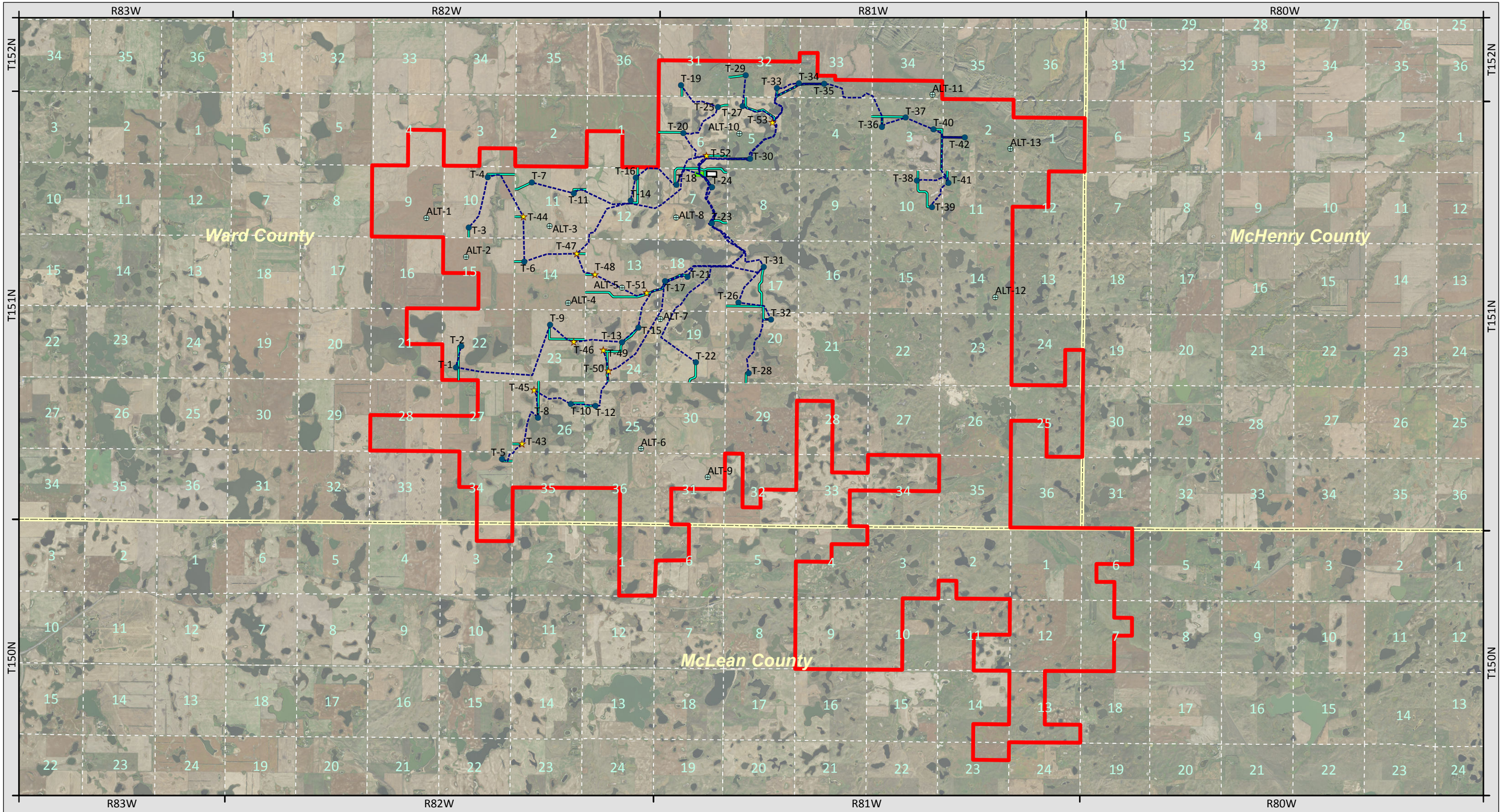
Avoidance Areas
- Historic Landslide
- Military Installation
- USFWS NWI

Avoidance Areas (continued)
- Woodlands

Field Assessed Wetlands
- Freshwater Emergent Wetland

- Primary Turbine-Siemens SG 4.2-145 (Layout 21)
- Primary Turbine-Siemens SWT 2.415-108 (Layout 21)
- Alternate Turbine (Layout 21)
- Collector Line
- Access Roads
- O&M Facility
- Substation

Document Location: \\bsmk-files01\P\Power\Southern Power\1809-00886\GIS\1809_00886_Exh3_AvoidanceAreas.mxd



KLJ

Southern Power

0 0.5 1 2 Miles

N W E S

KLJ Project Number: 1809-00886	
Date Created: 12/21/2018	Created By: JDP

Exhibit 4: Facilities Layout
Ruso Wind Project

Counties of Ward & McLean, ND

- Project Area
- Sections
- County Boundary
- Primary Turbine-Siemens SG 4.2-145 (Layout 21)
- Primary Turbine-Siemens SWT 2.415-108 (Layout 21)
- Alternate Turbine (Layout 21)
- Collector Line
- Access Roads
- O&M Facility
- Substation

Document Location: \\bsmk-files01\P\Power\Southern Power\1809-00886\GIS\1809_00886_Exh4_Facilities.mxd

R83W R82W R81W R80W

T152N T151N T150N

Ward County

McHenry County

McLean County

KLJ Southern Power

0 0.5 1 2 Miles

N W E S

KLJ Project Number: 1809-00886

Date Created: 12/21/2018 | Created By: JDP

Exhibit 5: Land Use
Ruso Wind Project

Counties of Ward & McLean, ND

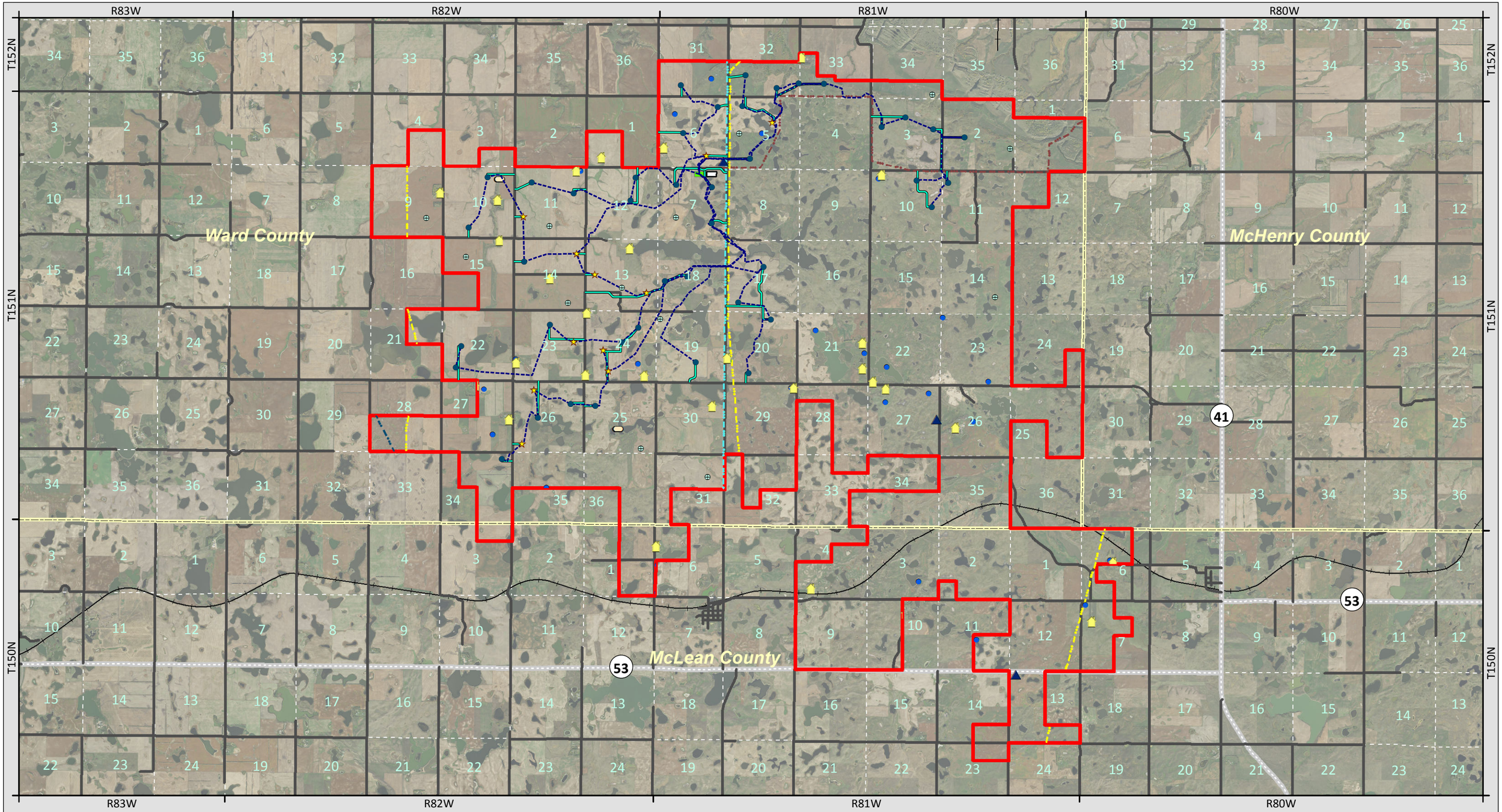
- Project Area
- Sections
- County Boundary
- NDGFD Plots
- NDDTL
- USFWS WPA

USFWS Easement
- Grassland
- Wetland

Land Class
- Cultivated
- Barren
- Developed
- Grasslands
- Open Water
- Wetlands
- Woodlands

- Primary Turbine-Siemens SG 4.2-145 (Layout 21)
- Primary Turbine-Siemens SWT 2.415-108 (Layout 21)
- Alternate Turbine (Layout 21)
- Collector Line
- Access Roads
- O&M Facility
- Substation

Document Location: \\bsmk-files01\P\Power\Southern Power\1809-00886\GIS\1809_00886_Exh5_LandUse.mxd



KLJ

Southern Power

0 0.5 1 2 Miles

N W E S

KLJ Project Number: 1809-00886	
Date Created: 12/21/2018	Created By: JDP

Exhibit 6: Infrastructure
Ruso Wind Project

Counties of Ward & McLean, ND

- Project Area
- County/City Roads
- State Highway
- Railroads
- Sections
- County Boundary
- Dams
- Residence
- Water Wells
- Antenna Structure
- Electric Transmission Line (<115 kV)
- Electric Transmission Line (115+ kV)
- Gas Line
- Proposed Ruso Wind Transmission Project (230 KV)
- Primary Turbine-Siemens SG 4.2-145 (Layout 21)
- Primary Turbine-Siemens SWT 2.415-108 (Layout 21)
- Alternate Turbine (Layout 21)
- Collector Line
- Access Roads
- O&M Facility
- Substation

Document Location: \\bsmk-files01\P\Power\Southern Power\1809-00886\GIS\1809_00886_Exh6_Infrastructure.mxd

R83W R82W R81W R80W

T152N T151N T150N

Ward County

McHenry County

McLean County

KLJ Southern Power

0 0.5 1 2 Miles

N W E S

KLJ Project Number: 1809-00886	
Date Created: 12/21/2018	Created By: JDP

Exhibit 7: Microwave Beam Paths
Ruso Wind Project

Counties of Ward & McLean, ND

- Project Area
- Sections
- County Boundary
- Antenna Structure

Microwave Beam Path

- 6.1 GHz

- Primary Turbine-Siemens SG 4.2-145 (Layout 21)
- Primary Turbine-Siemens SWT 2.415-108 (Layout 21)
- Alternate Turbine (Layout 21)
- Collector Line
- Access Roads
- Substation
- O&M Facility

Document Location: \\bsmk-files01\P\Power\Southern Power\1809-00886\GIS\1809_00886_Exh7_MicrowavePaths.mxd

R83W R82W R81W R80W

T152N T151N T150N

Ward County

McHenry County

McLean County

Exhibit 8: Prime and Unique Farmlands
Ruso Wind Project

Counties of Ward & McLean, ND

KLJ Southern Power

0 0.5 1 2 Miles

N W E S

KLJ Project Number: 1809-00886	
Date Created: 12/21/2018	Created By: JDP

- Project Area
- Sections
- County Boundary
- All areas are prime farmland
- Prime farmland if drained
- Farmland of statewide importance
- Primary Turbine-Siemens SG 4.2-145 (Layout 21)
- Primary Turbine-Siemens SWT 2.415-108 (Layout 21)
- Alternate Turbine (Layout 21)
- Collector Line
- Access Roads
- O&M Facility
- Substation

Document Location: \\bsmk-files01\P\Power\Southern Power\1809-00886\GIS\1809_00886_Exh8_Farmlands.mxd

R83W R82W R81W R80W

T152N T151N T150N

Ward County

McHenry County

McLean County

Snake Creek Aquifer

Strawberry Lake Aquifer

KLJ Southern Power

0 0.5 1 2 Miles

N W E S

KLJ Project Number: 1809-00886
Date Created: 12/21/2018 | Created By: JDP

Exhibit 9: Geologic and Groundwater Resources
Ruso Wind Project

Counties of Ward & McLean, ND

- Project Area
- Sections
- County Boundary
- Surficial Aquifers

Surface Geology

- Water
- Coleharbor

- Primary Turbine-Siemens SG 4.2-145 (Layout 21)
- Primary Turbine-Siemens SWT 2.415-108 (Layout 21)
- Alternate Turbine (Layout 21)
- Collector Line
- Access Roads
- O&M Facility
- Substation

Document Location: \\bsmk-files01\P\Power\Southern Power\1809-00886\GIS\1809_00886_Exh9_Geologic_Groundwater.mxd

R83W R82W R81W R80W

T152N T151N T150N

Moose Mountain Creek-Souris River Subbasin

Ward County

Oak Creek-Souris River Watershed

Blacktail Coulee-Souris River Watershed

McHenry County

Lower Souris Subbasin

Upper Wintering River Watershed

Town of Max Watershed

Lake Sakakawea Subbasin

McLean County

Audubon Lake Watershed

Painted Woods-Square Butte Subbasin

Lake Nettie National Wildlife Refuge Watershed

KLJ

Southern Power

0 0.5 1 2 Miles

N W E S

KLJ Project Number: 1809-00886	
Date Created: 12/21/2018	Created By: JDP

Exhibit 10: Surface Waters and Wetlands
Ruso Wind Project

Counties of Ward & McLean, ND

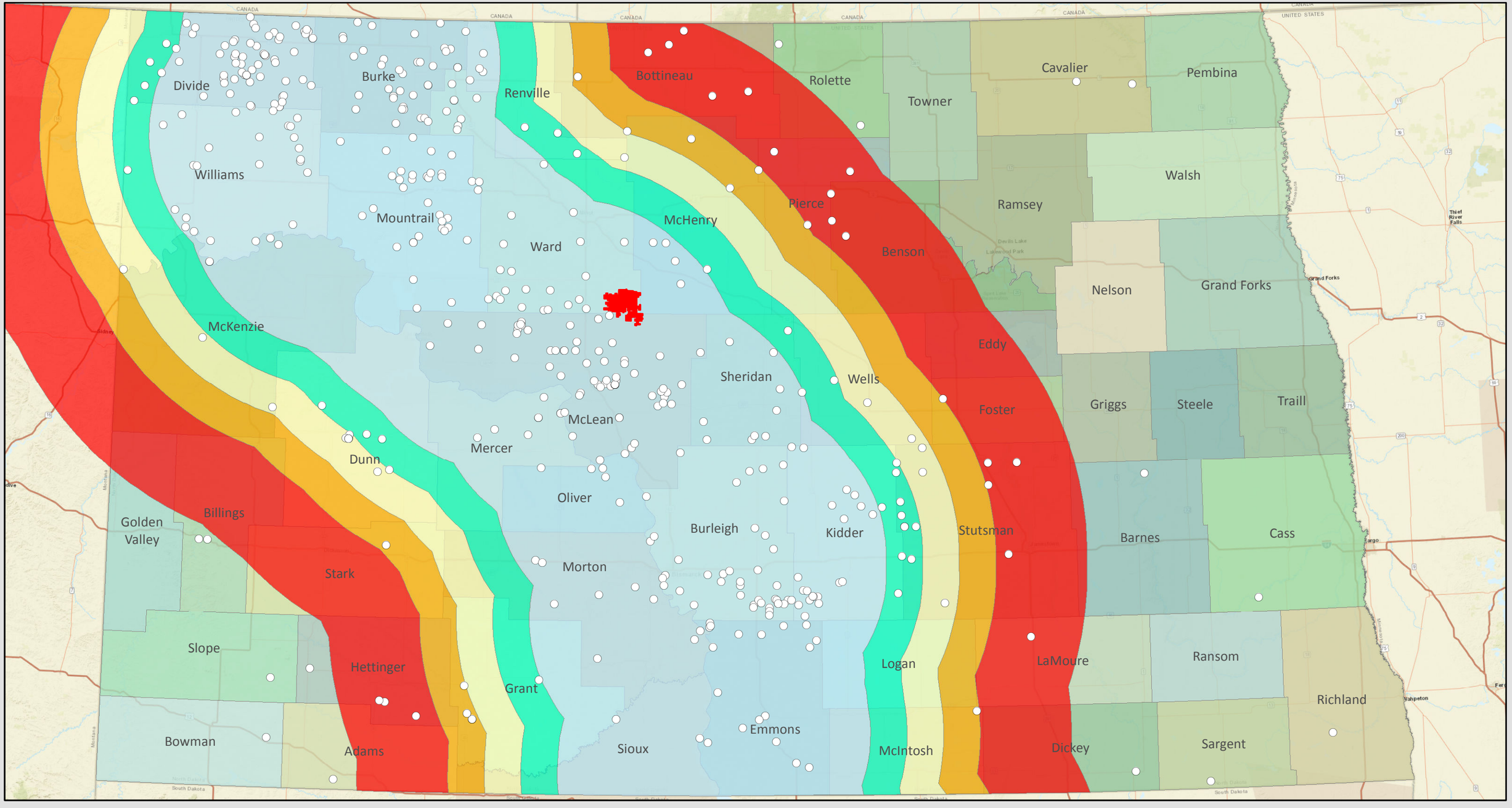
- Project Area
- Sections
- County Boundary
- Rivers and Streams
- USFWS NWI
- Watershed
- Subbasin

Field Assessed Wetlands

- Freshwater Emergent Wetland

- Primary Turbine-Siemens SG 4.2-145 (Layout 21)
- Primary Turbine-Siemens SWT 2.415-108 (Layout 21)
- Alternate Turbine (Layout 21)
- Collector Line
- Access Roads
- O&M Facility
- Substation

Document Location: \\bsmk-files01\P\Power\Southern Power\1809-00886\GIS\1809_00886_Exh10_Waters.mxd



KLJ

Southern Power

0 10 20 40 Miles

KLJ Project Number: 1809-00886	
Date Created: 12/20/2018	Created By: JDP

Exhibit 11: Whooping Crane Migration Corridor
Ruso Wind Project

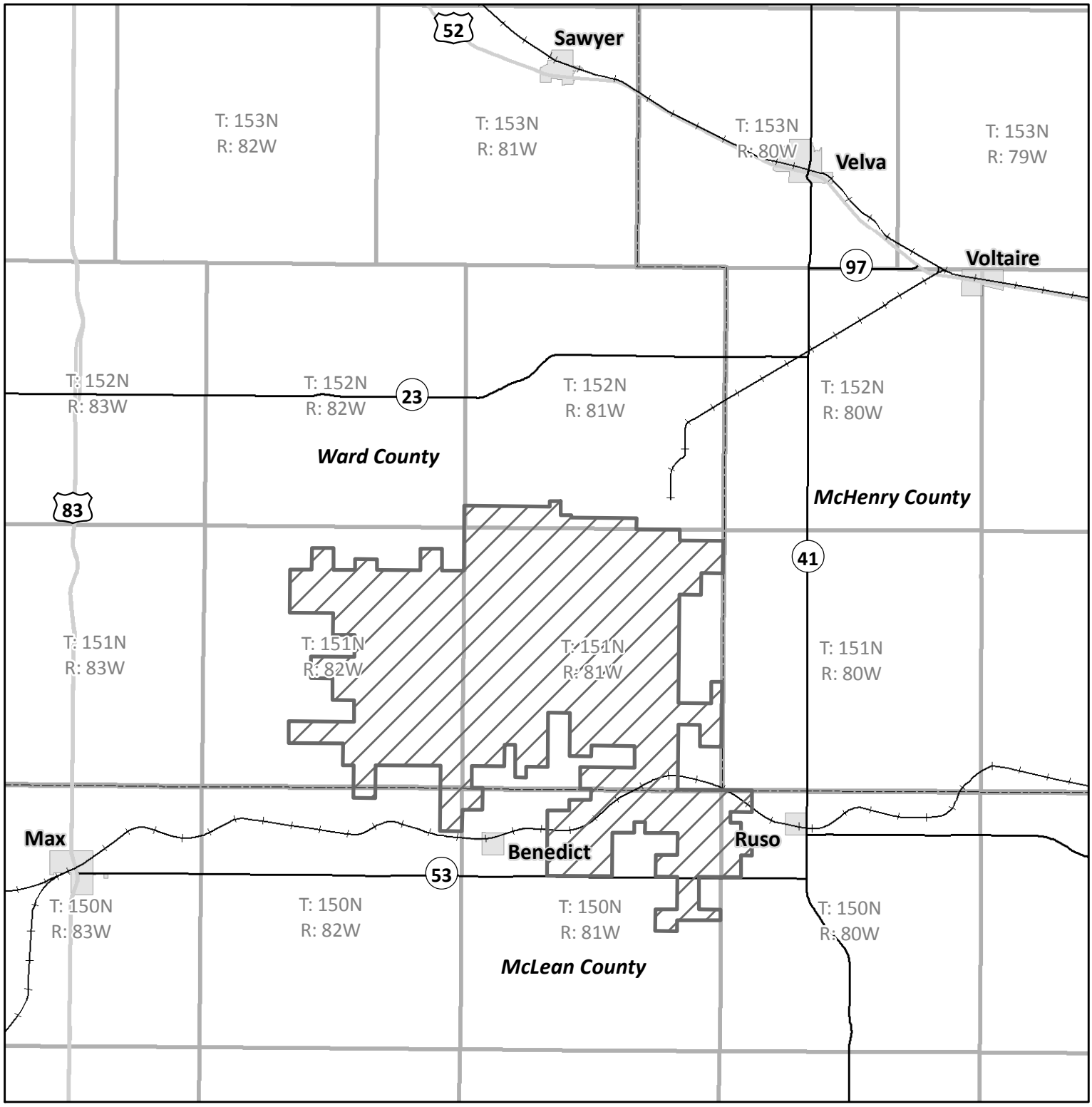
Counties of Ward & McLean, ND

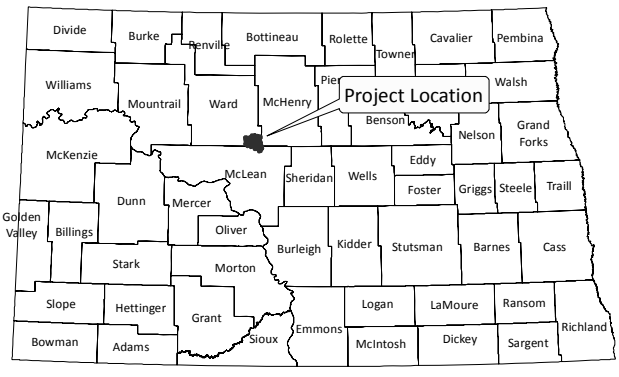
- Project Area
- Confirmed Whooping Crane Sightings

Whooping Crane Migration Corridor
Percent Total
- 75%
- 80%
- 85%
- 90%
- 95%

Document Location: \\bsmk-files01\P\Power\Southern Power\1809-00886\GIS\1809_00886_Exh11_WhoopingCrane.mxd

Appendix B. Black and White Project Location Map





Ruso Wind Project
Counties of Ward & McLean, ND
Project Location

Project Area

Miles
0 1 2 4

N
W E
S

KLJ

KLJ Project Number: 1809-00886	
Date Created: 12/20/2018	Created By: JDP

Appendix C. Scoping Package and Responses

4585 Coleman Street
Bismarck, ND 58503-0431
701 355 8400
KLJENG.COM

August 24, 2018

«First_Name» «Last_Name», «Title»
«Department»
«Agency»
«Address»
«City», «State» «Zip»

Re: Ruso Wind Project
Ruso Wind Partners, LLC
Ward, McLean and McHenry Counties, North Dakota

Dear «Salutation» «Last_Name»:

On behalf of Ruso Wind Partners, LLC, KLJ is preparing applications for the Ruso Wind Project pursuant to the North Dakota Energy Conversion and Transmission Facility Siting Act for consideration by the North Dakota Public Service Commission. The applications include the development of a wind farm and associated transmission line in Ward, McLean and McHenry Counties, North Dakota. Please refer to the enclosed ***Project Location Map***.

The Ruso Wind Project is expected to include approximately 52 turbines capable of generating approximately 200 megawatts of electric power. The power is expected be interconnected to the grid via a new 230-kilovolt transmission line approximately 6 to 8 miles in length. Construction of the project is expected to begin during the fall of 2020, with the wind farm expected to become operational by the end of 2021. No federal funding is anticipated.

We are soliciting your views and comments on the proposed project. We are particularly interested in any property within the project area that your agency may own or have an interest in. We would also appreciate being made aware of any proposed development your agency may be contemplating within or near the project area. Any information that might help us with the applications would be appreciated.

We request that you please provide any comments or information you may have regarding the Ruso Wind Project to our office on or before September 24, 2018. If you have any questions or need further information, please contact me at 701-250-5961 or ashley.ross@kljeng.com. Thank you for your time and cooperation.

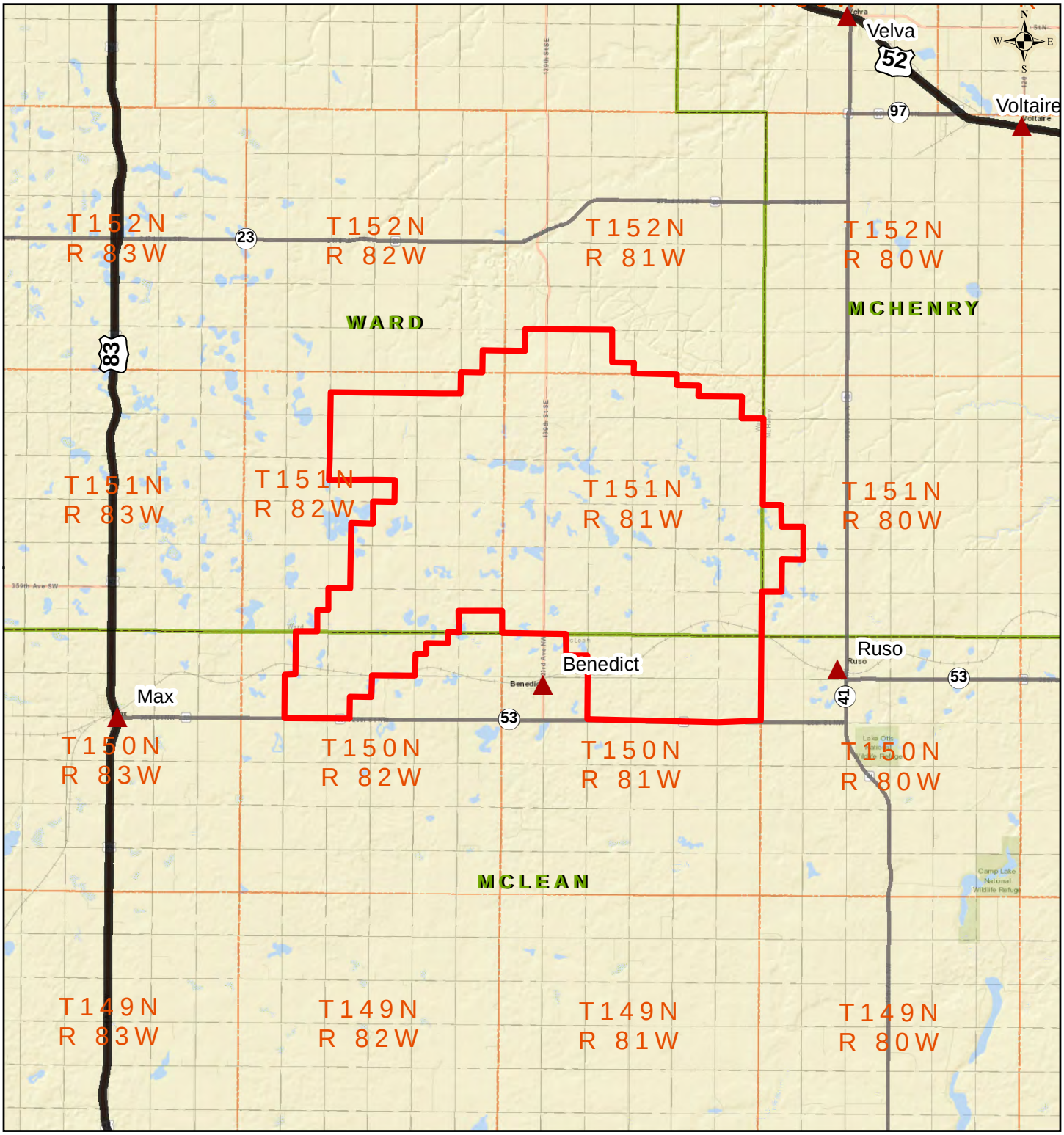
Sincerely,

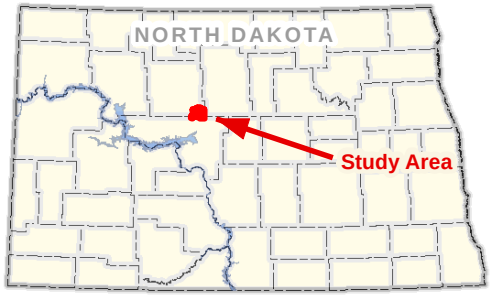
KLJ

Ashley Ross

Ashley Ross, Project Manager

Enclosure: Project Location Map





Ruso Wind Project

Ward, McLean & McHenry Counties,
North Dakota

US Highways
ND Highways
County Boundary
PLSS Townships
PLSS Sections
Cities
Study Area

0 1.75 3.5 7 Miles

KLJ

8/22/2018

4585 Coleman Street
Bismarck, ND 58503-0431
701 355 8400
KLJENG.COM

August 31, 2018

«First_Name» «Last_Name», «Title»
«Department»
«Agency»
«Address»
«City», «State» «Zip»

Re: Ruso Wind Project
Ruso Wind Partners, LLC
Ward, McLean and McHenry Counties, North Dakota

Dear «Salutation» «Last_Name»:

In a letter dated August 24, 2018, sent on behalf of Ruso Wind Partners, LLC, we announced the preparation of applications for the Ruso Wind Project pursuant to the North Dakota Energy Conversion and Transmission Facility Siting Act for the development of a wind farm and associated transmission line in Ward, McLean and McHenry Counties, North Dakota. This letter is intended to inform you of the revised study area to account for the proposed 230-kilovolt transmission line. The transmission line is expected to be approximately 6 to 8 miles long within Ward County and McHenry Counties. Please refer to the enclosed ***Project Location Map***.

We are soliciting your views and comments on the proposed project. We are particularly interested in any property within the study area that your agency may own or have an interest in. We would also appreciate being made aware of any proposed development your agency may be contemplating within or near the study area. Any information that might help us with the applications would be appreciated.

We request that you please provide any comments or information you may have regarding the Ruso Wind Project to our office on or before September 24, 2018, in effort to maintain the projects existing timeline. If you have any questions or need further information, please contact me at 701-250-5961 or ashley.ross@kljeng.com. Thank you for your time and cooperation.

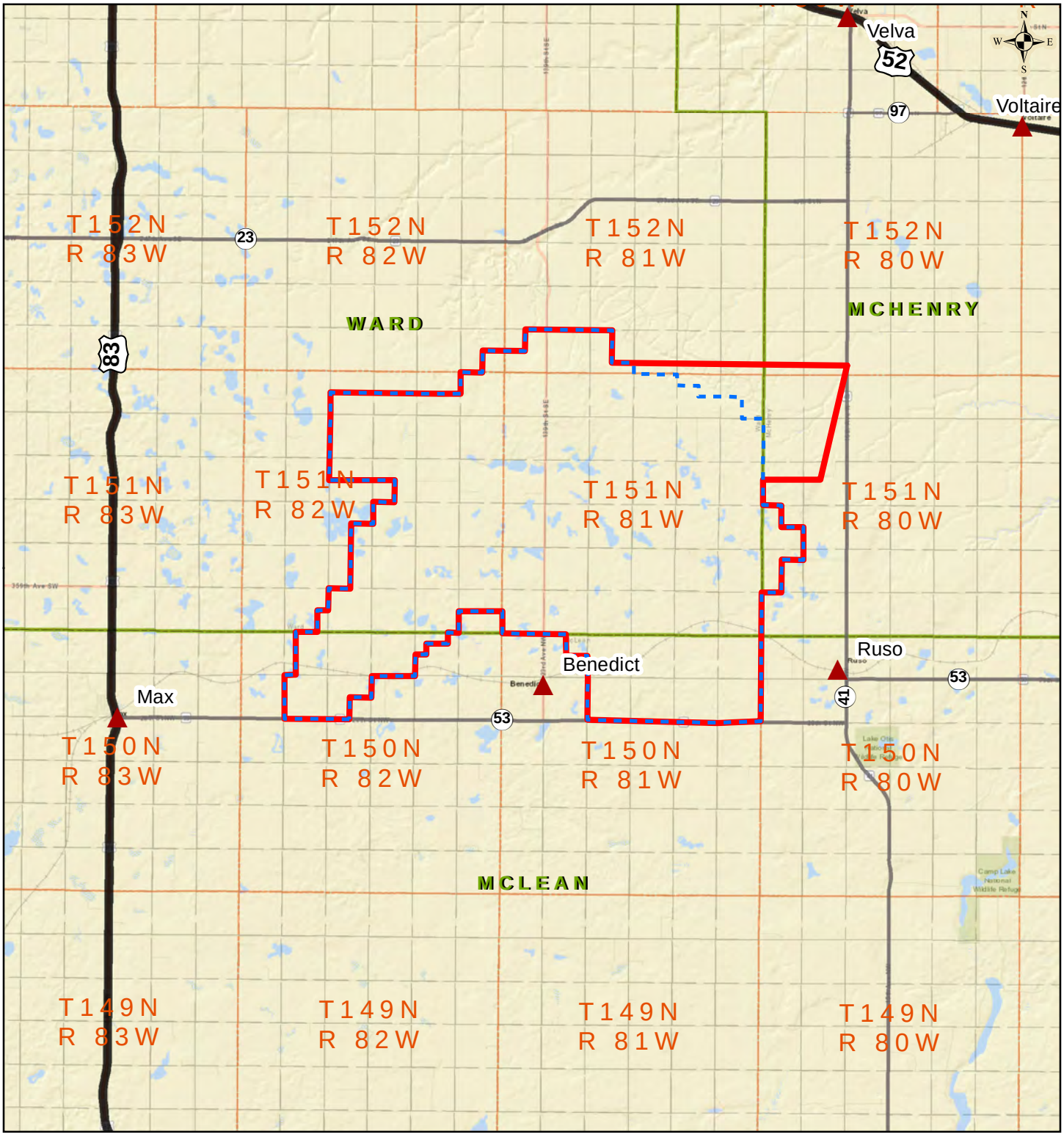
Sincerely,

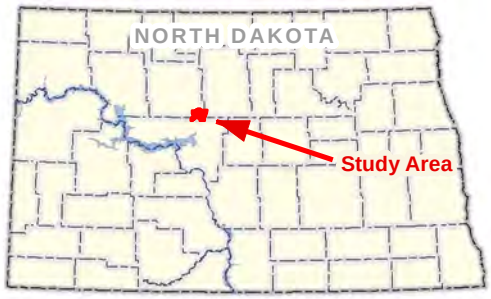
KLJ

Ashley Ross

Ashley Ross, Project Manager

Enclosure: Project Location Map





Ruso Wind Project

Ward, McLean & McHenry Counties, North Dakota

Revised Study Area
Previous Study Area
Cities
US Highways
ND Highways
County Boundary
PLSS Townships
PLSS Sections

0 1.75 3.5 7 Miles

KLJ

8/31/2018

4585 Coleman Street
Bismarck, ND 58503-0431
701 355 8400
KLJENG.COM

November 20, 2018

«First_Name» «Last_Name», «Title»
«Department»
«Agency»
«Address»
«City», «State» «Zip»

Re: Ruso Wind Project
Ruso Wind Partners, LLC
Ward, McLean and McHenry Counties, North Dakota

Dear «Salutation» «Last_Name»:

In a letter dated August 24, 2018, sent on behalf of Ruso Wind Partners, LLC, we announced the preparation of applications for the Ruso Wind Project pursuant to the North Dakota Energy Conversion and Transmission Facility Siting Act for the development of a wind farm and associated transmission line in Ward, McLean and McHenry Counties, North Dakota. In a second letter dated August 31, 2018, we provided a revised study area to account for the proposed 230-kilovolt transmission line. This letter is intended to inform you of an additional revision to the study area to account for a revised project layout. Please refer to the enclosed ***Project Location Map***.

We are soliciting your views and comments on the proposed project. We are particularly interested in any property within the study area that your agency may own or have an interest in. We would also appreciate being made aware of any proposed development your agency may be contemplating within or near the study area. Any information that might help us with the applications would be appreciated.

We request that you please provide any comments or information you may have regarding the Ruso Wind Project to our office on or before December 20, 2018, in effort to maintain the projects existing timeline. If you have any questions or need further information, please contact me at 701-250-5961 or ashley.ross@kljeng.com. Thank you for your time and cooperation.

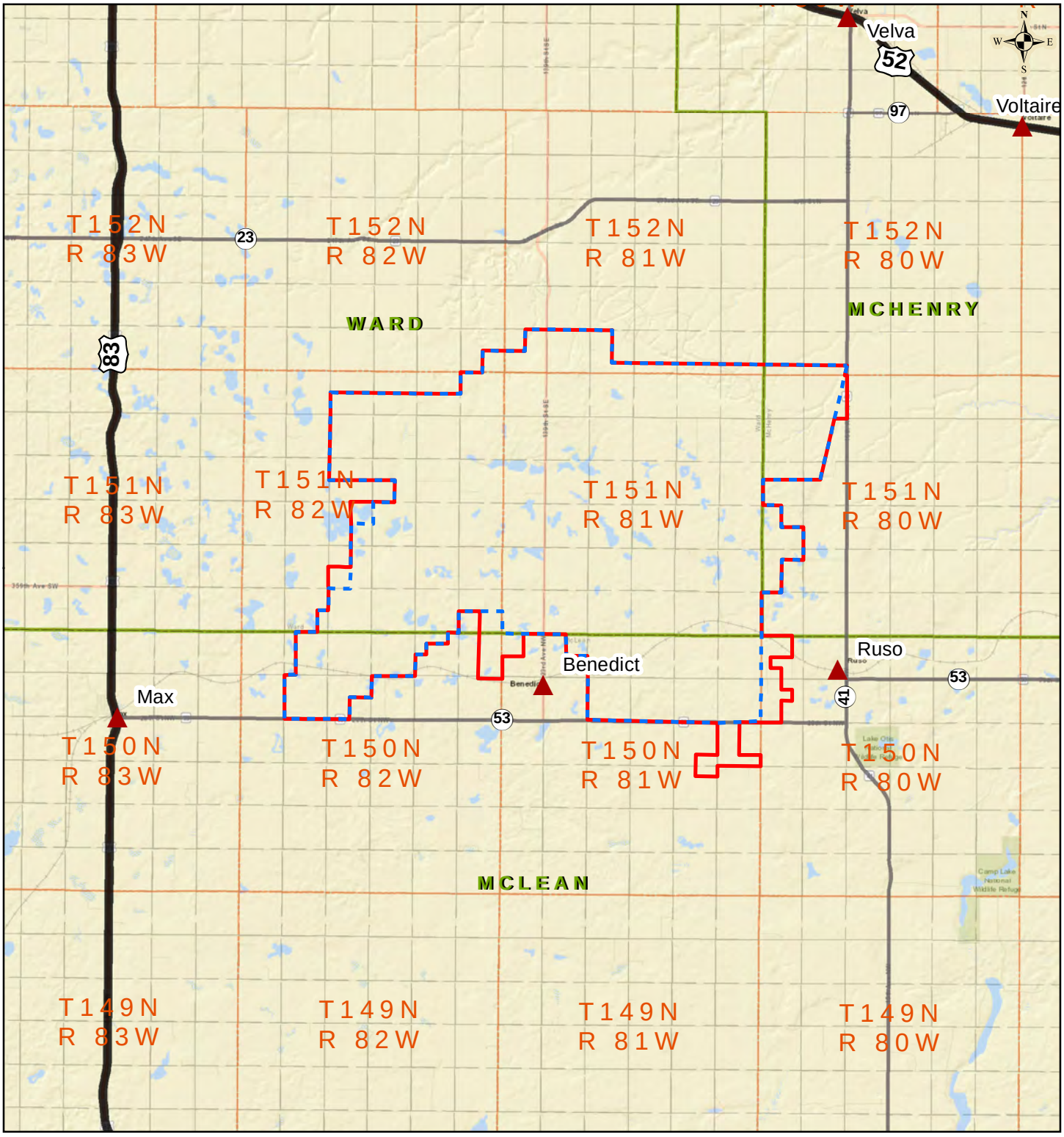
Sincerely,

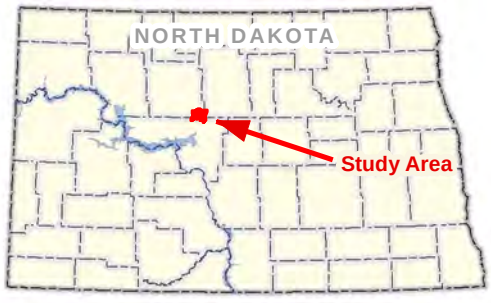
KLJ

Ashley Ross

Ashley Ross, Project Manager

Enclosure: Project Location Map





Ruso Wind Project

Ward, McLean & McHenry Counties, North Dakota

Revised Study Area
Previous Study Area
Cities
US Highways
ND Highways
County Boundary
PLSS Townships
PLSS Sections

0 1.75 3.5 7 Miles

KLJ

11/19/2018

Ruso Wind Project Scoping Letter Mailing List

Salutation	First Name	Last Name	Title	Department	Agency	Address	City	State	Zip
Mr.	Kyle	Wanner	Director		ND Aeronautics Commission	PO Box 5020	Bismarck	ND	58502-5020
Mr.	Wayne	Stenehjem	Attorney General		Office of Attorney General	600 E Boulevard Ave, Dept 125	Bismarck	ND	58505
Mr.	Doug	Goehring	Agriculture Commissioner		ND Department of Agriculture	600 E Boulevard Ave, Dept 602	Bismarck	ND	58505-0020
Mr.	Dave	Glatt	Chief	Environmental Health Section	ND Department of Health	918 E Divide Ave	Bismarck	ND	58501-1947
Mr.	Christopher	Jones	Executive Director		ND Department of Human Services	600 E Boulevard Ave, Dept 325	Bismarck	ND	58505-0250
Ms.	Michelle	Kommer	Commissioner of Labor		ND Department of Labor & Human Rights	600 E Boulevard Ave, Dept 406	Bismarck	ND	58505-0340
Mr.	Wayde	Sick	Director and Executive Officer		ND Department of Career & Technical Education	600 E Boulevard Ave, Dept 270	Bismarck	ND	58505-0610
Mr.	Jay	Schuler	Commissioner		ND Department of Commerce	1600 E Century Ave, Suite 2	Bismarck	ND	58503
Ms.	Jodi	Smith	EIIO Director & Commisioner of University and School Lands		ND Department of Trust Lands	PO Box 5523	Bismarck	ND	58506-5523
Mr.	Steve	Dyke	Conservation Supervisor	Conservation Section	ND Game & Fish Department	100 N Bismarck Expressway	Bismarck	ND	58501-5095
Ms.	Karlene	Fine	Executive Director		ND Industrial Commission	600 E Boulevard Ave, Dept 405	Bismarck	ND	58505-0840
Governor	Doug	Burgum	Governor		Office of Governor	600 E Boulevard Ave	Bismarck	ND	58505-0001
Mr.	Jim	Redding	District Engineer	Minot District Office	ND Department of Transportation	1305 Highway 2 Bypass E	Minot	ND	58701-7922
Ms.	Claudia	Berg	Director		State Historical Society of ND	612 E Boulevard Ave	Bismarck	ND	58505
Mr.	Scott	Davis	Executive Director		ND Indian Affairs Commission	600 E Boulevard Ave	Bismarck	ND	58505
Ms.	Michelle	Kommer	Interim Executive Director		Job Service ND	PO Box 5507	Bismarck	ND	58506-5507
Ms.	Melissa	Baker	Director		ND Parks & Recreation Department	PO Box 5594	Bismarck	ND	58506-5594
Mr.	Dennis	Renner	Chairperson		ND State Soil Conservation Committee	4530 Highway 6	Mandan	ND	58554
Mr.	Garland	Eberle	Chief Engineer and Secretary		ND State Water Commission	900 E Boulevard Ave, Dept 770	Bismarck	ND	58505-0850
Sir or Madam			Deputy Base Civil Engineer	319 CES/CD	Grand Forks Air Force Base	525 Tuskegee Airmen Blvd.	Grand Forks AFB	ND	58205-6434
Mr.	Daniel	Lewis	PE	Chief Missile Engineering	Minot Air Force Base	445 Peacekeeper Pl	Minot AFB	ND	58705
Mr.	Cy	Munos	Cable Affairs Officer	91st Missile Maintenance Squadron	Minot Air Force Base	300 Minuteman Dr	Minot AFB	ND	58705
Mr.	Todd	Frerichs	Refuge Manager	Audubon Wetland Management District	US Fish & Wildlife Service	3275 11th St NW	Coleharbor	ND	58531-9419
Mr.	Frank	Durbian	Refuge Manager	J. Clark Salyer Wetland Management District	US Fish & Wildlife Service	681 Salyer Rd	Upham	ND	58789-0066
Mr.	Kevin	Shelley	Field Supervisor	ND Field Office	US Fish & Wildlife Service	3425 Miriam Ave	Bismarck	ND	58501-7926
Ms.	Patricia	McQueary	ND State Regulatory Program Manager	ND Regulatory Office	US Army Corps of Engineers	3319 University Drive	Bismarck	ND	58504
Ms.	Laurie	Suttmeier	Manager	Dakota-Minnesota Airports District Office, BIS-ADO-600	Federal Aviation Administration	2301 University Dr, Bldg 23B	Bismarck	ND	58504
Mr.	Barry	Suydam	Chairperson		McLean County Commission	1612 39th Ave NW	Garrison	ND	58540-9237
Mr.	Alan	Walter	Chairperson		Ward County Commission	805 Bavaria Dr	Minot	ND	58703-1548
Mr.	David	Medalen	Chairperson		McHenry County Commission	1349 77th St NE	Willow City	ND	58384-9106
Mr.	John	Weeda	Director	ND Transmission Authority	ND Industrial Commission	600 E Boulevard Ave, Dept 405	Bismarck	ND	58505-0840
Mr.	Justin	Kringstad	Director	ND Pipeline Authority	ND Industrial Commission	600 E Boulevard Ave, Dept 405	Bismarck	ND	58505-0840

From:	Wingo, Jared L.
To:	Ashley Ross
Subject:	RE: Invite for comment: Ruso Wind Project, McHenry, McLean, Ward Counties, ND - ND Aeronautics Response
Date:	Wednesday, September 5, 2018 5:05:06 PM

Ashley,

I received the revised letter for the Ruso Wind project, dated 31 August. No additional potential impact other than what was stated in original response letter.

Have a great evening,

Jared L. Wingo

Airport Planner
North Dakota Aeronautics Commission
Work: (701) 328-9655
Cell: (701) 471-5548
Fax: (701) 328-9656
Email: jwingo@nd.gov
Website: http://www.aero.nd.gov

From: Wingo, Jared L.
Sent: Monday, August 27, 2018 2:29 PM
To: 'Ashley Ross' <Ashley.Ross@kljeng.com>
Subject: Invite for comment: Ruso Wind Project, McHenry, McLean, Ward Counties, ND - ND Aeronautics Response

Ashley,

Attached is the NDAC's response to your firm's invitation for comments.

Summarize – Few private airstrips lay in close proximity or within the proposed project boundary. Advise KLJ contact individuals to invite for comments as well as submit FAA Form 7460-1 if applicable.

Have a great day,

Jared L. Wingo

Airport Planner
North Dakota Aeronautics Commission

From:	Wingo, Jared L.
To:	Ashley Ross
Subject:	Invite for comment: Ruso Wind Project, McHenry, McLean, Ward Counties, ND - ND Aeronautics Response
Date:	Monday, August 27, 2018 2:29:21 PM
Attachments:	SND Aeronau18082713410.pdf

Ashley,

Attached is the NDAC's response to your firm's invitation for comments.

Summarize – Few private airstrips lay in close proximity or within the proposed project boundary. Advise KLJ contact individuals to invite for comments as well as submit FAA Form 7460-1 if applicable.

Have a great day,

Jared L. Wingo

Airport Planner
North Dakota Aeronautics Commission
Work: (701) 328-9655
Cell: (701) 471-5548
Fax: (701) 328-9656
Email: jwingo@nd.gov
Website: http://www.aero.nd.gov

27 August 2018

Ashley Ross
Project Manager, KLJ
4585 Coleman St.
Bismarck, ND 58503

Dear Ms. Ross,

I am writing in response to the invitation for comments concerning Project: RUSO WIND PROJECT –, MCHENRY, MCLEAN, AND WARD COUNTIES, NORTH DAKOTA

Upon review of the proposed project sketch, the North Dakota Aeronautics Commission (NDAC) found four potential private use airstrips within or close proximity of the projects' boundary as indicated using Google Earth. At this time, the NDAC recommends submitting FAA Form 7460-1s and to contact the potential landowner of these private airstrips.

Poleschook Airstrip
Polsfut Airstrip
Scheresky Airstrip
Semchenko Airport

Please give the NDAC a call if you have any comments, concerns, and/or questions.

Sincerely,

Jared L. Wingo

Jared L. Wingo
Airport Planner
North Dakota Aeronautics Commission
Office: (701) 328-9655
Email: jwingo@nd.gov

4585 Coleman Street
Bismarck, ND 58503-0431
701 355 8400
KLJENG.COM

RECEIVED
AUG 27 2018
ND Aeronautics Commission

Evaluated
27 AUG 18
Jared

August 24, 2018

Mr. Kyle Wanner, Director
ND Aeronautics Commission
PO Box 5020
Bismarck, ND 58502-5020

Re: Ruso Wind Project
Ruso Wind Partners, LLC
Ward, McLean and McHenry Counties, North Dakota

Dear Mr. Wanner:

On behalf of Ruso Wind Partners, LLC, KLJ is preparing applications for the Ruso Wind Project pursuant to the North Dakota Energy Conversion and Transmission Facility Siting Act for consideration by the North Dakota Public Service Commission. The applications include the development of a wind farm and associated transmission line in Ward, McLean and McHenry Counties, North Dakota. Please refer to the enclosed ***Project Location Map***.

The Ruso Wind Project is expected to include approximately 52 turbines capable of generating approximately 200 megawatts of electric power. The power is expected be interconnected to the grid via a new 230-kilovolt transmission line approximately 6 to 8 miles in length. Construction of the project is expected to begin during the fall of 2020, with the wind farm expected to become operational by the end of 2021. No federal funding is anticipated.

We are soliciting your views and comments on the proposed project. We are particularly interested in any property within the project area that your agency may own or have an interest in. We would also appreciate being made aware of any proposed development your agency may be contemplating within or near the project area. Any information that might help us with the applications would be appreciated.

We request that you please provide any comments or information you may have regarding the Ruso Wind Project to our office on or before September 24, 2018. If you have any questions or need further information, please contact me at 701-250-5961 or ashley.ross@kljeng.com. Thank you for your time and cooperation.

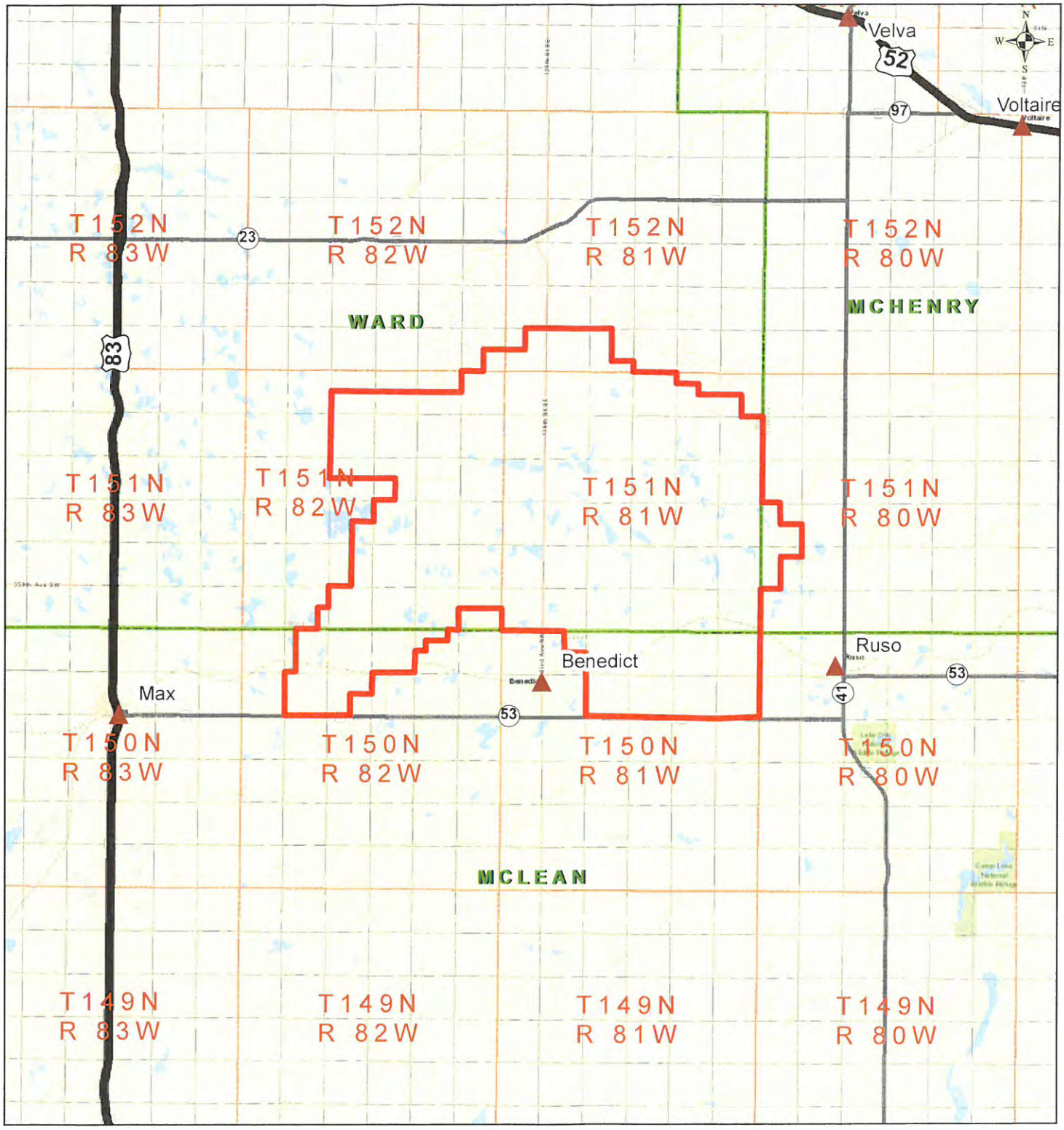
Sincerely,

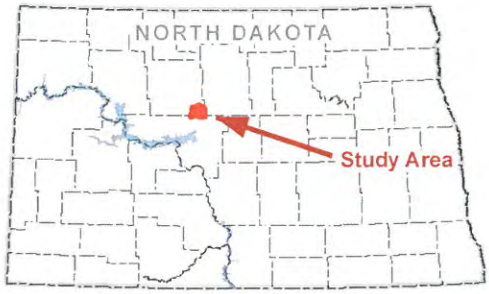
KLJ

Ashley Ross

Ashley Ross, Project Manager

Enclosure: Project Location Map





Ruso Wind Project

Ward, McLean & McHenry Counties, North Dakota

US Highways
ND Highways
County Boundary
PLSS Townships
PLSS Sections
Cities
Study Area

0 1.75 3.5 7 Miles

KLJ

8/22/2018

From: Wanner, Kyle C. [mailto:kcwanner@nd.gov]
Sent: Friday, October 5, 2018 12:25 PM
To: Ashley Ross <Ashley.Ross@kljeng.com>
Subject: RE: Invite for comment: Ruso Wind Project, McHenry, McLean, Ward Counties, ND - ND Aeronautics Response

My apologies – looks like I was also unbale to find the contact information for either of those private strips. I would recommend moving forward with the contacts that you have.

Regards,

Kyle Wanner, Director
North Dakota Aeronautics Commission
w (701) 328-9651
c (701) 425-5926
https://aero.nd.gov

From: Ashley Ross <Ashley.Ross@kljeng.com>
Sent: Thursday, October 4, 2018 9:15 AM
To: Wanner, Kyle C. <kcwanner@nd.gov>
Subject: RE: Invite for comment: Ruso Wind Project, McHenry, McLean, Ward Counties, ND - ND Aeronautics Response

CAUTION: This email originated from an outside source. Do not click links or open attachments unless you know they are safe.

Kyle,

What you had attached appears to be for the Poleschook Airstrip, not the Polsfut.

Thanks,

Ashley Ross
KLJ - Bismarck
701-250-5961

From: Wanner, Kyle C. [mailto:kcwanner@nd.gov]
Sent: Wednesday, October 3, 2018 1:35 PM
To: Ashley Ross <Ashley.Ross@kljeng.com>
Subject: RE: Invite for comment: Ruso Wind Project, McHenry, McLean, Ward Counties, ND - ND Aeronautics Response

Ashley,

I was able to find information related to the Polsfut Airstrip (see attached) but not the Schereski airstrip. It may no longer be a registered private airstrip. I would recommend moving forward without the need to try to contact the Schereski strip as I cannot find contact information either.

Regards,

Kyle Wanner, Director
North Dakota Aeronautics Commission
w (701) 328-9651
c (701) 425-5926
https://aero.nd.gov

From: Ashley Ross <Ashley.Ross@kljeng.com>
Sent: Tuesday, September 25, 2018 11:30 AM
To: Wanner, Kyle C. <kcwanner@nd.gov>
Subject: FW: Invite for comment: Ruso Wind Project, McHenry, McLean, Ward Counties, ND - ND Aeronautics Response

CAUTION: This email originated from an outside source. Do not click links or open attachments unless you know they are safe.

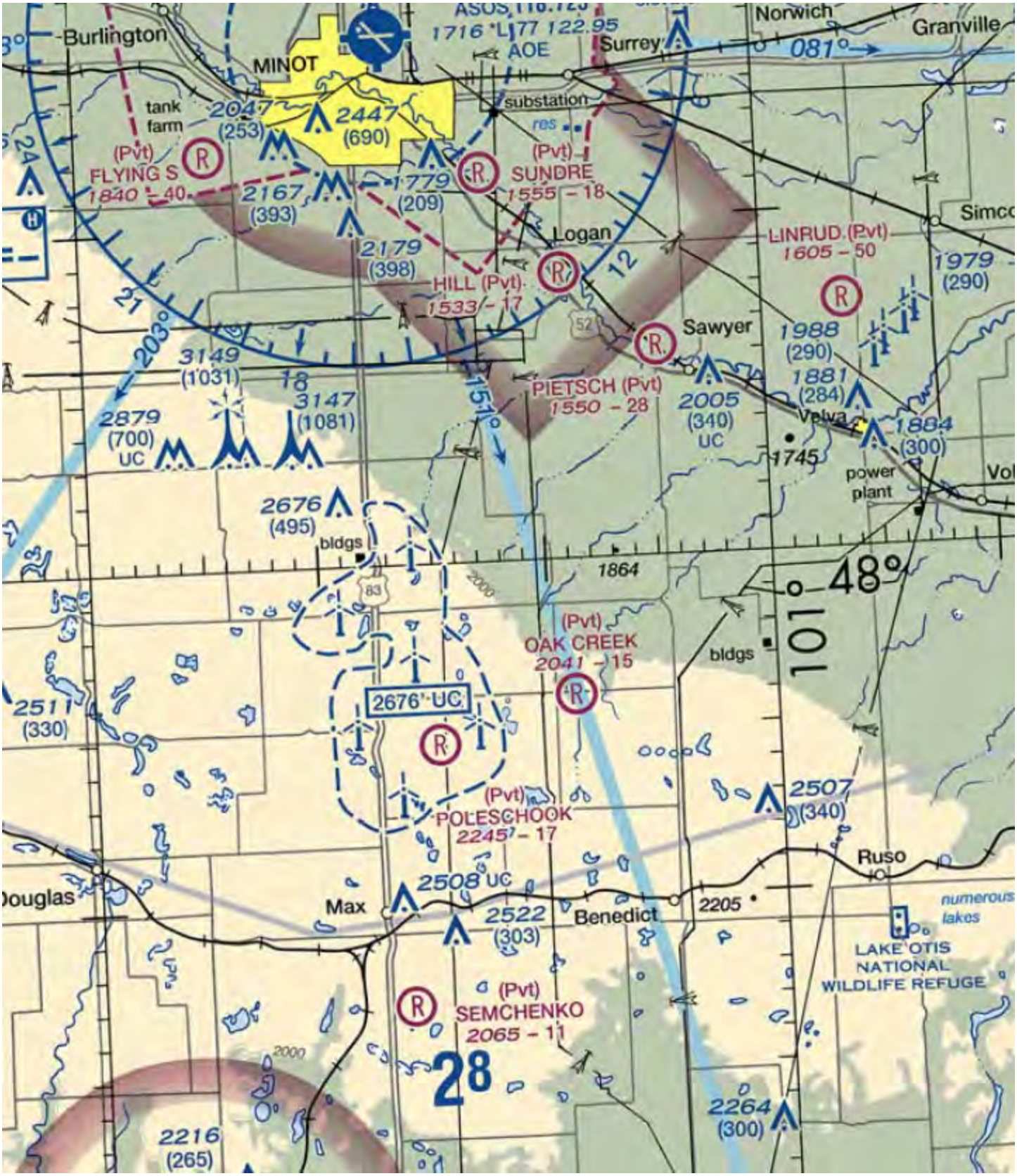
Kyle,
With Jared's departure, would you be able to assist with my question below? I've attached our project location map for your reference. Let me know if you need anything else.

Thank you,

Ashley Ross
KLJ - Bismarck
701-250-5961

From: Ashley Ross
Sent: Thursday, September 20, 2018 10:02 AM
To: 'Wingo, Jared L.' <jwingo@nd.gov>
Subject: RE: Invite for comment: Ruso Wind Project, McHenry, McLean, Ward Counties, ND - ND Aeronautics Response

Hi Jared,
Thank you for your comments regarding the Ruso Wind Project. We would like to clarify the location of the airstrips/airports you identified. We have located Poleschook Airstrip and Semchenko Airstrip (versus Airport) on the Billings Sectional Aeronautical Chart, in addition to Oak Creek Airstrip (see below). However, we do not see Polsfut Airstrip and Schereski Airstrip. Could you please provide the locations for those airstrips? Thank you!



Ashley Ross
KLJ - Bismarck
701-250-5961

From: Wingo, Jared L. [mailto:jwingo@nd.gov]
Sent: Monday, August 27, 2018 2:29 PM

To: Ashley Ross <Ashley.Ross@kljeng.com>
Subject: Invite for comment: Ruso Wind Project, McHenry, McLean, Ward Counties, ND - ND Aeronautics Response

Ashley,

Attached is the NDAC's response to your firm's invitation for comments.

Summarize – Few private airstrips lay in close proximity or within the proposed project boundary. Advise KLJ contact individuals to invite for comments as well as submit FAA Form 7460-1 if applicable.

Have a great day,

Jared L. Wingo

Airport Planner
North Dakota Aeronautics Commission
Work: (701) 328-9655
Cell: (701) 471-5548
Fax: (701) 328-9656
Email: jwingo@nd.gov
Website: http://www.aero.nd.gov

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

RECEIVED
SEP 10 2018

September 6, 2018

Ms. Ashley Ross
KLJ
4585 Coleman Street
Bismarck, ND 58503-0431

Re: Ruso Wind Project
Ward, McLean and McHenry Counties

Dear Ms. Ross:

This department has reviewed the information concerning the above-referenced project submitted under dates of August 24 and August 31, 2018, 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. 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.

2. 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). Also, cities may impose additional requirements and/or specific best management practices for construction affecting their storm drainage system. Check with the local officials to be sure any local storm water management considerations are addressed.

3. A portion of the proposed construction project overlies the Snake Creek glacial drift aquifer and lies adjacent to the Strawberry Lake aquifer, which is a sensitive groundwater area. Care should be taken to avoid spills of any materials that may have an adverse effect on groundwater quality. All spills must be immediately reported to this Department and appropriate remedial actions performed.

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.

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

December 4, 2018

RECEIVED
DEC 10 2018

Ms. Ashley Ross
KLJ
4585 Coleman Street
Bismarck, ND 58503-0431

Re: Ruso Wind Project – Additional Study Area Revision
Ward, McLean and McHenry Counties

Dear Ms. Ross:

This department has reviewed the information concerning the above-referenced project submitted under date of November 20, 2018, 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. 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.

2. 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). Also, cities may impose additional requirements and/or specific best management practices for construction affecting their storm drainage system. Check with the local officials to be sure any local storm water management considerations are addressed.

3. The proposed construction project overlies the Strawberry Lake glacial drift aquifer, which is a sensitive groundwater area, and the Snake Creek glacial drift aquifer. Several domestic and stock water supply wells are located within the project boundaries. Care should be taken to avoid spills of any materials that may have an adverse effect on groundwater quality. All spills must be immediately reported to this Department and appropriate remedial actions performed.

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.

North Dakota Department of Transportation

Thomas K. Sorel
Director

Doug Burgum
Governor

September 10, 2018

Ashley Ross
Project Manager
4585 Coleman Street
Bismarck, ND 58503-0431

DEVELOPMENT OF WIND FARM AND TRANSMISSION LINE, RUSO PROJECT, WARD COUNTY, NORTH DAKOTA

We have reviewed your August 28, 2018, letter.

The North Dakota Department of Transportation (NDDOT), does have load restrictions on our highways and in some areas may need to be extended to mid-May or June. We would need to discuss how you plan to move these various loads in and out of the initial area; however, at this time it would be our thoughts to travel on ND Highway 41 from the North. ND Highway 53 east and west and ND Highway 41 to the south are not really options for continuous loads any time of the year.

The Department is also concerned about access points and would need more information to discuss this. There may not be any additional access points available and would be necessary to utilize current access points. Should any additional ones be approved or developed, they would need to be constructed to standards for the safety of the highway user. The access points that could potentially be widened for wind tower construction would then need to be returned NDDOT original configuration when the project is completed.

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 701-857-6907.

Robert Fode

ROBERT A. FODE, P.E., DIRECTOR – OFFICE OF PROJECT DEVELOPMENT

57\raf\js
c: Jim Redding, Minot District Engineer

RECEIVED
DEC 0 4 2018

North Dakota Department of Transportation

Thomas K. Sorel
Director

Doug Burgum
Governor

November 26, 2018

Ashley Ross
Project Manager
4585 Coleman Street
Bismarck, ND 58503-0431

DEVELOPMENT OF WIND FARM AND TRANSMISSION LINE, RUSO PROJECT, WARD COUNTY, NORTH DAKOTA

We have reviewed your November 20, 2018, letter.

The following response sent to you in September regarding your August request remains the same for your November notification of revision.

The North Dakota Department of Transportation (NDDOT), does have load restrictions on our highways and in some areas may need to be extended to mid-May or June. We would need to discuss how you plan to move these various loads in and out of the initial area; however, at this time it would be our thoughts to travel on ND Highway 41 from the North. ND Highway 53 east and west and ND Highway 41 to the south are not really options for continuous loads any time of the year.

The Department is also concerned about access points and would need more information to discuss this. There may not be any additional access points available and would be necessary to utilize current access points. Should any additional ones be approved or developed, they would need to be constructed to standards for the safety of the highway user. The access points that could potentially be widened for wind tower construction would then need to be returned NDDOT original configuration when the project is completed.

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 701-857-6907.

Robert Fode

ROBERT A. FODE, P.E., DIRECTOR – OFFICE OF PROJECT DEVELOPMENT

57\raf\js
c: Jim Redding, Minot District Engineer

From:	Humann, Michael T.
To:	Ashley Ross
Cc:	McCusker, Kristie M.
Subject:	North Dakota Department of Trust Lands Ruso Wind Project comment letter
Date:	Wednesday, August 29, 2018 4:51:46 PM
Attachments:	ruso ltr.pdf

Ashley,

Attached is the North Dakota Department of Trust Lands Ruso Wind Project comment letter. The hard copy was sent via regular mail today. Let me know if you have any questions. Thanks

Michael Humann
Surface Division Manager, CPRM
ND Department of Trust Lands
PO Box 5523
Bismarck ND 58506-5523
PH: (701)328-1917
email: mhumann@nd.gov

1707 North 9th Street
PO Box 5523
Bismarck, ND 58506-5523
Phone: (701) 328 – 2800
Fax: (701) 328 – 3650

https://land.nd.gov

DEPARTMENT OF
ND TRUST LANDS
INVESTING FOR EDUCATION

Jodi A. Smith, Commissioner

August 29, 2018

ASHLEY ROSS PROJECT MANAGER
KLJ
4585 COLEMAN STREET
BISMARCK ND 58503-0431

Re: Information Request for the Proposed Ruso Wind Project, Ruso Wind Partners, LLC in Ward, McLean and McHenry Counties, North Dakota

Dear Ms. Ross:

We are in receipt of your August 24, 2018 letter regarding a request for information for the proposed Ruso Wind Project and proposed transmission line in Ward, McLean, and McHenry Counties, North Dakota. There are common schools trust fund surface interests that are managed by the North Dakota Department of Trust Lands on behalf of the Board of University and School Lands which are included in the **Ruso Wind Project Map**. These surface interests are as follows:

County	*Township*	*Range*	*Section*	*Subdivisions*
Ward	151	81	16	SE4, SW4
Ward	151	81	36	NE4, NW4, SE4
McLean	150	81	4	N2NE4, S2NW4

The following common schools trust fund surface interests are located adjacent to Ruso Wind Project area:

County	*Township*	*Range*	*Section*	*Subdivisions*
Ward	151	82	36	SE4, SW4
McLean	150	82	16	NE4, NW4

Should any trust land surface interests be proposed for inclusion in the project, separate right-of-way applications will need to be submitted as follows:

- An application for wind turbine sites and associated roads and electric collection lines.
- An application for electric collection lines crossing trust land surface interests having no wind tower improvements.
- An application for Transmission lines crossing trust land surface interests having no wind tower improvements.

Any trust land surface interest tracts within the project area will need to be evaluated for inclusion in the wind farm project. Prior to the Board considering Wind Energy Easement Agreements, an onsite inspection of the trust property is required. The inspection would include review of wind turbine site locations, associated access road, collection lines, construction crane access paths and transmission line corridors, as well as the following items which may be considered in the review of an easement application:

1. Financial benefit to the trusts;

2. Availability of alternate encumbrance site or route;
3. The least environmentally damaging site or route regardless of property ownership;
4. Physical stability of the landscape;
5. Other potential future uses for the trust lands, including urban development;
6. Potential mineral and other material development including oil, gas, coal, cement materials, sodium sulfate, sand and gravel, road material, building stone, chemical substances, metallic ores, uranium ores, or colloidal or other clays;
7. Feasibility for reclamation;
8. Maintenance of existing wetlands and water flows;
9. Any cultural, historical, archeological, and paleontological resources;
10. Federally listed threatened and endangered species;
11. Location of the proposed route or site in relation to section lines, quarter section lines and corridors;
12. Potential liability to the trusts;
13. Applicant's past encumbrances on trust lands;
14. Applicant's financial stability; and
15. Any other information relevant to the application which would assist in the determination.

Any proposed wind towers locations and associated electric collection lines and roads would be subject to review and approval by the Board of University and School Lands. The Board of University and School Lands will not move forward with the completion of Wind Energy Easement Agreements until site inspection and review has been completed and all local and state approvals have been obtained.

If you have any questions, feel free to contact our office at 701-328-2800.

Sincerely,

Michael Humann

Michael Humann
Surface Division Manager

g:\support\letters\lrs - dj\hum - ruso wind ltr-klj (8-2018).docx

1707 North 9th Street
PO Box 5523
Bismarck, ND 58506-5523
Phone: (701) 328 – 2800
Fax: (701) 328 – 3650

www.land.nd.gov

DEPARTMENT OF
NDTRUST LANDS
INVESTING FOR EDUCATION

Jodi Smith, Commissioner

September 5, 2018

ASHLEY ROSS
KLJ
4585 COLEMAN STREET
BISMARCK, ND 58503-0431

RE: COMMENTS ON RUSO WIND PROJECT - UPDATED PROJECT MAP

To Whom It May Concern:

The North Dakota Department of Trust lands (NDDTL) received a letter dated August 31, 2018, from KLJ regarding a request for additional review and comment on the proposed RUSO WIND PROJECT in Ward, McLean, and McHenry Counties, North Dakota due to an update in the project map.

A previous letter dated August 24, 2018 was received and responded to on August 29, 2018 by Michael Humann. Based off of the updated Ruso Wind Project Map, NDDTL has no additional tracts with in the project boundary or additional comments.

If you have any questions, feel free to contact our office at 701-328-2800.

Sincerely,

Kayla Graber
Land Management Specialist

1707 North 9th Street
PO Box 5523
Bismarck, ND 58506-5523
Phone: (701) 328 – 2800
Fax: (701) 328 – 3650

https://land.nd.gov

RECEIVED
DEC 04 2018

DEPARTMENT OF
NDTRUST LANDS
INVESTING FOR EDUCATION
Jodi A. Smith, Commissioner

November 28, 2018

ASHLEY ROSS
KLJ
4585 COLEMAN STREET
BISMARCK, ND 58503-0431

RE: RUSO WIND PROJECT COMMENTS; UPDATED PROJECT MAP

To Whom It May Concern:

The North Dakota Department of Trust lands (NDDTL) received a letter dated November 20, 2018, from KLJ regarding additional review and comment on the proposed RUSO WIND PROJECT in WARD, MCLEAN, AND MCHENRY COUNTIES, NORTH DAKOTA. Previous comment letters were sent on August 29, 2018 by Michael Humann and on September 5, 2018 by Kayla Graber.

Based off the received updated Ruso Wind Project Map, the SE4 of Section 36, T151N, R82W would be in the "Revised Study Area". NDDTL also manages the SW4 of the above section. This review did not include a review of NDDTL managed mineral ownership, just surface ownership. Mineral ownership questions can be directed to Drew Combs, NDDTL Mineral Division Manager.

Any proposed projects crossing NDDTL managed property would need to apply for a Rights of Way and would be subject to review and approval by the Board of University and School Lands. This application can be found at: https://land.nd.gov/SurfaceROW/RightOfWay.

If you have any questions, feel free to contact our office at 701-328-2800.

Sincerely,

Kayla Graber
Land Management Specialist

RECEIVED
SEP 2 8 2018

GOVERNOR, Doug Burgum
DIRECTOR, Terry Steinwand
DEPUTY, Scott A. Peterson

"VARIETY IN HUNTING AND FISHING"

NORTH DAKOTA GAME AND FISH DEPARTMENT
100 NORTH BISMARCK EXPRESSWAY BISMARCK, NORTH DAKOTA 58501-5095 PHONE 701-328-6300 FAX 701-328-6352

25 September 2018

Ashley Ross, Project Manager
KLJ
4585 Coleman Street
Bismarck, ND 58503-0431

Dear Ms. Ross:

RE: Ruso Wind Project- Ward, McLean, and McHenry Counties, North Dakota

The North Dakota Game and Fish Department has been in discussion with proponents of the Ruso Wind Project since 2017. During consultations, the Department indicated that, though parts of the project area have been altered by agriculture, there is still a notable amount of undisturbed native prairie and wetlands within the boundary. To avoid impacts to these habitats, the Department has emphasized the importance of careful placement of turbines, roads, and other associated infrastructure.

Native prairie is the most threatened ecosystem in North Dakota and, as we are a grassland state, the majority of our native species are closely connected to the resources our prairie systems provide. Disturbance, fragmentation, and loss of native prairie have already adversely impacted a wide variety of species and these negative impacts will only continue to accrete as more development takes place on the landscape. The remaining tracts of unbroken prairie are becoming increasingly more important to many declining species, including birds and pollinators. A portion of the wind resource area is composed of native, unbroken prairie which may support 30 or more of the 115 Species of Conservation Priority identified in the North Dakota State Wildlife Action Plan (Dyke et. al 2015). For species of conservation priority, such as the Chestnut-collared Longspur which has declined 86% or the Loggerhead Shrike which has declined 74% since 1974 (Rosenberg et. al 2016) the loss and fragmentation of native prairie in the area might mean trending closer to an Endangered Species Act listing.

The proposed project area is located within the Missouri Coteau, a landscape that not only has a considerable amount of native prairie, but an extremely high concentration of wetlands, roughly 800,000 basin acres. Prairie Pothole wetlands are the most productive wildlife habitat in North Dakota, supporting 54 Species of Conservation Priority, as well as a considerable number of waterfowl, shorebirds and cranes throughout the year. The project area includes a large number of wetlands, and the resources they provide are of great value to many of our native species.

Though the Department believes the best way to protect our species of conservation priority is by taking a habitat-focused approach, we would also like to reiterate the following species-specific concerns.

- Nearly 31% of the continental Sharp-tailed Grouse population falls within North Dakota and declines to the state's population will likely lead to range-wide population declines. Sharp-tailed Grouse are a high-valued upland game bird, and because research indicates that prairie grouse may be adversely affected by energy development, careful consideration of turbine placement around active leks is imperative.

- Bats are long-lived, reproduce slowly, and migrate long distances, making them particularly susceptible to wind development. Acoustic surveys should begin one to two years pre-construction to assess the risk the project poses to local bat populations.

- The Whooping Crane's migration corridor enters North Dakota in the northwest corner of the state, angling through Burke County and directly through the proposed project area. The migration corridor then proceeds south to just north of the Van Hook Arm on Lake Sakakawea and follows just east of the Missouri River and its reservoirs until it exits the southern portion of the state. This federally listed endangered species uses a wide variety of shallow wetlands for roosting and foraging. The project falls within the 75% core migration corridor and the risk of Whooping Cranes striking a turbine or a transmission line will be elevated in this area. While no fatalities have been documented of Whooping Cranes from collision with wind turbines in the United States, collisions with transmission lines are the leading known cause of death in the wild for whooping cranes. Contact the US Fish and Wildlife Habitat and Population Evaluation Team (HAPET) in Bismarck to request the Whooping Crane model of predicted use of landscapes.

- The project area is highly important to waterfowl production. HAPET has developed a Local Siting Decision Support Tool (DST) to estimate the number of duck pairs that are displaced based on research conducted in the Dakotas (Loesch et al. 2013, Loesch 2016). The research documented 20% avoidance of wetlands by five species of ducks. Breeding ducks are territorial; as such, they won't reliably find a breeding territory that is as suitable as that found in the proposed project area, and other surrounding areas will likely not be able to support additional breeding pairs. Contact the HAPET office to request the DST to better analyze the risk and impacts of the project to waterfowl.

- The number of Bald Eagle nest sites is increasing substantially in North Dakota. The number of nest sites has increased from 10 known sites in the year 2000 to more than 300 in the year 2017. Due to the continual increase and selection of non-traditional nest sites, it is possible that Bald Eagle nests may be found anywhere across the state where large trees are present. Therefore, it is necessary to conduct searches for raptor nests during the breeding season to understand the risk associated with development.

As we continue to address the challenges of stemming the decline of our state's most sensitive species, we have become increasingly more concerned about the disturbance, fragmentation, and loss of the remaining high value habitats essential to our Species of Conservation Priority.

Ensuring these habitats remain on the landscape is the only way to stem the decline of these species and prevent listings through the Endangered Species Act, which could impact both the state and its citizens by restricting further construction of infrastructure, energy development, recreational activities, grazing, vegetation control, and land-use changes or conversion on both public and private land. To address any losses to native habitats that may be associated with the project, we recommend that a voluntary offset package be developed for the permanent direct and indirect impacts of roads, turbine pads, and associated infrastructure. The Department is committed to working with project proponents to assist in measuring impacts and creating an offset package, if it is determined one would be appropriate.

Sincerely,

Greg Link
Chief, Conservation and Communications Division

em

GOVERNOR, Doug Burgum
DIRECTOR, Terry Steinwand
DEPUTY, Scott A. Peterson

"VARIETY IN HUNTING AND FISHING"

NORTH DAKOTA GAME AND FISH DEPARTMENT
100 NORTH BISMARCK EXPRESSWAY BISMARCK, NORTH DAKOTA 58501-5095 PHONE 701-328-6300 FAX 701-328-6352

December 20, 2018

Ashley Ross, Project Manager
KLJ
4584 Coleman Street
Bismarck, ND 58503-0431

Re: Ruso Wind Project
Ruso Wind Partners, LLC
Ward, McLean and McHenry Counties, North Dakota

Dear Ms. Ross:

The North Dakota Game and Fish Department has been in discussion with proponents of the Ruso Wind Project since 2017. We have provided comments on this project on several occasions, the most recent being a letter dated September 5, 2018. In this letter, the Department expressed its concerns about the impacts, both direct and indirect, wind energy development can have on native habitats and the wildlife they host. In this letter it was also emphasized that careful placement of turbines, roads, and other associated infrastructure is critical for reducing impacts to the states unique, rare, and declining species. Our concerns have not changed, though the project boundary has. Below are comments from our September letter that should be considered for the revised project layout.

> *"Native prairie is the most threatened ecosystem in North Dakota and, as we are a grassland state, the majority of our native species are closely connected to the resources our prairie systems provide. Disturbance, fragmentation, and loss of native prairie have already adversely impacted a wide variety of species and these negative impacts will only continue to accrete as more development takes place on the landscape. The remaining tracts of unbroken prairie are becoming increasingly more important to many declining species, including birds and pollinators. A portion of the wind resource area is composed of native, unbroken prairie which may support 30 or more of the 115 Species of Conservation Priority identified in the North Dakota State Wildlife Action Plan (Dyke et. al 2015). For species of conservation priority, such as the Chestnut-collared Longspur which has declined 86% or the Loggerhead Shrike which has declined 74% since 1974 (Rosenberg et. al 2016) the loss and fragmentation of native prairie in the area might mean trending closer to an Endangered Species Act listing.*
>
> *The proposed project area is located within the Missouri Coteau, a landscape that not only has a considerable amount of native prairie, but an extremely high concentration of wetlands, roughly 800,000 basin acres. Prairie Pothole wetlands are the most productive wildlife habitat in North Dakota, supporting 54 Species of Conservation Priority, as well as a considerable number of*

waterfowl, shorebirds and cranes throughout the year. The project area includes a large number of wetlands, and the resources they provide are of great value to many of our native species.

Though the Department believes the best way to protect our species of conservation priority is by taking a habitat-focused approach, we would also like to reiterate the following species-specific concerns.

- *Nearly 31% of the continental Sharp-tailed Grouse population falls within North Dakota and declines to the state's population will likely lead to range-wide population declines. Sharp-tailed Grouse are a high-valued upland game bird, and because research indicates that prairie grouse may be adversely affected by energy development, careful consideration of turbine placement around active leks is imperative.*

- *Bats are long-lived, reproduce slowly, and migrate long distances, making them particularly susceptible to wind development. Acoustic surveys should begin one to two years pre-construction to assess the risk the project poses to local bat populations.*

- *The Whooping Crane's migration corridor enters North Dakota in the northwest corner of the state, angling through Burke County and directly through the proposed project area. The migration corridor then proceeds south to just north of the Van Hook Arm on Lake Sakakawea and follows just east of the Missouri River and its reservoirs until it exits the southern portion of the state. This federally listed endangered species uses a wide variety of shallow wetlands for roosting and foraging. The project falls within the 75% core migration corridor and the risk of Whooping Cranes striking a turbine or a transmission line will be elevated in this area. While no fatalities have been documented of Whooping Cranes from collision with wind turbines in the United States, collisions with transmission lines are the leading known cause of death in the wild for whooping cranes. Contact the US Fish and Wildlife Habitat and Population Evaluation Team (HAPET) in Bismarck to request the Whooping Crane model of predicted use of landscapes.*

- *The project area is highly important to waterfowl production. HAPET has developed a Local Siting Decision Support Tool (DST) to estimate the number of duck pairs that are displaced based on research conducted in the Dakotas (Loesch et al. 2013, Loesch 2016). The research documented 20% avoidance of wetlands by five species of ducks. Breeding ducks are territorial; as such, they won't reliably find a breeding territory that is as suitable as that found in the proposed project area, and other surrounding areas will likely not be able to support additional breeding pairs. Contact the HAPET office to request the DST to better analyze the risk and impacts of the project to waterfowl.*

- *The number of Bald Eagle nest sites is increasing substantially in North Dakota. The number of nest sites has increased from 10 known sites in the year 2000 to more than 300 in the year 2017. Due to the continual increase and selection of non-traditional nest sites, it is possible that Bald Eagle nests may be found anywhere across the state where large trees are present. Therefore, it is necessary to conduct searches for raptor nests during the breeding season to understand the risk associated with development.*

As we continue to address the challenges of stemming the decline of our state's most sensitive species, we have become increasingly more concerned about the disturbance, fragmentation, and loss of the remaining high value habitats essential to our Species of Conservation Priority. Ensuring these habitats remain on the landscape is the only way to stem the decline of these

species and prevent listings through the Endangered Species Act, which could impact both the state and its citizens by restricting further construction of infrastructure, energy development, recreational activities, grazing, vegetation control, and land-use changes or conversion on both public and private land. To address any losses to native habitats that may be associated with the project, we recommend that a voluntary offset package be developed for the permanent direct and indirect impacts of roads, turbine pads, and associated infrastructure. The Department is committed to working with project proponents to assist in measuring impacts and creating an offset package, if it is determined one would be appropriate."

To further assist Ruso Wind Partners in this effort, we recommend quantifying the direct impacts due to turbine pads, roads, and associated infrastructure and the indirect impacts due to displacement and avoidance. Direct impacts can be easily quantified once the locations of all roads and structures are finalized. Any amount of native habitat that is disturbed, whether it be temporary or permanent, is a direct impact and should be quantified as such. To assess indirect impacts, the best available science conducted in North Dakota on avoidance and displacement due to wind development, Loesch et al. 2013 and Shaffer and Buhl 2016, should be used. Loesch et al. 2013 assessed the displacement of breeding waterfowl pairs on wetlands associated with wind farms in the Prairie Pothole Region. This study found an average rate of 20% displacement by five waterfowl species within a half mile of turbines. Shaffer and Buhl 2016, used a Before-After-Control-Impact (BACI) method to evaluate grassland bird displacement associated with turbines. They found avoidance from turbines by seven grassland bird species and a 53% displacement rate by the 5th year post-construction. By using the parameters within these studies, Ruso Wind Partners will be able estimate impacts for both grassland birds and breeding ducks, indicator species that reflect the use of habitats for a variety of other species.

If you should have any questions on the matter, please do not hesitate to reach out.

Sincerely,

Greg Link
Chief, Conservation and Communications Division

Cc: Scott Larson, US Fish and Wildlife Service
ND Public Service Commission

From: Anderson, Fred J.
To: Ashley Ross
Subject: N.D. Geological Survey - Ruso Wind Project Area Review Comments
Date: Tuesday, September 11, 2018 8:17:26 AM

Hello Ashley-

The project comment letter for the Ruso Wind project came to our offices at the NDGS through the NDIC and the Oil & Gas Division.

Here are our comments related to the project with respect to geologic hazards:

The project area is located dominantly on the Missouri Coteau in kettle moraine. As such, the project area is generally free of landslides, except along the eastern edge of the project area along the Ward/McHenry Co. border where a few localized slide areas were mapped along drainage features.

Six 24K quads were mapped ahead of this project (four were recently completed and the other two were done in 2016) and included:

Benedict NW, Robinson Coulee, Blacktail Coulee, Benedict SW, Benedict, and Ruso.

Published areas of landslides maps for the project area can be found on our website at: https://www.dmr.nd.gov/ndgs/landslides/

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/

From: Hicks, Bruce E.
To: Ashley Ross
Cc: Murphy, Ed C.; Fine, Karlene K.
Subject: Ruso Wind Farm
Date: Monday, September 10, 2018 10:58:33 AM

Ashley,

We are in receipt of your letter concerning the revised study area for the proposed Ruso Wind Project. Please be aware that although no producing oil or gas wells currently exist within the study area, the following wells were plugged within the proposed area. Note surface casing was cut off approximately three feet below ground level:

- File #5401: Cardinal Petroleum Co. & Tom Stock #1 Hauf, SWSE 19-151-81, plugged in 3-08-1974
- File #14494: Bennett Exploration & Production Co. #1 Henry Linke, NESW 9-151-81, plugged in 11-23-1996
- File #14959: Westech Energy Corporation #1-7 Emil Hauf, NENE 7-151-81, plugged in 3-27-2000

Please let us know if you have any questions or comments.

Sincerely,

Bruce E. Hicks
Assistant Director
Oil and Gas Division
Dept of Mineral Resources
North Dakota Industrial Commission
701-328-8020
bhicks@nd.gov
www.dmr.nd.gov/oilgas
Bismarck, ND 58505-0840

STATE HISTORICAL SOCIETY OF NORTH DAKOTA

RECEIVED
SEP 04 2018

Doug Burgum
Governor of North Dakota

North Dakota State Historical Board

Terrance Rockstad
Bismarck - President

H. Patrick Weir
Medora - Vice President

Steve C. Martens
Fargo - Secretary

Albert I. Berger
Grand Forks

Daniel Stenberg
Watford City

Sara Otte Coleman
Director
Tourism Division

Kelly Schmidt
State Treasurer

Alvin A. Jaeger
Secretary of State

Melissa Baker
Director
Parks and Recreation Department

Thomas Sorel
Director
Department of Transportation

Claudia J. Berg
Director

Accredited by the American Alliance of Museums since 1986

August 28, 2018

Ms. Ashley Ross, Project Manager
KLJ
4585 Coleman Street
Bismarck, ND 58503-0431

ND SHPO REF: 18-1317 ND Public Service Commission – Proposed 200 MW, 52 turbines Ruso Wind Project and Transmission siting project in Ward, McLean and McHenry Counties, North Dakota

Dear Ms. Ross,

Thank you for your preliminary information on ND SHPO REF: 18-1317 ND Public Service Commission – Proposed 200 MW, 52 turbines Ruso Wind Project and Transmission siting project in Ward, McLean and McHenry Counties, North Dakota, which is located between the proposed New Frontier (2016) and existing Prairiewinds ND 1 (2009) wind turbine projects. We recommend survey for cultural resources as follows:

- A current Class I (file search) to determine recorded cultural resources in the project 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. See page 16 of the ND SHPO Guidelines Manual for additional information.

- A Class III archaeological survey of all areas of direct impact including crane paths, met towers, access roads, turbine locations and staging areas, unless the footprint has been recently surveyed for cultural resources.

Thank you for the opportunity to review preliminary information on this project. We look forward to answering any questions and reviewing the requested reports. If you have questions please contact or Susan Quinnell at squinnell@nd.gov or (701) 328-3576.

Sincerely,

Claudia J. Berg
Director, State Historical Society of North Dakota

STATE HISTORICAL SOCIETY OF NORTH DAKOTA

Doug Burgum
Governor of North Dakota

North Dakota State Historical Board

Terrance Rockstad
Bismarck - President

H. Patrick Weir
Medora - Vice President

Steve C. Martens
Fargo - Secretary

Albert I. Berger
Grand Forks

Daniel Stenberg
Watford City

Sara Otte Coleman
Director
Tourism Division

Kelly Schmidt
State Treasurer

Alvin A. Jaeger
Secretary of State

Melissa Baker
Director
Parks and Recreation Department

Thomas Sorel
Director
Department of Transportation

Claudia J. Berg
Director

Accredited by the American Alliance of Museums since 1986

September 5, 2018

Ms. Ashley Ross, Project Manager
KLJ
4585 Coleman Street
Bismarck, ND 58503-0431

ND SHPO REF: 18-1317A ND Public Service Commission – Proposed 200 MW, 52 turbines Ruso Wind Project - Transmission siting portion of the project in Ward and McHenry Counties, North Dakota

Dear Ms. Ross,

Thank you for your preliminary information on ND SHPO REF: 18-1317A ND Public Service Commission – Proposed 200 MW, 52 turbines Ruso Wind Project - Transmission siting portion of the project in Ward and McHenry Counties, North Dakota, which is located between the proposed New Frontier (2016) and existing Prairiewinds ND 1 (2009) wind turbine projects. We recommend survey for cultural resources as follows:

- A current Class I (file search) to determine recorded cultural resources in the project 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. See page 16 of the ND SHPO Guidelines Manual for additional information.

- A Class III archaeological survey of all areas of direct impact including crane paths, met towers, access roads, turbine locations and staging areas, unless the footprint has been recently surveyed for cultural resources.

Thank you for the opportunity to review preliminary information on this project. We look forward to answering any questions and reviewing the requested reports. If you have questions please contact or Susan Quinnell at squinnell@nd.gov or (701) 328-3576.

Sincerely,

Claudia J. Berg
Director, State Historical Society of North Dakota

STATE HISTORICAL SOCIETY OF NORTH DAKOTA

Doug Burgum
Governor of North Dakota

North Dakota State Historical Board

Terrance Rockstad
Bismarck - President

H. Patrick Weir
Medora - Vice President

Steve C. Martens
Fargo - Secretary

Albert I. Berger
Grand Forks

Daniel Stenberg
Watford City

Calvin Grinnell
Bismarck

Allan Demaray
New Town

Sara Otte Coleman
Director
Tourism Division

Kelly Schmidt
State Treasurer

Alvin A. Jaeger
Secretary of State

Melissa Baker
Director
Parks and Recreation Department

Sondra Goebel
Representative
Department of Transportation

Claudia J. Berg
Director

Accredited by the American Alliance of Museums since 1986

Nov. 30, 2018

Ms. Ashley Ross, Project Manager
KLJ
4585 Coleman Street
Bismarck, ND 58503-0431

ND SHPO REF: 18-1317 ND Public Service Commission – Proposed 200 MW, 52 turbines Ruso Wind Project and Transmission siting project in Ward, McLean and McHenry Counties, North Dakota

Dear Ms. Ross,

Thank you for your preliminary information on ND SHPO REF: 18-1317 ND Public Service Commission – Proposed 200 MW, 52 turbines Ruso Wind Project and Transmission siting project in Ward, McLean and McHenry Counties, North Dakota, which is located between the proposed New Frontier (2016) and existing Prairiewinds ND 1 (2009) wind turbine projects. We recommend survey for cultural resources as follows:

- A current Class I (file search) to determine recorded cultural resources in the project 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. See page 16 of the ND SHPO Guidelines Manual for additional information.

- A Class III archaeological survey of all areas of direct impact including crane paths, met towers, access roads, turbine locations and staging areas, unless the footprint has been recently surveyed for cultural resources.

Thank you for the opportunity to review preliminary information on this project. We look forward to answering any questions and reviewing the requested reports. If you have questions please contact or Susan Quinnell at squinnell@nd.gov or (701) 328-3576.

Sincerely,

Claudia J. Berg
Director, State Historical Society of North Dakota

North Dakota State Water Commission

900 EAST BOULEVARD AVENUE, DEPT 770 • BISMARCK, NORTH DAKOTA 58505-0850
(701) 328-2750 • TTY 1-800-366-6888 or 711 • FAX (701) 328-3696 • http://swc.nd.gov

September 13, 2018

Ashley Ross
KLJ
4585 Coleman Street
Bismarck, ND 58503-0431

Dear Ms. Ross:

This is in response to your request for a review of the environmental impacts associated with the Ruso Wind Project located in Ward, McLean and McHenry Counties, ND.

The proposed project has been reviewed by State Water Commission staff, and the following comments are provided:

- Initial review indicates the project does not require a conditional or temporary permit for water appropriation. However, if surface water or groundwater will be diverted for construction of the project, a water permit will be required per North Dakota Century Code (NDCC) § 61-04-02. Please consult with the Water Appropriations Division of the Office of the State Engineer (OSE) if you have any questions regarding this comment at 701-328-2754 or waterpermits@nd.gov.

The State Water Commission (SWC) maintains a network of observation wells across the state for monitoring the water levels and quality in glacial and bedrock aquifers. These wells are often installed in road and highway rights-of-way to limit inconvenience to the adjacent landowners. SWC observation wells have a yellow protective casing extending between 1 and 3 feet above ground surface, and their locations are marked with a stake. If an observation well is encountered during project activities and must be removed, please contact the Water Appropriations Division. The SWC hopes to keep all observation wells, but otherwise will ensure the well is properly abandoned.

- Through the National Flood Insurance Program, a floodplain permit is required for all development that takes place within a Special Flood Hazard Area, as identified by FEMA. Please work with the local floodplain administrator(s) for additional information and permit requirements. The floodplain administrator for Ward County is Nancy Simpson, 701-838-0767 or nancy.simpson@wardnd.com. The floodplain administrator for McClean County is Les Korgel, 701-462-8541 or lkorgel@nd.gov.

- There are dams located in the following locations within the revised project area. Should a dam be encountered during construction, please contact Karen Goff at 701-328-4953 or kgoff@nd.gov.
(Township - Range - Section - ¼), 152 - 81 - 36 – SW; 152 - 81 - 36 – SE; 151 - 82 - 10 – NE; 151 - 82 - 25 – SW; and 150 - 82 - 03 – SW

Thank you for the opportunity to provide review comments. If you have any questions, please call me at 701-328-4967.

Sincerely,

Jared Huibregtse
Water Resource Planner IV

JH:dm/1570

DOUG BURGUM, GOVERNOR
CHAIRMAN

GARLAND ERBELE, P.E.
CHIEF ENGINEER-SECRETARY

North Dakota State Water Commission

900 EAST BOULEVARD AVENUE, DEPT 770 • BISMARCK, NORTH DAKOTA 58505-0850
(701) 328-2750 • TTY 1-800-366-6888 or 711 • FAX (701) 328-3696 • http://swc.nd.gov

December 12, 2018

Ashley Ross
KLJ
4585 Coleman Street
Bismarck, ND 58503-0431

Dear Ms. Ross:

This is in response to your request for a review of the environmental impacts associated with the Ruso Wind Project located in Ward, McLean and McHenry Counties, ND.

Agency comments have not changed from the enclosed letter dated September 13, 2018. However, please note a different contact for McLean County's floodplain administrator: Todd Schreiner, 701-462-8541, tschreiner@nd.gov.

Thank you for the opportunity to provide review comments. If you have any questions, please call me at 701-328-4967.

Sincerely,

Jared Huibregtse

Jared Huibregtse
Water Resource Planner IV

JH:dm/1570
Encl.

DOUG BURGUM, GOVERNOR
CHAIRMAN

GARLAND ERBELE, P.E.
CHIEF ENGINEER-SECRETARY

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, OMAHA DISTRICT
NORTH DAKOTA REGULATORY OFFICE
3319 UNIVERSITY DRIVE
BISMARCK, NORTH DAKOTA 58504-7565

September 13, 2018

NWO-2018-01598-BIS

Kadrmas Lee & Jackson
Attn: Ms. Ashley Ross
4585 Coleman St
Bismarck, North Dakota 58504-0431

Dear Ms. Ross:

This is in response to your solicitation letters dated August 24 and 31, 2018, requesting Department of the Army (DA), United States Army Corps of Engineers (Corps) comments on the proposed Ruso Wind Farm and Associated Transmission Line project. The project is located Ward, McLean, and McHenry Counties, North Dakota.

Corps Regulatory Offices administers Section 404 of the Clean Water Act. Section 404 of the Clean Water Act regulates the discharge of dredge or fill material (temporarily or permanently) in waters of the United States. Waters of the United States may include, but are not limited to, rivers, streams, ditches, coulees, lakes, ponds, and their adjacent wetlands. Fill material includes, but is not limited to, rock, sand, soil, clay, plastics, construction debris, wood chips, overburden from mines or other excavation activities and materials used to create any structure or infrastructure in waters of the United States.

Enclosed for your information is the fact sheet for Nationwide Permit 12, Utility Line Activities. Utility lines are already authorized by Nationwide Permit 12 provided the utility line can be placed without any change to pre-construction contours and all other proposed construction activities and facilities are in compliance with the Nationwide's permit conditions and 401 Water Quality Certification. On Tribal Lands, Water Quality Certification is denied for all Nationwide Permits. Applicants must work with EPA to obtain individual water quality certification. Please note the pre-construction notification requirements on page 2 of the fact sheet. If a project involves any one of the seven notification requirements, the project proponent must submit a DA application. Furthermore, a project must also be in compliance with the "Regional Conditions for Nationwide Permits within the State of North Dakota", found on pages 18 thru 21 of the fact sheet.

In the event your project(s) requires approval from the U.S. Army Corps of Engineers and cannot be authorized by Nationwide Permit(s), a Standard or Individual Permit will be required. A project that requires a Standard or Individual Permit is intensely

Printed on Recycled Paper

reviewed and will require the issuance of a public notice. A Standard or Individual Permit generally requires a minimum of 120 days for processing but based on the project impacts and comments received through the public notice may extend well beyond 120 days.

This correspondence letter does not approve the proposed construction work or does not verify the proposed project complies with the Nationwide Permit(s).

If any of these projects require a Section 404 permit, please complete and submit the enclosed Department of the Army permit application (ENG Form 4345) to the U.S. Army Corps of Engineers, North Dakota Regulatory Office, 3319 University Drive, Bismarck, North Dakota 58504 or to the email address below. If you are unsure if a permit is required, you may submit an application; include a project location map, description of work, and construction methodology.

The North Dakota Regulatory office can accept (and prefers) electronic submissions to the following email: CENWO-OD-RND@usace.army.mil.

If we can be of further assistance or should you have any questions regarding our program, please do not hesitate to contact this office by letter of phone at (701) 255-0015.

Sincerely,

Patricia L. McQueary
State Program Manager
North Dakota

Enclosure
ENG Form 4345
Permit Completion Instructions
Fact Sheet NWP 12

Instructions for Preparing a
Department of the Army Permit Application

Blocks 1 through 4. To be completed by Corps of Engineers.

Block 5. Applicant's Name. Enter the name and the E-mail address of the responsible party or parties. If the responsible party is an agency, company, corporation, or other organization, indicate the name of the organization and responsible officer and title. If more than one party is associated with the application, please attach a sheet with the necessary information marked Block 5.

Block 6. Address of Applicant. Please provide the full address of the party or parties responsible for the application. If more space is needed, attach an extra sheet of paper marked Block 6.

Block 7. Applicant Telephone Number(s). Please provide the number where you can usually be reached during normal business hours.

Blocks 8 through 11. To be completed, if you choose to have an agent.

Block 8. Authorized Agent's Name and Title. Indicate name of individual or agency, designated by you, to represent you in this process. An agent can be an attorney, builder, contractor, engineer, or any other person or organization. Note: An agent is not required.

Blocks 9 and 10. Agent's Address and Telephone Number. Please provide the complete mailing address of the agent, along with the telephone number where he / she can be reached during normal business hours.

Block 11. Statement of Authorization. To be completed by applicant, if an agent is to be employed.

Block 12. Proposed Project Name or Title. Please provide name identifying the proposed project, e.g., Landmark Plaza, Burned Hills Subdivision, or Edsall Commercial Center.

Block 13. Name of Waterbody. Please provide the name of any stream, lake, marsh, or other waterway to be directly impacted by the activity. If it is a minor (no name) stream, identify the waterbody the minor stream enters.

Block 14. Proposed Project Street Address. If the proposed project is located at a site having a street address (not a box number), please enter it here.

Block 15. Location of Proposed Project. Enter the latitude and longitude of where the proposed project is located. If more space is required, please attach a sheet with the necessary information marked Block 15.

Block 16. Other Location Descriptions. If available, provide the Tax Parcel Identification number of the site, Section, Township, and Range of the site (if known), and / or local Municipality that the site is located in.

Block 17. Directions to the Site. Provide directions to the site from a known location or landmark. Include highway and street numbers as well as names. Also provide distances from known locations and any other information that would assist in locating the site. You may also provide description of the proposed project location, such as lot numbers, tract numbers, or you may choose to locate the proposed project site from a known point (such as the right descending bank of Smith Creek, one mile downstream from the Highway 14 bridge). If a large river or stream, include the river mile of the proposed project site if known

Block 18. Nature of Activity. Describe the overall activity or project. Give appropriate dimensions of structures such as wing walls, dikes (identify the materials to be used in construction, as well as the methods by which the work is to be done), or excavations (length, width, and height). Indicate whether discharge of dredged or fill material is involved. Also, identify any structure to be constructed on a fill, piles, or float-supported platforms.

The written descriptions and illustrations are an important part of the application. Please describe, in detail, what you wish to do. If more space is needed, attach an extra sheet of paper marked Block 18.

Block 19. Proposed Project Purpose. Describe the purpose and need for the proposed project. What will it be used for and why? Also include a brief description of any related activities to be developed as the result of the proposed project. Give the approximate dates you plan to both begin and complete all work.

Block 20. Reasons for Discharge. If the activity involves the discharge of dredged and/or fill material into a wetland or other waterbody, including the temporary placement of material, explain the specific purpose of the placement of the material (such as erosion control).

Block 21. Types of Material Being Discharged and the Amount of Each Type in Cubic Yards. Describe the material to be discharged and amount of each material to be discharged within Corps jurisdiction. Please be sure this description will agree with your illustrations. Discharge material includes: rock, sand, clay, concrete, etc.

Block 22. Surface Areas of Wetlands or Other Waters Filled. Describe the area to be filled at each location. Specifically identify the surface areas, or part thereof, to be filled. Also include the means by which the discharge is to be done (backhoe, dragline, etc.). If dredged material is to be discharged on an upland site, identify the site and the steps to be taken (if necessary) to prevent runoff from the dredged material back into a waterbody. If more space is needed, attach an extra sheet of paper marked Block 22.

Block 23. Description of Avoidance, Minimization, and Compensation. Provide a brief explanation describing how impacts to waters of the United States are being avoided and minimized on the project site. Also provide a brief description of how impacts to waters of the United States will be compensated for, or a brief statement explaining why compensatory mitigation should not be required for those impacts.

Block 24. Is Any Portion of the Work Already Complete? Provide any background on any part of the proposed project already completed. Describe the area already developed, structures completed, any dredged or fill material already discharged, the type of material, volume in cubic yards, acres filled, if a wetland or other waterbody (in acres or square feet). If the work was done under an existing Corps permit, identity the authorization, if possible.

Block 25. Names and Addresses of Adjoining Property Owners, Lessees, etc., Whose Property Adjoins the Project Site. List complete names and full mailing addresses of the adjacent property owners (public and private) lessees, etc., whose property adjoins the waterbody or aquatic site where the work is being proposed so that they may be notified of the proposed activity (usually by public notice). If more space is needed, attach an extra sheet of paper marked Block 24.

Information regarding adjacent landowners is usually available through the office of the tax assessor in the county or counties where the project is to be developed.

Block 26. Information about Approvals or Denials by Other Agencies. You may need the approval of other federal, state, or local agencies for your project. Identify any applications you have submitted and the status, if any (approved or denied) of each application. You need not have obtained all other permits before applying for a Corps permit.

Block 27. Signature of Applicant or Agent. The application must be signed by the owner or other authorized party (agent). This signature shall be an affirmation that the party applying for the permit possesses the requisite property rights to undertake the activity applied for (including compliance with special conditions, mitigation, etc.).

DRAWINGS AND ILLUSTRATIONS

General Information.

Three types of illustrations are needed to properly depict the work to be undertaken. These illustrations or drawings are identified as a Vicinity Map, a Plan View or a Typical Cross-Section Map. Identify each illustration with a figure or attachment number.

Please submit one original, or good quality copy, of all drawings on 8½ x11 inch plain white paper (electronic media may be substituted). Use the fewest number of sheets necessary for your drawings or illustrations.

Each illustration should identify the project, the applicant, and the type of illustration (vicinity map, plan view, or cross-section). **While illustrations need not be professional (many small, private project illustrations are prepared by hand), they should be clear, accurate, and contain all necessary information.**

U.S. Army Corps of Engineers (USACE)

APPLICATION FOR DEPARTMENT OF THE ARMY PERMIT

33 CFR 325. The proponent agency is CECW-CO-R.

Form Approved - OMB No. 0710-0003 Expires: 01-08-2018

The public reporting burden for this collection of information, OMB Control Number 0710-0003, is estimated to average 11 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimate or burden reduction suggestions to the Department of Defense, Washington Headquarters Services, at whs.mc-alex.esd.mbx.dd-dod-information-collections@mail.mil. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. PLEASE DO NOT RETURN YOUR APPLICATION TO THE ABOVE EMAIL.

PRIVACY ACT STATEMENT

Authorities: Rivers and Harbors Act, Section 10, 33 USC 403; Clean Water Act, Section 404, 33 USC 1344; Marine Protection, Research, and Sanctuaries Act, Section 103, 33 USC 1413; Regulatory Programs of the Corps of Engineers; Final Rule 33 CFR 320-332. Principal Purpose: Information provided on this form will be used in evaluating the application for a permit. Routine Uses: This information may be shared with the Department of Justice and other federal, state, and local government agencies, and the public and may be made available as part of a public notice as required by Federal law. Submission of requested information is voluntary, however, if information is not provided the permit application cannot be evaluated nor can a permit be issued. One set of original drawings or good reproducible copies which show the location and character of the proposed activity must be attached to this application (see sample drawings and/or instructions) and be submitted to the District Engineer having jurisdiction over the location of the proposed activity. An application that is not completed in full will be returned. System of Record Notice (SORN). The information received is entered into our permit tracking database and a SORN has been completed (SORN #A1145b) and may be accessed at the following website: http://dpcld.defense.gov/Privacy/SORNsIndex/DOD-wide-SORN-Article-View/Article/570115/a1145b-ce.aspx

(ITEMS 1 THRU 4 TO BE FILLED BY THE CORPS)

1. APPLICATION NO.	2. FIELD OFFICE CODE	3. DATE RECEIVED	4. DATE APPLICATION COMPLETE

(ITEMS BELOW TO BE FILLED BY APPLICANT)

5. APPLICANT'S NAME	8. AUTHORIZED AGENT'S NAME AND TITLE (agent is not required)
First - Middle - Last -	First - Middle - Last -
Company -	Company -
E-mail Address -	E-mail Address -
6. APPLICANT'S ADDRESS:	9. AGENT'S ADDRESS:
Address-	Address-
City - State - Zip - Country -	City - State - Zip - Country -
7. APPLICANT'S PHONE NOs. w/AREA CODE	10. AGENTS PHONE NOs. w/AREA CODE
a. Residence b. Business c. Fax	a. Residence b. Business c. Fax

STATEMENT OF AUTHORIZATION

11. I hereby authorize, _____ to act in my behalf as my agent in the processing of this application and to furnish, upon request, supplemental information in support of this permit application.

_____ _____
SIGNATURE OF APPLICANT DATE

NAME, LOCATION, AND DESCRIPTION OF PROJECT OR ACTIVITY

12. PROJECT NAME OR TITLE (see instructions)

13. NAME OF WATERBODY, IF KNOWN (if applicable)	14. PROJECT STREET ADDRESS (if applicable)
	Address
15. LOCATION OF PROJECT	City - State- Zip-
Latitude: °N Longitude: °W	

16. OTHER LOCATION DESCRIPTIONS, IF KNOWN (see instructions)

State Tax Parcel ID Municipality

Section - Township - Range -

17. DIRECTIONS TO THE SITE

18. Nature of Activity (Description of project, include all features)

19. Project Purpose (Describe the reason or purpose of the project, see instructions)

USE BLOCKS 20-23 IF DREDGED AND/OR FILL MATERIAL IS TO BE DISCHARGED

20. Reason(s) for Discharge

21. Type(s) of Material Being Discharged and the Amount of Each Type in Cubic Yards:

Type Amount in Cubic Yards	Type Amount in Cubic Yards	Type Amount in Cubic Yards

22. Surface Area in Acres of Wetlands or Other Waters Filled (see instructions)

Acres

or

Linear Feet

23. Description of Avoidance, Minimization, and Compensation (see instructions)

24. Is Any Portion of the Work Already Complete? ☐ Yes ☐ No IF YES, DESCRIBE THE COMPLETED WORK

25. Addresses of Adjoining Property Owners, Lessees, Etc., Whose Property Adjoins the Waterbody (if more than can be entered here, please attach a supplemental list)

a. Address-

City - State - Zip -

b. Address-

City - State - Zip -

c. Address-

City - State - Zip -

d. Address-

City - State - Zip -

e. Address-

City - State - Zip -

26. List of Other Certificates or Approvals/Denials received from other Federal, State, or Local Agencies for Work Described in This Application.

AGENCY	TYPE APPROVAL*	IDENTIFICATION NUMBER	DATE APPLIED	DATE APPROVED	DATE DENIED

* Would include but is not restricted to zoning, building, and flood plain permits

27. Application is hereby made for permit or permits to authorize the work described in this application. I certify that this information in this application is complete and accurate. I further certify that I possess the authority to undertake the work described herein or am acting as the duly authorized agent of the applicant.

SIGNATURE OF APPLICANT DATE SIGNATURE OF AGENT DATE

The Application must be signed by the person who desires to undertake the proposed activity (applicant) or it may be signed by a duly authorized agent if the statement in block 11 has been filled out and signed.

18 U.S.C. Section 1001 provides that: Whoever, in any manner within the jurisdiction of any department or agency of the United States knowingly and willfully falsifies, conceals, or covers up any trick, scheme, or disguises a material fact or makes any false, fictitious or fraudulent statements or representations or makes or uses any false writing or document knowing same to contain any false, fictitious or fraudulent statements or entry, shall be fined not more than $10,000 or imprisoned not more than five years or both.

FACT SHEET
NATIONWIDE PERMIT 12
(2017)

UTILITY LINE ACTIVITIES

Activities required for the construction, maintenance, repair, and removal of utility lines and associated facilities in waters of the United States, provided the activity does not result in the loss of greater than 1/2-acre of waters of the United States for each single and complete project.
Utility lines: This NWP authorizes discharges of dredged or fill material
into waters of the United States and structures or work in navigable waters for crossings of those waters associated with the construction, maintenance, or repair of utility lines, including outfall and intake structures. There must be no change in pre-construction contours of waters of the United States. A ''utility line'' is defined as any pipe or pipeline for the transportation of any gaseous, liquid, liquescent, or slurry substance, for any purpose, and any cable, line, or wire for the transmission for any purpose of electrical energy, telephone, and telegraph messages, and internet, radio, and television communication. The term ''utility line'' does not include activities that drain a water of the United States, such as drainage tile or french drains, but it does apply to pipes conveying drainage from another area. Material resulting from trench excavation may be temporarily sidecast into waters of the United States for no more than three months, provided the material is not placed in such a manner that it is dispersed by currents or other forces. The district engineer may extend the period of temporary side casting for no more than a total of 180 days, where appropriate. In wetlands, the top 6 to 12 inches of the trench should normally be backfilled with topsoil from the trench. The trench cannot be constructed or backfilled in such a manner as to drain waters of the United States (e.g., backfilling with extensive gravel layers, creating a french drain effect). Any exposed slopes and stream banks must be stabilized immediately upon completion of the utility line crossing of each waterbody.
Utility line substations: This NWP authorizes the construction, maintenance, or expansion of substation facilities associated with a power line or utility line in non-tidal waters of the United States, provided the activity, in combination with all other activities included in one single and complete project, does not result in the loss of greater than 1/2-acre of waters of the United States. This NWP does not authorize discharges into non-tidal wetlands adjacent to tidal waters of the United States to construct, maintain, or expand substation facilities. Foundations for overhead utility line towers, poles, and anchors: This NWP authorizes the construction or maintenance of foundations for overhead utility line towers, poles, and anchors in all waters of the United States, provided the foundations are the minimum size necessary and separate footings for each tower leg (rather than a larger single pad) are used where feasible.
Access roads: This NWP authorizes the construction of access roads for the
construction and maintenance of utility lines, including overhead power lines and utility line substations, in non-tidal waters of the United States, provided the activity, in combination with all other activities included in one single and complete project, does not cause the loss of greater than 1/2-acre of non-tidal waters of the United States. This NWP does not authorize discharges into non- tidal wetlands adjacent to tidal waters for access roads. Access roads must be the minimum width necessary (see Note 2, below). Access roads must be constructed so that the length of the road minimizes any adverse effects on waters of the United States and must be as near as possible to pre-construction contours and elevations (e.g., at grade corduroy roads or

geotextile/gravel roads). Access roads constructed above pre-construction contours and elevations in waters of the United States must be properly bridged or culverted to maintain surface flows. This NWP may authorize utility lines in or affecting navigable waters of the United States even if there is no associated discharge of dredged or fill material (See 33 CFR part 322). Overhead utility lines constructed over section 10 waters and utility lines that are routed in or under section 10 waters without a discharge of dredged or fill material require a section 10 permit. This NWP authorizes, to the extent that Department of the Army authorization is required, temporary structures, fills, and work necessary for the remediation of inadvertent returns of drilling fluids to waters of the United States through sub-soil fissures or fractures that might occur during horizontal directional drilling activities conducted for the purpose of installing or replacing utility lines. These remediation activities must be done as soon as practicable, to restore the affected waterbody. District engineers may add special conditions to this NWP to require a remediation plan for addressing inadvertent returns of drilling fluids to waters of the United States during horizontal directional drilling activities conducted for the purpose of installing or replacing utility lines. This NWP also authorizes temporary structures, fills, and work, including the use of temporary mats, necessary to conduct the utility line activity. Appropriate measures must be taken to maintain normal downstream flows and minimize flooding to the maximum extent practicable, when temporary structures, work, and discharges, including cofferdams, are necessary for construction activities, access fills, or dewatering of construction sites. Temporary fills must consist of materials, and be placed in a manner, that will not be eroded by expected high flows. After construction, temporary fills must be removed in their entirety and the affected areas returned to pre- construction elevations. The areas affected by temporary fills must be revegetated, as appropriate.
Notification: The permittee must submit a pre-construction notification to the district engineer prior to commencing the activity if any of the following criteria are met: (1) The activity involves mechanized land clearing in a forested wetland for the utility line right-of-way; (2) a section 10 permit is required; (3) the utility line in waters of the United States, excluding overhead lines, exceeds 500 feet; (4) the utility line is placed within a jurisdictional area (i.e., water of the United States), and it runs parallel to or along a stream bed that is within that jurisdictional area; (5) discharges that result in the loss of greater than 1/10- acre of waters of the United States; (6) permanent access roads are constructed above grade in waters of the United States for a distance of more than 500 feet; or (7) permanent access roads are constructed in waters of the United States with impervious materials. (See general condition 32.) (Sections 10 and 404)

Note 1: Where the utility line is constructed or installed in navigable waters of the United States (i.e., section 10 waters) within the coastal United States, the Great Lakes, and United States territories, a copy of the NWP verification will be sent by the Corps to the National Oceanic and Atmospheric Administration (NOAA), National Ocean Service (NOS), for charting the utility line to protect navigation.

Note 2: For utility line activities crossing a single waterbody more than one time at separate and distant locations, or multiple waterbodies at separate and distant locations, each crossing is considered a single and complete project for purposes of NWP authorization. Utility line activities must comply with 33 CFR 330.6(d).

Note 3: Utility lines consisting of aerial electric power transmission lines crossing navigable waters of the United States (which are defined at 33 CFR part 329) must comply with the applicable minimum clearances specified in 33 CFR 322.5(i).

Note 4: Access roads used for both construction and maintenance may be authorized, provided they meet the terms and conditions of this NWP. Access roads used solely for construction of the utility line must be removed upon completion of the work, in accordance with the requirements for temporary fills.

Note 5: Pipes or pipelines used to transport gaseous, liquid, liquescent, or slurry substances over navigable waters of the United States are considered to be bridges, not utility lines, and may require a permit from the U.S. Coast Guard pursuant to section 9 of the Rivers and Harbors Act of 1899. However, any discharges of dredged or fill material into waters of the United States associated with such pipelines will require a section 404 permit (see NWP 15).

Note 6: This NWP authorizes utility line maintenance and repair activities that do not qualify for the Clean Water Act section 404(f) exemption for maintenance of currently serviceable fills or fill structures.

Note 7: For overhead utility lines authorized by this NWP, a copy of the PCN and NWP verification will be provided to the Department of Defense Siting Clearinghouse, which will evaluate potential effects on military activities.

Note 8: For NWP 12 activities that require pre-construction notification, the PCN must include any other NWP(s), regional general permit(s), or individual permit(s) used or intended to be used to authorize any part of the proposed project or any related activity, including other separate and distant crossings that require Department of the Army authorization but do not require pre-construction notification (see paragraph (b) of general condition 32). The district engineer will evaluate the PCN in accordance with Section D, "District Engineer's Decision." The district engineer may require mitigation to ensure that the authorized activity results in no more than minimal individual and cumulative adverse environmental effects (see general condition 23).

Nationwide Permit General Conditions

Note: To qualify for NWP authorization, the prospective permittee must comply with the following general conditions, as applicable, in addition to any regional or case-specific conditions imposed by the division engineer or district engineer. Prospective permittees should contact the appropriate Corps district office to determine if regional conditions have been imposed on an NWP. Prospective permittees should also contact the appropriate Corps district office to determine the status of Clean Water Act Section 401 water quality certification and/ or Coastal Zone Management Act consistency for an NWP. Every person who may wish to obtain permit authorization under one or more NWPs, or who is currently relying on an existing or prior permit authorization under one or more NWPs, has been and is on notice that all of the provisions of 33 CFR 330.1 through 330.6 apply to every NWP authorization. Note especially 33 CFR 330.5 relating to the modification, suspension, or revocation of any NWP authorization.

1. Navigation.

(a) No activity may cause more than a minimal adverse effect on navigation.
(b) Any safety lights and signals prescribed by the U.S. Coast Guard, through regulations or otherwise, must be installed and maintained at the permittee's expense on authorized facilities in navigable waters of the United States.
(c) The permittee understands and agrees that, if future operations by the United States require the removal, relocation, or other alteration, of the structure or work herein authorized, or if, in the opinion of the Secretary of the Army or his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the permittee will be required, upon due notice from the Corps of Engineers, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the United States. No claim shall be made against the United States on account of any such removal or alteration.

2. Aquatic Life Movements.

No activity may substantially disrupt the necessary life cycle movements of those species of aquatic life indigenous to the waterbody, including those species that normally migrate through the area, unless the activity's primary purpose is to impound water. All permanent and temporary crossings of waterbodies shall be suitably culverted, bridged, or otherwise designed and constructed to maintain low flows to sustain the movement of those aquatic species. If a bottomless culvert cannot be used, then the crossing should be designed and constructed to minimize adverse effects to aquatic life movements.

3. Spawning Areas.

Activities in spawning areas during spawning seasons must be avoided to the maximum extent practicable. Activities that result in the physical destruction (e.g., through excavation, fill, or downstream smothering by substantial turbidity) of an important spawning area are not authorized.

4. Migratory Bird Breeding Areas.

Activities in waters of the United States that serve as breeding areas for migratory birds must be avoided to the maximum extent practicable.

5. Shellfish Beds.

No activity may occur in areas of concentrated shellfish populations, unless the activity is directly related to a shellfish harvesting activity authorized by NWPs 4 and 48, or is a shellfish seeding or habitat restoration activity authorized by NWP 27.

6. Suitable Material.

No activity may use unsuitable material (e.g., trash, debris, car bodies, asphalt, etc.). Material used for construction or discharged must be free from toxic pollutants in toxic amounts (see section 307 of the Clean Water Act).

7. Water Supply Intakes.

No activity may occur in the proximity of a public water supply intake, except where the activity is for the repair or improvement of public water supply intake structures or adjacent bank stabilization.

8. Adverse Effects from Impoundments.

If the activity creates an impoundment of water, adverse effects to the aquatic system due to accelerating the passage of water, and/or restricting its flow must be minimized to the maximum extent practicable.

9. Management of Water Flows.

To the maximum extent practicable, the pre-construction course, condition, capacity, and location of open waters must be maintained for each activity, including stream channelization, storm water management activities, and temporary and permanent road crossings, except as provided below. The activity must be constructed to withstand expected high flows. The activity must not restrict or impede the passage of normal or high flows, unless the primary purpose of the activity is to impound water or manage high flows. The activity may alter the pre-construction course, condition, capacity, and location of open waters if it benefits the aquatic environment (e.g., stream restoration or relocation activities).

10. Fills Within 100-Year Floodplains.

The activity must comply with applicable FEMA-approved state or local floodplain management requirements.

11. Equipment.

Heavy equipment working in wetlands or mudflats must be placed on mats, or other measures must be taken to minimize soil disturbance.

12. Soil Erosion and Sediment Controls.

Appropriate soil erosion and sediment controls must be used and maintained in effective operating condition during construction, and all exposed soil and other fills, as well as any work below the ordinary high water mark or high tide line, must be permanently stabilized at the earliest practicable date. Permittees are encouraged to perform work within waters of the United States during periods of low-flow or no-flow, or during low tides.

13. Removal of Temporary Fills.

Temporary fills must be removed in their entirety and the affected areas returned to pre-construction elevations. The affected areas must be revegetated, as appropriate.

14. Proper Maintenance.

Any authorized structure or fill shall be properly maintained, including maintenance to ensure public safety and compliance with applicable NWP general conditions, as well as any activity-specific conditions added by the district engineer to an NWP authorization.

15. Single and Complete Project.

The activity must be a single and complete project. The same NWP cannot be used more than once for the same single and complete project.

16. Wild and Scenic Rivers.

(a) No NWP activity may occur in a component of the National Wild and Scenic River System, or in a river officially designated by Congress as a ''study river'' for possible inclusion in the system while the river is in an official study status, unless the appropriate Federal agency with direct management responsibility for such river, has determined in writing that the proposed activity will not adversely affect the Wild and Scenic River designation or study status.
(b) If a proposed NWP activity will occur in a component of the National Wild and Scenic River System, or in a river officially designated by Congress as a ''study river'' for possible inclusion in the system while the river is in an official study status, the permittee must submit a pre-construction notification (see general condition 32). The district engineer will coordinate the PCN with the Federal agency with direct management responsibility for that river. The permittee shall not begin the NWP activity until notified by the district engineer that the Federal agency with direct management responsibility for that river has determined in writing that the proposed NWP activity will not adversely affect the Wild and Scenic River designation or study status.
(c) Information on Wild and Scenic Rivers may be obtained from the appropriate Federal land management agency responsible for the designated Wild and Scenic River or study river (e.g., National Park Service, U.S. Forest Service, Bureau of Land Management, U.S. Fish and Wildlife Service). Information on these rivers is also available at: http://www.rivers.gov/.

17. Tribal Rights.

No NWP activity may cause more than minimal adverse effects on tribal rights (including treaty rights), protected tribal resources, or tribal lands.

18. Endangered Species.

(a) No activity is authorized under any NWP which is likely to directly or indirectly jeopardize the continued existence of a threatened or endangered species or a species proposed for such designation, as identified under the Federal Endangered Species Act (ESA), or which will

directly or indirectly destroy or adversely modify the critical habitat of such species. No activity is authorized under any NWP which ''may affect'' a listed species or critical habitat, unless ESA section 7 consultation addressing the effects of the proposed activity has been completed. Direct effects are the immediate effects on listed species and critical habitat caused by the NWP activity. Indirect effects are those effects on listed species and critical habitat that are caused by the NWP activity and are later in time, but still are reasonably certain to occur.

(b) Federal agencies should follow their own procedures for complying with the requirements of the ESA. If pre- construction notification is required for the proposed activity, the Federal permittee must provide the district engineer with the appropriate documentation to demonstrate compliance with those requirements. The district engineer will verify that the appropriate documentation has been submitted. If the appropriate documentation has not been submitted, additional ESA section 7 consultation may be necessary for the activity and the respective federal agency would be responsible for fulfilling its obligation under section 7 of the ESA.

(c) Non-federal permittees must submit a pre-construction notification to the district engineer if any listed species or designated critical habitat might be affected or is in the vicinity of the activity, or if the activity is located in designated critical habitat, and shall not begin work on the activity until notified by the district engineer that the requirements of the ESA have been satisfied and that the activity is authorized. For activities that might affect Federally-listed endangered or threatened species or designated critical habitat, the pre-construction notification must include the name(s) of the endangered or threatened species that might be affected by the proposed activity or that utilize the designated critical habitat that might be affected by the proposed activity. The district engineer will determine whether the proposed activity ''may affect'' or will have ''no effect'' to listed species and designated critical habitat and will notify the non-Federal applicant of the Corps' determination within 45 days of receipt of a complete pre-construction notification. In cases where the non- Federal applicant has identified listed species or critical habitat that might be affected or is in the vicinity of the activity, and has so notified the Corps, the applicant shall not begin work until the Corps has provided notification that the proposed activity will have ''no effect'' on listed species or critical habitat, or until ESA section 7 consultation has been completed. If the non-Federal applicant has not heard back from the Corps within 45 days, the applicant must still wait for notification from the Corps.

(d) As a result of formal or informal consultation with the FWS or NMFS the district engineer may add species- specific permit conditions to the NWPs.

(e) Authorization of an activity by an NWP does not authorize the ''take'' of a threatened or endangered species as defined under the ESA. In the absence of separate authorization (e.g., an ESA Section 10 Permit, a Biological Opinion with ''incidental take'' provisions, etc.) from the FWS or the NMFS, the Endangered Species Act prohibits any person subject to the jurisdiction of the United States to take a listed species, where ''take'' means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. The word ''harm'' in the definition of ''take'' means an act which actually kills or injures wildlife. Such an act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering.

(f) If the non-federal permittee has a valid ESA section 10(a)(1)(B) incidental take permit with an approved Habitat Conservation Plan for a project or a group of projects that includes the proposed NWP activity, the non-federal applicant should provide a copy of that ESA section 10(a)(1)(B) permit with the PCN required by paragraph (c) of this general condition. The district

engineer will coordinate with the agency that issued the ESA section 10(a)(1)(B) permit to determine whether the proposed NWP activity and the associated incidental take were considered in the internal ESA section 7 consultation conducted for the ESA section 10(a)(1)(B) permit. If that coordination results in concurrence from the agency that the proposed NWP activity and the associated incidental take were considered in the internal ESA section 7 consultation for the ESA section 10(a)(1)(B) permit, the district engineer does not need to conduct a separate ESA section 7 consultation for the proposed NWP activity. The district engineer will notify the non-federal applicant within 45 days of receipt of a complete pre-construction notification whether the ESA section 10(a)(1)(B) permit covers the proposed NWP activity or whether additional ESA section 7 consultation is required.
(g) Information on the location of threatened and endangered species and their critical habitat can be obtained directly from the offices of the FWS and NMFS or their world wide Web pages at http://www.fws.gov/ or http:// www.fws.gov/ipac and http:// www.nmfs.noaa.gov/pr/species/esa/ respectively.

19. Migratory Birds and Bald and Golden Eagles.

The permittee is responsible for ensuring their action complies with the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act. The permittee is responsible for contacting appropriate local office of the U.S. Fish and Wildlife Service to determine applicable measures to reduce impacts to migratory birds or eagles, including whether "incidental take" permits are necessary and available under the Migratory Bird Treaty Act or Bald and Golden Eagle Protection Act for a particular activity.

20. Historic Properties.

(a) In cases where the district engineer determines that the activity may have the potential to cause effects to properties listed, or eligible for listing, in the National Register of Historic Places, the activity is not authorized, until the requirements of Section 106 of the National Historic Preservation Act (NHPA) have been satisfied.
(b) Federal permittees should follow their own procedures for complying with the requirements of section 106 of the National Historic Preservation Act. If pre-construction notification is required for the proposed NWP activity, the Federal permittee must provide the district engineer with the appropriate documentation to demonstrate compliance with those requirements. The district engineer will verify that the appropriate documentation has been submitted. If the appropriate documentation is not submitted, then additional consultation under section 106 may be necessary. The respective federal agency is responsible for fulfilling its obligation to comply with section 106.
(c) Non-federal permittees must submit a pre-construction notification to the district engineer if the NWP activity might have the potential to cause effects to any historic properties listed on, determined to be eligible for listing on, or potentially eligible for listing on the National Register of Historic Places, including previously unidentified properties. For such activities, the pre-construction notification must state which historic properties might have the potential to be affected by the proposed NWP activity or include a vicinity map indicating the location of the historic properties or the potential for the presence of historic properties. Assistance regarding information on the location of, or potential for, the presence of historic properties can be sought

from the State Historic Preservation Officer, Tribal Historic Preservation Officer, or designated tribal representative, as appropriate, and the National Register of Historic Places (see 33 CFR 330.4(g)). When reviewing pre-construction notifications, district engineers will comply with the current procedures for addressing the requirements of section 106 of the National Historic Preservation Act. The district engineer shall make a reasonable and good faith effort to carry out appropriate identification efforts, which may include background research, consultation, oral history interviews, sample field investigation, and field survey. Based on the information submitted in the PCN and these identification efforts, the district engineer shall determine whether the proposed NWP activity has the potential to cause effects on the historic properties. Section 106 consultation is not required when the district engineer determines that the activity does not have the potential to cause effects on historic properties (see 36 CFR 800.3(a)). Section 106 consultation is required when the district engineer determines that the activity has the potential to cause effects on historic properties. The district engineer will conduct consultation with consulting parties identified under 36 CFR 800.2(c) when he or she makes any of the following effect determinations for the purposes of section 106 of the NHPA: no historic properties affected, no adverse effect, or adverse effect. Where the non-Federal applicant has identified historic properties on which the activity might have the potential to cause effects and so notified the Corps, the non-Federal applicant shall not begin the activity until notified by the district engineer either that the activity has no potential to cause effects to historic properties or that NHPA section 106 consultation has been completed.
(d) For non-federal permittees, the district engineer will notify the prospective permittee within 45 days of receipt of a complete pre-construction notification whether NHPA section 106 consultation is required. If NHPA section 106 consultation is required, the district engineer will notify the non- Federal applicant that he or she cannot begin the activity until section 106 consultation is completed. If the non-Federal applicant has not heard back from the Corps within 45 days, the applicant must still wait for notification from the Corps.
(e) Prospective permittees should be aware that section 110k of the NHPA (54 U.S.C. 306113) prevents the Corps from granting a permit or other assistance to an applicant who, with intent to avoid the requirements of section 106 of the NHPA, has intentionally significantly adversely affected a historic property to which the permit would relate, or having legal power to prevent it, allowed such significant adverse effect to occur, unless the Corps, after consultation with the Advisory Council on Historic Preservation (ACHP), determines that circumstances justify granting such assistance despite the adverse effect created or permitted by the applicant. If circumstances justify granting the assistance, the Corps is required to notify the ACHP and provide documentation specifying the circumstances, the degree of damage to the integrity of any historic properties affected, and proposed mitigation. This documentation must include any views obtained from the applicant, SHPO/ THPO, appropriate Indian tribes if the undertaking occurs on or affects historic properties on tribal lands or affects properties of interest to those tribes, and other parties known to have a legitimate interest in the impacts to the permitted activity on historic properties.

21. <u>Discovery of Previously Unknown Remains and Artifacts.</u>

If you discover any previously unknown historic, cultural or archeological remains and artifacts while accomplishing the activity authorized by this permit, you must immediately notify the district engineer of what you have found, and to the maximum extent practicable, avoid

construction activities that may affect the remains and artifacts until the required coordination has been completed. The district engineer will initiate the Federal, Tribal, and state coordination required to determine if the items or remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

22. Designated Critical Resource Waters.

Critical resource waters include, NOAA-managed marine sanctuaries and marine monuments, and National Estuarine Research Reserves. The district engineer may designate, after notice and opportunity for public comment, additional waters officially designated by a state as having particular environmental or ecological significance, such as outstanding national resource waters or state natural heritage sites. The district engineer may also designate additional critical resource waters after notice and opportunity for public comment.
(a) Discharges of dredged or fill material into waters of the United States are not authorized by NWPs 7, 12, 14, 16, 17, 21, 29, 31, 35, 39, 40, 42, 43, 44, 49, 50, 51, and 52 for any activity within, or directly affecting, critical resource waters, including wetlands adjacent to such waters.
(b) For NWPs 3, 8, 10, 13, 15, 18, 19, 22, 23, 25, 27, 28, 30, 33, 34, 36, 37, 38, and 54, notification is required in accordance with general condition 32, for any activity proposed in the designated critical resource waters including wetlands adjacent to those waters. The district engineer may authorize activities under these NWPs only after it is determined that the impacts to the critical resource waters will be no more than minimal.

23. Mitigation.

The district engineer will consider the following factors when determining appropriate and practicable mitigation necessary to ensure that the individual and cumulative adverse environmental effects are no more than minimal:
(a) The activity must be designed and constructed to avoid and minimize adverse effects, both temporary and permanent, to waters of the United States to the maximum extent practicable at the project site (i.e., on site).
(b) Mitigation in all its forms (avoiding, minimizing, rectifying, reducing, or compensating for resource losses) will be required to the extent necessary to ensure that the individual and cumulative adverse environmental effects are no more than minimal.
(c) Compensatory mitigation at a minimum one-for-one ratio will be required for all wetland losses that exceed 1/10-acre and require pre- construction notification, unless the district engineer determines in writing that either some other form of mitigation would be more environmentally appropriate or the adverse environmental effects of the proposed activity are no more than minimal, and provides an activity-specific waiver of this requirement. For wetland losses of 1/10-acre or less that require pre- construction notification, the district engineer may determine on a case-by- case basis that compensatory mitigation is required to ensure that the activity results in only minimal adverse environmental effects.
(d) For losses of streams or other open waters that require pre-construction notification, the district engineer may require compensatory mitigation to ensure that the activity results in no more than minimal adverse environmental effects. Compensatory mitigation for losses of streams should be provided, if practicable, through stream rehabilitation, enhancement, or preservation, since streams are difficult- to-replace resources (see 33 CFR 332.3(e)(3)).

(e) Compensatory mitigation plans for NWP activities in or near streams or other open waters will normally include a requirement for the restoration or enhancement, maintenance, and legal protection (e.g., conservation easements) of riparian areas next to open waters. In some cases, the restoration or maintenance/protection of riparian areas may be the only compensatory mitigation required. Restored riparian areas should consist of native species. The width of the required riparian area will address documented water quality or aquatic habitat loss concerns. Normally, the riparian area will be 25 to 50 feet wide on each side of the stream, but the district engineer may require slightly wider riparian areas to address documented water quality or habitat loss concerns. If it is not possible to restore or maintain/protect a riparian area on both sides of a stream, or if the waterbody is a lake or coastal waters, then restoring or maintaining/protecting a riparian area along a single bank or shoreline may be sufficient. Where both wetlands and open waters exist on the project site, the district engineer will determine the appropriate compensatory mitigation (e.g., riparian areas and/or wetlands compensation) based on what is best for the aquatic environment on a watershed basis. In cases where riparian areas are determined to be the most appropriate form of minimization or compensatory mitigation, the district engineer may waive or reduce the requirement to provide wetland compensatory mitigation for wetland losses.
(f) Compensatory mitigation projects provided to offset losses of aquatic resources must comply with the applicable provisions of 33 CFR part 332.

(1) The prospective permittee is responsible for proposing an appropriate compensatory mitigation option if compensatory mitigation is necessary to ensure that the activity results in no more than minimal adverse environmental effects. For the NWPs, the preferred mechanism for providing compensatory mitigation is mitigation bank credits or in-lieu fee program credits (see 33 CFR 332.3(b)(2) and (3)). However, if an appropriate number and type of mitigation bank or in-lieu credits are not available at the time the PCN is submitted to the district engineer, the district engineer may approve the use of permittee-responsible mitigation.

(2) The amount of compensatory mitigation required by the district engineer must be sufficient to ensure that the authorized activity results in no more than minimal individual and cumulative adverse environmental effects (see 33 CFR 330.1(e)(3)). (See also 33 CFR 332.3(f)).

(3) Since the likelihood of success is greater and the impacts to potentially valuable uplands are reduced, aquatic resource restoration should be the first compensatory mitigation option considered for permittee-responsible mitigation.

(4) If permittee-responsible mitigation is the proposed option, the prospective permittee is responsible for submitting a mitigation plan. A conceptual or detailed mitigation plan may be used by the district engineer to make the decision on the NWP verification request, but a final mitigation plan that addresses the applicable requirements of 33 CFR 332.4(c)(2) through (14) must be approved by the district engineer before the permittee begins work in waters of the United States, unless the district engineer determines that prior approval of the final mitigation plan is not practicable or not necessary to ensure timely completion of the required compensatory mitigation (see 33 CFR 332.3(k)(3)).

(5) If mitigation bank or in-lieu fee program credits are the proposed option, the mitigation plan only needs to address the baseline conditions at the impact site and the number of credits to be provided.

(6) Compensatory mitigation requirements (e.g., resource type and amount to be provided as compensatory mitigation, site protection, ecological performance standards, monitoring requirements) may be addressed through conditions added to the NWP authorization, instead of components of a compensatory mitigation plan (see 33 CFR 332.4(c)(1)(ii)).

(g) Compensatory mitigation will not be used to increase the acreage losses allowed by the acreage limits of the NWPs. For example, if an NWP has an acreage limit of 1/2-acre, it cannot be used to authorize any NWP activity resulting in the loss of greater than 1/2- acre of waters of the United States, even if compensatory mitigation is provided that replaces or restores some of the lost waters. However, compensatory mitigation can and should be used, as necessary, to ensure that an NWP activity already meeting the established acreage limits also satisfies the no more than minimal impact requirement for the NWPs.
(h) Permittees may propose the use of mitigation banks, in-lieu fee programs, or permittee-responsible mitigation. When developing a compensatory mitigation proposal, the permittee must consider appropriate and practicable options consistent with the framework at 33 CFR 332.3(b). For activities resulting in the loss of marine or estuarine resources, permittee-responsible mitigation may be environmentally preferable if there are no mitigation banks or in-lieu fee programs in the area that have marine or estuarine credits available for sale or transfer to the permittee. For permittee- responsible mitigation, the special conditions of the NWP verification must clearly indicate the party or parties responsible for the implementation and performance of the compensatory mitigation project, and, if required, its long-term management.
(i) Where certain functions and services of waters of the United States are permanently adversely affected by a regulated activity, such as discharges of dredged or fill material into waters of the United States that will convert a forested or scrub-shrub wetland to a herbaceous wetland in a permanently maintained utility line right-of-way, mitigation may be required to reduce the adverse environmental effects of the activity to the no more than minimal level.

24. Safety of Impoundment Structures.

To ensure that all impoundment structures are safely designed, the district engineer may require non-Federal applicants to demonstrate that the structures comply with established state dam safety criteria or have been designed by qualified persons. The district engineer may also require documentation that the design has been independently reviewed by similarly qualified persons, and appropriate modifications made to ensure safety.

25. Water Quality.

Where States and authorized Tribes, or EPA where applicable, have not previously certified compliance of an NWP with CWA section 401, individual 401 Water Quality Certification must be obtained or waived (see 33 CFR 330.4(c)). The district engineer or State or Tribe may require additional water quality management measures to ensure that the authorized activity does not result in more than minimal degradation of water quality. *Specifically for North Dakota, the North Dakota Department of Health has denied water quality certification for all projects proposed to affect Class 1 and 1A, II and Class III rivers and streams or classified lakes listed in Appendices I and II of the standards, individual certification must be obtained. For project proposed to affect any other waters, the North Dakota Department of Health has issued water quality certification provided the attached Construction and Environmental Disturbance Requirements are followed. The Standards may be found at*
http://www.legis.nd.gov/information/acdata/pdf/33-16-02.1.pdf?20160311115632
On Tribal Lands, Water Quality Certification is denied for all Nationwide Permits. Applicants must work with EPA to obtain individual water quality certification. Contact: USEPA, Region 8,

401 Certification Program – 8WP-AAP, 1595 Wynkoop Street, Denver, Colorado 80202-1129. (303-312-6909)

26. Coastal Zone Management.

In coastal states where an NWP has not previously received a state coastal zone management consistency concurrence, an individual state coastal zone management consistency concurrence must be obtained, or a presumption of concurrence must occur (see 33 CFR 330.4(d)). The district engineer or a State may require additional measures to ensure that the authorized activity is consistent with state coastal zone management requirements.

27. Regional and Case-By-Case Conditions.

The activity must comply with any regional conditions that may have been added by the Division Engineer (see 33 CFR 330.4(e)) and with any case specific conditions added by the Corps or by the state, Indian Tribe, or U.S. EPA in its section 401 Water Quality Certification, or by the state in its Coastal Zone Management Act consistency determination.

28. Use of Multiple Nationwide Permits.

The use of more than one NWP for a single and complete project is prohibited, except when the acreage loss of waters of the United States authorized by the NWPs does not exceed the acreage limit of the NWP with the highest specified acreage limit. For example, if a road crossing over tidal waters is constructed under NWP 14, with associated bank stabilization authorized by NWP 13, the maximum acreage loss of waters of the United States for the total project cannot exceed 1/3-acre.

29. Transfer of Nationwide Permit Verifications.

If the permittee sells the property associated with a nationwide permit verification, the permittee may transfer the nationwide permit verification to the new owner by submitting a letter to the appropriate Corps district office to validate the transfer. A copy of the nationwide permit verification must be attached to the letter, and the letter must contain the following statement and signature:

> When the structures or work authorized by this nationwide permit are still in existence at the time the property is transferred, the terms and conditions of this nationwide permit, including any special conditions, will continue to be binding on the new owner(s) of the property. To validate the transfer of this nationwide permit and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below.
>
> _____ (Transferee) _____ (Date)

30. Compliance Certification.

Each permittee who receives an NWP verification letter from the Corps must provide a signed certification documenting completion of the authorized activity and implementation of any required compensatory mitigation. The success of any required permittee-responsible mitigation, including the achievement of ecological performance standards, will be addressed separately by the district engineer. The Corps will provide the permittee the certification document with the NWP verification letter. The certification document will include:
(a) A statement that the authorized activity was done in accordance with the NWP authorization, including any general, regional, or activity-specific conditions;
(b) A statement that the implementation of any required compensatory mitigation was completed in accordance with the permit conditions. If credits from a mitigation bank or in-lieu fee program are used to satisfy the compensatory mitigation requirements, the certification must include the documentation required by 33 CFR 332.3(l)(3) to confirm that the permittee secured the appropriate number and resource type of credits; and
(c) The signature of the permittee certifying the completion of the activity and mitigation. The completed certification document must be submitted to the district engineer within 30 days of completion of the authorized activity or the implementation of any required compensatory mitigation, whichever occurs later.

31. Activities Affecting Structures or Works Built by the United States.

If an NWP activity also requires permission from the Corps pursuant to 33 U.S.C. 408 because it will alter or temporarily or permanently occupy or use a U.S. Army Corps of Engineers (USACE) federally authorized Civil Works project (a ''USACE project''), the prospective permittee must submit a pre- construction notification. See paragraph (b)(10) of general condition 32. An activity that requires section 408 permission is not authorized by NWP until the appropriate Corps office issues the section 408 permission to alter, occupy, or use the USACE project, and the district engineer issues a written NWP verification.

32. Pre-Construction Notification.

(a) Timing. Where required by the terms of the NWP, the prospective permittee must notify the district engineer by submitting a pre-construction notification (PCN) as early as possible. The district engineer must determine if the PCN is complete within 30 calendar days of the date of receipt and, if the PCN is determined to be incomplete, notify the prospective permittee within that 30 day period to request the additional information necessary to make the PCN complete. The request must specify the information needed to make the PCN complete. As a general rule, district engineers will request additional information necessary to make the PCN complete only once. However, if the prospective permittee does not provide all of the requested information, then the district engineer will notify the prospective permittee that the PCN is still incomplete and the PCN review process will not commence until all of the requested information has been received by the district engineer. The prospective permittee shall not begin the activity until either:

(1) He or she is notified in writing by the district engineer that the activity may proceed under the NWP with any special conditions imposed by the district or division engineer; or

(2) 45 calendar days have passed from the district engineer's receipt of the complete PCN and the prospective permittee has not received written notice from the district or division

engineer. However, if the permittee was required to notify the Corps pursuant to general condition 18 that listed species or critical habitat might be affected or are in the vicinity of the activity, or to notify the Corps pursuant to general condition 20 that the activity might have the potential to cause effects to historic properties, the permittee cannot begin the activity until receiving written notification from the Corps that there is ''no effect'' on listed species or ''no potential to cause effects'' on historic properties, or that any consultation required under Section 7 of the Endangered Species Act (see 33 CFR 330.4(f)) and/or section 106 of the National Historic Preservation Act (see 33 CFR 330.4(g)) has been completed. Also, work cannot begin under NWPs 21, 49, or 50 until the permittee has received written approval from the Corps. If the proposed activity requires a written waiver to exceed specified limits of an NWP, the permittee may not begin the activity until the district engineer issues the waiver. If the district or division engineer notifies the permittee in writing that an individual permit is required within 45 calendar days of receipt of a complete PCN, the permittee cannot begin the activity until an individual permit has been obtained. Subsequently, the permittee's right to proceed under the NWP may be modified, suspended, or revoked only in accordance with the procedure set forth in 33 CFR 330.5(d)(2).

(b) Contents of Pre-Construction Notification: The PCN must be in writing and include the following information:

(1) Name, address and telephone numbers of the prospective permittee;

(2) Location of the proposed activity;

(3) Identify the specific NWP or NWP(s) the prospective permittee wants to use to authorize the proposed activity;

(4) A description of the proposed activity; the activity's purpose; direct and indirect adverse environmental effects the activity would cause, including the anticipated amount of loss of wetlands, other special aquatic sites, and other waters expected to result from the NWP activity, in acres, linear feet, or other appropriate unit of measure; a description of any proposed mitigation measures intended to reduce the adverse environmental effects caused by the proposed activity; and any other NWP(s), regional general permit(s), or individual permit(s) used or intended to be used to authorize any part of the proposed project or any related activity, including other separate and distant crossings for linear projects that require Department of the Army authorization but do not require pre-construction notification. The description of the proposed activity and any proposed mitigation measures should be sufficiently detailed to allow the district engineer to determine that the adverse environmental effects of the activity will be no more than minimal and to determine the need for compensatory mitigation or other mitigation measures. For single and complete linear projects, the PCN must include the quantity of anticipated losses of wetlands, other special aquatic sites, and other waters for each single and complete crossing of those wetlands, other special aquatic sites, and other waters. Sketches should be provided when necessary to show that the activity complies with the terms of the NWP. (Sketches usually clarify the activity and when provided results in a quicker decision. Sketches should contain sufficient detail to provide an illustrative description of the proposed activity (e.g., a conceptual plan), but do not need to be detailed engineering plans);

(5) The PCN must include a delineation of wetlands, other special aquatic sites, and other waters, such as lakes and ponds, and perennial, intermittent, and ephemeral streams, on the project site. Wetland delineations must be prepared in accordance with the current method required by the Corps. The permittee may ask the Corps to delineate the special aquatic sites and other waters on the project site, but there may be a delay if the Corps does the delineation,

especially if the project site is large or contains many wetlands, other special aquatic sites, and other waters. Furthermore, the 45 day period will not start until the delineation has been submitted to or completed by the Corps, as appropriate;

(6) If the proposed activity will result in the loss of greater than 1/10-acre of wetlands and a PCN is required, the prospective permittee must submit a statement describing how the mitigation requirement will be satisfied, or explaining why the adverse environmental effects are no more than minimal and why compensatory mitigation should not be required. As an alternative, the prospective permittee may submit a conceptual or detailed mitigation plan.

(7) For non-Federal permittees, if any listed species or designated critical habitat might be affected or is in the vicinity of the activity, or if the activity is located in designated critical habitat, the PCN must include the name(s) of those endangered or threatened species that might be affected by the proposed activity or utilize the designated critical habitat that might be affected by the proposed activity. For NWP activities that require pre-construction notification, Federal permittees must provide documentation demonstrating compliance with the Endangered Species Act.

(8) For non-Federal permittees, if the NWP activity might have the potential to cause effects to a historic property listed on, determined to be eligible for listing on, or potentially eligible for listing on, the National Register of Historic Places, the PCN must state which historic property might have the potential to be affected by the proposed activity or include a vicinity map indicating the location of the historic property. For NWP activities that require pre-construction notification, Federal permittees must provide documentation demonstrating compliance with section 106 of the National Historic Preservation Act;

(9) For an activity that will occur in a component of the National Wild and Scenic River System, or in a river officially designated by Congress as a ''study river'' for possible inclusion in the system while the river is in an official study status, the PCN must identify the Wild and Scenic River or the ''study river'' (see general condition 16); and

(10) For an activity that requires permission from the Corps pursuant to 33 U.S.C. 408 because it will alter or temporarily or permanently occupy or use a U.S. Army Corps of Engineers federally authorized civil works project, the pre-construction notification must include a statement confirming that the project proponent has submitted a written request for section 408 permission from the Corps office having jurisdiction over that USACE project.

(c) Form of Pre-Construction Notification: The standard individual permit application form (Form ENG 4345) may be used, but the completed application form must clearly indicate that it is an NWP PCN and must include all of the applicable information required in paragraphs (b)(1) through (10) of this general condition. A letter containing the required information may also be used. Applicants may provide electronic files of PCNs and supporting materials if the district engineer has established tools and procedures for electronic submittals.

(d) Agency Coordination:

(1) The district engineer will consider any comments from Federal and state agencies concerning the proposed activity's compliance with the terms and conditions of the NWPs and the need for mitigation to reduce the activity's adverse environmental effects so that they are no more than minimal.

(2) Agency coordination is required for: (i) All NWP activities that require pre-construction notification and result in the loss of greater than 1/2-acre of waters of the United States; (ii) NWP 21, 29, 39, 40, 42, 43, 44, 50, 51, and 52 activities that require pre-construction notification and will result in the loss of greater than 300 linear feet of stream bed; (iii) NWP 13

activities in excess of 500 linear feet, fills greater than one cubic yard per running foot, or involve discharges of dredged or fill material into special aquatic sites; and (iv) NWP 54 activities in excess of 500 linear feet, or that extend into the waterbody more than 30 feet from the mean low water line in tidal waters or the ordinary high water mark in the Great Lakes.

(3) When agency coordination is required, the district engineer will immediately provide (e.g., via email, facsimile transmission, overnight mail, or other expeditious manner) a copy of the complete PCN to the appropriate Federal or state offices (FWS, state natural resource or water quality agency, EPA, and, if appropriate, the NMFS). With the exception of NWP 37, these agencies will have 10 calendar days from the date the material is transmitted to notify the district engineer via telephone, facsimile transmission, or email that they intend to provide substantive, site-specific comments. The comments must explain why the agency believes the adverse environmental effects will be more than minimal. If so contacted by an agency, the district engineer will wait an additional 15 calendar days before making a decision on the pre-construction notification. The district fully consider agency comments received within the specified time frame concerning the proposed activity's compliance with the terms and conditions of the NWPs, including the need for mitigation to ensure the net adverse environmental effects of the proposed activity are no more than minimal. The district engineer will provide no response to the resource agency, except as provided below. The district engineer will indicate in the administrative record associated with each pre-construction notification that the resource agencies' concerns were considered. For NWP 37, the emergency watershed protection and rehabilitation activity may proceed immediately in cases where there is an unacceptable hazard to life or a significant loss of property or economic hardship will occur. The district engineer will consider any comments received to decide whether the NWP 37 authorization should be modified, suspended, or revoked in accordance with the procedures at 33 CFR 330.5.

(4) In cases of where the prospective permittee is not a Federal agency, the district engineer will provide a response to NMFS within 30 calendar days of receipt of any Essential Fish Habitat conservation recommendations, as required by section 305(b)(4)(B) of the Magnuson-Stevens Fishery Conservation and Management Act.

5) Applicants are encouraged to provide the Corps with either electronic files or multiple copies of pre- construction notifications to expedite agency coordination.

Further Information

1. District Engineers have authority to determine if an activity complies with the terms and conditions of an NWP.
2. NWPs do not obviate the need to obtain other federal, state, or local permits, approvals, or authorizations required by law.
3. NWPs do not grant any property rights or exclusive privileges.
4. NWPs do not authorize any injury to the property or rights of others.
5. NWPs do not authorize interference with any existing or proposed Federal project (see general condition 31).

2017 NATIONWIDE PERMITS
REGIONAL CONDITIONS
OMAHA DISTRICT
STATE OF NORTH DAKOTA

The following Nationwide Permit Regional Conditions will be used in the State of North Dakota. Regional conditions are placed on Nationwide Permits to ensure projects result in no more than minimal adverse impacts to the aquatic environment and to address local resource concerns.

1. **Wetlands Classified as Peatlands – Revoked for use**

All Nationwide Permits, with the exception of 3, 5, 20, 32, 38 and 45, are revoked for use in peatlands. Peatlands are permanently or seasonally saturated and inundated wetlands where conditions inhibit organic matter decomposition and allow for the accumulation of peat. Under cool, anaerobic, and acidic conditions, the rate of organic matter accumulation exceeds organic decay.

2. **Wetlands Classified as Peatlands – Preconstruction Notification Requirement**

For Nationwide Permits 3, 5, 20, 32, 38 and 45 permittees must notify the Corps in accordance with General Condition 32 (Pre-Construction Notification) prior to initiating any regulated activity impacting peatlands.

3. **Waters Adjacent to Natural Springs – Preconstruction Notification Requirement**

For all Nationwide Permits permittees must notify the Corps in accordance with General Condition No. 32 (Pre-Construction Notification) for regulated activities located within 100 feet of the water source in natural spring areas. For purposes of this condition, a spring source is defined as any location where there is flow emanating from a distinct point at any time during the growing season. Springs do not include seeps and other groundwater discharge areas where there is no distinct point source.

4. **Missouri River, including Lake Sakakawea and Lake Oahe – Pre-construction Notification Requirement**

For all Nationwide Permits permittees must notify the Corps in accordance with General Condition No. 32 (Pre-Construction Notification) prior to initiating any regulated activity occurring in or under the Missouri River, including Lake Sakakawea and Lake Oahe. In addition, any activity occurring in an off channel area (marinas, bays, etc.) of any of these waterbodies, a preconstruction notification is required.

5. **Spawning Areas**

Spawning restrictions and important fish habitat areas, if applicable, can be accessed on the North Dakota Game & Fish Department's website at:

http://gf.nd.gov/gnf/conservation/docs/spawning-restriction-exclusions.pdf

No regulated activity within the Red River of the North shall occur between 15 April and 1 July. Spawning season restrictions do not apply to projects involving dredging or other discharges of less than 25 cubic yards of material in any jurisdictional water.

6. **Counter-Sinking Culverts and Associated Riprap – All Nationwide Permits**

In streams with intermittent or perennial flow and a stable stream bed, culvert stream crossings shall be installed with the culvert invert set below the natural streambed according to the table below. This regional condition does not apply in instances where the lowering of the culvert invert would allow a headcut to migrate upstream of the project into an unaffected stream reach or result in lowering the elevation of the stream reach.

Riprap inlet and outlet protection shall be placed to match the height of the culvert invert.

Culvert Type	Drainage Area	Minimum Distance Culvert Invert Shall Be Lowered Below Stream Flow Line
All culvert types	$\leq$ 100 acres	Not required
Pipe diameter <8.0 ft	100 to 640 acres	0.5 ft
Pipe diameter <8.0 ft	>640 acres	1.0 ft
Pipe diameter $\geq$ 8.0 ft	All drainage sizes	1.0 ft
Box culvert	All drainage sizes	1.0 ft

REGIONAL CONDITIONS APPLICABLE TO SPECIFIC NATIONWIDE PERMITS

Nationwide Permit 7 – Outfall Structures and Associated Intake Structures and Nationwide Permit 12 – Utility Line Activities.

Intake Structures – Intake screens with a maximum mesh opening of ¼-inch must be provided, inspected annually, and maintained. Wire, Johnson-like, screens must have a maximum distance between wires of 1/8-inch. Water velocity at the intake screen shall not exceed ½-foot per second.

Pumping plant sound levels will not exceed 75 dB at 50 feet.

Intakes located in Lake Sakakawea, above river mile 1519, and on the Yellowstone River, are subject to the following conditions:

- The intakes shall be floating.
- At the beginning of the pumping season, the intake shall be placed over water with a minimum depth of 20 feet.
- If the 20-foot depth is not attainable, then the intake shall be located over the deepest water available.

- If the water depth falls below six feet, the intake shall be moved to deeper water or the maximum intake velocity shall be limited to ¼ foot per second.

Intakes located in Lake Sakakawea, below river mile 1519, and the Missouri River below Garrison Dam are subject to the following conditions:

- The intakes shall be submerged.
- At the beginning of the pumping season, the intake will be placed at least 20 vertical feet below the existing water level.
- The intake shall be elevated 2 to 4 feet off the bottom of the river or reservoir bed.
- If the 20-foot depth is not attainable, then the intake velocity shall be limited to ¼-foot per second with intake placed at the maximum practicable attainable depth.

Intakes and associated utility lines that are proposed to cross sandbars in areas designated as piping plover critical habitat are prohibited.

Utility Lines

- Any temporary open trench associated with utility lines are to be closed within 30 days of excavation. This time limit may be extended by notifying the North Dakota Regulatory Office and receiving a written response that the extension is acceptable.

Nationwide Permit 11 – Temporary Recreational Structures – Boat Docks

To ensure that the work or structure shall not cause unreasonable obstruction to the free navigation of the navigable waters, the following conditions are required:

- No boat dock shall be located on a sandbar or barren sand feature. The farthest point riverward of a dock shall not exceed a total length of 30 feet from the ordinary high watermark. Information Note: Issuance of this permit does not supersede authorization required by the North Dakota State Engineer's Office.
- Any boat dock shall be anchored to the top of the high bank.
- Any boat dock located within an excavated bay or marina that is off the main river channel may be anchored to the bay or marina bottom with spuds.

Section 10 Waters located in the State of North Dakota are:

Bois de Sioux River
James River
Missouri River
Red River of the North
Upper Des Lacs Lake
Yellowstone River

Nationwide Permit 13 – Bank Stabilization

Permittees must notify the Corps in accordance with General Condition No. 32 (Pre-Construction Notification) prior to initiating any regulated activity. The notification must also include photo evidence of erosion in the area. Prohibited materials found at

http://www.nwo.usace.army.mil/Media/FactSheets/FactSheetArticleView/tabid/2034/Article/487696/prohibited-restricted-materials.aspx cannot be used in waters of the United States.

Nationwide Permit 23 – Approved Categorical Exclusions

Permittees must notify the Corps in accordance with General Condition No. 32 (Pre-Construction Notification) prior to initiating any regulated activity. In addition to information required by General Condition 32 (Pre-Construction Notification), permittees must identify the approved categorical exclusion that applies and provide documentation that the project fits the categorical exclusion.

GENERAL CONDITIONS (REGIONAL ADDITIONS)

General Condition 32 Notification– Pre-construction Notification

Prospective permittees should be aware that a field aquatic resources delineation may be required for applications where notification is required in accordance with General Condition 32 (Pre-Construction Notification) and/or mitigation may be required. Specific guidelines outlining the aquatic resources delineation process in the State of North Dakota and the Corps 1987 Wetland Delineation Manual and applicable Regional supplements to the Manual can be accessed on the North Dakota Regulatory Office's website at:
http://www.nwo.usace.army.mil/Missions/RegulatoryProgram/NorthDakota.aspx

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.

From:	WARREN, SAMUELE M CIV USAF AFGSC 5 CES/CENP
To:	Ashley Ross
Cc:	SPECHT, JOEY R GS-12 USAF AFGSC 5 CES/CEMD; LEWIS, DANIEL S GS-12 USAF AFGSC 5 CES/CEMC; JOHNSON, BRUCE A GS-12 USAF AFGSC 5 CES/CENP; ALBRIGHT, TREV A GS-13 USAF AFGSC 5 CES/CEN; LONNING, GARY G GS-13 USAF AFGSC 5 CES/CEM
Subject:	Ruso Wind Project
Date:	Monday, September 10, 2018 4:15:10 PM

Ms. Ross

I've plotted information that was received and there are some concerns.
First has this project been pushed to the DoD Clearing House https://www.acq.osd.mil/dodsc/ .
It appears that a couple of the windmills are within the 1200 ft easement the launch facilities. There should be no facilities within these 1200 ft areas.
With so many windmill locations there will be a concern of the HICS cables.

The request needs to go in front of the Installation Encroachment Management Team for their input.

sam

Sam Warren
Community Planner
DSN 483-4894 or Comm. 701-723-4894

From: MUNOS, CY I GS-11 USAF AFGSC 91 MMXS/MMXSFK
To: Ashley Ross
Subject: Ruso Wind Project
Date: Thursday, September 13, 2018 2:59:59 PM

Ashely,

The Minot AFB has assets in the project area. Our requirements for transmission lines are as followed

- 90 degree crossing of USAF buried cable
- preferred 100ft separation of poles

Could you please send me the proposed route when it becomes available? If you have a shape file, it would be better. Thanks.

Cy Munos
Chief, Cable Affairs
91 MMXS/MMXSFK
Minot AFB, ND
DSN: 453-6053
COMM.: 701-723-6053
CELL: 701-720-8274

From:	JOHNSON, BRUCE A GS-12 USAF AFGSC 5 CES/CENP
To:	Bowker, Alexandria C. (SPC); SPECHT, JOEY R GS-12 USAF AFGSC 5 CES/CEMD; LEWIS, DANIEL S GS-12 USAF AFGSC 5 CES/CEMC; ALBRIGHT, TREV A GS-13 USAF AFGSC 5 CES/CEN; LONNING, GARY G GS-13 USAF AFGSC 5 CES/CEM; PEARSON, RENETTA J GS-14 USAF AFGSC 5 CES/CD
Cc:	Ashley Ross; Mikayla Boche; MUNOS, CY I GS-11 USAF AFGSC 91 MMXS/MMXSFK; MCMAHON, ROXANNE M GS-13 USAF AFGSC 5 BW/JA
Subject:	RE: Ruso Wind Project
Date:	Thursday, December 20, 2018 4:14:33 PM
Attachments:	image001.gif

Ms. Bowker,

Mr. Cy Munos previously sent you his comments on the planned layout. Only one other comment has been made regarding the layout. All comments are as follows:

- There are 9 collector crossings. We have regulations on collector cable crossings and a few of them will have to be modified to be within our regulations. Some access roads will have to be modified as well.
- 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)'
- 90 degree crossing is mandatory
- No cable crossing within 50ft of our buried splices
- Access roads will cross our cable at a minimum of 45 degrees (90 preferred)
- Will not allow access road to run in USAF easement
- We will not allow any ditch cutting for access roads on our easement without approval.
- We require a 48hr notice prior to cable crossing or any construction on USAF easement. (Cable Affairs Office 701-723-6053)
- Must maintain a 1200 foot separation from any LF. Restrictive easement.

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

V/r,
Bruce

Bruce Johnson
Chief, Portfolio Optimization
DSN: 453-4693
Comm: (701) 723-4693

From: Bowker, Alexandria C. (SPC) [mailto:acbowker@southernco.com]
Sent: Tuesday, December 18, 2018 11:16 AM
To: WARREN, SAMUELE M CIV USAF USAFE 48 CES/PMO <samuele.warren.1@us.af.mil>; SPECHT, JOEY R GS-12 USAF AFGSC 5 CES/CEMD <joey.specht@us.af.mil>; LEWIS, DANIEL S GS-12 USAF AFGSC 5 CES/CEMC <daniel.lewis.23@us.af.mil>; JOHNSON, BRUCE A GS-12 USAF AFGSC 5 CES/CENP <bruce.johnson.25@us.af.mil>; ALBRIGHT, TREV A GS-13 USAF AFGSC 5 CES/CEN

<trev.albright@us.af.mil>; LONNING, GARY G GS-13 USAF AFGSC 5 CES/CEM <gary.lonning@us.af.mil>; PEARSON, RENETTA J GS-14 USAF AFGSC 5 CES/CD <renetta.pearson@us.af.mil>
Cc: Ashley Ross <Ashley.ross@kljeng.com>; Mikayla Boche <Mikayla.Boche@kljeng.com>
Subject: [Non-DoD Source] Ruso Wind Project

All,
Since our last discussion, Southern Power has revised the Ruso Wind Project layout. I have attached the turbine layout, road and collector system, and gen tie route. The project will generate up to 200 megawatts of electricity and will result in up to 66 wind turbines. The current project layout includes up to 53 primary turbine locations and 13 alternate turbine locations. SPC plans to utilize two turbine models, with an output between 2.415 MW – 4.8 MW. The maximum number of Siemens 2.415-108 is 11 and the maximum number of Siemens 4.2-145 is 42. The planned project layout is designed to accommodate both of the turbine models under consideration. The turbine specifications are as follows:

Turbine Type	Rotor Diameter (meters - feet)	Rotor Swept Area ($meters^2$ – $feet^2$)	Cut-in Wind Speed (m/s)	Rated Power (MW)	Cut-out Wind Speed (m/s)	Blade Length (meters - feet)	Hub Height (meters - feet)	Blade Height (Highest) (meters - feet)	Blade Height (Lowest) (meters - feet)	Max # of Project Turbines
Siemens SWT-2.415-108	108 – 354.3	9,144 – 98,425.2	3.0	2.415	25.0	52.6 – 172.6	80 – 262.5	134 – 439.6	26 – 85.3	11
Siemens SG 4.2-145	145 – 475.7	16,506 – 177,669.1	3.0	4.2	27.0	71 – 232.9	107.5 – 352.7	180 – 590.6	35 – 114.8	42

Please let me know if you need any additional information. We are planning to submit a permit application to the North Dakota Public Service Commission on December 28, 2018 and would appreciate any input before that date.
Thanks,
Alex Bowker

Alex C. Bowker
Siting
Southern Power Company
3535 Colonnade Parkway, BIN S-855-EC
Birmingham, AL 35243
O: 205.992.0163
M: 205.915.9519
southernpowercompany.com

From:	JOHNSON, BRUCE A GS-12 USAF AFGSC 5 CES/CENP
To:	Bowker, Alexandria C. (SPC); SPECHT, JOEY R GS-12 USAF AFGSC 5 CES/CEMD; LEWIS, DANIEL S GS-12 USAF AFGSC 5 CES/CEMC; ALBRIGHT, TREV A GS-13 USAF AFGSC 5 CES/CEN; LONNING, GARY G GS-13 USAF AFGSC 5 CES/CEM; PEARSON, RENETTA J GS-14 USAF AFGSC 5 CES/CD
Cc:	Ashley Ross; Mikayla Boche; MUNOS, CY I GS-11 USAF AFGSC 91 MMXS/MMXSFK; MCMAHON, ROXANNE M GS-13 USAF AFGSC 5 BW/JA
Subject:	RE: Ruso Wind Project
Date:	Thursday, December 20, 2018 4:14:33 PM
Attachments:	image001.gif

Ms. Bowker,

Mr. Cy Munos previously sent you his comments on the planned layout. Only one other comment has been made regarding the layout. All comments are as follows:

- There are 9 collector crossings. We have regulations on collector cable crossings and a few of them will have to be modified to be within our regulations. Some access roads will have to be modified as well.
- 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)'
- 90 degree crossing is mandatory
- No cable crossing within 50ft of our buried splices
- Access roads will cross our cable at a minimum of 45 degrees (90 preferred)
- Will not allow access road to run in USAF easement
- We will not allow any ditch cutting for access roads on our easement without approval.
- We require a 48hr notice prior to cable crossing or any construction on USAF easement. (Cable Affairs Office 701-723-6053)
- Must maintain a 1200 foot separation from any LF. Restrictive easement.

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

V/r,
Bruce

Bruce Johnson
Chief, Portfolio Optimization
DSN: 453-4693
Comm: (701) 723-4693

From: Bowker, Alexandria C. (SPC) [mailto:acbowker@southernco.com]
Sent: Tuesday, December 18, 2018 11:16 AM
To: WARREN, SAMUELE M CIV USAF USAFE 48 CES/PMO <samuele.warren.1@us.af.mil>; SPECHT, JOEY R GS-12 USAF AFGSC 5 CES/CEMD <joey.specht@us.af.mil>; LEWIS, DANIEL S GS-12 USAF AFGSC 5 CES/CEMC <daniel.lewis.23@us.af.mil>; JOHNSON, BRUCE A GS-12 USAF AFGSC 5 CES/CENP <bruce.johnson.25@us.af.mil>; ALBRIGHT, TREV A GS-13 USAF AFGSC 5 CES/CEN

<trev.albright@us.af.mil>; LONNING, GARY G GS-13 USAF AFGSC 5 CES/CEM <gary.lonning@us.af.mil>; PEARSON, RENETTA J GS-14 USAF AFGSC 5 CES/CD <renetta.pearson@us.af.mil>
Cc: Ashley Ross <Ashley.ross@kljeng.com>; Mikayla Boche <Mikayla.Boche@kljeng.com>
Subject: [Non-DoD Source] Ruso Wind Project

All,
Since our last discussion, Southern Power has revised the Ruso Wind Project layout. I have attached the turbine layout, road and collector system, and gen tie route. The project will generate up to 200 megawatts of electricity and will result in up to 66 wind turbines. The current project layout includes up to 53 primary turbine locations and 13 alternate turbine locations. SPC plans to utilize two turbine models, with an output between 2.415 MW – 4.8 MW. The maximum number of Siemens 2.415-108 is 11 and the maximum number of Siemens 4.2-145 is 42. The planned project layout is designed to accommodate both of the turbine models under consideration. The turbine specifications are as follows:

Turbine Type	Rotor Diameter (meters - feet)	Rotor Swept Area ($meters^2$ – $feet^2$)	Cut-in Wind Speed (m/s)	Rated Power (MW)	Cut-out Wind Speed (m/s)	Blade Length (meters - feet)	Hub Height (meters - feet)	Blade Height (Highest) (meters - feet)	Blade Height (Lowest) (meters - feet)	Max # of Project Turbines
Siemens SWT-2.415-108	108 – 354.3	9,144 – 98,425.2	3.0	2.415	25.0	52.6 – 172.6	80 – 262.5	134 – 439.6	26 – 85.3	11
Siemens SG 4.2-145	145 – 475.7	16,506 – 177,669.1	3.0	4.2	27.0	71 – 232.9	107.5 – 352.7	180 – 590.6	35 – 114.8	42

Please let me know if you need any additional information. We are planning to submit a permit application to the North Dakota Public Service Commission on December 28, 2018 and would appreciate any input before that date.
Thanks,
Alex Bowker

Alex C. Bowker
Siting
Southern Power Company
3535 Colonnade Parkway, BIN S-855-EC
Birmingham, AL 35243
O: 205.992.0163
M: 205.915.9519
southernpowercompany.com

From: Baer, Kathy
To: Ashley Ross
Subject: Re: [EXTERNAL] RE: Ruso Wind Project
Date: Thursday, November 29, 2018 11:35:20 AM
Attachments: Ruso Wind - November 2018.pdf

Ashley,
Thanks for the new boundary layer. I reviewed it compared to the last map I sent and there are no additional easements associated with the new boundary. I have attached a new map that shows where the Service easements are located. As we have stated before, we would like to work with those involved as early in the siting process as possible to avoid impacts to our easements.
Thank you,
Kathy

Kathy Baer
Wetland District Manager
Audubon NWR Complex
3275 11th St NW
Coleharbor, ND 58531
701-442-5474 ext. 114

The Prairie is calling and I must go...
--

On Wed, Nov 28, 2018 at 3:52 PM Ashley Ross <Ashley.Ross@kljeng.com> wrote:

> Kathy,
>
> Attached is the study area shapefile. Let me know if you need anything else.
>
> Thank you,
>
> Ashley Ross
> **KLJ - Bismarck**
> 701-250-5961
>
> **From:** Baer, Kathy [mailto:kathy_baer@fws.gov]
> **Sent:** Tuesday, November 27, 2018 11:22 AM
> **To:** Ashley Ross <Ashley.Ross@kljeng.com>
> **Subject:** Ruso Wind Project

Ashley,

We received your November 20 letter regarding the revised Project Location Map for the Ruso Wind project. Could you send me the shapefile for the new boundary and I can send an updated map of where FWS easements are located.

Thank you,

Kathy

Kathy Baer

Wetland District Manager

Audubon NWR Complex

3275 11th St NW

Coleharbor, ND 58531

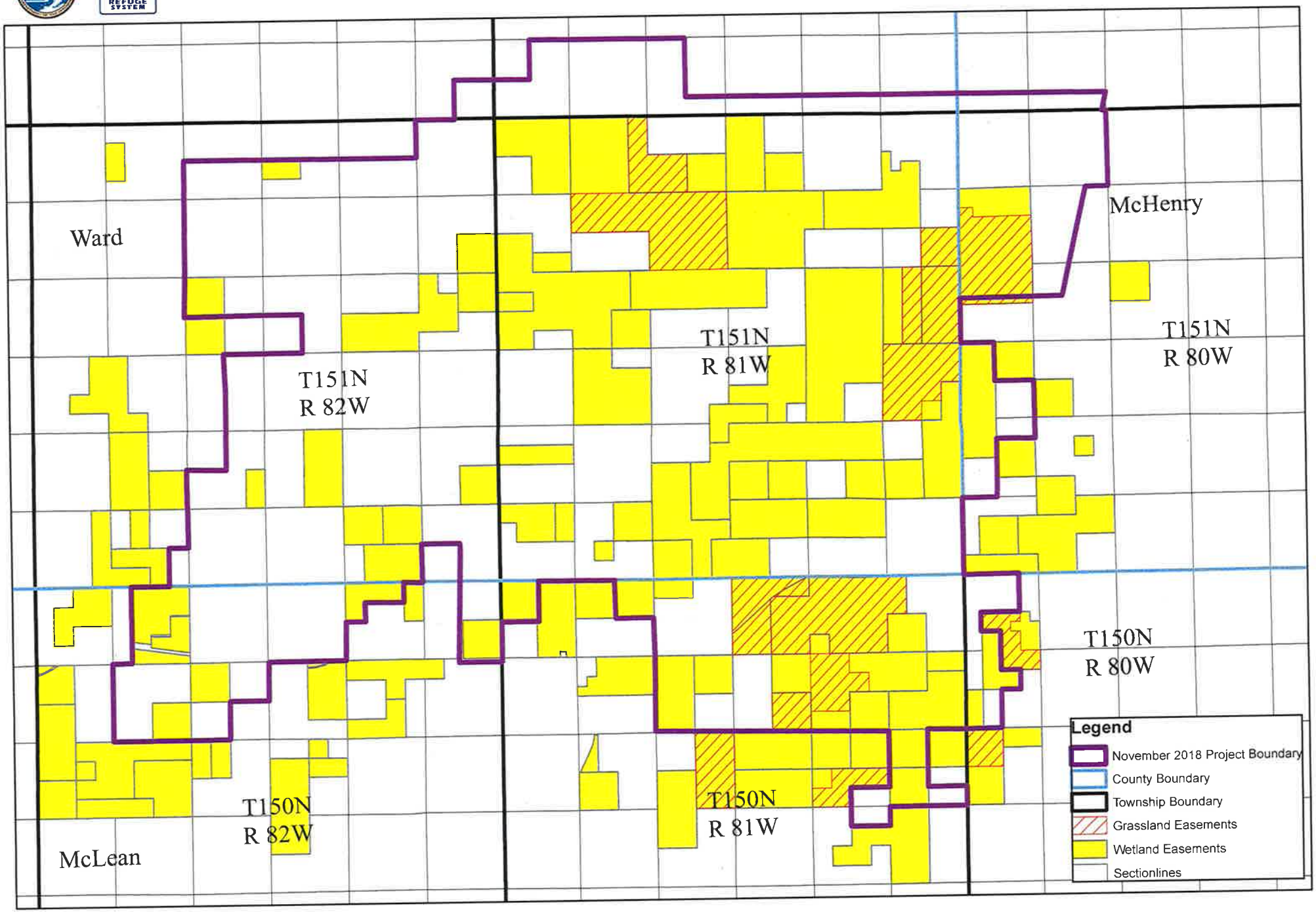
701-442-5474 ext. 114

The Prairie is calling and I must go...

--

U.S. Fish & Wildlife Service

Ruso Wind Project



UNITED STATES DEPARTMENT OF COMMERCE
National Telecommunications and Information Administration
Washington, D.C. 20230

Mr. Frank O'Brien
COMSEARCH
19700 Janelia Farm Blvd.
Ashburn, VA 20147

Re: Ruso Wind Project: Ward, McLean & McHenry Counties, ND

Dear Mr. O'Brien:

In response to your request on October 25, 2018, the National Telecommunications and Information Administration provided to the federal agencies represented in the Interdepartment Radio Advisory Committee (IRAC) the plans for the Ruso Wind Partners Project, LLC, located in Ward, McLean, and McHenry Counties, North Dakota.

After a 45+ day period of review, one federal agency, the Department of Energy (DOE), identified concerns with turbine placement in this area. Their concerns are noted below:

> The Ruso Wind Partners project has the potential to adversely affect Western Area Power Administration operations. Energy requests the developer coordinate turbine placement directly with our Western Spectrum Manager, whose contact details are noted below.
>
> Mr. Scott E. Johnson; US Department of Energy; Western Area Power Admin Headquarters; P.O. Box 281213, Lakewood, CO, 80228-8213; phone: (720)-962-7380; fax: (720) 962-4080; email: sjohnson@wapa.gov

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,

John R. McFall
Deputy, Frequency Assignment Subcommittee
Office of Spectrum Management

Appendix D. USFWS Species List

IPaC Information for Planning and Consultation **U.S. Fish & Wildlife Service**

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

NOT FOR CONSULTATION

Location

McHenry, McLean and Ward counties, North Dakota

Local office

North Dakota Ecological Services Field Office

(701) 250-4481
(701) 355-8513

3425 Miriam Avenue
Bismarck, ND 58501-7926

http://www.fws.gov/northdakotafieldoffice/endspecies/endangered_species.htm

NOT FOR CONSULTATION

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population, even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

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 from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species[1] and their critical habitats are managed by the Ecological Services Program of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries[2]).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact NOAA Fisheries for species under their jurisdiction.

NOT FOR CONSULTATION

1. Species listed under the Endangered Species Act are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the listing status page for more information.
2. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Mammals

NAME	STATUS
Gray Wolf Canis lupus There is **final** critical habitat for this species. The location of the critical habitat is not available. https://ecos.fws.gov/ecp/species/4488	Endangered
Northern Long-eared Bat Myotis septentrionalis No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/9045	Threatened

Birds

NAME	STATUS
Least Tern Sterna antillarum No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/8505	Endangered
Piping Plover Charadrius melodus There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/6039	Threatened
Red Knot Calidris canutus rufa No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/1864	Threatened
Whooping Crane Grus americana There is **final** critical habitat for this species. Your location is outside the critical habitat. https://ecos.fws.gov/ecp/species/758	Endangered

NOT FOR CONSULTATION

Fishes

NAME	STATUS
Pallid Sturgeon Scaphirhynchus albus No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/7162	Endangered

Insects

NAME	STATUS

Dakota Skipper Hesperia dacotae — Threatened

There is **final** critical habitat for this species. Your location is outside the critical habitat.
https://ecos.fws.gov/ecp/species/1028

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

THERE ARE NO CRITICAL HABITATS AT THIS LOCATION.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act[1] and the Bald and Golden Eagle Protection Act[2].

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described below.

1. The Migratory Birds Treaty Act of 1918.
2. The Bald and Golden Eagle Protection Act of 1940.

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
- Measures for avoiding and minimizing impacts to birds http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php
- Nationwide conservation measures for birds http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf

The birds listed below are birds of particular concern either because they occur on the USFWS Birds of Conservation Concern (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ below. This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the E-bird data mapping tool (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the

NOT FOR CONSULTATION

relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found below.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON (IF A BREEDING SEASON IS INDICATED FOR A BIRD ON YOUR LIST, THE BIRD MAY BREED IN YOUR PROJECT AREA SOMETIME WITHIN THE TIMEFRAME SPECIFIED, WHICH IS A VERY LIBERAL ESTIMATE OF THE DATES INSIDE WHICH THE BIRD BREEDS ACROSS ITS ENTIRE RANGE. "BREEDS ELSEWHERE" INDICATES THAT THE BIRD DOES NOT LIKELY BREED IN YOUR PROJECT AREA.)
Bald Eagle *Haliaeetus leucocephalus* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Dec 1 to Aug 31
Golden Eagle *Aquila chrysaetos* This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1680	Breeds Jan 1 to Aug 31

NOT FOR CONSULTATION

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ “Proper Interpretation and Use of Your Migratory Bird Report” before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is 0.25/0.25 = 1; at week 20 it is 0.05/0.25 = 0.2.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season (■)
Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)
Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

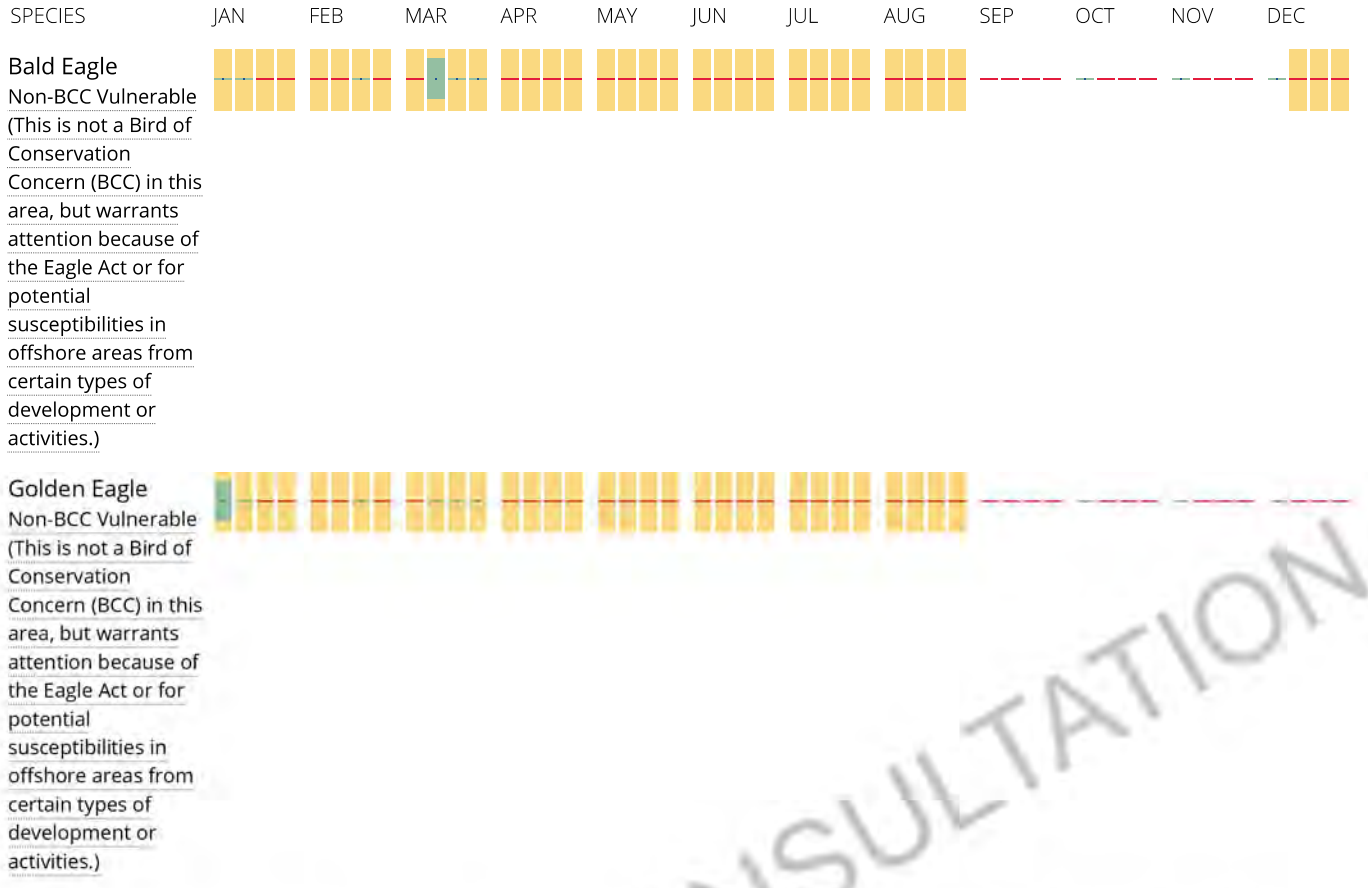
To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (–)
A week is marked as having no data if there were no survey events for that week.

Survey Timeframe
Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.

■ probability of presence ■ breeding season | survey effort – no data

NOT FOR CONSULTATION



NOT FOR CONSULTATION

Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

Nationwide Conservation Measures describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. Additional measures and/or permits may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS Birds of Conservation Concern (BCC) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the Avian Knowledge Network (AKN). The AKN data is based on a growing collection of survey, banding, and citizen science datasets and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle (Eagle Act requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the E-bird Explore Data Tool.

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the Avian Knowledge Network (AKN). This data is derived from a growing collection of survey, banding, and citizen science datasets .

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: The Cornell Lab of Ornithology All About Birds Bird Guide, or (if you are unsuccessful in locating the bird of interest there), the Cornell Lab of Ornithology Neotropical Birds guide. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are Birds of Conservation Concern (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the Eagle Act requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the Northeast Ocean Data Portal. The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the Diving Bird Study and the nanotag studies or contact Caleb Spiegel or Pam Loring.

NOT FOR CONSULTATION

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

NOT FOR CONSULTATION

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

This location overlaps the following National Wildlife Refuge lands:

LAND	ACRES
Audubon National Wildlife Refuge	438.2 acres

(701) 442-5474
(701) 442-5546

3275 11th Street Nw
Coleharbor, ND 58531-9419

https://www.fws.gov/refuges/profiles/index.cfm?id=62540

J. Clark Salyer National Wildlife Refuge 0 acres

(701) 768-2548
(701) 768-2834

681 Salyer Road
Upham, ND 58789-9307

https://www.fws.gov/refuges/profiles/index.cfm?id=62620

Fish hatcheries

THERE ARE NO FISH HATCHERIES AT 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.

WETLAND INFORMATION IS NOT AVAILABLE AT THIS TIME

This can happen when the National Wetlands Inventory (NWI) map service is unavailable, or for very large projects that intersect many wetland areas. Try again, or visit the NWI map to view wetlands at this location.

NOT FOR CONSULTATION

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.

NOT FOR CONSULTATION

Appendix E. Policies and Commitments Statement

Since
2003,
we have
invested more than
$14.2 million in 306 grants,
restoring or enhancing
over 1.7 million acres.

Environmental stewardship

The Southern Company system is a leader in environmental stewardship. In addition to maintaining environmental compliance in our operations, we work to protect wildlife by conserving their natural habitats. We are also improving the overall ecosystem through partnerships with public and private organizations, like the National Fish and Wildlife Foundation (NFWF).

Our partnership with NFWF began more than 15 years ago with a focus on restoring and reviving the populations and habitats of southern birds. Since then, the partnership has developed into a portfolio of efforts addressing critical conservation needs including long-term restoration of the longleaf pine ecosystem, recovery of imperiled species and community-based stewardship of forests, rivers, coastal areas and wetlands. This alliance is a successful model of collaborative conservation that has generated 15 years of measurable outcomes and accelerated results.

Conserving wildlife and habitats

Longleaf Stewardship Fund: Invested nearly $7.4 million to restore or enhance over 1.2 million acres of longleaf pines.

Power of Flight: Translocated 379 red-cockaded woodpeckers, which are on a trajectory for potential down listing from endangered status within the next decade.

Five Star and Urban Waters Restoration: Invested nearly $2.8 million in 118 projects improving 1,300 acres and 26 miles of stream bank.

Bats for the Future Fund: First in our industry to support research by investing $100,000 in the NFWF program to find a cure for a deadly disease that threatens North America's bat population.

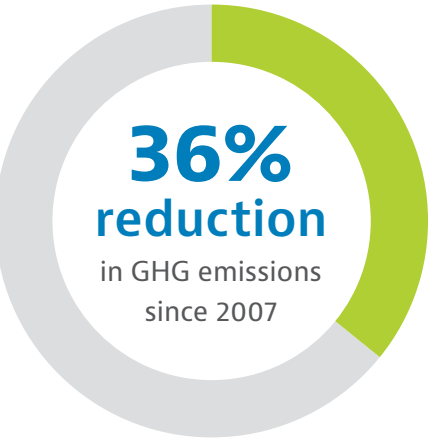
Renew Our Rivers: Removed 15 million pounds of trash and debris since 2000 with the help of 110,000 volunteers.

We are reducing our GHG and air emissions, responsibly using natural resources and managing byproducts and waste, all while meeting or surpassing environmental laws and regulations. We do this because we want to leave our world a better place.

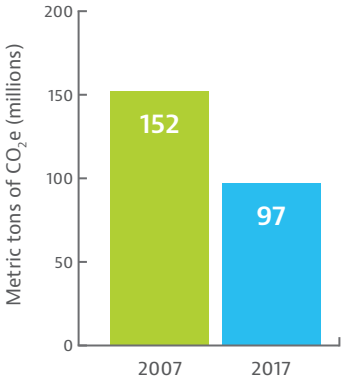
Reducing GHG emissions

The Southern Company system is committed to providing clean, safe, reliable and affordable energy, while setting a long-term goal to transition to low- to no-carbon operations by 2050. We have already made significant progress with an "all of the above" approach to electric generation resource diversity.

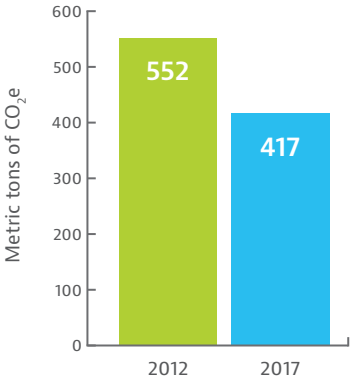
Without any regulatory mandates, our system's total annual GHG emissions in 2017 of 97 million metric tons of CO_2 equivalent (CO_2e), were approximately 36 percent (55 million metric tons) lower than 2007 levels.



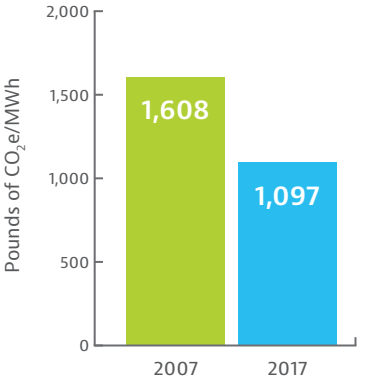
Total GHG emissions
(based on financial control)



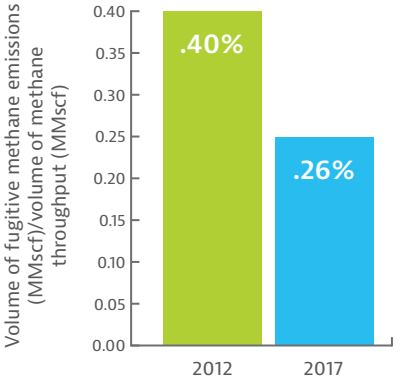
Gas distribution total CO_2e emissions
(based on financial control)



Electricity GHG intensity
(based on financial control)



Gas distribution methane emissions intensity rate
(based on financial control)



Back to contents

GHG reduction activities

- **GHG emission reduction** is a major focus of our research and development organization, which has a historic record of technology advancement since the 1960s. We lead the industry in conducting robust research and development of new innovative energy technologies – and in deploying those technologies to reduce GHG emissions.
- **We consider retirement options** for generating units as a part of our overall resource strategy. In fact, this has led to approximately 4,200 MW of coal- and oil-related retirements since 2010 and approximately 3,300 MW of natural gas fuel switches since 2015.
- **Since 1998**, Southern Company Gas has replaced over 5,600 miles of bare steel and cast iron pipe and, as a result, has removed 2.5 million metric tons of CO_2 equivalent from its natural gas distribution system.
- **We've exceeded** emissions intensity reduction goals established by the Our Nation's Future Energy Program (ONE Future) for our natural gas distribution operations. Our current intensity rate of 0.26 percent is less than ONE Future goals for 2020 (0.48 percent) and 2025 (0.44 percent).
- **For more than two decades**, Southern Company Gas has spearheaded several projects that reduce methane emissions, served as a trusted education source for consumers and participated in federal emissions reduction programs.

We have, for the first time, set emission reduction goals that are aligned with our long-term business strategy and our commitment to a leadership role in developing solutions that make technological and economic sense.

We have established an intermediate goal to reduce carbon emissions from 2007 levels by 50 percent by 2030 and a long-term goal of low- to no-carbon operations by 2050.

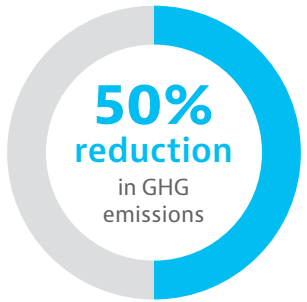
In addition, we aim to maintain the fugitive methane emissions for our natural gas distribution operations to 1 percent or less of our total volume of methane throughput.

To achieve these goals, the Southern Company system expects to continue growing its renewable energy portfolio, optimize technology advancements to modernize its transmission and distribution systems, increase the use of natural gas for generation, complete construction of Plant Vogtle Units 3 and 4, invest in energy efficiency and continue research and development efforts focused on technologies to lower GHG emissions. The Southern Company system's ability to achieve these goals will be dependent on many external factors, including supportive national energy policies, low natural gas prices, and the development, deployment and advancement of relevant energy technologies.

GHG metrics and goals

(based on 2007 GHG levels)

2017



2030

2050

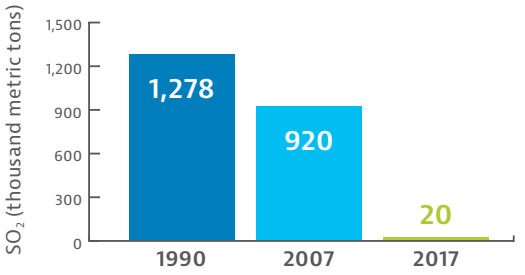
Southern Power is a leading U.S. wholesale energy provider with clean generation facilities from coast to coast. The company is currently constructing its most recent renewable project, the Cactus Flats Wind Facility in Texas.

Reducing air emissions

The Southern Company system addresses emissions like nitrogen oxides (NO_X), sulfur dioxide (SO_2) and mercury as part of our commitment to environmental responsibility. Since 1990, we've reduced NO_X emissions by 89 percent and SO_2 emissions by 98 percent. During the same period, electricity generation has increased about 30 percent to serve growing demand. In addition, since 2007, the system has reduced mercury emissions by over 90 percent.

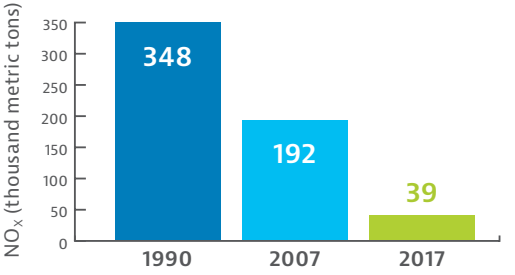
SO_2 emissions total

(based on financial control)



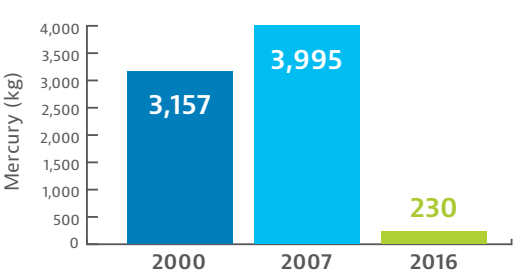
NO_X emissions total

(based on financial control)



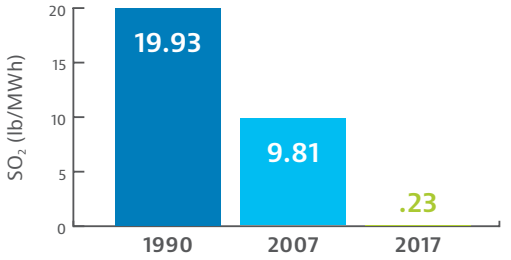
Mercury emissions total

(based on financial control)



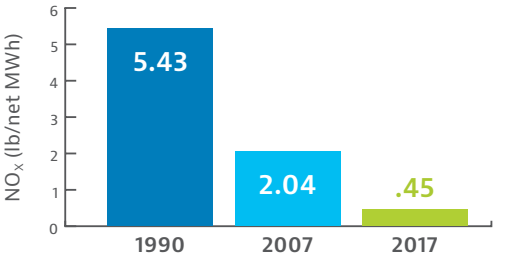
SO_2 emissions intensity

(based on financial control)



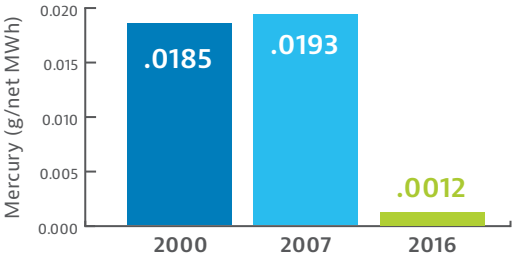
NO_X emissions intensity

(based on financial control)



Mercury emissions intensity

(based on financial control)

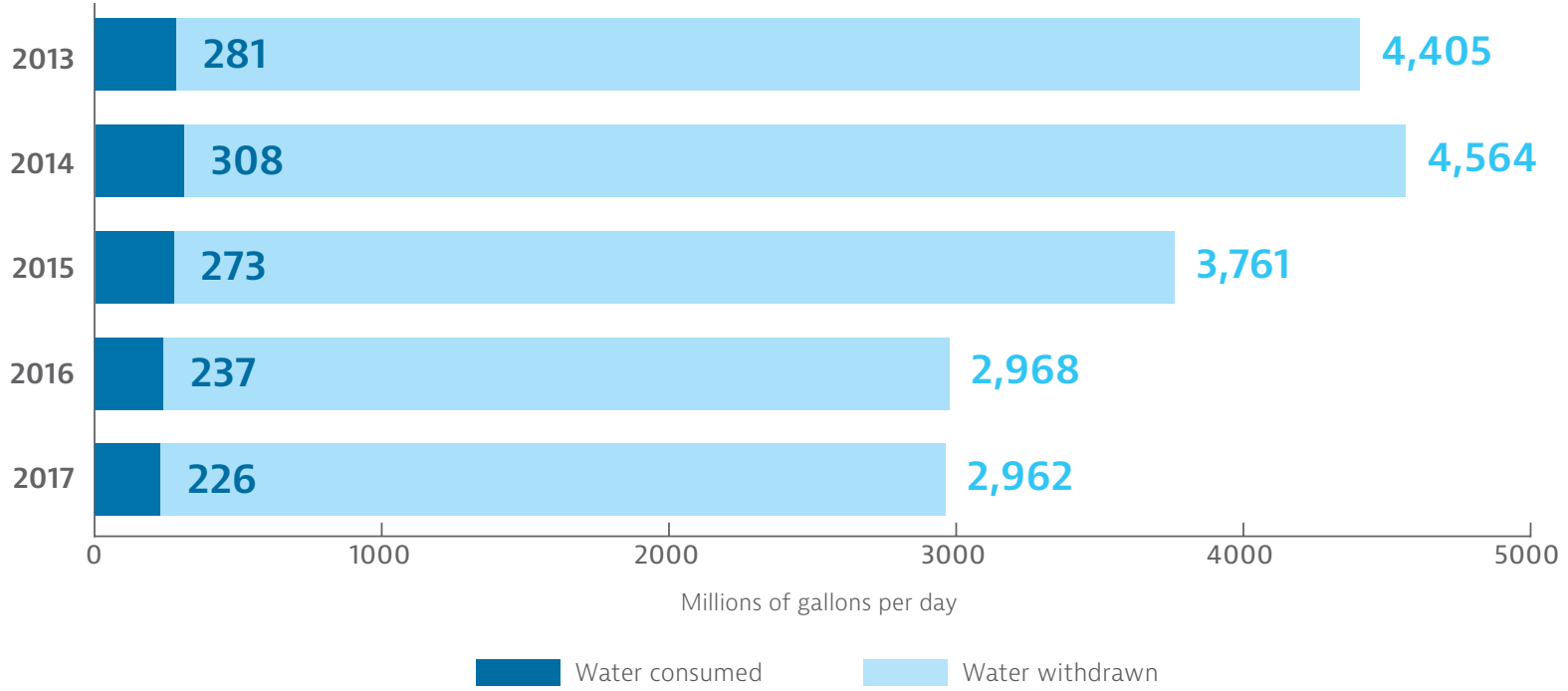


Back to contents

Conserving water

Southern Company system operations rely heavily on water supply. Our state-regulated electric companies' draw from a variety of abundant surface waters including rivers and streams, lakes and reservoirs, coastal water and groundwater sources. Each source presents unique and valuable differences and challenges in the process of power production. Between 2013 and 2017, the system's thermoelectric plants withdrew on average a total of 3.7 billion gallons of water per day, returning 93 percent to the source – rivers or lakes. Over the same period, surface water withdrawal has reduced nearly 33 percent. In addition, our 33 hydroelectric facilities make up about 6 percent of the system's generating capacity and provide more than 200,000 acres of lakes and more than 5,000 miles of shoreline for public use.

Southern Company system surface water withdrawal and consumption



We operate rigorous programs with the goal to safely and effectively manage coal ash and other waste resulting from power generation.

Managing solid wastes

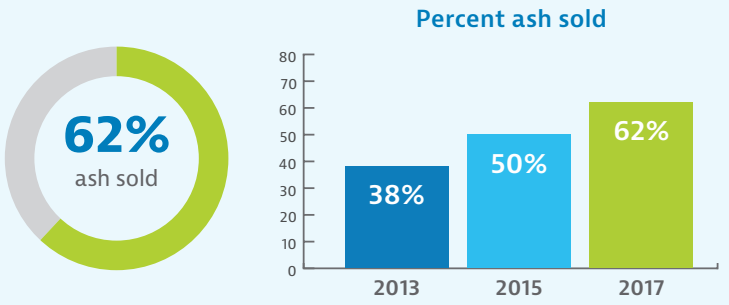
The Southern Company system operates a rigorous Coal Combustion Residuals (CCR) compliance program that complies with applicable laws and regulations to safely, effectively and responsibly manage CCR.

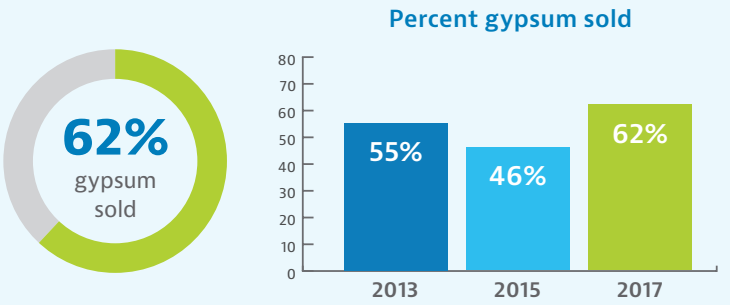
Our state-regulated electric companies have established groundwater monitoring systems around CCR units that meet the EPA's monitoring requirements. We are also moving aggressively to divert ash and wastewater from ash ponds, including the construction of dry ash handling equipment and wastewater treatment systems.

We made a commitment to close all ash ponds and we continue to be proactive in our approach to ash ponds. We are closing inactive ponds, have put a schedule in place for all ponds in the system to stop receiving ash by 2019 and, thereafter, will close every remaining ash pond in our system.

Additionally, the Southern Company system currently avoids CCR disposal by beneficially using 62 percent of produced ash and gypsum.

Ash and gypsum sold for beneficial use





Back to contents

The Southern Company system has reduced hazardous waste generation in routine electric utility work by employing simple measures like replacing hazardous materials with safer options such as non-chlorinated cleaners and water-based paints.

Nuclear power plants produce two levels of radioactive waste, high-level and low-level. High-level waste is used fuel. Used fuel is handled by remote control and safely stored inside the most highly secured area of the plant in steel-lined, concrete pools filled with water or on the plant property in steel-lined, concrete containers. A thimble-sized nuclear fuel pellet produces the equivalent energy of 1 ton of coal. An average nuclear plant unit retires about 20 tons of fuel each year that, in volume, could fit in a small room. Low-level waste includes protective clothing, tools and equipment that may contain small amounts of radioactive material. Low-level waste can be shipped to a licensed disposal facility or stored at the plant.

Southern Company, through its subsidiaries, operates three nuclear power plants. At plants Vogtle, Hatch and Farley, on-site dry storage facilities are being used to house spent fuel once it reaches a lower level of radioactivity and can be expanded to accommodate used fuel through the life of each plant. The casks are constructed of steel-reinforced concrete, proven to safely protect the fuel under extreme conditions such as earthquakes, tornadoes, hurricanes, floods and explosions.

Appendix F. Bat Monitoring Report

Bat Monitoring at the Proposed Ruso Wind Energy Project, McLean and Ward Counties, North Dakota

FINAL REPORT – Spring–Fall 2017

December 2017

Prepared For:

Westwood Professional Services
7699 Anagram Drive
Eden Prairie, MN 55344

Prepared By:

Rogelio M. Rodriguez
Zotz Ecological Solutions, LLC
PO Box 2113
Bend, OR 97702

EXECUTIVE SUMMARY

At the proposed Ruso Wind Energy Project, acoustic monitoring was performed using two Wildlife Acoustics SM2BAT+ and one SM3BAT ultrasonic systems with one placed at each of three locations throughout the Project Study Area. At one location, two microphones were attached to a meteorological (met) tower; one microphone from the system was placed at a height of 5 meters and another microphone at 45 meters. At the two other locations, the microphone was elevated 3 meters from ground level. Monitoring occurred from April to November 2017.

A total of 3,716 bat passes were recorded; 1,562 bat passes were detected at Met Tower 1, 688 bat passes at North Station, and 1,466 bat passes at South Station. At Met Tower 1, the little brown bat composed the greatest proportion of bat passes (40.52 percent) followed by the UNKHIGH group (12.42 percent) and the hoary bat (12.10 percent). Average nightly activity at Met Tower 1 resulted in 2.52 ± 0.35 bat passes/night at the 45 m height and 5.45 ± 0.56 bat passes/night at the 5 m height. At North Station, the little brown bat composed the greatest proportion of bat passes (44.33 percent) followed by the silver-haired bat (21.95 percent), and the UNKHIGH group (18.31 percent). Average nightly activity at North Station resulted in 5.93 ± 0.97 bat passes/night. At South Station, the little brown bat composed the greatest proportion of bat passes (46.38 percent) followed by the UNKHIGH group (30.56 percent) and the hoary bat (5.46 percent). Average nightly activity at South Station resulted in 7.48 ± 0.77 bat passes/night.

Nightly bat activity was greatest during August and September 2017 for the 45 m height of Met Tower 1, while near ground level for Met Tower 1 (5 m) and the North and South Stations activity was greatest during most of the summer, i.e., late May to mid-August 2017. Considering all detector locations, hourly activity was greatest during the middle of the night, 2200—0300 hrs (10:00 PM—3:00 AM). Activity during these dates and times was attributed largely to the little brown bat, hoary bat, and the silver-haired bat.

Bat activity was 36.88 percent greater at the 5 m height at Met Tower 1 compared to the 45 m height. Bat activity was not significantly different among detector locations at ground level (i.e., Met Tower 1-5m, North Station, and South Station). As for activity by species and species groups between the two monitoring heights at Met Tower 1, smaller bats appeared more active at the 5 m height while larger bats were more active at the 45 m height. That is, activity by the little brown bat, the northern long-eared bat, and the Myotis bat group were significantly greater at the 5 m height while activity by the hoary bat and the UNKLOW group were significantly greater at the 45 m height.

Bat species detected consisted primarily of the non-migratory species (little brown bat) and migratory species (the hoary and silver-haired bats). Three species (big brown, little brown, and northern long-eared bat) listed as Species of Conservation Priority by the North Dakota Game and Fish Department were detected during the monitoring period. Based on several detections (n=88 bat passes) classified to the northern long-eared bat, this species may occur in the Study Area.

TABLE OF CONTENTS

EXECUTIVE SUMMARY i
1. INTRODUCTION 1
1.1 Study Area 1
2. METHODS 2
2.1 Passive Acoustic Monitoring 2
2.2 Data Analysis 3
3. RESULTS 4
3.1 Met Tower 1 6
3.2 North Station 6
3.3 South Station 6
3.4 Comparison of Bat Activity among Detector Locations 7
3.5 Comparison of Bat Activity for Species between Heights 7
4. DISCUSSION 7
4.1 Northern Long-eared Bat 7
4.2 Overall Activity and Species Composition 8
4.3 Regional Fatality Studies and Potential Impacts 9
5. LITERATURE CITED 12
APPENDIX A 29

LIST OF TABLES

Table 1. Bat species potentially found in the study area based on distributional records. Presence of habitat is based on habitat descriptions and review of aerial imagery. 15
Table 2. Land Cover Types within the Study Area. 16
Table 3. Species and species group designations used to categorize acoustic data. 17
Table 4. Species composition and activity (number of bat passes) recorded during the period of April to November 2017 at heights of 45 and 5 meters at one met tower and two ground level detector locations (North and South) within the study area 18

Table 5. Results of paired t-test analyses comparing activity by each species or species group between 45 m and 5 m heights at Met Tower 1. 19

LIST OF FIGURES

Figure 1. Combined composition of species and species groups (percent of total bat passes) from all detector locations. 20

Figures 2A and 2B. Nightly total of bat passes at Met Tower 1; (A) 45 meters and (B) 5 meters. 21

Figures 3A and 3B. Hourly average of bat passes at Met Tower 1; (A) 45 meters and (B) 5 meters. Averages are reported with ± standard error. 22

Figures 4A and 4B. (A) Nightly total of bat passes and (B) Hourly average (± standard error) of bat passes at North Station. 23

Figures 5A and 5B. (A) Nightly total of bat passes and (B) Hourly average (± standard error) of bat passes at South Station. 24

Figure 6. Average number of nightly bat passes (±SE) at 45 m and 5 m at Met Tower 1. There was a significant effect of height on the average number of bats recorded per night ($t_{195} = 5.660$, $P < 0.001$). 25

Figure 7. Average number of nightly bat passes (±SE) at Met Tower 1 (5 m), North Station, and South Station. There was not a significant effect of detector location on the average number of bats recorded per night ($F_{2,504} = 2.580$, $P = 0.077$). 26

Figure 8. Monthly activity by migratory and non-migratory species. 27

Figure 9. Monthly activity by migratory species; eastern red, hoary, and silver-haired bats. 28

1. INTRODUCTION

In cooperation with Westwood Professional Services (Westwood), Zotz Ecological Solutions, LLC (ZotzEco) was requested to conduct a bat acoustic monitoring study for the Ruso Wind Energy Project (hereafter referred to as Project or proposed Project) in McLean and Ward Counties, North Dakota. It has been well documented that bats, especially migratory species (hoary bat [*Lasiurus cinereus*], eastern red bat [*Lasiurus borealis*], and the silver-haired bat [*Lasionycteris noctivagans*]), are at risk from operating wind turbines during the late summer and fall migratory period (Arnett et al. 2008; Johnson 2005; Kunz et al. 2007a). Yet, questions remain as to how bats are killed by wind turbines and to what degree bat populations are affected throughout the United States, as well as, in North Dakota (Bicknell and Gillam 2013).

The objective of the study was to document bat species occurrence and activity during the 2017 spring migratory, summer resident, and fall migratory periods within the proposed Project Area (hereafter referred to as the Study Area). Seven bat species are potentially present within McLean and Ward Counties, North Dakota based on distributional records (Dyke et al. 2015; IUCN 2016; USGS-GAP 2013), with six of these species possibly present in the Study Area (Table 1). The western small-footed myotis (*Myotis ciliolabrum*) is considered by the North Dakota Game and Fish Department (NDGFD) to have a restricted range in the State and to occur in McLean County only in proximity to the Missouri River, which is well outside of the Study Area (Dyke et al. 2015). Three of the species (big brown [*Eptesicus fuscus*], little brown [*Myotis lucifugus*], and northern long-eared bat [*Myotis septentrionalis*]) possibly occurring in the Study Area are listed as Species of Conservation Priority by NDGFD. The northern long-eared bat is also listed as federally threatened by the U.S. Fish and Wildlife Service (USFWS). While all other species are considered to occur throughout both counties (as well as throughout the entire State), the northern long-eared bat is considered by the NDGFD to occur in McLean County primarily in proximity to the Missouri River, although there is the possibility of this species occurring throughout the State (Dyke et al. 2015). This area along the Missouri River is at the closest proximity (~25 miles) to the southwestern portion of the Study Area (Appendix A: Exhibit 1). Occurrence in the Study Area for all species is dependent upon species-specific habitat use (i.e., foraging and roosting) and migratory movements.

1.1 Study Area

The Study Area consists of approximately 43,344 acres (68 square miles). Topography within the Study Area is relatively uniform, as the site contains numerous wetlands and hummocky, rolling hills with few streams and drainages present (Appendix A: Exhibits 2 and 3). The elevation of the Study Area ranges from approximately 1,950 feet to 2,205 feet above mean sea level (amsl). Portions of two named waterways are located within the Study Area: McMann Lake and Robinson Coulee. Audubon Lake and Souris River are located approximately 9.7 miles to the south and 8.7 miles to the northeast of the Study Area, respectively (see Appendix A: Exhibit 1).

Surface ownership in the Study Area is nearly all private (92 percent [39,766 acres]) with the remaining 3 percent (1,277 acres) and 4 percent (1,913 acres) in State ownership, managed by the North Dakota Department of Trust Lands (NDDTL) under the direction of the Board of University of School Lands) and NDGFD, respectively. The remaining 1 percent (395 acres) of lands are county Waterfowl Production Areas (WPAs) jointly managed by Ward and McLean counties and the U.S. Fish and Wildlife Service (USFWS). No other federal lands are located within the Study Area.

A total of seven land cover types are recognized and mapped within the Study Area (Appendix A: Exhibit 4). These include cultivated crops, hay/pasture, herbaceous grassland, wetland, open water, disturbed/developed, and deciduous forest (Table 2).

2. METHODS

2.1 Passive Acoustic Monitoring

Passive acoustic bat monitoring was performed during the period of 19 April 2017 to 1 November 2017 within the Study Area. Monitoring during the spring and fall seasons was performed to document the activity by migratory species, especially since these species make up the majority of documented mortalities at wind energy developments (Arnett et al. 2008; Kunz et al. 2007a). Passive acoustic monitoring was performed through the use of Song Meter SM2BAT+ and SM3BAT passive ultrasonic recorders (Wildlife Acoustics, Inc.) supplied by Westwood. Wildlife Acoustic systems are increasingly being used to perform bat monitoring at wind energy developments due to their readiness for field deployment and collection of full-spectrum data. Full-spectrum data retain the full information content of the acoustic signal, which includes higher resolution time-frequency, amplitude, and multiple frequency content of bat echolocation. This additional information retained in full-spectrum data can allow for enhanced species discrimination (Kunz et al. 2007b).

Three Wildlife Acoustics systems were placed at three separate locations within the Study Area (Appendix A: Exhibit 2). At one location, a detector was placed on a meteorological (met) tower with one microphone installed at a height of approximately 45 meters and the other microphone installed at approximately 5 meters. A microphone was placed at 45 m to simulate a height within the potential turbine rotor sweep zone. Furthermore, because migrating bats have been hypothesized to fly up to heights of 100 meters and the number of bat fatalities increases with turbine height (Barclay et al. 2007), it is important to record bat activity at heights well above ground level. A microphone was placed at 5 m to aid in fully documenting the species composition of the Study Area, given that different species have been documented at different monitoring heights (Arnett et al. 2006; Collins and Jones 2009).

Installation of pulley systems to the met tower for raising and lowering the Wildlife Acoustics microphones at these heights was conducted by personnel contracted by Ruso Wind Partners,

LLC. Westwood and ZotzEco installed the Wildlife Acoustics systems prior to commencement of monitoring. Wildlife Acoustics microphones were not sheltered as they are weatherproofed by the manufacturer, yet the microphones were pointed slightly downward to decrease the accumulation of precipitation on the microphone.

At two other locations, one in the northern and one in the southern portions of the Study Area, a detector was placed to further document bat activity throughout the Study Area (Appendix A: Exhibit 2). At each location, a single detector microphone was elevated at a height of 3 meters above the ground using a PVC pipe and oriented towards a pond (at least 5-10 meters away).

Recording was conducted every night from an hour before sunset until an hour after sunrise during the monitoring period. Sound files recorded by the Wildlife Acoustics units were stored on compact flash (Secure Digital [SD]) memory cards within each system. Westwood rotated fresh SD memory cards and batteries into deployment on a bi-weekly basis. Sound files were downloaded and backed up to a local hard drive and the files were sent to ZotzEco for analysis either through directly sending them the memory cards or transfer via a cloud storage website.

2.2 Data Analysis

Qualitative analysis of Wildlife Acoustics data was performed by first processing and filtering audio files for bat calls using the program Kaleidoscope version 3.1.1 (Wildlife Acoustics Inc. 2015) on a personal computer running a Windows operating system. The resulting call files were filtered and visually screened using Sonobat version 4.x (Sonobat 2017) and AnalookW version 4.2n (Corben 2017) to remove any remaining files containing non-bat sounds (e.g., wind noise, insects). Files with suitable bat calls were examined visually and classified to species and species groups based on comparison to libraries of known bat reference calls. Classification to species was possible only when clear calls were recorded and only for certain species. In the event that a call was not classifiable to species, the call was classified to species group categories or not classified (Table 3).

Unclassified bat passes include files with fragmentary calls and files with solely non-search phase calls (i.e., approach, feeding buzz, social). Unclassified calls can be the result of different species of bats having similar body sizes and thus call characteristics (Jones 1999) or differences in behavior of a single bat species producing various call characteristics (Hayes 2000). Unlike other animal species, such as birds that use species-specific calls for courtship and breeding purposes, different bat species may have similar calls based on the environment in which they are active and the prey which they are detecting (Barclay 1999). For example, a bat pass composed of two call pulses at the same frequency could be produced by three or more species. One such fragmentary bat pass around 25 kilohertz (kHz) could be produced by big brown bats, silver-haired bats, or hoary bats.

The presence of one species or species group within a call file of a 5 second max duration was described as a bat pass. Thus, call analysis may result in more bat passes than call files if two or more species (or species groups) could be classified in the same call file. It should be noted that the number of bat passes recorded does not necessarily represent the number of bats present, as a single bat could make several passes within a night.

Effects of detector location near ground level (i.e., 5 m height for Met Tower 1 compared to the North and South Stations) on nightly bat activity were analyzed using an analysis of covariance (ANCOVA) with recording date as a covariate. In the case of significant effects of detector location on bat activity, post-hoc planned pairwise comparisons were performed using a Tukey's HSD test. To determine if activity of each species/species group was different between monitoring heights at Met Tower 1, paired *t*-tests were performed for each species/species group between the 5 m and the 45 m heights. Statistical analyses were performed using Systat 12 and Excel Analysis ToolPak (Microsoft Office 2007) and considered significant at $P < 0.05$.

During the call analysis process, files containing suspected calls of the northern long-eared bat (as well as any possible Myotis calls) were further scrutinized using two independent software programs for auto-classifying the echolocation calls of bats. The first program was Kaleidoscope version 3.1.1 (Wildlife Acoustics Inc. 2015) with the classifier set version 3.1.0 for Bats of North America and using -1 more sensitive (Liberal) setting which has passed the U.S. Fish and Wildlife Service's standardized test/validation process for possible presence/absence surveys for the northern long-eared bat (Ford 2015). The second program was EchoClass version 3.1 (U.S. Army Engineer Research and Development Center 2015) which was funded by the U.S. Fish and Wildlife Service primarily for presence/absence surveys of the Indiana bat (*Myotis sodalis*) but can also classify calls to the northern long-eared bat. Call files initially vetted as those made by Myotis species were processed with the two programs.

3. RESULTS

From the three Wildlife Acoustics systems with four microphones, a total of 1,228,379 sound files were recorded during the period of 19 April 2017 to 1 November 2017. Filtering and visual examination of files to eliminate extraneous noise (e.g., wind, insects, etc.) resulted in a total of 3,709 call files containing 3,716 bat passes (Table 4). Of these bat passes, 1,562 bat passes were detected at Met Tower 1, 688 bat passes at North Station, and 1,466 bat passes at South Station. Six species and six species groups were documented. The little brown bat composed the greatest proportion of bat passes (Figure 1). This was followed by the UNKHIGH group (which was composed of potential calls by the little brown, eastern red, and northern long-eared bat) and the silver-haired bat.

For Met Tower 1, Kaleidoscope classified 110 call files as the northern long-eared bat, while EchoClass classified 53 call files as the northern long-eared bat. Among these calls, 39 call files were classified in agreement between the two programs. Manual review of all 124 files both in full spectrum and zero-crossings format resulted in 61 files with a greater potential for being produced by the northern long-eared bat.

For North Station, Kaleidoscope classified 6 call files as the northern long-eared bat, while EchoClass classified 3 call files as the northern long-eared bat. Among these calls, 2 call files were classified in agreement between the two programs. Manual review of all 7 files both in full spectrum and zero-crossings format resulted in 4 files with a greater potential for being produced by the northern long-eared bat.

For South Station, Kaleidoscope classified 40 call files as the northern long-eared bat, while EchoClass classified 12 call files as the northern long-eared bat. Among these calls, 6 call files were classified in agreement between the two programs. Manual review of all 46 files both in full spectrum and zero-crossings format resulted in 23 files with a greater potential for being produced by the northern long-eared bat.

The files overturned from a northern long-eared bat classification were classified as the little brown bat, Myotis species (i.e., either as being produced by the little brown bat or northern long-eared bat), or UNKHIGH. Although these files contained characteristics of the northern long-eared bat, they did not contain strong characteristics (e.g., large bandwidth call pulses with a high frequency exceeding ~90 kHz) of this species. And many of these files often contained approach phase call pulses, which share a high degree of characteristics among species producing calls at the same frequency.

Both programs calculate *p*-values based on a Maximum Likelihood Estimator that a given species is likely present at a site (i.e., "the null hypothesis that the species is falsely identified at a site on a given night, given the error rates for identification" [Britzke 2016], thus a low *p*-value indicates that the species is likely present at the site). A *P*-value calculated by Kaleidoscope on the original number of calls classified as the northern long-eared bat equaled 0.00 for Met Tower 1, indicating that the northern long-eared bat is likely present at the site. While for the North and South Stations, the *P*-values equaled 1.00 indicating that the northern long-eared bat is not likely present at these sites. *P*-values calculated by EchoClass on the original number of calls classified as the northern long-eared bat equaled 0.00 and 0.0005 for Met Tower 1 on a total of 11 nights (June: 5 nights, July: 5 nights, and August: 1 night), indicating that the northern long-eared bat was likely detected at the site on these nights. For the North Station, *P*-values equaled 1.00 on three nights (one in each of May, June, and July) indicating only one call sequence detected and a calculation of presence could not be made. For the South Station, *P*-values equaled 0.0005 on a total of 3 nights (June: 2 nights and August: 1 night), indicating that the northern long-eared bat was likely detected at the site on these nights. On 6 other nights (June: 2 nights, July: 1 night, and August: 3 nights), *P*-values

equaled 1.00 indicating only one call sequence detected and a calculation of presence could not be made.

3.1 Met Tower 1

Among the 1,562 bat passes detected at Met Tower 1, the little brown bat composed the greatest proportion of bat passes (40.52 percent) followed by the UNKHIGH group (12.42 percent), and the hoary bat (12.10 percent). On average, the greatest number of bat passes per night ($\bar{x}$ =5.45 ± 0.56 bat passes/night) was recorded at the 5 m height.

Met Tower 1, 45m – Among 196 nights, a total of 493 bat passes were recorded yielding an average of 2.52 ± 0.35 bat passes per night (Table 4). The majority of bat passes were by the hoary bat (n=140) and the UNKLOW group (n=127, which was composed of potential calls by the silver-haired, big brown, and hoary bat). Among all 196 nights, activity was greatest on 21 August 2017 (n=38), followed by 1 September 2017 (n=28), and 10 August 2017 (n=23) (Figure 2A). Activity on these nights was largely attributed to hoary and little brown bats. Average hourly activity was greatest at 2200 hrs ($\bar{x}$ =0.40 ± 0.08 bat passes/hour) followed by 2300 ($\bar{x}$ =0.36 ± 0.08 bat passes/hour), and 0200 hrs ($\bar{x}$ =0.31 ± 0.07 bat passes/hour) (Figure 3A).

Met Tower 1, 5m – Among 196 nights, a total of 1,069 bat passes were recorded yielding an average of 5.45 ± 0.56 bat passes per night (Table 4). The majority of bat passes were made by the little brown bat (n=567) and the UNKHIGH group (n=152). Among all 196 nights, activity was greatest on 29 July 2017 (n=59), followed by 27 July 2017 (n=37), and 21 July 2017 (n=35) (Figure 2B). Activity on these nights was largely attributed to little brown bats and the little brown/northern long-eared bat group. Average hourly activity was greatest at 0100 hrs ($\bar{x}$ =1.38 ± 0.28 bat passes/hour) followed by 0200 hrs ($\bar{x}$ =0.94 ± 0.22 bat passes/hour) and 0000 hrs ($\bar{x}$ =0.92 ± 0.12 bat passes/hour) (Figure 3B).

3.2 North Station

Among 116 nights, a total of 688 bat passes were recorded yielding an average of 5.93 ± 0.97 bat passes per night (Table 4). The majority of bat passes were made by the little brown bat (n=305) and the silver-haired bat (n=151). Among all 116 nights, activity was greatest on 25 June 2017 (n=84) followed by 2 June 2017 (n=35), and 27 May 2017 (n=25) (Figure 4A). Activity on these nights was largely attributed to little brown and silver-haired bats. Average hourly activity was greatest at 2300 hrs ($\bar{x}$ =1.72 ± 0.58 bat passes/hour), followed by 0000 hrs ($\bar{x}$ =0.86 ± 0.15 bat passes/hour), and 0200 hrs ($\bar{x}$ =0.79 ± 0.16 bat passes/hour) (Figure 4B).

3.3 South Station

Among 196 nights, a total of 1,466 bat passes were recorded yielding an average of 7.48 ± 0.77 bat passes per night (Table 4). The majority of bat passes were made by the little brown bat (n=680) and the UNKHIGH group (n=448). Among all 196 nights, activity was greatest on 28 June 2017 (n=70) followed by 19 August 2017 (n=66), and 13 June 2017 (n=58) (Figure 5A).

Activity on these nights was largely attributed to little brown bats. Average hourly activity was greatest at 2300 hrs ($\bar{x}$ =1.74 ± 0.32 bat passes/hour), followed by 0100 hrs ($\bar{x}$ =1.51 ± 0.33 bat passes/hour), and 0000 hrs ($\bar{x}$ =1.23 ± 0.15 bat passes/hour) (Figure 5B).

3.4 Comparison of Bat Activity among Detector Locations

Nightly bat activity significantly differed between the 5 m and 45 m detector heights at Met Tower 1 (t_{195} = 5.660, P < 0.001, Figure 6). Average bat activity was 36.88 percent higher at 5 m compared to 45 m at Met Tower 1. Nightly bat activity did not significantly vary by detector location near ground level, e.g., 5 m height at Met Tower 1, North, and South Stations ($F_{2,504}$ = 2.580, P = 0.077, Figure 7).

3.5 Comparison of Bat Activity for Species between Heights

Average bat activity differed significantly between the 5 m and 45 m heights for three species and four species groups at Met Tower 1 (Table 5). Bat activity was significantly greater at 5 m compared to 45 m for the little brown bat, the northern long-eared bat, the Myotis bat group, and the UNKHIGH group. Bat activity was significantly greater at 45 m compared to 5 m for the hoary bat and UNKLOW group. The hoary/silver-haired bat group was only detected at the 45 m height.

4. DISCUSSION

Passive acoustic monitoring documented six species and six species groups during the period of 19 April 2017 to 1 November 2017 within the study area. Species (or species groups) that were detected in this study confirmed potential occurrences based on existing distributions (Dyke et al. 2015; IUCN 2016; USGS-GAP 2013). The big brown and little brown bats which are both listed as Species of Conservation Priority by the NDGFD were detected during the monitoring period. The northern long-eared bat which is listed as Species of Conservation Priority by the NDGFD and federally threatened by the USFWS may have been detected.

4.1 Northern Long-eared Bat

Echolocation calls produced by the northern long-eared bat can overlap in characteristics with the little brown bat, making identification and differentiation of calls by these species difficult. Differentiation of calls between both species is especially problematic in open (low clutter) environments (Broders et al. 2004), similar to the areas where the detector locations were situated. In cluttered habitats (e.g., forests), however, the echolocation call of the northern long-eared bat is more easily distinguished due to its feeding specialization in these habitats. After completion of analysis, potential calls by the northern long-eared bat represented 2.37 percent (n=88 bat passes) of the total bat passes recorded. Additionally, likelihood of presence analyses suggested that this species does likely occur in the area based on the number of calls originally identified to the northern long-eared bat.

The USFWS (2015) considers the northern long-eared bat to occur throughout the entire state. Yet, the NDGFD (Dyke et al. 2015) considers the northern long-eared bat to primarily occur in limited areas in the state including the Missouri River (i.e., approximately 20 miles southwest of the study area within McLean County). In North Dakota, the northern long-eared bat is considered to occupy summer roosting habitat during 1 April–30 September and winter hibernacula during 1 October–15 May (USFWS 2014). Suitable summer roosting habitat for the northern long-eared bat primarily consists of a variety of forested and wooded habitats including fencerows, riparian forests, and other wooded corridors. These habitats may be composed of dense or loose groups of trees including individual trees that are within 1,000 feet of other wooded habitat (USFWS 2014). The northern long-eared bat appears to be opportunistic in selecting roosts, that is, using both live and dead tree species and/or snags (typically ≥3 inches diameter at breast height [dbh]) based on presence of cavities, cracks, crevices, or exfoliating bark (USFWS 2014). The northern long-eared bat has also been documented roosting in man-made structures, such as buildings, barns, and bridges. Based on a review of aerial imagery, the Study Area includes some of these habitats, yet a more comprehensive habitat survey would need to be completed to determine the presence of suitable roost trees. Although imagery suggests that approximately 95 percent (411 acres) of the Study Area land cover is deciduous forest (Table 2).

Operating wind turbines have been documented to kill northern long-eared bats, particularly during the fall migratory period (USFWS 2014). Northern long-eared bats have been reported in percentages ranging from 0.7 to 1.3 percent (2-6 individuals) among fatalities at two wind energy facilities in the eastern United States (Arnett et al. 2008). More recent data reveals a total of 43 fatalities have been reported throughout North America with the majority found during the fall (1 August–5 October) (Gruver and Bishop-Boros 2015).

The northern long-eared bat was listed as threatened under the Endangered Species Act on April 2, 2015 due to declines caused by white-nose syndrome (WNS). On January 14, 2016, the final 4(d) rule was established identifying prohibitions that focus on protecting the species in areas affected by WNS. Thus, there are no prohibitions on incidental take for areas not affected by WNS. According to the last updated (October 31, 2017) WNS Zone Map, McLean and Ward Counties, are not within the WNS-affected area.

4.2 Overall Activity and Species Composition

Bat activity appeared not to differ significantly among detector locations at ground level. As for activity by species and species groups between the two monitoring heights at Met Tower 1, smaller bats appeared more active at the 5 m height while larger bats were more active at the 45 m height. That is, activity by the little brown bat, the northern long-eared bat, and the Myotis bat group were significantly greater at the 5 m height while activity by the hoary bat and the UNKLOW group were significantly greater at the 45 m height. These results are very interesting given that hoary bats and other larger bat species (e.g., silver-haired bats) are

among the highest reported fatalities at operating wind facilities (Arnett and Baerwald 2013; Arnett et al. 2008).

Nightly bat activity appeared to differ among all detector locations. That is, nightly bat activity was greatest during August and September 2017 for the 45 m height of Met Tower 1, while near ground level for Met Tower 1 (5 m) and the North and South Stations activity was greatest during most of the summer (late May to mid-August 2017). Activity during this period was largely attributed to little brown bats. Hourly bat activity appeared more consistent among all detector locations. That is, bat activity was greatest during the middle part of the night, 2200—0300 hrs (10:00 pm—3:00 am), a pattern not generally observed in studies of temporal bat activity (Hayes 2000). Activity during these hours was largely attributed to little brown, hoary, and silver-haired bats. High activity by species, especially the hoary and silver-haired bats, within this period most likely signifies fall migratory movements.

4.3 Regional Fatality Studies and Potential Impacts

In North Dakota, there are a limited number of publicly available studies on the impacts to bats from wind energy developments. Data are available from three studies; two from the Tatanka Wind Farm and one from the Edgeley-Kulm Wind Farm. The Tatanka Wind Farm is located in Dickey County, North Dakota and MacPherson County, South Dakota, which is approximately 160 miles direct-line southeast from the proposed Ruso Wind Energy Project. During a fatality monitoring study conducted in 2010 for the North Dakota portion of the Tatanka Wind Farm (which consists of 61 1.5-MW turbines), eight hoary bats and one silver-haired bat fatalities were found (Bicknell and Gillam 2013). No fatality rates were estimated for this study due to a lack of accounting for searcher efficiency or carcass removal rates. Searches were conducted at 12 of the 61 turbines in North Dakota from 23 July to 12 September 2010 with no fatalities found after 27 August. During a fatality monitoring study conducted of both the North and South Dakota portions of the Tatanka Wind Farm, one silver-haired bat fatality was found (Graff 2015). An estimated fatality rate of 16 with a confidence interval of 0-41 fatalities was calculated. From the combined total of turbines (n=120) in North and South Dakota, 52 turbines were searched. Fatality searches only took place from 11 March to 7 June 2013 and from 10 March to 6 June 2014 because the focus of the study was on spring migration and the initial nesting period of grassland birds and after the first week of June the height of vegetation limited searcher efficiency. The third study involved the Edgeley-Kulm Wind Farm, which is in LaMoure County, North Dakota, which is approximately 140 miles direct-line southeast from the proposed Ruso Wind Energy Project. During a fatality monitoring study conducted at 17 of the 41 turbines of this wind farm, one silver-haired bat fatality was found (Graff 2015). An estimated fatality rate of 5 with a confidence interval of 0-12 fatalities was calculated. This study was conducted concurrently with the 2013 and 2014 Tatanka Wind Farm study by the same researchers, hence fatality searches were only performed from 11 March to 7 June 2013 and from 10 March to 6 June 2014.

There are apparent issues with all three studies that preclude an appropriate understanding of the impacts to bats from these wind projects. That is, the 2010 Tatanka Wind Farm study (Bicknell and Gillam 2013) included only a small portion of the full size of the wind project (i.e., 12 of 120) and lack of a complete study to calculate a fatality rate estimate. While there was not fatality searches conducted during the late summer and fall for the 2013 and 2014 Tatanka Wind Farm and the Edgeley-Kulm Wind Farm studies, which is the period of time that has been strongly determined to show the greatest number of fatalities for bats across North America. Nonetheless, these projects provide the only known data on the impacts to bats from wind turbines in North Dakota. The species, the hoary and silver-haired bat, found among these studies represent those that have been reported among the greatest numbers of fatalities at wind projects across North America (Arnett et al. 2008). In reference to the Great Plains region in general, fatality rates have been highly variable (0.16–21.6 individuals/MW) and moderately high on average (Arnett and Baerwald 2013).

In the present study for the proposed Ruso Wind Energy Project, the primary species detected were the little brown, hoary, and silver-haired bat. All three of these species have been reported among fatalities at operating wind energy developments across the United States (Arnett and Baerwald 2013; Arnett et al. 2008). Furthermore, the majority of fatalities have been reported during the late summer and early fall, which corresponds to the period of time during which the greatest activity was acoustically recorded in the present study. Activity and subsequent fatalities during the late summer/early fall period is primarily due to the migratory nature of species such as the hoary and silver-haired bat. In order to further understand seasonal activity by these migratory species, species classifications were further grouped into migratory and non-migratory species. Activity was greatest by migratory species, particularly during August (Figure 8). Further analysis by individual migratory species demonstrate that hoary bats composed the greatest activity during August while the silver-haired bat demonstrated the majority of activity in May and increased activity in June and August (Figure 9). The eastern red bat demonstrated increased activity in August.

To date, it remains unclear whether data acquired from pre-construction acoustic monitoring are able to predict post-construction fatalities. However, some studies have attempted to correlate post-construction acoustic bat pass rates with fatalities at operating wind energy projects (Baerwald and Barclay 2009; Gruver et al. 2009; Johnson et al. 2004) with varying degrees of success. One recent and comprehensive study (Hein et al. 2013) aimed to address this issue by characterizing bat activity based on acoustic monitoring and post-construction fatality studies across geographic regions. Hein et al. (2013) synthesized data from 94 pre-construction bat acoustic surveys and 75 post-construction bat fatality studies at proposed and operating wind energy facilities across four regions in the United States and Canada. From 12 of these facilities, both pre-construction acoustic and post-construction fatality data were available to examine whether bat acoustic data collected prior to construction can be used to predict fatality. Among the larger synthesis study, both pre-construction acoustic and post-construction fatality data varied considerably both within and among regions. Yet, the region (Great Plains) that included North Dakota was the exception in that pre-construction

activity and post-construction fatality data showed both low and relatively precise averages. The examination of the 12 facilities with paired pre- and post-construction data suggested a positive relationship, but was found to be not significant and pre-construction activity only explained a small portion of the variation in fatalities (Hein et al. 2013). However, the authors cited that more data with consistent methodologies could help to tease out a relationship between pre-construction bat acoustic surveys and post-construction fatality studies.

In light of the Hein et al. (2013) study, there is a lack of data (or data are publicly unavailable) on pre-construction acoustic bat pass rates and post-construction fatality rates in North Dakota or the northern Great Plains to make a scientifically plausible prediction of fatalities for any wind energy development in the region. Hence, the acoustic data obtained in the present study may not necessarily indicate bat mortalities at the proposed Ruso Wind Energy Project. However, data obtained from this study can be useful in determining potential mitigation measures such as altering turbine operation which has been shown to be an effective method for reducing fatalities (Arnett et al. 2011; Baerwald et al. 2009). For example, the activity recorded during the late summer through early fall period indicates a period of about 6-8 weeks from late July to mid September when bat activity is the highest, and the majority of this activity was within five hours during the middle part of the night, 2200—0300 hrs (10:00 pm—3:00 am). If fatalities are detected during post-construction, then this information could be of value when determining a mitigation strategy, such as curtailing wind turbine operation between 10:00 pm—2:00 am during the 6-8 week period of July to September. Furthermore, greater efficiency in a mitigation strategy could be gained by modeling environmental variables to predict bat activity throughout the late summer to early fall period (Weller and Baldwin 2011).

5. LITERATURE CITED

Arnett, E.B., and E.F. Baerwald. 2013. Impacts of Wind Energy Development on Bats: Implications for Conservation. Pages 435-456 in A. Adams and S. C. Pedersen, editors. Bat Evolution, Ecology, and Conservation. Springer Science+Business Media, New York.

Arnett, E.B., W.K. Brown, W.P. Erickson, J.K. Fielder, B.L. Hamilton, T.H. Henry, A. Jain, G.D. Johnson, J. Kerns, R.R. Koford, C.P. Nicholson, T.J. O'Connell, M.D. Piorkowski, R.D. Tankersley, Jr. 2008. Patterns of bat fatalities at wind energy facilities in North America. Journal of Wildlife Management 72(1):61-78.

Arnett, E.B., J.P. Hayes, and M.M.P. Huso. 2006. An evaluation of the use of acoustic monitoring to predict bat fatality at a proposed wind facility in south-central Pennsylvania. An annual report submitted to the Bats and Wind Energy Cooperative. Bat Conservation International. Austin, Texas, USA.

Arnett, E. B., M. M. Huso, M. R. Schirmacher, and J. P. Hayes. 2011. Altering turbine speed reduces bat mortality at wind-energy facilities. Frontiers in Ecology and the Environment 9:209–214.

Baerwald, E.F. and R.M.R. Barclay. 2009. Geographic variation in activity and fatality of migratory bats at wind energy facilities. Journal of Mammalogy 90(6):1341–1349.

Baerwald, E. F., J. Edworthy, M. Holder, and R. M. R. Barclay. 2009. A large-scale mitigation experiment to reduce bat fatalities at wind energy facilities. Journal of Wildlife Management 73:1077–1081.

Barclay, R.M.R. 1999. Bats are not birds: a cautionary note on using echolocation calls to identify bats: a comment. Journal of Mammalogy 80:290-296.

Barclay, R.M.R., E.F. Baerwald, and J.C. Gruver. 2007. Variation in bat and bird fatalities at wind energy facilities: assessing the effects of rotor size and tower height. Canadian Journal of Zoology 85:381-387.

Bicknell, L.J. and E.H. Gillam. 2013. Survey of bat mortalities at a wind-energy facility in North Dakota. Journal of Fish and Wildlife Management 4(1):139–143.

Britzke, E. 2016. Instructions for using the EchoClass Acoustic ID Program. Version 3.0. U.S. Army Engineer Research and Development Center. https://www.fws.gov/Midwest/endangered/mammals/inba/surveys/pdf/EchoclassV3Instructions.pdf

Broders, H.G., C.S. Findlay, and L. Zheng. 2004. Effects of clutter on echolocation call

structure of *Myotis septentrionalis* and *Myotis lucifugus*. Journal of Mammalogy 85:273-281.

Collins, J. and G. Jones. 2009. Differences in bat activity in relation to bat detector height: implications for bat surveys at proposed wind farm sites. Acta Chiropterologica 11:343–350.

Dyke, S.R., S.K. Johnson, and P.T. Isakson. 2015. North Dakota State Wildlife Action Plan. North Dakota Game and Fish Department, Bismarck, ND.

Ford, M. 2015. USGS Test Report 4 – Kaleidoscope 3.1 Modification. 25 May 2015. https://www.fws.gov/Midwest/endangered/mammals/inba/surveys/pdf/USGSTestReport4KPro3_1.pdf

Graff, B.J. 2015. An assessment of direct mortality to avifauna from wind energy facilities in North Dakota and South Dakota. M.S. thesis, South Dakota State University. 77 pp.

Gruver, J. and L. Bishop-Boros. 2015. Summary and synthesis of *Myotis* fatalities at wind facilities with a focus on northeastern North America. Unpublished report prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. April 13, 2015.

Gruver, J., M. Sonnenburg, K. Bay, and W. Erickson. 2009. Post-construction bat and bird fatality study at the Blue Sky Green Field Wind Energy Center, Fond Du Lac County, Wisconsin July 21 - October 31, 2008 and March 15 - June 4, 2009. Unpublished report prepared by Western EcoSystems Technology, Inc. (WEST), Cheyenne, Wyoming. December 17, 2009.

Hayes, J.P. 2000. Assumptions and practical considerations in the design and interpretation of echolocation-monitoring studies. Acta Chiropterologica 2:225-236.

Hein, C. D., J. Gruver, and E. B. Arnett. 2013. Relating pre-construction bat activity and post-construction bat fatality to predict risk at wind energy facilities: a synthesis. A report submitted to the National Renewable Energy Laboratory. Bat Conservation International, Austin, TX, USA.

International Union of Conservation of Nature (IUCN). 2017. The IUCN Red List of Threatened Species. Version 2017-3. <http://www.iucnredlist.org>. Downloaded on 21 October 2017.

Johnson, G. D. 2005. A review of bat mortality at wind-energy developments in the United States. Bat Research News 46:45-49.

Johnson, G.D., M.K. Perlik, W.P. Erickson, and M.D. Strickland. 2004. Bat activity, composition and collision mortality at a large wind plant in Minnesota. Wildlife Society Bulletin 32:1278-1288.

Jones, G. 1999. Scaling of echolocation call parameters in bats. The Journal of Experimental Biology 202:3359–3367.

Kunz, T. H., E. B. Arnett, W. P. Erickson, A. R. Hoar, G. D. Johnson, R. P. Larkin, M. D. Strickland, R. W. Thresher, and M. D. Tuttle. 2007a. Ecological impacts of wind energy development on bats: questions, research needs, and hypotheses. Frontiers in Ecology and Environment 5:315-324.

Kunz, T. H., E. B. Arnett, B. M. Cooper, W. P. Erickson, R. P. Larkin, T. Mabee, M. L. Morrison, M. D. Strickland, and J. M. Szewczak. 2007b. Assessing impacts of wind-energy development on nocturnally active birds and bats: a guidance document. Journal of Wildlife Management 71(8):2449-2489.

Nelson, J.J., P.R. Barnhart, and E.H. Gillam. 2015. Distribution and occurrence of bat species in North Dakota. The Prairie Naturalist 47:84-93.

O'Farrell, M. J. and W. L. Gannon. 1999. A comparison of acoustic versus capture techniques for the inventory of bats. Journal of Mammalogy 80(1):24-30.

U.S. Fish and Wildlife Service (USFWS). 2014. Northern long-eared bat interim conference and planning guidance. January 6, 2014. https://www.fws.gov/northeast/virginiafield/pdf/NLEBinterimGuidance6Jan2014.pdf

USFWS. 2015. Northern long-eared bat range map. April 30, 2015. https://www.fws.gov/Midwest/endangered/mammals/nleb/nlebRangeMap.html

U.S. Geological Survey Gap Analysis Program (USGS-GAP). 2013. National Species Ranges. Available: http://gapanalysis.usgs.gov. Accessed 21 October 2017.

Weller, T. J. and J. A. Baldwin. 2011. Using echolocation monitoring to model bat occupancy and inform mitigations at wind energy facilities. The Journal of Wildlife Management 9999:1-13.

Table 1. Bat species potentially found in the Study Area based on distributional records. Presence of habitat is based on habitat descriptions and review of aerial imagery.

Common Name	Species Name	Habitat	Habitat Present in Study Area
Big brown bat[1]	*Eptesicus fuscus*	Variety of habitats including open and forested areas; roosts in buildings, bridges, caves, mines, trees, cliff and rock crevices	Yes
Silver-haired bat	*Lasionycteris noctivagans*	Forested areas and areas adjacent to forested areas; roosts primarily in trees	Yes - Sparse
Eastern red bat	*Lasiurus borealis*	Forested areas and areas adjacent to forested areas; roosts primarily in trees	Yes - Sparse
Hoary bat	*Lasiurus cinereus*	Forested areas and areas adjacent to forested areas; roosts primarily in trees	Yes - Sparse
Little brown bat[1]	*Myotis lucifugus*	Variety of habitats including open and forested areas; roosts in buildings, caves, and trees	Yes
Northern long-eared bat[1,2]	*Myotis septentrionalis*	Forested areas and areas adjacent to forested areas; roosts primarily in trees	Yes - Sparse

[1]Species of Conservation Priority in North Dakota.
[2]Species listed as Threatened under the U.S. Fish and Wildlife Service.

Table 2. Land cover types within the Study Area.

Land Cover Type	Total Area (Acres)	Percent of Study Area
Cultivated Crops	15,192	35.04
Hay/Pasture	10,029	23.13
Herbaceous Grassland	7,920	18.27
Wetland	4,743	10.94
Open Water	3,257	7.51
Disturbed/Developed	1,792	4.15
Deciduous Forest	411	0.95
TOTAL	43,344	100.00

Table 3. Species and species group designations used to categorize acoustic data.

Species/Species Group	Description
Big brown bat (*Eptesicus fuscus*)	
Eastern red bat (*Lasiurus borealis*)	
Hoary bat (*Lasiurus cinereus*)	
Silver-haired bat (*Lasionycteris noctivagans*)	
Little brown bat (*Myotis lucifugus*)	
MYSE-POS	Possibly the northern long-eared bat (*Myotis septentrionalis*)
EPFULANO	Big brown/silver-haired bat group
LACILANO	Hoary/silver-haired bat group
MYOTIS	Little brown/northern long-eared bat group
UNKHIGH	Bat passes with characteristics of the eastern red bat, little brown bat, and northern long-eared bat that may be either fragmentary calls or solely non-search phase calls (i.e., approach, feeding buzz, social)
UNKMED	Bat passes with characteristics of the eastern red bat, big brown bat, and the silver-haired bat that may be either fragmentary calls or solely non-search phase calls (i.e., approach, feeding buzz, social)
UNKLOW	Bat passes with characteristics of the big brown bat, silver-haired bat, and hoary bat that may be either fragmentary calls or solely non-search phase calls (i.e., approach, feeding buzz, social)

Table 4. Species composition and activity (number of bat passes) recorded during the period of April to November 2017 at heights of 45 and 5 meters at one met tower and two ground level detector locations (North and South) within the Study Area.

Species/Species Group	Number of Bat Passes					Percent of Total
	Met 1		North Station	South Station	Total	
	45 m	5 m				
Big brown bat	2	2	3	0	7	0.19%
Eastern red bat	15	12	4	64	95	2.56%
Hoary bat	140	49	22	80	291	7.83%
Silver-haired bat	69	72	151	62	354	9.53%
Little brown bat	66	567	305	680	1,618	43.54%
MYSE-POS	1	60	4	23	88	2.37%
EPFULANO	13	6	12	2	33	0.89%
LACILANO	10	0	5	2	17	0.46%
MYOTIS	3	109	10	75	197	5.30%
UNKHIGH	42	152	126	448	768	20.67%
UNKMED	5	1	2	4	12	0.32%
UNKLOW	127	39	44	26	236	6.35%
Total	493	1,069	688	1,466	3,716	
No. of Nights	196		116	196		
Average ± Standard Error	2.52 ± 0.35	5.45 ± 0.56	5.93 ± 0.97	7.48 ± 0.77		

Table 5. Results of paired t-test analyses comparing activity by each species or species group between 45 m and 5 m heights at Met Tower 1.

Species/Species Group	45 m Avg. ± SE	5 m Avg. ± SE	*t* statistic	Degrees of Freedom (df)	*P* value
Big brown bat	0.01 ± 0.01	0.01 ± 0.01	0.00	195	1.00
Eastern Red bat	0.08 ± 0.02	0.06 ± 0.02	0.58	195	0.57
Hoary bat	0.71 ± 0.13	0.25 ± 0.06	3.41	195	0.00
Silver-haired bat	0.35 ± 0.07	0.37 ± 0.07	0.19	195	0.85
Little brown bat	0.34 ± 0.08	2.89 ± 0.32	9.28	195	0.00
MYSE-POS	0.01 ± 0.01	0.31 ± 0.08	3.90	195	0.00
EPFULANO	0.07 ± 0.05	0.03 ± 0.02	0.72	195	0.47
LACILANO	0.05 ± 0.02	--	--	--	--
MYOTIS	0.02 ± 0.01	0.56 ± 0.17	3.21	195	0.00
UNKHIGH	0.21 ± 0.07	0.78 ± 0.10	4.80	195	0.00
UNKMED	0.03 ± 0.01	0.01 ± 0.01	1.42	195	0.16
UNKLOW	0.65 ± 0.15	0.20 ± 0.04	3.01	195	0.00

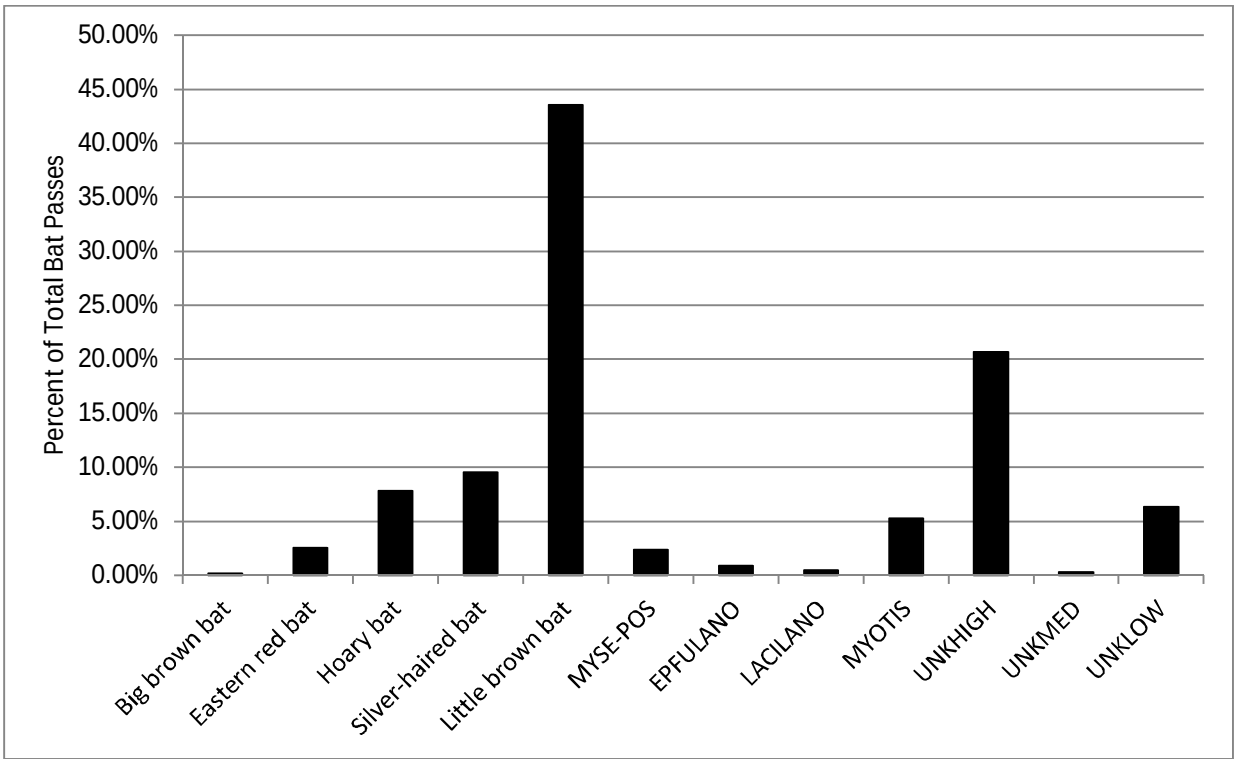
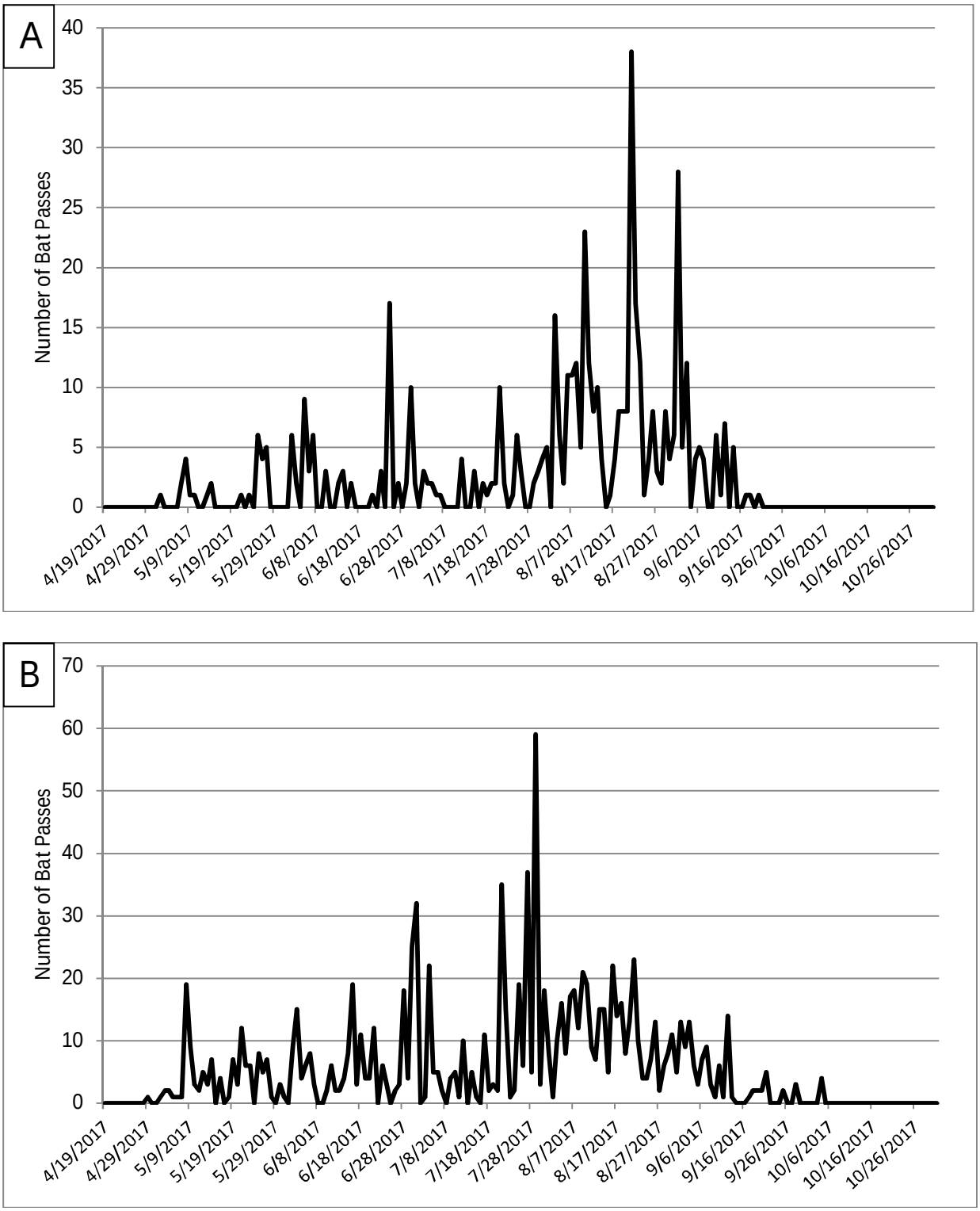
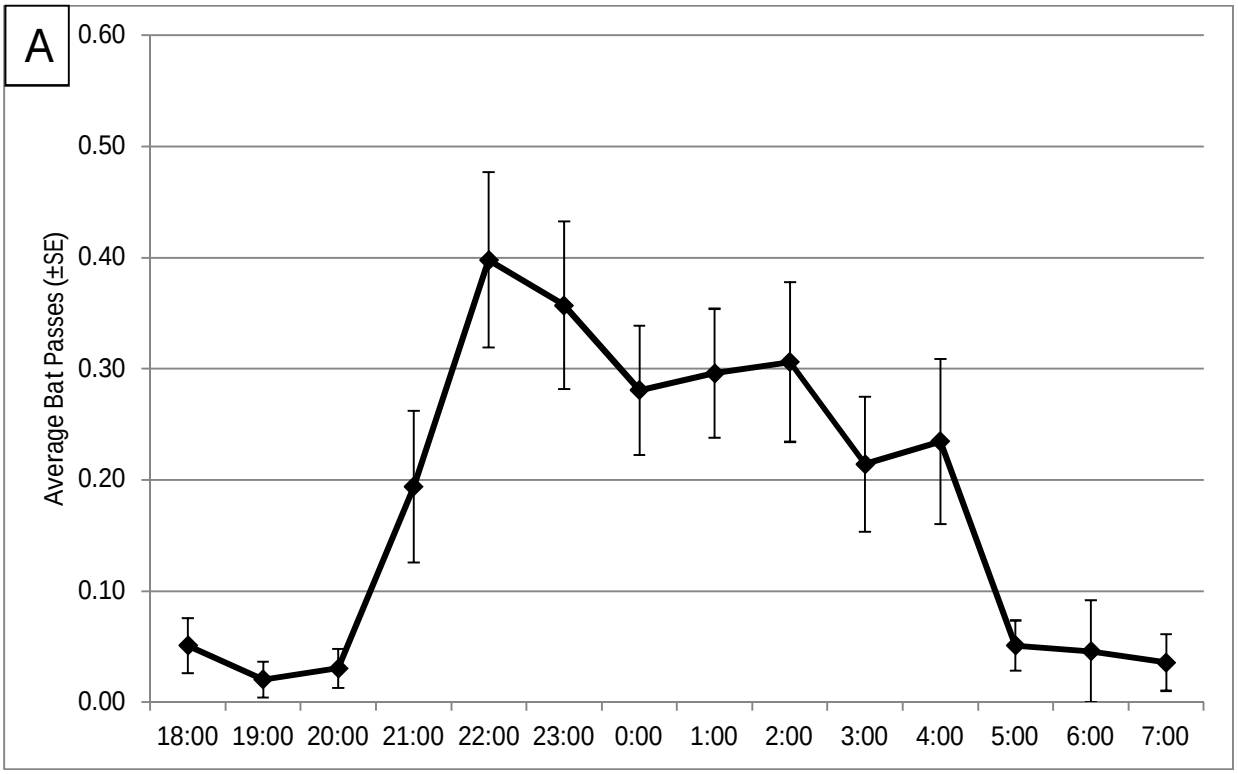
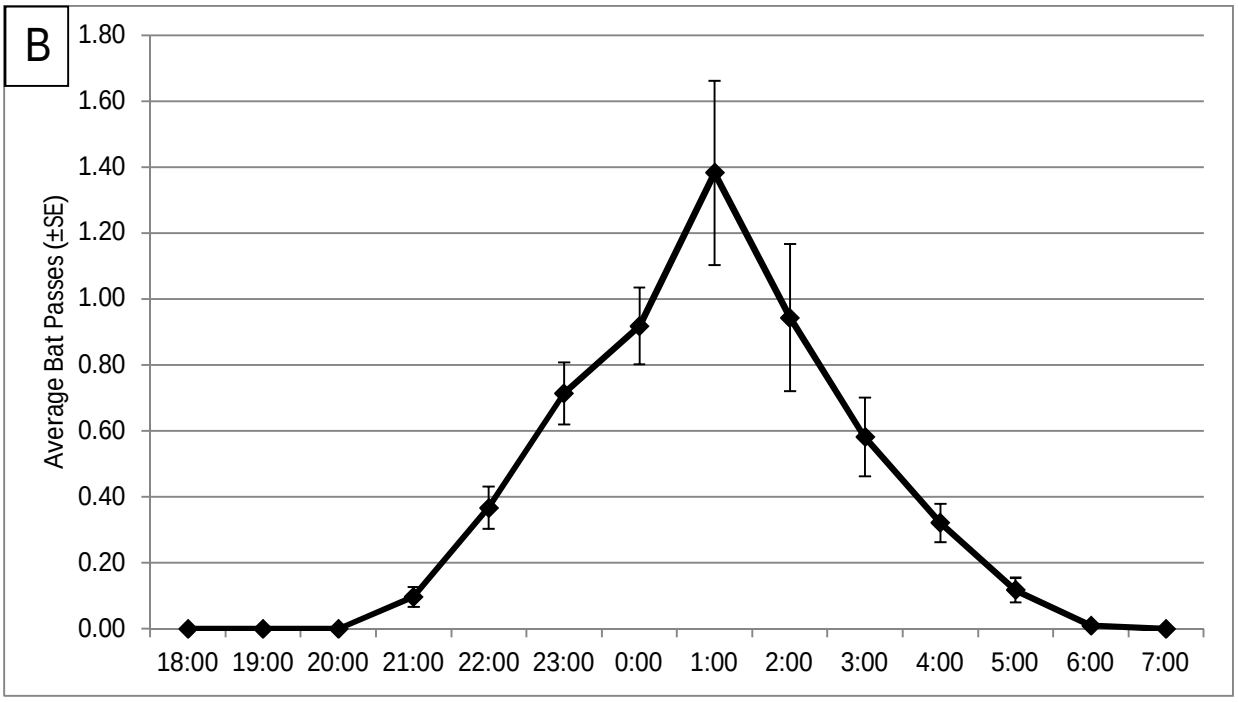


Figure 1. Combined composition of species and species groups (percent of total bat passes) from all detector locations.

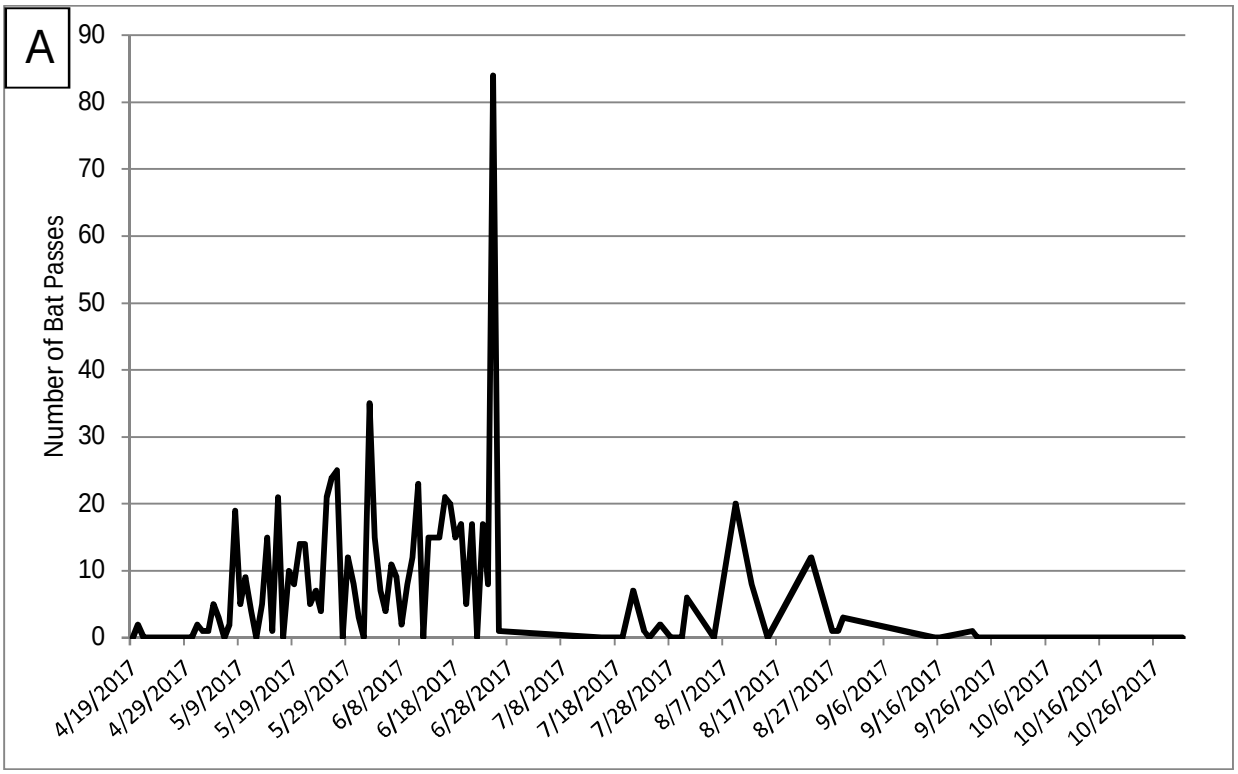


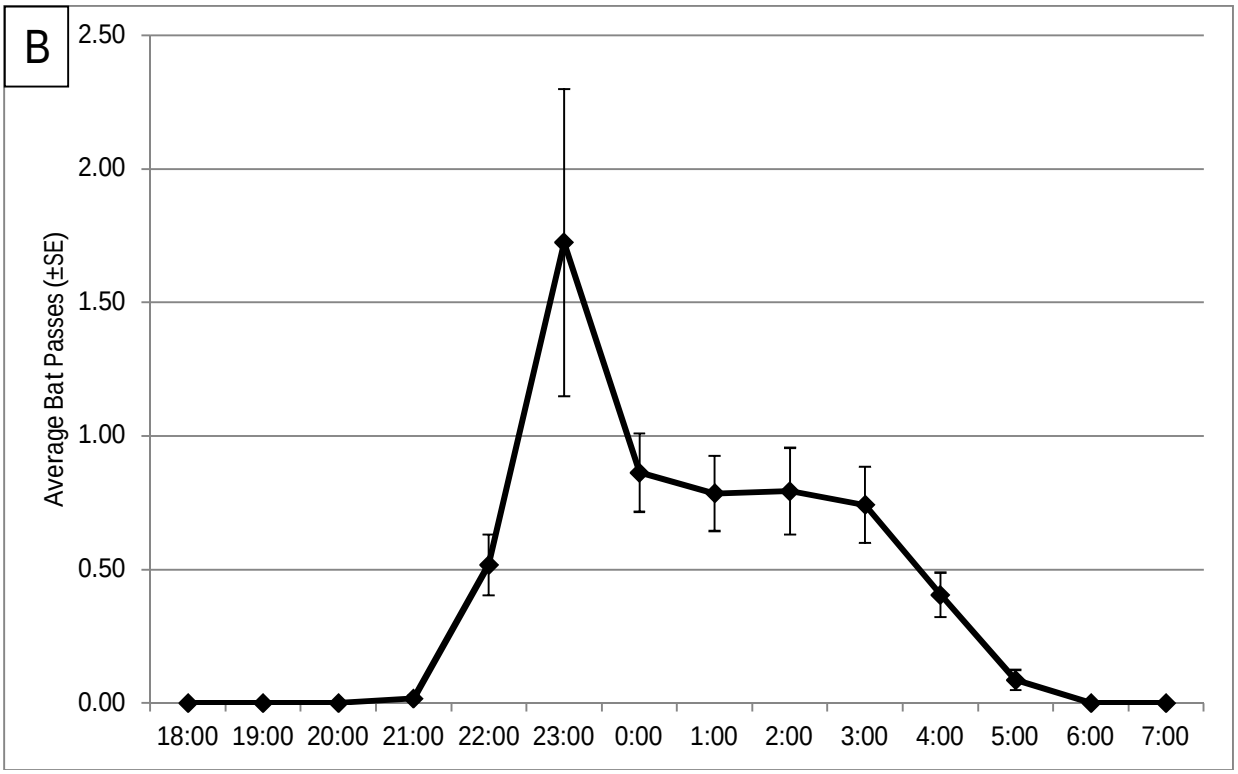
Figures 2A and 2B. Nightly total of bat passes at Met Tower 1; (A) 45 meters and (B) 5 meters.



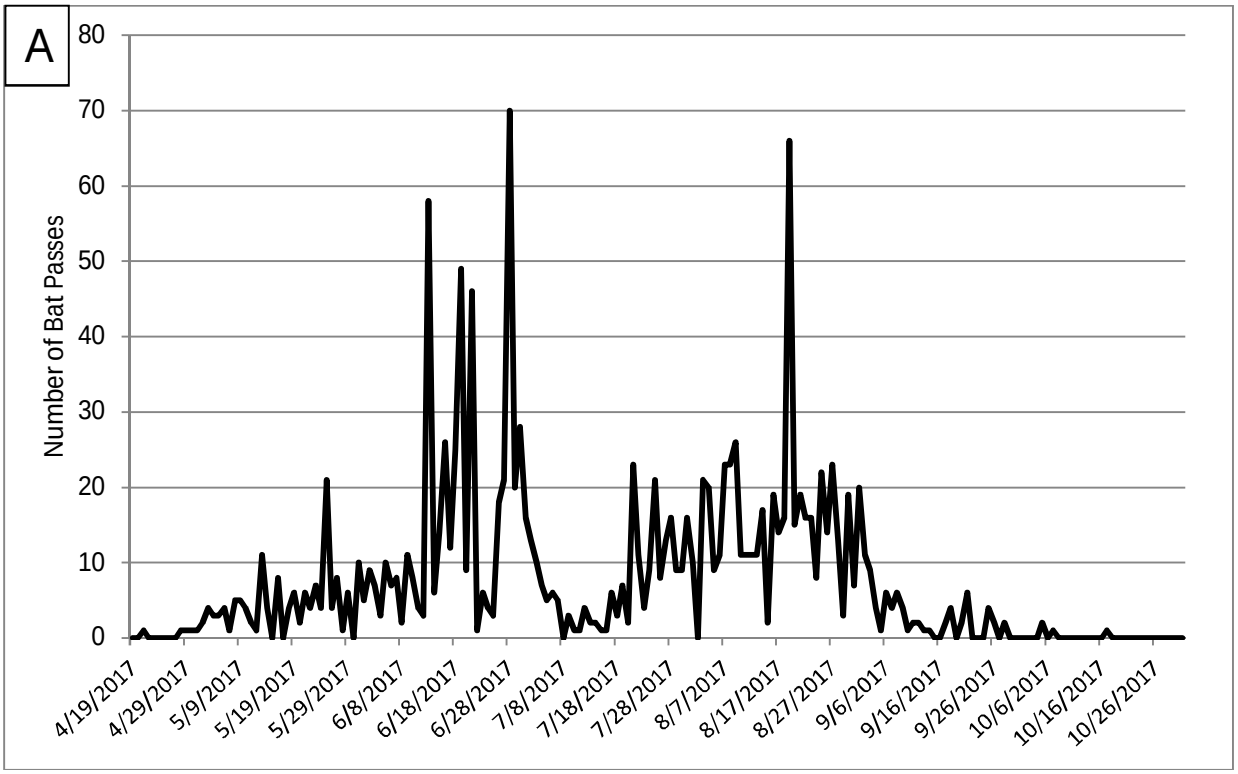


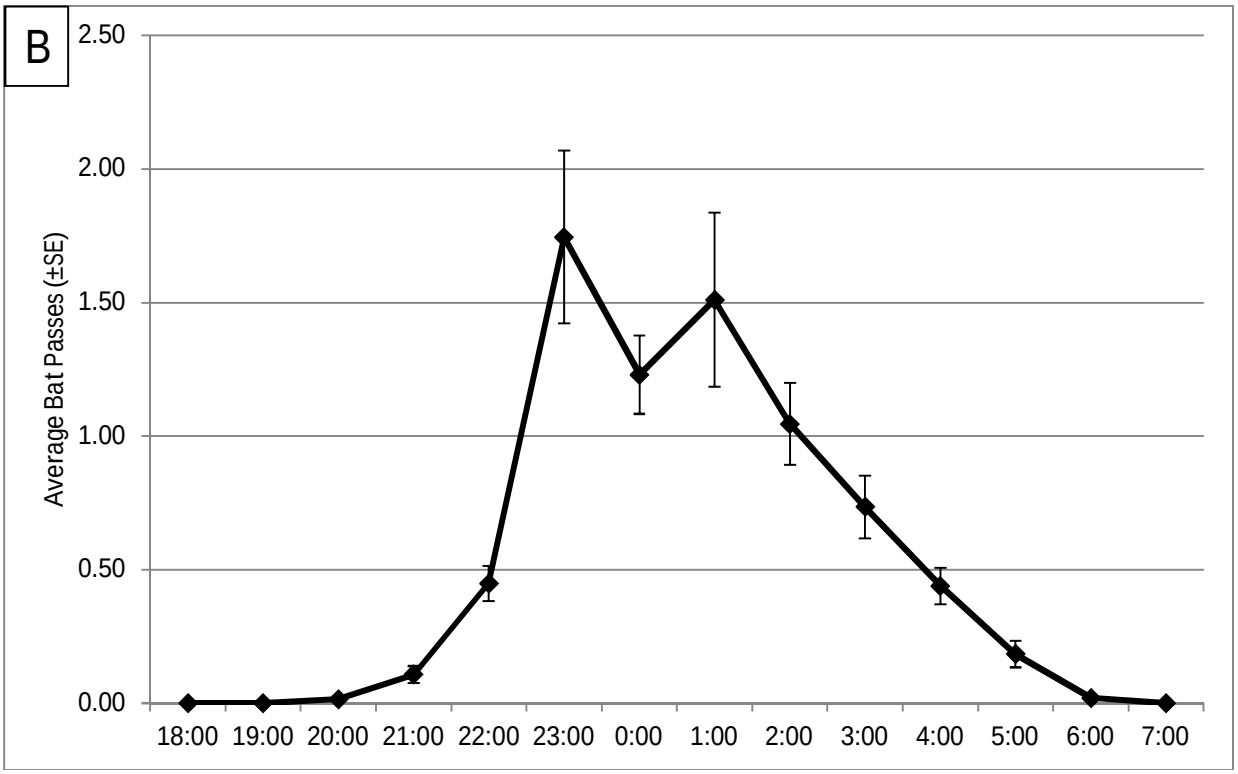
Figures 3A and 3B. Hourly average of bat passes at Met Tower 1; (A) 45 meters and (B) 5 meters. Averages are reported with ± standard error.





Figures 4A and 4B. (A) Nightly total of bat passes and (B) Hourly average (± standard error) of bat passes at North Station.





Figures 5A and 5B. (A) Nightly total of bat passes and (B) Hourly average (± standard error) of bat passes at South Station.

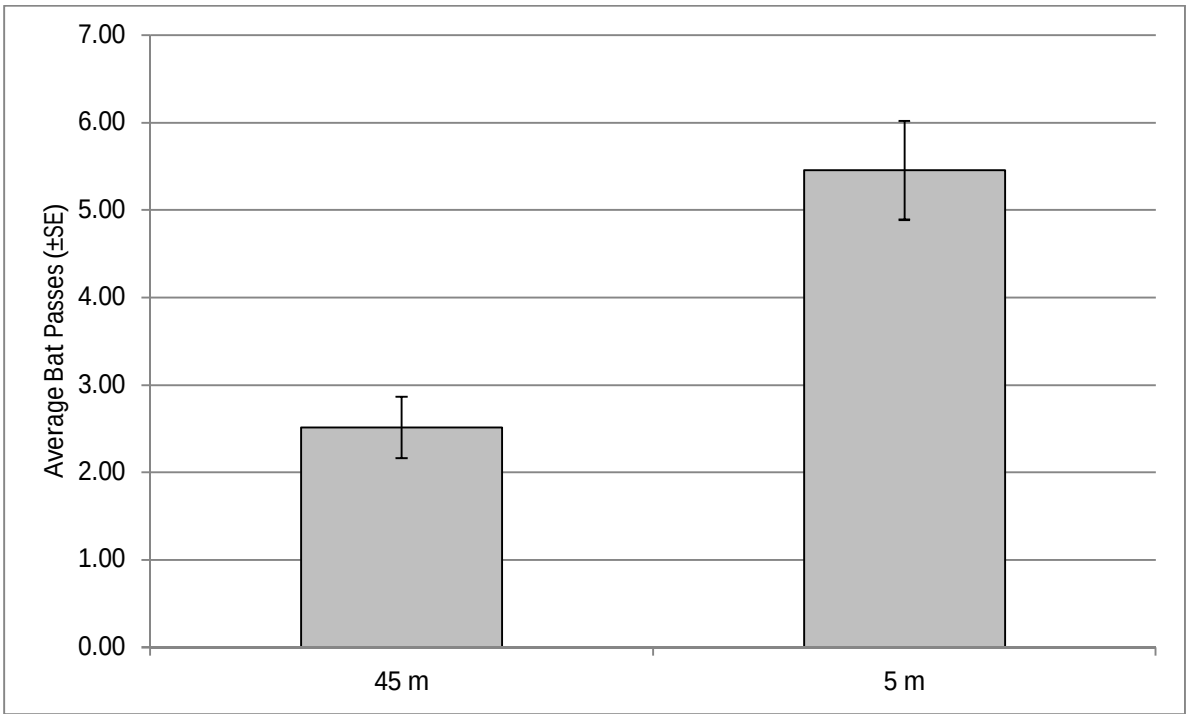


Figure 6. Average number of nightly bat passes (±SE) at 45 m and 5 m at Met Tower 1. There was a significant effect of height on the average number of bats recorded per night (t_{195} = 5.660, P < 0.001).

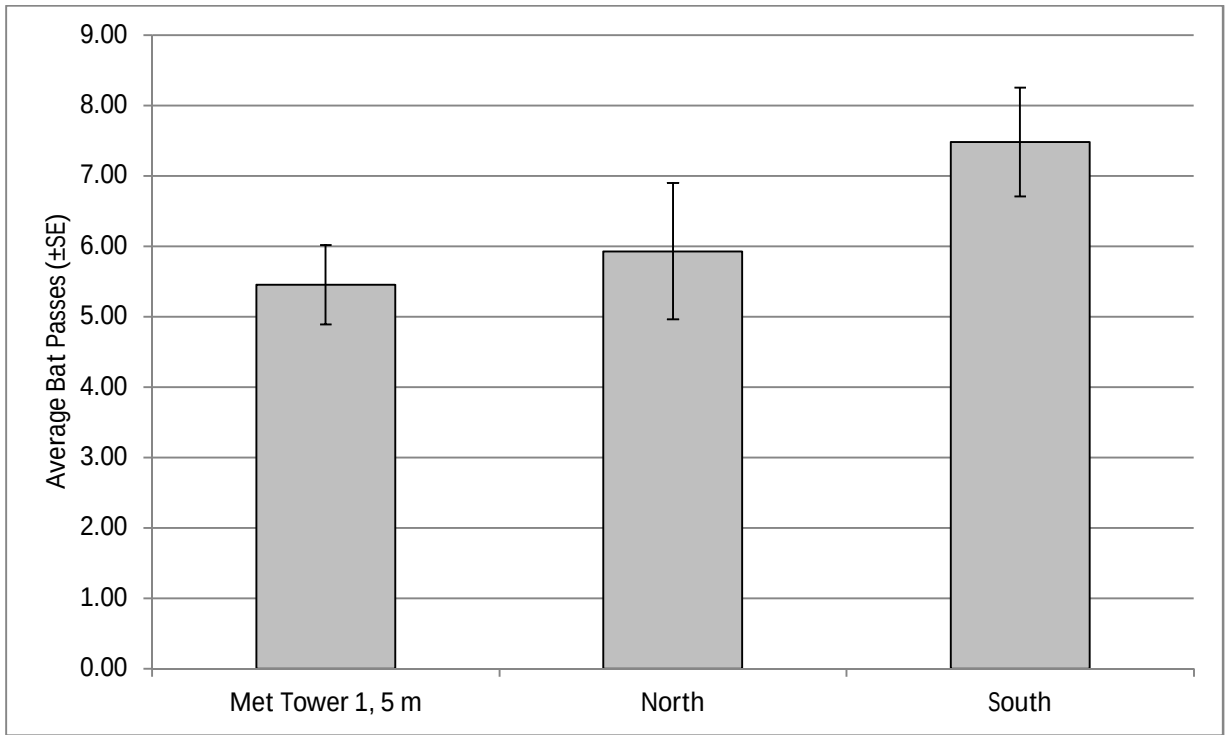


Figure 7. Average number of nightly bat passes (±SE) at Met Tower 1 (5 m), North Station, and South Station. There was not a significant effect of detector location on the average number of bats recorded per night ($F_{2,504}$ = 2.580, P = 0.077).

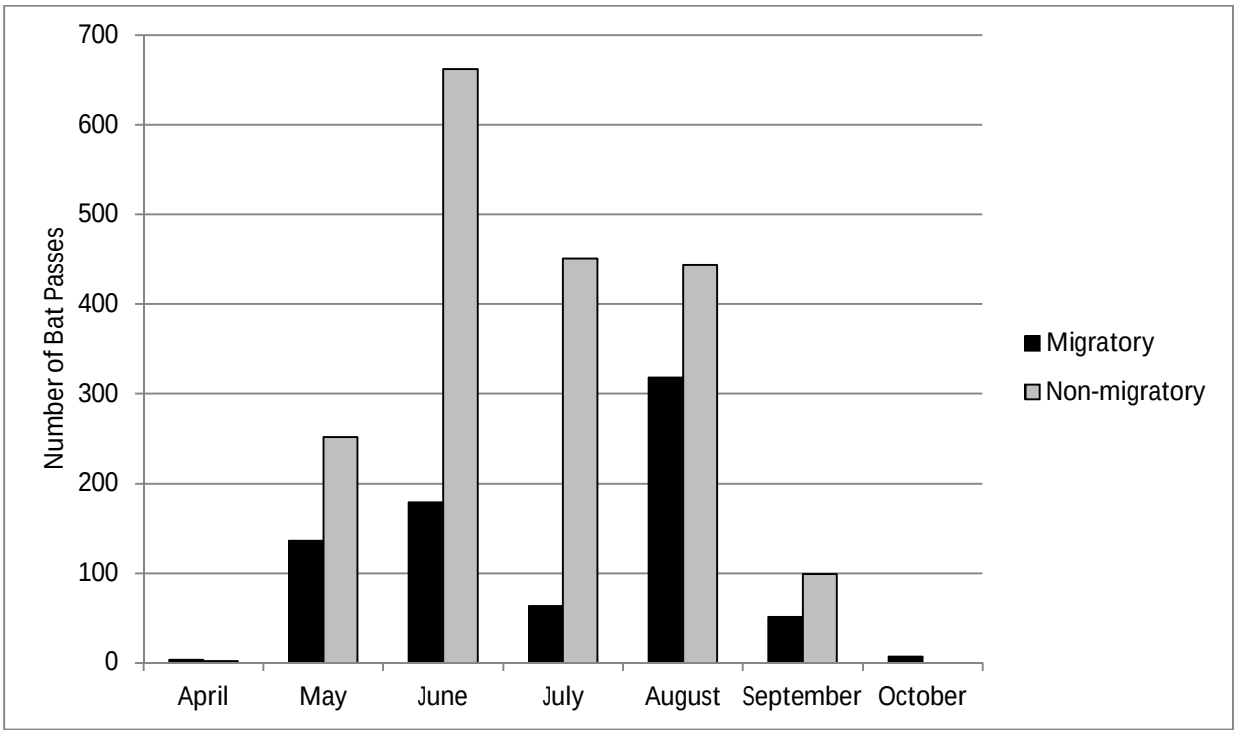


Figure 8. Monthly activity by migratory and non-migratory species.

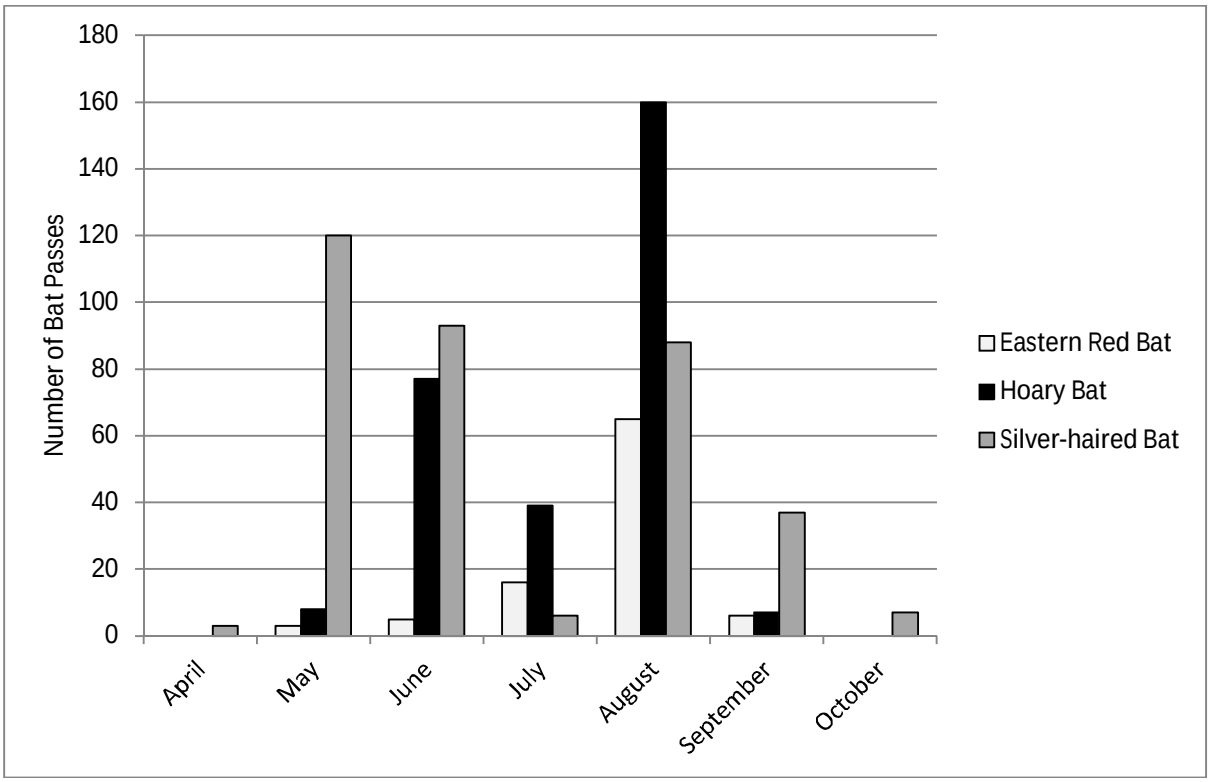
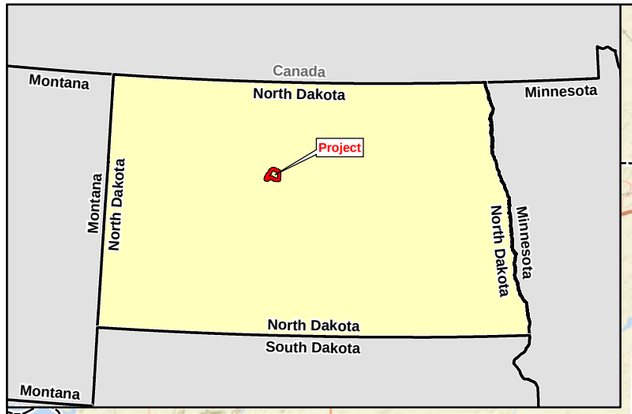


Figure 9. Monthly activity by migratory species; eastern red, hoary, and silver-haired bats.

APPENDIX A

© 2017 Westwood Professional Services, Inc.



Renville County
Towner County
Ward County
Pierce County
McHenry County
Benson County
Mountrail County
McKenzie County
McLean County
Sheridan County
Wells County
Dunn County
Mercer County
Burleigh County
Kidder County
Stutsman County
Oliver County
Audubon Lake
Souris River
Missouri River
Minot
Minot Air Force Base
Rugby
New Town
Parshall
Garrison
Harvey
Hazen
Beulah
Washburn
Fort Berthold Reservation
Lake Ilo Nat'l Wildlife Refuge

Data Source(s): Westwood (2017); ESRI WMS World Streets Basemap Imagery (Accessed 2017).

Legend

- Project Area Boundary
- County Boundary
- Souris River

N

0 10 Miles

Ruso Wind Project

McLean & Ward County, North Dakota

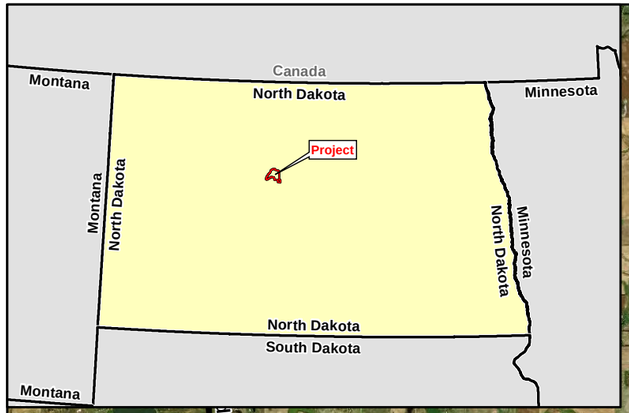
Project Area Vicinity Map

EXHIBIT 1

Westwood
Toll Free (888) 937-5150 westwoodps.com
Westwood Professional Services, Inc.

Map Document: N:\0010625.00\GIS\Avian Survey Report Exhibits\RW_ASR_Ex1_ProjectAreaVicinityMap_171019.mxd 10/19/2017 9:28:51 AM

© 2017 Westwood Professional Services, Inc.



North Station
South Station
Met Tower 1
Ward County
McHenry County
McLean County
Co Hwy 24
US Hwy 83
1St SW
Hwy 41
16th Ave N
State Hwy 41
28th St NW
State Hwy 53
Hwy 53
29th St NW
16th Ave NW
33rd Ave NW
15th Ave NW

Data Source(s): Westwood (2017); ESRI WMS World Basemap Imagery (Accessed 2017); Census Bureau (2015).

Legend

- Project Area Boundary
- Major Road
- Met Tower 1
- North Station
- South Station

N

0 Miles 1.5

Ruso Wind Project

McLean & Ward County, North Dakota

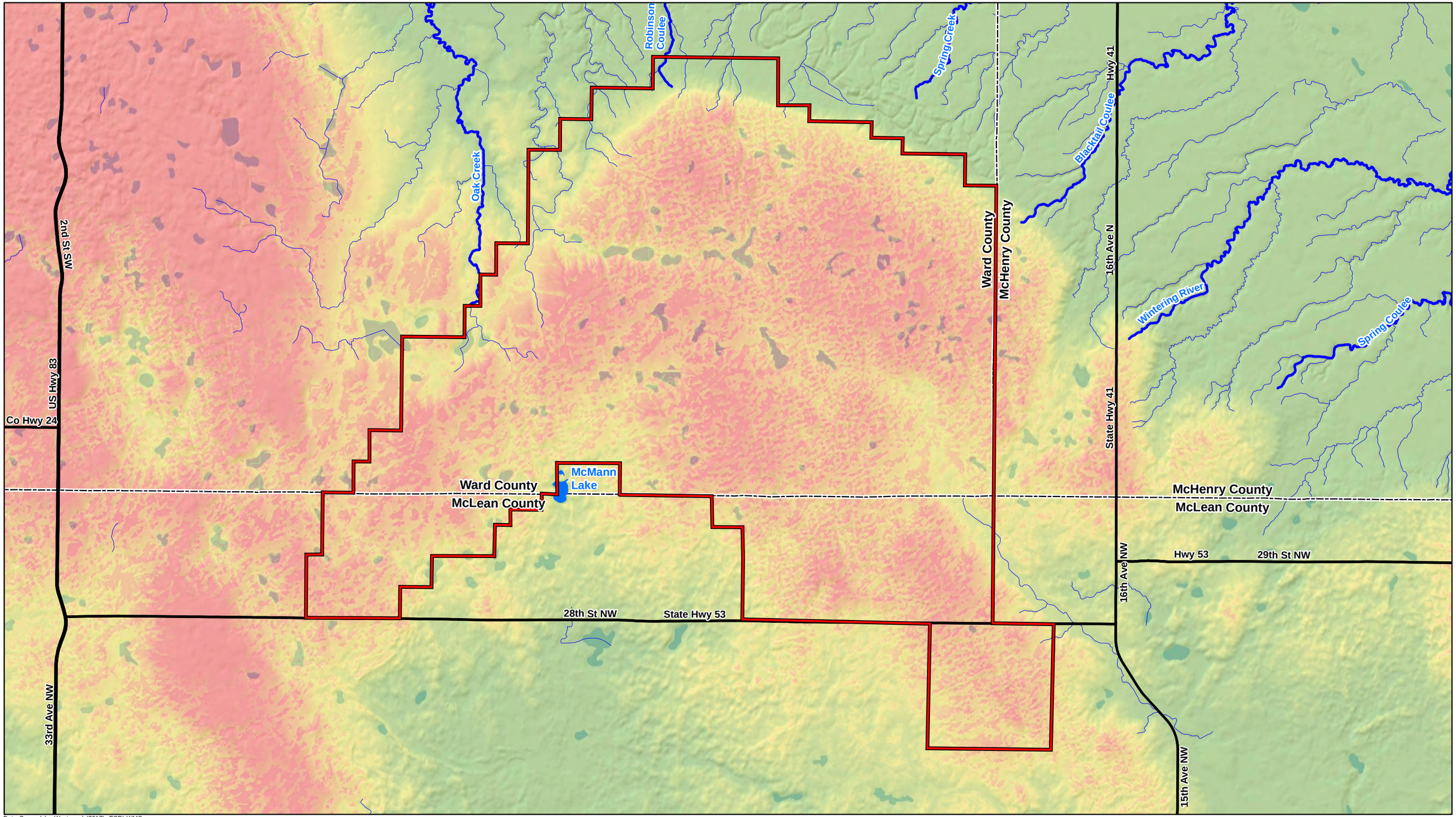
Project Area Site Map

EXHIBIT 2

Westwood
Toll Free (888) 937-5150 westwoodps.com
Westwood Professional Services, Inc.

Map Document: N:\0010625.00\GIS\RW_ASR_ProjectAreaSiteMapWithSubAndTower_171222.mxd 12/22/2017 10:47:57 AM

© 2017 Westwood Professional Services, Inc.



Data Source(s): Westwood (2017); ESRI WMS World Shaded Relief Basemap Imagery (Accessed 2017); Census Bureau (2015); USGS NHD Dataset (2013).

Legend

- Study Area Boundary
- County Boundary
- Major Road
- Major Drainage Feature
- Minor Drainage Feature
- McMann Lake

Elevation Range

2,202.8ft

2,005.9ft

N

0 Miles 1.5

Ruso Wind Project

McLean & Ward County, North Dakota

Topography & Major Drainage Features

EXHIBIT 3

Westwood
Toll Free (888) 937-5150 westwoodps.com
Westwood Professional Services, Inc.

Map Document: N:\0010625.00\GIS\Avian Survey Report Exhibits\RW_ASR_Ex3_Topo&Drainage_171019.mxd 10/19/2017 2:32:17 PM

© 2017 Westwood Professional Services, Inc.

Ward County
McHenry County
Ward County
McLean County
McHenry County
McLean County

Data Source(s): Westwood (2017); U.S. Geological Survey (2011).

Legend

- Study Area Boundary
- County Boundary
- Open Water
- Developed, Open Space
- Developed, Low Intensity
- Developed, Medium Intensity
- Developed, High Intensity
- Barren Land
- Deciduous Forest
- Evergreen Forest
- Grassland/Herbaceous
- Pasture/Hay
- Cultivated Crops
- Woody Wetlands
- Emergent Herbaceous Wetlands

N

0 Miles 1.5

Ruso Wind Project

McLean & Ward County, North Dakota

Land Cover Types

EXHIBIT 4

Westwood
Toll Free (888) 937-5150 westwoodps.com
Westwood Professional Services, Inc.

Map Document: N:\0010\625.00\GIS\Avian Survey Report Exhibits\RW_ASR_Ex4_LandCoverTypes_171019.mxd 10/19/2017 2:32:08 PM

Appendix G. 2017–2018 Annual Pre-Construction Avian Survey Report

Westwood

2017-2018 Annual Pre-Construction
Avian Survey Report

Ruso Wind Project

Ward and McLean Counties, North Dakota
June 20, 2018

Prepared For:

Ruso Wind Partners, LLC
3535 Colonnade Parkway
Birmingham, Alabama 35243

2017-2018 Annual Pre-Construction Avian Survey Report

Ruso Wind Project

Ward and McLean Counties, North Dakota

Prepared for:

Ruso Wind Partners, LLC
3535 Colonnade Parkway
Birmingham, Alabama 35243

Prepared by:

Westwood Professional Services
12701 Whitewater Drive, Suite 300
Minnetonka, Minnesota 55343
(952) 937-5150

Project Number: R0010625.00
Date: 6/20/18

TABLE OF CONTENTS

TABLE OF CONTENTS ..... **i**

1.0 INTRODUCTION **1**
1.1 Goals and Objectives of the Avian Baseline Study 1

2.0 STUDY AREA **3**

3.0 METHODS. **4**
3.1 General Avian Point Count Surveys 4
3.1.1 Data Analysis 5
3.2 Eagle Point Count Surveys 6
3.3 Aerial Raptor Nest Survey 6
3.4 Sharp-tailed Grouse Lek Survey 7

4.0 RESULTS **9**
4.1 General Avian Point Count Surveys 9
4.1.1 Avian Use 10
4.1.2 Species Composition and Frequency of Occurrence 21
4.1.3 Spatial Use 22
4.1.4 Seasonal Abundance and Species Richness 22
4.1.5 Flight Height and Encounter Rates 29
4.1.6 Special-Status Avian Species 30
4.1.7 Sharp-tailed Grouse 32
4.1.8 Incidental Observations 33
4.2 Eagle Point Count Surveys 34
4.3 Aerial Raptor Nest Survey 34
4.3.1 Nesting Species Composition and Frequency of Occurrence 35

5.0 DISCUSSION **38**
5.1 General Avian Use 38
5.2 Special-Status Bird Species Use 38
5.2.1 Nesting Species Composition and Frequency of Occurrence 39
5.3 Sharp-tailed Grouse Use 40
5.4 Raptor Use 40
5.4.1 Nesting Raptors 41

6.0 REFERENCES CITED **43**

TABLES

Table 1: Land Cover Types within the Study Area
Table 2: Avian Species by Species Group Observed during Spring 2017 General Avian Point Count Surveys
Table 3: Avian Species by Species Group Observed during Summer 2017 General Avian Point Count Surveys
Table 4: Avian Species by Species Group Observed during Fall 2017 General Avian Point Count Surveys
Table 5: Avian Species by Species Group Observed during Winter 2017-2018 General Avian Point Count Surveys
Table 6: Avian Species Observed by Sampling Point during all Seasons of Avian Point Count Surveys
Table 7: Avian Species Observed by Survey Period during Spring, Summer, Fall, and Winter General Avian Point Count Surveys
Table 8: Flight Characteristics and Encounter Rates for Avian Species Flying within the Turbine Rotor Swept Area (RSA) for all Surveys Combined
Table 9: Special Status Species Observed during 2017-2018 Avian Point Count Surveys
Table 10: Summary of Confirmed Sharp-tailed Grouse Lek Locations
Table 11: Summary of Eagle Point Count Surveys
Table 12: Aerial Raptor Nest Survey Results

EXHIBITS

Exhibit 1: Project Area Vicinity Map
Exhibit 2: Project Area Site Map
Exhibit 3: Topography and Major Drainage Features
Exhibit 4: Land Cover Types
Exhibit 5: General Avian and Eagle Point Count Survey Locations
Exhibit 6: Raptor Nest Survey Area
Exhibit 7: Sharp-tailed Grouse Survey Roads
Exhibit 8: Frequency of Birds Observed During Spring General Avian Point Count Surveys
Exhibit 9: Frequency of Birds Observed During Summer General Avian Point Count Surveys
Exhibit 10: Frequency of Birds Observed During Fall General Avian Point Count Surveys
Exhibit 11: Frequency of Birds Observed During Winter General Avian Point Count Surveys
Exhibit 12: Mean Bird Use by Sample Point for all Surveys Combined
Exhibit 13: Bird Species Richness by Sample Point for all Surveys Combined
Exhibit 14a: Species Richness by Survey Period for all Birds Combined during Spring, Summer, Fall, and Winter General Avian Point Count Surveys
Exhibit 14b: Mean Bird Use by Survey Period for all Birds Combined during Spring, Summer, Fall, and Winter General Avian Point Count Surveys

Exhibit 15: Height Data for Birds Observed Flying for all General Avian Point Count Surveys Combined
Exhibit 16: Sharp-tailed Grouse Lek Locations
Exhibit 17: Bald Eagle and General Raptor Nest Locations

ACRONYMS AND ABBREVIATIONS

amsl	above mean sea level
BCC	Birds of Conservation Concern
Corridor Certificate	Consolidated Certificate of Corridor Compatibility
ECPC	Eagle Conservation Plan Guidance
ESA	Endangered Species Act
GPS	Global Positioning System
mi^2	square mile(s)
MW	megawatt
NDGFD	North Dakota Game and Fish and Game Department
NDPSC	North Dakota Public Service Commission
O&M	operations and maintenance
Ruso	Ruso Wind Partners, LLC
RSA	rotor swept area
Site Permit	Certificate of Site Compatibility
USFWS	U.S. Fish and Wildlife Service
Westwood	Westwood Professional Services
WTG	wind turbine generator

1.0 INTRODUCTION

Ruso Wind Partners, LLC (Ruso) proposes to construct and operate the Ruso Wind Energy Project (hereafter referred to as "Project" or "proposed Project") in Ward and McLean counties, North Dakota. The proposed Project site is located in north central North Dakota, directly adjacent to the Town of Benedict and 1.4 miles to the west of the Town of Ruso; directly north of 28th Street NW/U.S. Highway 53 and 3.9 miles east of U.S. Highway 83 (Exhibits 1 and 2).

The proposed Project would entail the construction and operation of a wind energy generation facility that would produce up to 250 megawatts (MW) of renewable energy. Ruso continues to assess its turbine options, and is currently evaluating wind turbine generators (WTG) with rated power outputs from 2.0 to 3.45 MW, which would result in the installation of 72 to 125 wind turbines depending upon the model chosen. The proposed Project will consist of WTGs, supporting towers, foundations, crane pads, gravel access roads, meteorological tower(s), an operation and maintenance (O&M) facility, underground and overhead electric collection and communication systems, and a new substation to interconnect the proposed Project with the transmission infrastructure.

The initial project assumptions are that turbine sites (crane pad and foundation) would occupy up to 1 acre per turbine (100 total acres), access roads approximately 40 acres, and the operation and maintenance (O&M) facility approximately 5 acres. Some additional areas may be required during construction for material laydown and staging, a concrete batch plant, spoils storage, etc. It is anticipated that the combined total areas of temporary and permanent disturbance would not exceed 165 acres.

Construction of the proposed Project will require a Certificate of Site Compatibility (Site Permit) and Consolidated Certificate of Corridor Compatibility (Corridor Certificate) and Route Permit from the North Dakota Public Service Commission (NDPSC). To help meet the project proponent's biological resource requirements under conditions of the Site Permit and Corridor Certificate pursuant to North Dakota Administrative Code, Ruso Wind contracted Westwood Professional Services (Westwood) to conduct pre-construction avian surveys at the proposed Project site.

1.1 Goals and Objectives of the Avian Baseline Study

The principal goals of the studies were to (1) provide baseline information on activity of avian species in the proposed development area useful in evaluating the impact to birds from the wind power development, and (2) to provide information that would help in designing a wind plant that is less likely to expose avian species to potential collisions with turbines. Specific objectives of the studies were to:

- Identify avian species using the Study Area during the nesting period and spring and fall migrations;

- Quantitatively and qualitatively describe the relative abundance and temporal and spatial use by avian species of the Study Area during the spring, summer, fall, and winter survey periods;
- Identify areas of high avian use within the Study Area which may pose a higher risk to avian species from development;
- Determine what raptor species nest and the spatial distribution of raptor nests in the Study Area;
- Determine sharp-tailed grouse (*Tympanuchus phasianellus*) lek locations and abundance within and directly surrounding the Study Area;
- Determine the habitat suitability and use by special-status avian species; and
- Determine locations and relative abundance of avian species in the Study Area, with an emphasis on federally listed species, U.S. Fish and Wildlife Service (USFWS) birds of conservation and habitat fragmentation concern, and North Dakota species of conservation priority.

This report contains results from all avian studies conducted within the Study Area. It combines results from the spring, summer, fall, and winter general avian point count studies with additional results from eagle point count surveys, ground-based lek surveys, aerial lek surveys, and aerial nesting raptor surveys.

2.0 STUDY AREA

The Study Area consists of approximately 43,344 acres (68 square miles). Topography within the Study Area is relatively uniform, as the site contains numerous wetlands and hummocky, rolling hills with few streams and drainages present (Exhibit 3). The elevation of the Study Area ranges from approximately 1,950 feet to 2,205 feet above mean sea level (amsl). Portions of two named waterways are located within the Study Area: McMann Lake and Robinson Coulee. Audubon Lake and Souris River are located approximately 9.7 miles to the south and 8.7 miles to the northeast of the Study Area, respectively (see Exhibit 1).

Surface ownership in the Study Area is nearly all private (92 percent [39,766 acres]) with the remaining 3 percent (1,277 acres) and 4 percent (1,913 acres) in State ownership, managed by the North Dakota Department of Trust Lands (NDDTL) under the direction of the Board of University of School Lands) and North Dakota Game and Fish Department (NDGFD), respectively. The remaining 1 percent (395 acres) of lands are county Waterfowl Production Areas (WPAs) jointly managed by Ward and McLean counties and the U.S. Fish and Wildlife Service (USFWS). No other federal lands are located within the Study Area.

A total of seven land cover types are recognized and mapped within the Study Area. These include cultivated crops, hay/pasture, herbaceous grassland, wetland, open water, disturbed/developed, and deciduous forest (Exhibit 4, Table 1).

Table 1: Land Cover Types within the Study Area

Land Cover Type	Area (Acres)	Percent of Total
Cultivated Crops	15,192	35.04
Hay/Pasture	10,029	23.13
Herbaceous Grassland	7,920	18.27
Wetland	4,743	10.94
Open Water	3,257	7.51
Disturbed/Developed	1,792	4.15
Deciduous Forest	411	0.95
TOTAL	**43,344**	**100.00**

3.0 METHODS

To evaluate avian risk at wind energy facilities, standardized protocols for pre-construction avian surveys have been established and were used in this report. These protocols are 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), USFWS *Land-Based Wind Energy Guidelines* (USFWS 2012), and USFWS *Eagle Conservation Plan Guidance* (USFWS 2013). Data collected from these studies are used to identify species or species groups that may be at risk from Project development and may provide additional information for micro-siting wind facilities to minimize impacts to birds. The avian baseline studies conducted for the proposed Project consisted of general avian point count surveys, eagle point count surveys, lek surveys, and aerial raptor nest surveys[1].

3.1 General Avian Point Count Surveys

A total of 27 surveys were conducted at 18 sampling point locations over four seasons as defined by spring (April 15-June 16, 2017 [9 weekly point counts]), summer (June 17-August 31, 2017 [5 bi-monthly point counts]), fall (September 1-November 15, 2017 [9 weekly point counts]), and winter (November 16, 2017-March 31, 2018 [4 monthly point counts]). Surveys were conducted in accordance with standard variable circular-plot point count survey methods (Reynolds *et al*. 1980, Ralph *et al*. 1995) to measure species composition, relative abundance, and spatial and temporal use of the site by migrating and resident birds.

Each individual point count station was surveyed for a period of ten (10) minutes. All birds detected by sight or sound were identified to species (where possible) and recorded on a data form at each of the sampling stations. Birds that flew too rapidly or are too distant to be accurately identified were recorded at the genus level or by functional group where possible. Flight paths of all large birds observed flying or perched within the Study Area were plotted on topographic maps. Birds detected while traveling between stations were recorded as incidental observations, but were included in the estimate of bird use. Locations of any federally or state listed species, or species of concern observed incidentally, were recorded using a global positioning system (GPS) unit.

Each bird or flock of birds was given a unique observation number. Detailed notes were recorded on each observed bird/flock at the time they were first observed, including horizontal distance from observer and flight altitude. Flight altitude was estimated and categorized into one of three flight height zones (1) 0-100 feet (below the rotor swept area [RSA]), (2) 101-460 feet (within the RSA), and (3) > 460 feet (above the RSA). The behavior of each bird observed and the vegetation type in which the bird occurred were recorded based

[1] A tele-conference was held with the USFWS and NDGFD on July 5, 2017 to review and discuss the Pre-construction Avian and Bat Survey Work Plan prepared for the Project. Westwood presented information on the Project description and location, habitat types, and survey methods and schedule for proposed avian and bat surveys within the Project Area.

on the point of first observation. The date, start/end times, and weather were also recorded for each sampling station.

3.1.1 Data Analysis

An electronic database (MS Access) was created to store, retrieve and organize field observations. Data from field forms were keyed into electronic data files using a pre-defined format that made subsequent data analysis straightforward. All field data forms, field notebooks, and electronic data files were retained for future reference.

The number of species seen during each point count survey was standardized to a unit time searched. The field data were then calculated as the mean number of observations per 10-minute survey. Standardizing the data to a unit time allows comparison of avian use data between sample locations, time of day, and season, as well as with other projects surveyed using the same methods.

The frequency of occurrence by species was calculated as the percent of surveys in which a particular species was observed. Species composition was represented by the mean use for a species divided by the total use for all species and multiplied by 100. Frequency of occurrence and percent composition provide relative estimates of the avian diversity of the Study Area. For example, a particular species may have high use estimates for the site based on just a few observations of large flocks, however, the frequency of occurrence will indicate that it occurs during very few of the surveys and therefore, may have less exposure risk from the Project.

To estimate the rate at which a species flew at the height of the anticipated RSA, the following equation was applied to every species observed in the Study Area:

Encounter Rate = A*Pf*Pt

Where A is the mean number of birds/10 min for a given species, *Pf* is the proportion of all activity observations for a given species that were flying; and *Pt* is the proportion flying observations that were at the height of a turbine RSA for a given species. The encounter rate provides information on the rate at which a species may move at a height that is consistent with the RSA of the proposed turbines. This information is an important component in evaluating risk of collisions; however, this number alone does not indicate risk to a species. Species with a high encounter rate are at a higher risk of collision than species with a low encounter rate, but it does not mean that mortality is certain. Other factors such as turbine location or a species ability to detect turbine blades, flight maneuverability, and habitat selection also influence mortality.

3.2 Eagle Point Count Surveys

Following Stage 2 of the *Eagle Conservation Plan Guidance* (USFWS 2013), point count surveys were conducted from March 31, 2017 to March 31, 2018 to collect quantitative data on eagle presence that would allow estimation of eagle exposure rate that forms the basis of a risk assessment model. Since the USFWS Eagle Guidance recommends that an area equal to 30 percent of the project footprint (and 1-mile buffer) be surveyed, 18 points were evenly distributed and surveyed within the Project Area (Exhibit 7).

Each sampling point consisted of an 800m (0.5-mile) radius circle (0.77 square mile) that provided distant, unobstructed views and allowed visual observations of eagles and other large birds at a 1 to 2 mile distance. Observations were conducted for a minimum of 1 hour per point, for a total of approximately 18 hours per survey. A total of 14 surveys were conducted at each of the 18 sampling locations over the one-year survey period, as follows: twice per month in March and April; once per month from May through September and December 2017; and once per month in January and February 2018.

Surveys occurred in all weather conditions except when visibility was poor. The starting point count location changed each survey cycle to enable sampling of each plot during a range of daylight hours. Point count surveys for eagles were accomplished in conjunction with general avian point count surveys immediately prior to or following the avian point count survey effort.

Following each point count survey, the duration of observation of each eagle flying within the plot was summarized in number of minutes. The horizontal distance of each eagle-minute was estimated and recorded as 800m or greater than 800m and the vertical distance of each eagle-minute was estimated and recorded as either 200m (at or below conservative approximation of maximum height of blade tip of tallest turbine) or above 200m in height.

3.3 Aerial Raptor Nest Survey

An aerial survey using a helicopter was conducted to document eagle nest sites and record incidental observations for these and other raptor species within the Study Area and an area encompassed by a 10-mile (16 kilometer) buffer around the proposed turbine locations (hereafter referred to as the Survey Area [approximately 475,011 acres or 742 square miles [mi^2] in size]) (Exhibit 8). Aerial nest surveys followed methods suggested in the *USFWS 2013 Eagle Conservation Plan Guidance* (USFWS 2013).

Surveys were conducted during the April 4-6, 2017, which is within the timeline with the highest probability of detecting bald eagles incubating eggs or adults tending young. Pre-flight planning included a background review of previously recorded nest locations and a review of topographic maps and aerial imagery.

Surveys were conducted in a Bell Jet Ranger helicopter traveling at an air speed of approximately 69 km/h (80 mph) and an altitude of approximately 400-500 feet above ground level. The helicopter was flown by a pilot who has considerable prior experience conducting wildlife surveys that require slow, low-level flying. One biologist was positioned in the front next to the pilot and a second biologist positioned in the rear of the helicopter on the opposite side to maximize visual detection. Flight transects were flown at 1-mile intervals to focus on areas of suitable nesting habitat and structure (i.e., large trees).

All identified nests locations were recorded and given a unique nest identification number (Nest ID). Data collected for each nest included nest status (see below), nest condition (i.e., poor, fair, good, excellent), nest height, nest substrate (e.g., tree, tower, etc.), and nest aspect. Nest use was categorized consistent with definitions in the USFWS *2013 Eagle Conservation Plan Guidance*. Nests were classified as occupied or unoccupied. Nests were classified as occupied if any of the following are observed at the nest structure: (1) an adult in an incubation position; (2) eggs present; (3) nestlings of fledglings present; (4) occurrence of a pair of adults; (5) a newly constructed or refurbished stick nest in the area where territorial behavior of an eagle was observed; or (6) a recently repaired nest with fresh sticks or fresh boughs on top, and/or droppings and/or molted feathers on the rim or underneath. Occupied nests were further classified as active if one or more eggs are present or nestlings are observed, or inactive if no eggs or chicks are present.

3.4 Sharp-tailed Grouse Lek Surveys

2017 Surveys

Sharp-tailed grouse lek surveys were initially conducted from April 4-6, 2017, concurrently with aerial raptor nest surveys. As with aerial raptor nest surveys, sharp-tailed grouse lek surveys were conducted in a Bell Jet Ranger helicopter traveling at an airspeed of approximately 43 knots (50 mph) and an altitude of approximately 200 feet above ground level. The helicopter was flown by a pilot who has considerable prior experience conducting wildlife surveys that require slow, low-level flying. Suspected breeding habitat was flown on north – south transects with transects spaced at approximately 1 mile intervals (Exhibit 7). One biologist was positioned in the front next to the pilot and a second biologist positioned in the rear of the helicopter on the opposite side so that one observer was always looking away from the sun regardless of the direction the helicopter was flying. Surveys began at the east edge of the Survey Area and worked west to minimize the possibility of the helicopter flying over leks prior to them being observed.

Lek searches were conducted from 0.5 hours before to two hours after sunrise during calm, clear mornings. When a lek was identified, data was collected to include the approximate numbers of individuals in attendance and the location, which was accurately determined and recorded with a GPS.

2018 Surveys

Due to the limited results from April 4-6, 2017 aerial surveys for sharp-tailed grouse, a second year of surveys were conducted within the Study Area from April 1 to April 30, which generally coincides with the peak in breeding activity. Roadside listing station surveys were conducted beginning approximately 30-40 minutes before sunrise and were limited to the first 3 hours after daylight on days with acceptable weather conditions (i.e., no precipitation or high winds). Surveys were conducted in a vehicle driving slowly along accessible roads with the vehicle stopping at listening stations every mile. At each stop, biologists would exit the vehicle and listen for booming males for a period of 5-8 minutes, with the approximate locations of audibly detected sharp-tailed grouse males recorded. Where access was possible for all access roads, an estimated 63 stops along approximately 65 miles of roadway was required for each survey period.

On subsequent mornings after each initial roadside effort has been completed, the general location of leks previously heard were recorded by a biologist who located the approximate location of each of the leks on foot on the parcels that were accessible. The number of sharp-tailed grouse present on each of the leks were recorded. Grouse numbers at each previously recorded lek, as well as new leks, were recorded weekly for the duration of the survey.

4.0 RESULTS

4.1 General Avian Point Count Surveys

Over the spring and fall survey periods, each of the 18 general avian point count locations were surveyed 9 times each, resulting in a total of 162, 10-minute point count surveys per season. Over the summer survey period, each of the 18 point count locations were surveyed 5 times each, resulting in a total of 90 10-minute point count surveys. Each of the 18 point count locations were surveyed 4 times during the winter survey period, resulting in a total of 72 10-minute point count surveys.

A total of 3,561 birds representing 63 species and eleven species groups were identified during the 162 spring fixed-point count surveys (Table 2). The most commonly observed birds during the spring survey effort were the red-winged blackbird (*Agelaius phoeniceus*) (25.08 percent of all birds observed), Canada goose (*Branta Canadensis*) (7.92 percent of all birds observed), yellow-headed blackbird (*Xanthocephalus xanthocephalus*) (7.55 percent of all birds observed), lesser scaup (*Aythya affinis*) (7.19 percent of all birds observed), mallard (*Anas platyrhynchos*) (7.02 percent of all birds observed), and ring-billed gull (*Larus delawarensis*) (5.45 percent of all birds).

1,416 birds representing 52 species and 8 species groups were identified during the 108 summer fixed point count surveys (Table 3). The most commonly observed birds were the red-winged blackbird (14.55 percent of all birds observed), mourning dove (*Zenaida macroura*) (11.02 percent of all birds observed), ring-billed gull (9.46 percent of all birds observed), barn swallow (*Hirundo rustica*) (8.33 percent of all birds observed), common grackle (*Quiscalus quiscula*) (7.06 percent of all birds observed), and Canada goose (5.44 percent of all birds observed) (Table 3).

11,538 birds representing 47 species and nine species groups were identified during the 162 fall fixed point count surveys (Table 4). The most commonly observed birds were the red-winged blackbird (19.24 percent of all birds observed), yellow-headed blackbird (17.64 percent of all birds observed), Canada goose (13.5 percent of all birds observed), unidentified blackbird (Family Icteridae) (13.39 percent of all birds observed), snow goose (*Chen caerulescens*) (10.49 percent of all birds observed), and the horned lark (*Eremophila alpestris*) (5.77 percent of all birds observed) (Table 4).

968 birds representing 15 species and five species groups were identified during the 72 winter fixed point count surveys (Table 5). The most commonly observed birds were the snow bunting (*Plectrophenax nivalis*) (66.84 percent of all birds observed), horned lark (17.56 percent of all birds observed), American tree sparrow (*Spizella arborea*) (3.62 percent of all birds observed), black-capped chickadee (*Poecile atricapillus*) (3.00 percent of all birds observed), pine siskin (*Spinus pinus*) (2.58 percent of all birds observed), and the common redpoll (*Acanthis flammea*) (1.45 percent of all birds observed) (Table 5).

4.1.1 Avian Use

Avian use by species was calculated as the mean number of birds observed per 10-minute point count. Overall mean bird use within the Study Area during the spring survey period was 21.981 birds/10 min, ranging from one to 187 birds/10 min point count. Among all species groups, mean use was highest for passerines (10.123 birds/10 min). The most commonly observed species, red-winged blackbird, accounted for 54.45 percent of individuals in this species group. Among waterfowl, the second highest species group (7.611 birds/10 min), the most commonly observed species included the Canada goose (1.741 birds/10 min) and mallard (1.543 birds/10 min). Among the remaining species groups, shorebirds and cormorants/pelicans had the third and fourth highest mean use at 2.160 birds/10min and 0.488 birds/10min, respectively (Table 2).

Overall mean bird use within the Study Area during the summer survey period was 15.733 birds/10 min, ranging from one to 57 birds/10 min point count. Among all species groups, mean use was highest for passerines (8.300 birds/10 min). The most commonly observed species, red-winged blackbird, accounted for 27.58 percent of individuals in this species group. Among waterfowl, the second highest species group (2.367 birds/10 min), the most commonly observed species included the Canada goose (0.856 birds/10 min) and mallard (0.689 birds/10 min). Among shorebirds, the third highest species group, (2.333 birds/10 min) the most commonly observed species, ring-billed gull, accounted for 63.81 percent of individuals in this species group (Table 3).

Overall mean bird use within the Study Area during the fall survey period was 71.22 birds/10 min, ranging from one to 4,241 birds/10 min point count. Among all species groups, mean use was highest for passerines (43.25 birds/10 min). The most commonly observed species, red-winged blackbird, accounted for 31.68 percent of individuals in this species group. Among waterfowl, the second highest species group (22.67 birds/10 min), the most commonly observed species included the Canada goose (9.62 birds/10 min) and snow goose (7.49 birds/10 min). Among the remaining species groups, shorebirds and cranes/herons/egrets/rails had the third and fourth highest mean use at 2.02 birds/10min and 1.19 birds/10min, respectively (Table 4).

Overall mean bird use within the Study Area during the winter survey period was 13.44 birds/10 min, ranging from one to 321 birds/10 min point count. Among all species groups, mean use was highest for passerines (12.86 birds/10 min). The most commonly observed species, snow bunting, accounted for 69.87 percent of individuals in this species group. Among the remaining species groups, upland gamebirds, raptors and had the third and fourth highest mean use values of 0.53 birds/10min and 0.03 birds/10min, respectively (Table 5).

Table 2: Avian Species by Species Group Observed during Spring 2017 General Avian Point Count Surveys

Species Group	Overall Rank	Number of Birds	Number of Occurrences	Mean Use (No. Birds/10 minutes)	Frequency (% of Surveys Detected)	Species Composition (%)	
						Group	Overall
Passerines							
American Crow	34	8	2	0.049	1.85	0.49	0.22
Common Grackle	17	46	26	0.284	16.05	2.80	1.29
Red-winged Blackbird	1	893	116	5.512	60.49	54.45	25.08
Yellow-headed Blackbird	3	269	34	1.660	20.99	16.40	7.55
American Goldfinch	40	2	2	0.012	1.23	0.12	0.06
American Robin	24	24	18	0.148	9.26	1.46	0.67
Blue Jay	40	2	2	0.012	1.23	0.12	0.06
Brown-headed Cowbird	10	80	32	0.494	17.90	4.88	2.25
Western Kingbird	26	21	10	0.130	6.17	1.28	0.59
Baltimore Oriole	41	1	1	0.006	0.62	0.06	0.03
Purple Martin	41	1	1	0.006	0.62	0.06	0.03
Horned Lark	16	49	31	0.302	15.43	2.99	1.38
Western Meadowlark [4]	10	80	56	0.494	32.72	4.88	2.25
Chestnut-collared Longspur [1, 2, 3]	41	1	1	0.006	0.62	0.06	0.03
Bobolink [1, 4]	29	15	15	0.093	5.56	0.91	0.42
Clay-colored Sparrow	34	8	8	0.049	4.94	0.49	0.22
Grasshopper Sparrow [1, 2, 3]	40	2	2	0.012	1.23	0.12	0.06
Savannah Sparrow	38	4	4	0.025	2.47	0.24	0.11
Vesper Sparrow	31	12	12	0.074	7.41	0.73	0.34
Yellow Warbler	39	3	3	0.019	1.85	0.18	0.08
Unidentified Blackbird	37	5	1	0.031	0.62	0.30	0.14
Unidentified Sparrow	9	82	4	0.506	1.23	5.00	2.30
Barn Swallow	21	32	7	0.198	4.32	1.95	0.90
Total	**--**	**1,640**	**388**	**10.123**	**--**	**100.00**	**46.05**
Waterfowl							
Canada Goose	2	282	82	1.741	43.21	22.87	7.92
Mallard	5	250	95	1.543	51.23	20.28	7.02

Species Group	Overall Rank	Number of Birds	Number of Occurrences	Mean Use (No. Birds/10 minutes)	Frequency (% of Surveys Detected)	Species Composition (%)	
						Group	Overall
Northern Pintail [4]	14	55	26	0.340	13.58	4.46	1.54
Northern Shoveler	12	66	15	0.407	8.02	5.35	1.85
Blue-winged Teal	7	152	59	0.938	29.01	12.33	4.27
Canvasback [4]	18	45	38	0.278	10.49	3.65	1.26
Redhead	11	76	13	0.469	6.17	6.16	2.13
Gadwall	15	50	32	0.309	18.52	4.06	1.40
Lesser Scaup[4]	4	256	22	1.580	12.96	20.76	7.19
Common Merganser	41	1	1	0.006	0.62	0.08	0.03
Total	**--**	**1,233**	**383**	**7.611**	**--**	**100.00**	**34.63**
Coots/Grebes							
American Coot	13	60	5	0.370	2.47	96.77	1.68
Horned Grebe [2, 3]	41	1	1	0.006	0.62	1.61	0.03
Pied-billed Grebe	41	1	1	0.006	0.62	1.61	0.03
Total	**--**	**62**	**7**	**0.383**	**--**	**100.00**	**1.74**
Cormorants/Pelicans							
Double-crested Cormorant	16	49	17	0.302	10.49	62.03	1.38
American White Pelican [4]	23	30	4	0.185	2.47	37.97	0.84
Total	**--**	**79**	**21**	**0.488**	**--**	**100.00**	**2.22**
Raptors							
American Kestrel [4]	40	2	2	0.012	0.62	10.00	0.06
Red-tailed Hawk	31	12	12	0.074	6.79	60.00	0.34
Northern Harrier [1, 4]	36	6	6	0.037	2.47	30.00	0.17
Total	**--**	**20**	**20**	**0.123**	**--**	**100.00**	**0.57**
Upland Gamebirds							
Ring-necked Pheasant	22	32	29	0.198	16.67	94.12	0.90
Sharp-tailed Grouse [4]	40	2	1	0.012	0.62	5.88	0.06
Total	**--**	**34**	**30**	**0.210**	**--**	**100.00**	**0.96**
Pigeons/Doves							
Mourning Dove	20	33	15	0.204	7.41	94.29	0.93
Rock Pigeon	40	2	1	0.012	0.62	5.71	0.06
Total	**--**	**35**	**16**	**0.216**	**--**	**100.00**	**0.99**

Species Group	Overall Rank	Number of Birds	Number of Occurrences	Mean Use (No. Birds/10 minutes)	Frequency (% of Surveys Detected)	Species Composition (%)	
						Group	Overall
Shorebirds							
Killdeer	19	35	34	0.216	17.90	10.00	0.98
Upland Sandpiper [1,2,4]	28	18	18	0.111	10.49	5.14	0.51
Solitary Sandpiper [2]	35	7	1	0.043	0.62	2.00	0.20
Wilson's Snipe	30	13	6	0.080	3.09	3.71	0.37
Common Snipe	25	22	20	0.136	12.35	6.29	0.62
Common Tern	35	7	2	0.043	0.62	2.00	0.20
Bonaparte's Gull	31	12	2	0.074	0.62	3.43	0.34
Franklin's Gull [3]	36	6	1	0.037	0.62	1.71	0.17
Ring-billed Gull	6	194	37	1.198	18.52	55.43	5.45
American Avocet [4]	32	11	6	0.068	3.09	3.14	0.31
Lesser Yellowlegs	39	3	1	0.019	0.62	0.86	0.08
Willet [4]	39	3	3	0.019	1.85	0.86	0.08
Wilson's Phalarope [3]	27	19	4	0.117	1.85	5.43	0.53
Total	**--**	**350**	**135**	**2.160**	**--**	**100.00**	**9.83**
Woodpeckers							
Northern Flicker	38	4	4	0.025	1.85	100.00	0.11
Total	**--**	**4**	**4**	**0.025**	**--**	**100.00**	**0.11**
Kingfishers							
Belted Kingfisher	41	1	1	0.006	0.62	100.00	0.03
Total	**--**	**1**	**1**	**0.006**	**--**	**100.00**	**0.03**
Herons/Egrets/Cranes/Rails							
Great Blue Heron	33	11	8	0.068	3.70	10.68	0.31
Black-crowned Night Heron	40	2	2	0.012	0.62	1.94	0.06
Sandhill Crane	8	90	3	0.556	1.23	87.38	2.53
Total	**--**	**103**	**13**	**0.636**	**--**	**100.00**	**2.89**
Grand Total	**--**	**3,561**	**980**	**21.981**	**--**	**--**	**100.00**

[1]USFWS Species of Habitat Fragmentation Concern, [2]USFWS Bird of Conservation Concern, [3]Level I North Dakota Species of Conservation Priority, [4]Level II North Dakota Species of Conservation Priority

Table 3: Avian Species by Species Group Observed during Summer 2017 General Avian Point Count Surveys

Species Group	Overall Rank	Number of Birds	Number of Occurrences	Mean Use (No. Birds/10 minutes)	Frequency (% of Surveys Detected)	Species Composition (%)	
						Group	Overall
Passerines							
American Crow	31	2	1	0.022	1.11	0.27	0.14
Common Grackle	5	100	28	1.111	31.11	13.39	7.06
Red-winged Blackbird	1	206	50	2.289	55.56	27.58	14.55
Yellow-headed Blackbird	9	46	16	0.511	17.78	6.16	3.25
Brewer's Blackbird	13	34	2	0.378	2.22	4.55	2.40
American Goldfinch	18	17	12	0.189	13.33	2.28	1.20
American Robin	24	9	9	0.100	10.00	1.20	0.64
Brown-headed Cowbird	10	45	20	0.500	22.22	6.02	3.18
Eastern Kingbird	8	60	22	0.667	24.44	8.03	4.24
Western Kingbird	15	25	15	0.278	16.67	3.35	1.77
Horned Lark	20	15	15	0.167	16.67	2.01	1.06
Western Meadowlark [4]	14	33	30	0.367	32.22	4.42	2.33
Bobolink [1, 4]	31	2	2	0.022	2.22	0.27	0.14
Marsh Wren	32	1	1	0.011	1.11	0.13	0.07
Clay-colored Sparrow	31	2	2	0.022	2.22	0.27	0.14
Grasshopper Sparrow [1, 2, 3]	27	6	5	0.067	5.56	0.80	0.42
House Sparrow	32	1	1	0.011	1.11	0.13	0.07
Song Sparrow	30	3	2	0.033	2.22	0.40	0.21
Vesper Sparrow	29	4	4	0.044	4.44	0.54	0.28
Yellow Warbler	30	3	3	0.033	3.33	0.40	0.21
Common Yellowthroat	32	1	1	0.011	1.11	0.13	0.07
Unidentified Blackbird	25	8	1	0.089	1.11	1.07	0.56
Unidentified Sparrow	27	6	1	0.067	1.11	0.80	0.42
Barn Swallow	4	118	13	1.311	14.44	15.80	8.33
Total	**--**	**747**	**256**	**8.300**	**--**	**100.00**	**52.75**
Waterfowl							
Canada Goose	6	77	13	0.856	14.44	36.15	5.44

Species Group	Overall Rank	Number of Birds	Number of Occurrences	Mean Use (No. Birds/10 minutes)	Frequency (% of Surveys Detected)	Species Composition (%)	
						Group	Overall
Mallard	7	62	37	0.689	41.11	29.11	4.38
Northern Pintail [4]	25	8	6	0.089	6.67	3.76	0.56
Northern Shoveler	32	1	1	0.011	1.11	0.47	0.07
Blue-winged Teal	19	16	13	0.178	14.44	7.51	1.13
Canvasback [4]	25	8	2	0.089	2.22	3.76	0.56
Redhead	32	1	1	0.011	1.11	0.47	0.07
Gadwall	11	39	12	0.433	13.33	18.31	2.75
Wood Duck	32	1	1	0.011	1.11	0.47	0.07
Total	**--**	**213**	**86**	**2.367**	**--**	**100.00**	**15.04**
Cormorants/Pelicans							
Double-crested Cormorant	16	22	11	0.244	12.22	64.71	1.55
American White Pelican [4]	22	12	3	0.133	3.33	35.29	0.85
Total	**--**	**34**	**14**	**0.378**	**--**	**100.00**	**2.40**
Raptors							
Swainson's Hawk [3]	32	1	1	0.011	1.11	7.69	0.07
Red-tailed Hawk	26	7	6	0.078	6.67	53.85	0.49
Northern Harrier [1, 4]	28	5	5	0.056	5.56	38.46	0.35
Total	**--**	**13**	**12**	**0.144**	**--**	**100.00**	**0.92**
Upland Gamebirds							
Ring-necked Pheasant	17	19	14	0.211	15.56	57.58	1.34
Gray Partridge	21	14	2	0.156	2.22	42.42	0.99
Total	**--**	**33**	**16**	**0.367**	**--**	**100.00**	**2.33**
Pigeons/Doves							
Mourning Dove	2	156	39	1.733	43.33	94.55	11.02
Rock Pigeon	24	9	2	0.100	2.22	5.45	0.64
Total	**--**	**165**	**41**	**1.833**	**--**	**100.00**	**11.66**
Shorebirds							
Killdeer	12	38	26	0.422	28.89	18.10	2.68
Upland Sandpiper [1, 2, 4]	23	11	11	0.122	12.22	5.24	0.78
Common Snipe	21	14	13	0.156	14.44	6.67	0.99

Species Group	Overall Rank	Number of Birds	Number of Occurrences	Mean Use (No. Birds/10 minutes)	Frequency (% of Surveys Detected)	Species Composition (%)	
						Group	Overall
Black Tern [4]	26	7	1	0.078	1.11	3.33	0.49
Marbled Godwit [2, 3]	31	2	1	0.022	1.11	0.95	0.14
Ring-billed Gull	3	134	22	1.489	24.44	63.81	9.46
Unidentified Gull	32	1	1	0.011	1.11	0.48	0.07
American Avocet [4]	31	2	1	0.022	1.11	0.95	0.14
Willet [4]	32	1	1	0.011	1.11	0.48	0.07
Total	**--**	**210**	**77**	**2.333**	**--**	**100.00**	**14.83**
Herons/Egrets/Cranes/Rails							
Sora	32	1	1	0.011	1.11	100.00	0.07
Total	**--**	**1**	**1**	**0.011**	**--**	**100.00**	**0.07**
Grand Total	**--**	**1,416**	**503**	**15.733**	**--**	**--**	**100.00**

[1]USFWS Species of Habitat Fragmentation Concern, [2]USFWS Bird of Conservation Concern, [3]Level I North Dakota Species of Conservation Priority, [4]Level II North Dakota Species of Conservation Priority

Table 4: Avian Species by Species Group Observed during Fall 2017 General Avian Point Count Surveys

Species Group	Overall Rank	Number of Birds	Number of Occurrences	Mean Use (No. Birds/10 minutes)	Frequency (% of Surveys Detected)	Species Composition (%)	
						Group	Overall
Passerines							
Red-winged Blackbird	1	2,220	74	13.70	6.79	31.68	19.24
Yellow-headed Blackbird	2	2,035	15	12.56	0.62	29.04	17.64
Unidentified Blackbird	4	1,545	13	9.54	4.32	22.05	13.39
Horned Lark	6	666	12	4.11	41.36	9.50	5.77
Common Grackle	9	203	7	1.25	7.41	2.90	1.76
Brewer's Blackbird	13	125	6	0.77	1.85	1.78	1.08
European Starling	15	101	6	0.62	1.85	1.44	0.88
Snow Bunting	23	36	5	0.22	3.09	0.51	0.31
Barn Swallow	26	29	5	0.18	3.09	0.41	0.25
Western Meadowlark[4]	28	12	3	0.07	7.41	0.17	0.10
American Robin	28	12	3	0.07	1.85	0.17	0.10
American Goldfinch	31	6	3	0.04	3.70	0.09	0.05
Blue Jay	31	6	3	0.04	3.70	0.09	0.05
Eastern Kingbird	32	4	2	0.02	0.62	0.06	0.03
American Crow	32	4	1	0.02	1.85	0.06	0.03
House Sparrow	34	1	1	0.01	0.62	0.01	0.01
Vesper Sparrow	34	1	1	0.01	0.62	0.01	0.01
Sedge Wren[1]	34	1	1	0.01	0.62	0.01	0.01
Total	--	**7,007**	**161**	**43.25**	--	**100.00**	**60.73**
Waterfowl							
Canada Goose	3	1558	66	9.62	34.57	42.42	13.50
Snow Goose	5	1210	35	7.47	3.09	32.94	10.49
Unidentified Duck	7	331	14	2.04	8.64	9.01	2.87
Mallard	8	277	12	1.71	19.75	7.54	2.40
Gadwall	11	146	9	0.90	7.41	3.97	1.27
Blue-winged Teal	18	61	6	0.38	4.94	1.66	0.53
Tundra Swan	21	48	5	0.30	3.70	1.31	0.42
Greater White-fronted Goose	25	31	3	0.19	1.23	0.84	0.27

Species Group	Overall Rank	Number of Birds	Number of Occurrences	Mean Use (No. Birds/10 minutes)	Frequency (% of Surveys Detected)	Species Composition (%)	
						Group	Overall
Northern Pintail[4]	29	9	2	0.06	1.85	0.25	0.08
American Wigeon	33	2	2	0.01	1.23	0.05	0.02
Total	--	**3,673**	**154**	**22.67**	--	**100.00**	**31.83**
Shorebirds							
Ring-billed Gull	12	128	28	0.79	14.20	39.14	1.11
Unidentified Larus Gull	16	71	16	0.44	1.23	21.71	0.62
Franklin's Gull[3]	17	68	4	0.42	1.85	20.80	0.59
Killdeer	19	60	2	0.37	8.64	18.35	0.52
Total	--	**327**	**50**	**2.02**	--	**100.00**	**2.83**
Cranes/Herons/Egrets/Rails							
Sandhill Crane	10	186	8	1.15	4.32	96.88	1.61
Great Blue Heron	31	6	5	0.04	2.47	3.13	0.05
Total	--	**192**	**13**	**1.19**	--	**100.00**	**1.66**
Pigeons/Doves							
Mourning Dove	14	120	16	0.74	9.26	78.43	1.04
Rock Pigeon	24	33	5	0.20	3.09	21.57	0.29
Total	--	**153**	**21**	**0.94**	--	**100.00**	**1.33**
Cormorants/Pelicans							
American White Pelican[4]	18	61	18	0.38	3.70	52.59	0.53
Double-crested Cormorant	20	55	6	0.34	9.88	47.41	0.48
Total	--	**116**	**24**	**0.72**	--	**100.00**	**1.01**
Raptors							
Red-tailed Hawk	22	37	29	0.23	15.43	62.71	0.32
Northern Harrier [1, 4]	27	15	15	0.09	8.64	25.42	0.13
Unidentified Hawk	32	4	3	0.02	1.85	6.78	0.03
American Kestrel[4]	33	2	2	0.01	1.23	3.39	0.02
Prairie Falcon[4]	34	1	1	0.01	0.62	1.69	0.01
Total	--	**59**	**50**	**0.36**	--	**100.00**	**0.51**
Upland Gamebirds							
Ring-necked Pheasant	30	7	7	0.04	3.70	77.78	0.06
Sharp-tailed Grouse[1, 4]	33	2	1	0.01	0.62	22.22	0.02

Species Group	Overall Rank	Number of Birds	Number of Occurrences	Mean Use (No. Birds/10 minutes)	Frequency (% of Surveys Detected)	Species Composition (%)	
						Group	Overall
Total	**--**	**9**	**8**	**0.06**	--	**100.00**	**0.08**
Kingfishers							
Belted Kingfisher	34	1	1	0.01	0.62	100.00	0.01
Total	**--**	**1**	**1**	**0.01**	--	**100.00**	**0.01**
Coots/Gre bes							
Pied-billed Grebe	34	1	1	0.01	0.62	100.00	0.01
Total	--	**1**	**1**	**0.01**	--	**100.00**	**0.01**
Grand Total	**--**	**11,538**	**483**	**71.22**	--	--	**100.00**

[1]USFWS Species of Habitat Fragmentation Concern, [2]USFWS Bird of Conservation Concern, [3]Level I North Dakota Species of Conservation Priority, [4]Level II North Dakota Species of Conservation Priority

Table 5: Avian Species by Species Group Observed during Winter 2017/2018 General Avian Point Count Surveys

Species Group	Overall Rank	Number of Birds	Number of Occurrences	Mean Use (No. Birds/10 minutes)	Frequency (% of Surveys Detected)	Species Composition (%)	
						Group	Overall
Passerines							
Snow Bunting	1	647	19	8.99	22.22	69.87	66.84
Horned Lark	2	170	22	2.36	27.78	18.36	17.56
American Tree Sparrow	3	35	1	0.49	1.39	3.78	3.62
Black-capped Chickadee	4	29	2	0.40	2.78	3.13	3.00
Pine Siskin	5	25	1	0.35	1.39	2.70	2.58
Common Redpoll	6	14	1	0.19	1.39	1.51	1.45
Slate-colored Junco	8	3	1	0.04	1.39	0.32	0.31
Northern Shrike	9	2	2	0.03	2.78	0.22	0.21
Black-billed Magpie		1	1	0.01	1.39	0.11	0.10
Total	**--**	**926**	**50**	**12.86**	--	**100.00**	**95.66**
Upland Gamebirds							
Sharp-tailed Grouse[1, 4]	4	29	3	0.40	4.17	76.32	3.00
Ring-necked Pheasant	7	9	4	0.13	5.56	23.68	0.93
Total	**--**	**38**	**7**	**0.53**	--	**100.00**	**3.93**
Raptors							
Unidentified Hawk	10	1	1	0.01	1.39	50.00	0.10
Bald Eagle[2, 4]	10	1	1	0.01	1.39	50.00	0.10
Total	**--**	**2**	**2**	**0.03**	--	**100.00**	**0.21**
Woodpeckers							
Hairy Woodpecker	10	1	1	0.01	1.39	100.00	0.10
Total	**--**	**13**	**12**	**0.144**	**--**	**100.00**	**0.92**
Pigeons/Doves							
Rock Pigeon	10	1	1	0.01	1.39	100.00	0.10
Total	**--**	**1**	**1**	**0.01**	--	**100.00**	**0.10**
Grand Total	**--**	**968**	**61**	**13.44**	--		**100.00**

[1]USFWS Species of Habitat Fragmentation Concern, [2]USFWS Bird of Conservation Concern, [3]Level I North Dakota Species of Conservation Priority, [4]Level II North Dakota Species of Conservation Priority

Raptors are a group of special interest because of their propensity to fly at heights similar to those encompassed by the RSA of a turbine. Overall spring, summer, fall, and winter mean use for raptors was 0.123 birds/10 min, 0.144 birds/10 min, 0.360 birds/10 min, and 0.030 birds/10 min, respectively. The raptors with the highest use were the red-tailed hawk (*Buteo jamaicensis*) (0.074 birds/10 min [spring], 0.078 birds/10 min [summer], and 0.230 birds/10 min [fall])) and the northern harrier (*Circus cyaneus*) (0.037 birds/10 min [spring], 0.056 birds/10 min [summer], and 0.090 birds/10 min [fall]) (Tables 2, 3, and 4).

4.1.2 Species Composition and Frequency of Occurrence

Species composition is represented by the mean use for a species divided by the total use for all species and multiplied by 100 to provide percent composition. Frequency of occurrence was calculated as the percent of surveys in which a particular species was observed.

Passerines were the most commonly observed species group during spring, summer, fall, and winter surveys, comprising 46.05, 52.75, 60.73, and 95.66 percent of all species during these seasons, respectively. During the spring survey season and within the passerine group, the red-winged blackbird was observed most frequently (60.49 percent of all surveys), followed by the western meadowlark (*Sturnella neglecta*) (32.72 percent of all surveys), yellow-headed blackbird (20.99 percent of all surveys), brown-headed cowbird (*Molothrus ater*) (17.90 percent of all surveys), and common grackle (16.05 percent of all surveys). The waterfowl species group had the second highest species composition percentage during spring surveys at 34.63 percent. Within this group, the mallard was detected at 51.23 percent of all surveys and the Canada goose detected at 43.21 percent of all surveys (Exhibit 9) (Table 2). In order of descending species composition, shorebirds, herons/egrets/cranes/rails, cormorants/ pelicans, coots/grebes, pigeons/doves, upland gamebirds, raptors, woodpeckers, and kingfishers round out the remaining nine species groups. Within these species groups, species with highest frequencies of occurrence include the ring-billed gull (*Larus delawarensis*) (18.52 percent), great blue heron (*Ardea herodias*) (3.70 percent), double-crested cormorant (*Phalacrocorax auritus*)(10.49 percent), American coot (*Fulica americana*) (2.47 percent), mourning dove (7.41 percent), ring-necked pheasant (*Phasianus colchicus*) (16.67 percent), red-tailed hawk (6.79 percent), northern flicker (*Colaptes auratus*) (1.85 percent), and belted kingfisher (*Megaceryle alcyon*)(0.62 percent) (Exhibit 8) (Table 2).

During the summer survey season and within the passerine group, the red-winged blackbird was observed most frequently (55.56 percent of all surveys), followed by the western meadowlark (32.22 percent), common grackle (31.11 percent), eastern kingbird (*Tyrannus tyrannus*) (24.44 percent), and the brown-headed cowbird (22.22 percent). The waterfowl group had the second highest species composition percentage during summer surveys at 15.04 percent. Within this group, mallards were observed most frequently (41.11 percent), followed by the Canada goose and blue-winged teal (*Spatula discors*) (14.44 percent). In order of descending species composition, shorebirds, pigeons/doves, cormorants/pelicans, upland gamebirds, raptors, and herons/egrets/cranes/rails round out the remaining six species groups. Within these groups, species with highest frequencies of occurrence include the ring-

billed gull 24.44 percent), mourning dove (43.33 percent), double-crested cormorant (12.22 percent), ring-necked pheasant (57.58 percent), red-tailed hawk (53.58 percent), and sora (*Porzana carolina*) (1.11 percent) (Exhibit 9) (Table 3).

During the fall survey season and within the passerine group, the horned lark was observed the most frequently at 41.36 percent of all surveys. The waterfowl group had the second highest composition percentage during summer surveys at 15.04 percent. Within this group, the Canada goose and mallard were observed the most frequently, at 34.57 and 19.75 percent of all surveys, respectively. In order of descending species composition, shorebirds, cranes/herons/egrets/rails, pigeons/doves, cormorants/pelicans, raptors, upland gamebirds, kingfishers, and coots/grebes round out the remaining eight species groups. Within these groups, species with highest frequencies of occurrence include the ring-billed gull 14.20 percent), sandhill crane (*Antigone canadensis*) (4.32 percent), mourning dove (9.26 percent), American white pelican (3.70 percent), red-tailed hawk (15.43 percent), ring-necked pheasant (3.70 percent), belted kingfisher (0.62 percent), and pied-billed grebe (*Podilymbus podiceps*) (0.62 percent) (Table 4) (Exhibit 10).

During the winter survey season and within the passerine group, the horned lark and snow bunting were observed most frequently at 27.78 and 22.22 percent of all surveys, respectively. The Upland gamebirds group had the second highest composition percentage during summer surveys at 3.93 percent. Within this group, the ring-necked pheasant was observed the most frequently, at 5.56 percent of all surveys. In order of descending species composition, raptors, woodpeckers, and pigeons/doves were the next most commonly observed species group with the bald eagle, unidentified hawk, hairy woodpecker, and rock pigeon all observed at 1.39 percent of all surveys (Table 5) (Exhibit 11).

4.1.3 Spatial Use

Mean bird use and species richness (number of species per survey) estimates by survey point were mapped across the Study Area for all the survey seasons combined (Table 6) (Exhibits 12 and 13). Overall mean bird use was highest at sample point 10 in the southwest portion of the Study Area and sample point 2 in the east-central portion of the Study Area and lowest the southeast portion of the Study Area at sample points 8 and 13 and at sample point 4 in the northeast portion of the Study Area (Exhibit 12). The number of species per survey point showed a more distinct pattern with higher species richness within the eastern half of the Study Area and lower species richness in the west (Exhibit 13).

4.1.4 Seasonal Abundance and Species Richness

Survey data was categorized into 27 survey periods to evaluate bird use and species richness across the spring, summer, fall, and winter survey seasons (Table 7). A total of 16,960 birds representing 91 species and eleven species groups were identified during the 486 combined fixed point count surveys. Some of the species observed were recorded throughout the year, while others use the Study Area for only one or two seasons.

Table 6: Avian Species Observed by Avian Species Observed by Sampling Point during all Seasons of Avian Point Count Surveys

Species	Mean Use	Total No. Birds	Point ID Number																
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Red-winged Blackbird	6.13	2,981	88	147	53	23	41	49	27	79	18	2,048	71	23	31	57	38	47	87	54
Yellow-headed Blackbird	4.84	2,350	--	--	9	178	21	--	1	18	--	2,036	1	--	6	--	11	17	25	27
Canada Goose	3.86	1,875	77	7	19	243	212	305	36	43	129	167	52	95	105	43	190	24	86	42
Unidentified Blackbird	3.49	1,698	--	--	--	200	--	--	--	100	45	608	5	--	--	150	--	--	590	--
Snow Goose	2.49	1,210	--	--	--	--	--	85	--	--	575	250	300	--	--	--	--	--	--	--
Horned Lark	1.83	890	50	24	50	36	73	55	90	57	118	64	38	21	29	85	6	48	33	13
Snow Bunting	1.41	683	6	385	37	--	6	8	15	17	--	26	--	--	1	9	1	44	13	115
Mallard	1.15	558	59	75	26	29	10	4	13	23	--	41	21	41	78	1	28	21	28	60
Ring-billed Gull	0.83	405	11	30	2	66	6	3	48	5	35	6	22	33	8	7	41	35	9	38
Common Grackle	0.72	351	48	80	1	6	5	27	15	29	3	40	38	10	3	1	7	22	10	6
Unidentified Duck	0.68	331	--	--	--	155	--	60	--	--	--	--	--	--	--	--	42	24	14	36
Mourning Dove	0.63	306	12	19	18	18	--	11	3	--	27	34	7	22	4	43	22	53	8	5
Sandhill Crane	0.53	256	--	45	--	20	--	16	--	--	58	19	40	--	--	8	--	50	--	--
Lesser Scaup[4]	0.50	244	51	2	39	--	--	--	6	--	--	--	--	25	11	--	4	--	82	24
Gadwall	0.48	234	74	56	27	3	5	--	3	--	--	--	1	6	50	--	--	6	2	1
Blue-winged Teal	0.44	214	19	43	49	3	17	--	8	4	--	3	4	4	23	--	5	2	14	16
Barn Swallow	0.37	181	--	115	--	--	--	--	--	--	--	--	6	21	32	7	--	--	--	--
Brewer's Blackbird	0.33	159	30	75	--	--	--	20	--	20	--	--	--	--	14	--	--	--	--	--
Killdeer	0.27	129	11	11	14	7	6	4	4	2	1	3	34	12	5	1	1	9	1	3
Double-crested Cormorant	0.26	126	2	7	--	--	8	--	37	--	--	2	7	12	--	1	--	15	35	--
Brown-headed Cowbird	0.26	125	5	4	9	9	11	10	16	10	11	--	1	--	--	18	6	11	1	3
Western Meadowlark[4]	0.25	122	7	4	16	9	8	1	3	6	12	3	3	8	14	8	6	13	--	1
European Starling	0.21	101	--	45	--	--	--	--	--	--	--	--	30	--	--	--	26	--	--	--
American White Pelican[4]	0.18	88	--	1	--	--	--	--	28	--	--	11	25	--	--	--	--	--	23	--
Franklin's Gull[3]	0.15	74	--	25	--	--	--	--	7	--	--	--	--	6	--	--	--	36	--	--
Unidentified Larus Gull	0.15	72	--	--	--	26	--	--	--	--	--	--	--	--	--	--	--	45	1	--
Northern Pintail[4]	0.14	66	9	8	12	1	--	--	--	1	2	7	--	1	4	--	1	--	12	8
Ring-necked Pheasant	0.13	65	1	3	3	4	3	3	4	2	5	1	4	4	4	2	5	5	11	1
Eastern Kingbird	0.13	64	8	--	--	8	2	2	8	5	--	8	4	12	7	--	--	--	--	--
American Coot	0.12	59	--	45	--	--	7	--	--	--	--	--	--	--	6	--	--	--	1	--
Red-tailed Hawk	0.11	55	3	3	--	4	--	6	9	1	8	3	--	3	1	4	3	5	2	--
Rock Pigeon	0.11	54	--	--	--	--	--	4	--	--	--	--	20	--	--	--	23	--	7	--
Northern Shoveler	0.10	50	17	3	8	--	--	--	--	--	--	--	--	--	13	--	1	--	1	7
Tundra Swan	0.10	48	--	--	--	21	6	7	--	--	--	--	--	--	--	--	--	--	14	--
Unidentified Sparrow	0.10	47	--	--	--	--	--	1	--	40	6	--	--	--	--	--	--	--	--	--
Redhead	0.10	47	7	--	--	--	--	--	--	--	--	--	--	7	19	--	--	--	2	12
Western Kingbird	0.09	46	2	12	--	5	--	--	2	--	2	16	2	5	--	--	--	--	--	--
Canvasback[4]	0.09	45	8	--	3	--	--	--	--	--	--	--	--	1	16	--	--	--	3	14

Species	Mean Use	Total No. Birds	Point ID Number																
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
American Robin	0.09	43	--	4	--	--	1	--	1	7	4	16	4	1	--	2	3	--	--	--
Common Snipe	0.07	36	3	3	5	4	3	--	3	2	1	--	2	2	3	1	1	1	1	1
American Tree Sparrow	0.07	35	--	--	--	--	--	--	--	--	--	35	--	--	--	--	--	--	--	--
Sharp-tailed Grouse[1, 4]	0.07	33	--	--	2	--	--	--	--	--	--	1	--	--	18	--	12	--	--	--
Greater White-fronted Goose	0.06	31	--	--	--	--	14	--	--	--	--	--	--	17	--	--	--	--	--	--
Black-capped Chickadee	0.06	29	--	--	--	--	--	--	4	--	--	--	25	--	--	--	--	--	--	--
Upland Sandpiper[1, 2, 4]	0.06	28	5	--	2	2	2	1	--	1	3	--	2	1	1	--	1	3	3	1
American Goldfinch	0.05	25	5	6	2	--	--	1	--	1	3	4	1	--	--	1	--	--	1	--
Pine Siskin	0.05	25	--	25	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Northern Harrier [1, 4]	0.05	24	--	4	--	2	1	--	1	2	3	1	1	1	1	2	--	2	2	1
Vesper Sparrow	0.03	17	--	1	1	1	--	2	1	1	6	1	--	--	--	2	1	--	--	--
Bobolink[1, 4]	0.03	17	--	--	--	7	--	--	--	--	--	--	--	1	2	--	7	--	--	--
Wilson's Phalarope[3]	0.03	15	15	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Great Blue Heron	0.03	15	1	2	--	--	--	--	--	--	--	--	--	8	--	1	--	3	--	--
American Crow	0.03	14	--	2	--	1	--	--	--	--	--	1	--	2	--	--	7	--	1	--
Common Redpoll	0.03	14	--	14	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Gray Partridge	0.03	14	--	--	--	--	1	--	--	13	--	--	--	--	--	--	--	--	--	--
American Avocet[4]	0.02	11	9	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Clay-colored Sparrow	0.02	10	1	1	3	1	--	1	--	--	2	--	--	--	--	--	--	1	--	--
Wilson's Snipe	0.02	10	3	--	--	3	2	--	--	1	--	--	--	1	--	--	--	--	--	--
Blue Jay	0.02	8	--	3	--	--	--	--	--	--	4	--	1	--	--	--	--	--	--	--
Grasshopper Sparrow[1, 2, 3]	0.02	8	2	--	--	3	--	--	--	--	--	--	--	--	3	--	--	--	--	--
Solitary Sandpiper[2]	0.01	7	--	7	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Common Tern	0.01	7	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	7
Black Tern[2, 3]	0.01	7	7	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bonaparte's Gull	0.01	6	6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Yellow Warbler	0.01	6	--	4	--	--	--	--	--	--	--	1	--	1	--	--	--	--	--	--
Unidentified Hawk	0.01	5	--	--	--	1	--	--	--	--	--	--	3	--	--	--	--	1	--	--
Willet[4]	0.01	4	--	--	1	2	--	--	--	--	--	--	--	1	--	--	--	--	--	--
Savannah Sparrow	0.01	4	--	--	--	2	--	--	--	--	--	--	--	--	1	--	--	--	1	--
American Kestrel[4]	0.01	3	--	--	--	1	--	--	--	--	--	--	2	--	--	--	--	--	--	--
Song Sparrow	0.01	3	--	1	--	--	--	2	--	--	--	--	--	--	--	--	--	--	--	--
Northern Flicker	0.01	3	--	2	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Lesser Yellowlegs	0.01	3	--	--	--	--	3	--	--	--	--	--	--	--	--	--	--	--	--	--
Slate-colored Junco	0.01	3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3	--	--	--
House Sparrow	0.00	2	--	--	--	--	--	1	--	--	1	--	--	--	--	--	--	--	--	--
American Wigeon	0.00	2	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	1
Marbled Godwit[2, 3]	0.00	2	--	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Northern Shrike	0.00	2	1	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Species	Mean Use	Total No. Birds	Point ID Number																
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Pied-billed Grebe	0.00	2	--	--	--	--	1	--	--	--	--	--	--	1	--	--	--	--	--	--
Belted Kingfisher	0.00	2	--	1	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--
Sora	0.00	1	--	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--
Marsh Wren	0.00	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	--
Prairie Falcon[4]	0.00	1	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--
Hairy Woodpecker	0.00	1	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Baltimore Oriole	0.00	1	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--
Purple Martin	0.00	1	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--
Swainson's Hawk[2, 3]	0.00	1	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Wood Duck	0.00	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	--
Sedge Wren[1]	0.00	1	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Common Yellowthroat	0.00	1	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--
Chestnut-collared Longspur[1, 2, 3]	0.00	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--
Common Merganser	0.00	1	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Black-billed Magpie	0.00	1	--	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--
Black-crowned Night-Heron	0.00	1	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Horned Grebe[2, 3]	0.00	1	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--
Bald Eagle[2, 4]	0.00	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--
TOTAL	**34.90**	**16,960**	**664**	**1,362**	**412**	**1,106**	**477**	**689**	**393**	**490**	**1,083**	**5,456**	**780**	**410**	**514**	**454**	**504**	**543**	**1,126**	**497**
MEAN USE	--	**34.90**	**36.89**	**75.67**	**22.89**	**61.44**	**26.50**	**38.28**	**21.83**	**27.22**	**60.17**	**303.11**	**43.33**	**22.78**	**28.56**	**25.22**	**28.00**	**30.17**	**62.56**	**27.61**
NO. SPECIES	--	**91**	**37**	**49**	**27**	**38**	**29**	**27**	**27**	**27**	**27**	**30**	**36**	**35**	**32**	**23**	**31**	**27**	**36**	**26**

[1]USFWS Species of Habitat Fragmentation Concern, [2]USFWS Bird of Conservation Concern, [3]Level I North Dakota Species of Conservation Priority, [4]Level II North Dakota Species of Conservation Priority

Table 7: Avian Species Observed by Survey Period during Spring, Summer, Fall, and Winter General Avian Point Count Surveys

Species	Mean Use	No. Birds	Survey Period																										
			Spring									Summer					Fall									Winter			
			4/10	4/17	4/27	5/10	5/16	5/23	5/30	6/07	6/16	6/25	7/10	7/26	8/08	8/22	9/06	9/11	9/19	9/27	10/03	10/11	10/17	10/24	11/06	12/07	1/12	2/13	3/09
Red-winged Blackbird	6.13	2,981	147	120	55	38	64	51	40	40	36	40	21	62	47	--	76	123	--	2,000	3	--	5	--	13	--	--	--	--
Yellow-headed Blackbird	4.84	2,350	--	--	5	186	18	14	18	28	21	14	11	--	--	--	--	--	--	2,035	--	--	--	--	--	--	--	--	--
Canada Goose	3.86	1,875	32	23	54	20	18	40	12	41	19	3	11	1	--	43	122	89	220	79	56	401	64	267	260	--	--	--	--
Unidentified Blackbird	3.49	1,698	105	--	--	--	--	--	--	--	--	--	--	--	--	48	--	400	250	245	--	650	--	--	--	--	--	--	--
Snow Goose	2.49	1,210	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	260	950	--	--	--	--	--
Horned Lark	1.83	890	10	6	3	2	2	5	7	4	5	4	4	2	--	--	67	4	64	10	35	68	252	163	3	159	2	3	6
Snow Bunting	1.41	683	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	36	69	447	66	65
Mallard	1.15	558	28	41	31	26	26	25	17	25	14	15	15	1	16	1	24	17	47	13	33	8	34	101	--	--	--	--	--
Ring-billed Gull	0.83	405	51	25	30	7	4	20	3	3	--	16	5	63	36	14	30	53	7	4	9	9	9	7	--	--	--	--	--
Common Grackle	0.72	351	--	1	8	6	8	17	3	4	5	--	4	41	6	45	69	78	30	--	25	1	--	--	--	--	--	--	--
Unidentified Duck	0.68	331	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	5	60	--	4	35	77	150	--	--	--	--	--
Mourning Dove	0.63	306	--	5	1	3	2	5	10	4	--	13	15	47	38	43	81	24	14	1	--	--	--	--	--	--	--	--	--
Sandhill Crane	0.53	256	20	50	--	--	--	--	--	--	--	--	--	--	--	--	--	89	64	33	--	--	--	--	--	--	--	--	--
Lesser Scaup[4]	0.50	244	--	20	130	66	21	7	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Gadwall	0.48	234	--	--	2	7	10	13	8	9	8	1	6	--	16	8	--	28	54	11	10	--	23	20	--	--	--	--	--
Blue-winged Teal	0.44	214	11	46	11	20	14	15	9	11	11	3	2	--	--	--	--	1	7	53	--	--	--	--	--	--	--	--	--
Barn Swallow	0.37	181	--	--	--	6	3	12	9	4	6	3	3	7	75	24	28	--	--	1	--	--	--	--	--	--	--	--	--
Brewer's Blackbird	0.33	159	--	--	--	--	--	--	--	--	--	--	--	14	20	--	50	75	--	--	--	--	--	--	--	--	--	--	--
Killdeer	0.27	129	4	4	3	5	3	6	1	5	2	7	1	7	17	4	3	16	3	7	31	--	--	--	--	--	--	--	--
Double-crested Cormorant	0.26	126	--	13	1	2	1	13	6	13	1	4	8	5	2	2	10	6	4	--	2	31	--	2	--	--	--	--	--
Brown-headed Cowbird	0.26	125	--	3	4	16	26	11	8	12	6	15	15	7	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Western Meadowlark[4]	0.25	122	3	29	4	9	5	11	7	9	4	8	6	6	6	3	5	2	1	1	2	--	1	--	--	--	--	--	--
European Starling	0.21	101	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	101	--	--	--	--	--
American White Pelican[4]	0.18	88	--	--	1	--	9	--	3	1	--	--	--	--	7	6	19	26	--	--	16	--	--	--	--	--	--	--	--
Franklin's Gull[3]	0.15	74	--	--	--	6	--	--	--	--	--	--	--	--	--	--	--	--	--	68	--	--	--	--	--	--	--	--	--
Unidentified Larus Gull	0.15	72	--	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--	71	--	--	--	--	--	--	--	--	--	--
Northern Pintail[4]	0.14	66	3	17	17	2	2	1	3	4	6	2	--	--	--	--	--	--	4	4	--	--	--	1	--	--	--	--	--
Ring-necked Pheasant	0.13	65	2	7	3	1	3	8	1	5	--	14	--	5	--	--	--	1	--	--	--	--	1	3	2	1	2	--	6
Eastern Kingbird	0.13	64	--	--	--	--	--	--	--	--	--	--	--	6	20	34	4	--	--	--	--	--	--	--	--	--	--	--	--
American Coot	0.12	59	1	13	45	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Red-tailed Hawk	0.11	55	1	--	3	2	1	2	1	1	1	1	3	--	1	1	3	2	--	23	3	--	4	2	--	--	--	--	--
Rock Pigeon	0.11	54	--	--	--	--	2	--	--	--	--	2	--	7	--	9	--	2	18	--	5	--	--	8	--	--	--	--	1
Northern Shoveler	0.10	50	--	34	--	4	4	1	3	3	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tundra Swan	0.10	48	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	14	27	7	--	--	--	--	--
Unidentified Sparrow	0.10	47	41	--	--	--	--	--	--	--	--	--	--	--	--	6	--	--	--	--	--	--	--	--	--	--	--	--	--
Redhead	0.10	47	23	15	--	2	4	--	1	1	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Western Kingbird	0.09	46	--	--	--	--	6	3	6	6	5	12	4	3	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Canvasback[4]	0.09	45	10	10	6	3	3	1	3	1	1	--	7	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
American Robin	0.09	43	2	4	3	--	2	2	1	8	1	3	3	1	1	--	--	--	--	1	--	7	--	4	--	--	--	--	--
Common Snipe	0.07	36	--	--	4	5	1	6	1	5	--	14	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
American Tree Sparrow	0.07	35	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	35	--	--	--
Sharp-tailed Grouse[1, 4]	0.07	33	--	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2	--	--	--	12	--	--	17
Greater White-fronted Goose	0.06	31	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	31	--	--	--	--	--	--	--
Black-capped Chickadee	0.06	29	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	29	--	--	--
Upland Sandpiper[1, 2, 4]	0.06	28	--	--	--	4	3	5	1	4	--	8	--	2	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--
American Goldfinch	0.05	25	--	--	--	1	--	1	--	--	--	1	--	4	10	2	5	1	--	--	--	--	--	--	--	--	--	--	--

Species	Mean Use	No. Birds	Survey Period																										
			Spring									Summer					Fall									Winter			
			4/10	4/17	4/27	5/10	5/16	5/23	5/30	6/07	6/16	6/25	7/10	7/26	8/08	8/22	9/06	9/11	9/19	9/27	10/03	10/11	10/17	10/24	11/06	12/07	1/12	2/13	3/09
Pine Siskin	0.05	25	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	25	--	--	--
Northern Harrier [1, 4]	0.05	24	2	--	--	--	--	1	--	1	1	--	--	--	2	2	1	2	2	3	3	2	1	1	--	--	--	--	--
Vesper Sparrow	0.03	17	--	--	1	2	1	7	--	1	1	1	--	2	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--
Bobolink [1, 4]	0.03	17	--	--	--	--	2	1	4	8	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Wilson's Phalarope [3]	0.03	15	--	--	--	--	--	7	4	4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Great Blue Heron	0.03	15	1	1	1	--	--	5	--	1	--	--	--	--	--	--	--	2	3	--	--	--	--	--	1	--	--	--	--
American Crow	0.03	14	--	1	--	7	--	--	--	--	--	2	--	--	--	--	--	--	--	4	--	--	--	--	--	--	--	--	--
Common Redpoll	0.03	14	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	14	--	--	--
Gray Partridge	0.03	14	--	--	--	--	--	--	--	--	1	--	--	13	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
American Avocet [4]	0.02	11	--	--	--	--	2	3	2	2	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Clay-colored Sparrow	0.02	10	--	--	--	4	--	4	--	--	--	--	--	1	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Wilson's Snipe	0.02	10	--	10	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Blue Jay	0.02	8	--	--	--	--	--	1	1	--	--	--	--	--	--	--	1	2	2	--	--	--	--	--	1	--	--	--	--
Grasshopper Sparrow [1, 2, 3]	0.02	8	--	--	--	--	--	--	--	2	1	1	4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Solitary Sandpiper [2]	0.01	7	--	--	--	--	7	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Common Tern	0.01	7	--	--	--	7	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Black Tern [2, 3]	0.01	7	--	--	--	--	--	--	--	--	7	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bonaparte's Gull	0.01	6	--	--	--	--	--	--	6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Yellow Warbler	0.01	6	--	--	--	--	--	1	1	1	--	--	--	--	3	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Unidentified Hawk	0.01	5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2	--	--	2	--	--	--	--	1	--	--	--
Willet [1]	0.01	4	--	--	--	2	--	1	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Savannah Sparrow	0.01	4	--	--	--	--	--	2	--	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
American Kestrel [4]	0.01	3	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	1	--	--	--	--	--	--	--	--
Song Sparrow	0.01	3	--	--	--	--	--	--	--	--	--	1	--	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Northern Flicker	0.01	3	1	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Lesser Yellowlegs	0.01	3	--	--	--	3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Slate-colored Junco	0.01	3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3	--	--	--
House Sparrow	0.00	2	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--
American Wigeon	0.00	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2	--	--	--	--	--	--	--	--	--
Marbled Godwit [2, 3]	0.00	2	--	--	--	--	--	--	--	--	--	--	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Northern Shrike	0.00	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	1	--	--
Pied-billed Grebe	0.00	2	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--
Belted Kingfisher	0.00	2	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--
Sora	0.00	1	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Marsh Wren	0.00	1	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Prairie Falcon [4]	0.00	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--
Hairy Woodpecker	0.00	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1
Baltimore Oriole	0.00	1	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Purple Martin	0.00	1	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Swainson's Hawk [2, 3]	0.00	1	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Wood Duck	0.00	1	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Sedge Wren [1]	0.00	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--
Common Yellowthroat	0.00	1	--	--	--	--	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chestnut-collared Longspur [1, 2, 3]	0.00	1	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Common Merganser	0.00	1	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Black-billed Magpie	0.00	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1	--	--
Black-crowned Night-Heron	0.00	1	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Species	Mean Use	No. Birds	Survey Period																										
			Spring									Summer					Fall									Winter			
			4/10	4/17	4/27	5/10	5/16	5/23	5/30	6/07	6/16	6/25	7/10	7/26	8/08	8/22	9/06	9/11	9/19	9/27	10/03	10/11	10/17	10/24	11/06	12/07	1/12	2/13	3/09
Horned Grebe[2, 3]	0.00	1	--	--	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bald Eagle[2, 4]	0.00	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1
TOTAL	**34.90**	**16,960**	**500**	**503**	**429**	**474**	**277**	**329**	**200**	**275**	**169**	**211**	**153**	**309**	**329**	**296**	**598**	**1,053**	**925**	**4,601**	**240**	**1,259**	**758**	**1,788**	**316**	**349**	**453**	**69**	**97**
MEAN USE	**--**	**34.90**	**27.78**	**27.94**	**23.83**	**26.33**	**15.39**	**18.28**	**11.11**	**15.28**	**9.39**	**11.72**	**8.50**	**17.17**	**18.28**	**16.44**	**33.22**	**58.50**	**51.39**	**255.61**	**13.33**	**69.94**	**42.11**	**99.33**	**17.56**	**19.39**	**25.17**	**3.83**	**5.39**
NO. SPECIES	**--**	**91**	**23**	**27**	**28**	**32**	**32**	**38**	**32**	**37**	**27**	**30**	**24**	**24**	**23**	**19**	**18**	**28**	**20**	**24**	**17**	**13**	**13**	**17**	**7**	**11**	**5**	**2**	**7**

[1]USFWS Species of Habitat Fragmentation Concern, [2]USFWS Bird of Conservation Concern, [3]Level I North Dakota Species of Conservation Priority, [4]Level II North Dakota Species of Conservation Priority

The birds with the highest mean use for all surveys combined were the red-winged blackbird (6.134 birds/10 min), yellow-headed blackbird (4.835 birds/10 min), Canada goose (3.858 birds/10 min), and unidentified blackbird (3.494 birds/10 min) (Table 6).

Among all species groups, species richness generally trended downward in a consistent manner beginning in April 2017 through the survey year, ending in March 2018, with a slight increase through the fall migration period (Exhibit 14a). This decreasing trend was likely attributed to the fact that surveys began during peak spring migration, which is typically the period with the highest number of species observed.

While species richness showed a relatively consistent downward trend throughout the year, mean use showed greater variability. Beginning in late spring, mean use showed a decreasing trend before remaining relatively consistent through the summer. During the peak fall migration season, mean use showed a substantial increasing trend before once again decreasing into the winter months (Exhibit 14b).

4.1.5 Flight Height and Encounter Rates

For all four seasons combined, behavioral data were collected for all birds observed within the Study Area. Some 69.47 percent of all birds were observed flying and flight height data was collected for these species during the study (Exhibit 15). The proportion of observations of a bird species flying at heights that correspond with the RSA of turbines provides a rough estimate of the risk of collision for that species. The space occupied by turbine blades typically range from 30 to 110 meters (approximately 98 to 360 feet) above ground, which is approximately the estimated distance between the bottom of the tip of the blade when pointed straight down and the maximum height of a turbine blade when point straight up.

Table 8: Flight Characteristics and Encounter Rates for Avian Species Flying within the Turbine Rotor Swept Area (RSA) for all Avian Point Count Surveys Combined

Species	Number of Birds	Mean Use (No. Birds/10 minutes)	Frequency (% Flying)	Percent within RSA	Encounter Rate
Red-winged Blackbird	2,966	6.10	78.62	88.89	4.27
Yellow-headed Blackbird	2,350	4.84	86.68	98.18	4.12
Snow Goose	1,210	2.49	45.45	100.00	1.13
Snow Bunting	683	1.41	96.34	68.39	0.93
Canada Goose	1,830	3.77	52.08	32.32	0.63
Unidentified Blackbird	1,698	3.49	73.03	11.69	0.30
Ring-billed Gull	405	0.83	91.85	12.90	0.10
Sandhill Crane	256	0.53	100.00	17.58	0.09
Mallard	558	1.15	33.87	20.11	0.08
Double-crested Cormorant	126	0.26	40.48	25.49	0.03

Species	Number of Birds	Mean Use (No. Birds/10 minutes)	Frequency (% Flying)	Percent within RSA	Encounter Rate
Northern Pintail[4]	66	0.14	27.27	72.22	0.03
Red-tailed Hawk	55	0.11	85.45	23.40	0.02
Wilson's Snipe	6	0.01	100.00	100.00	0.01
American Crow	13	0.03	92.31	25.00	0.01
Blue-winged Teal	214	0.44	12.62	11.11	0.01
Common Grackle	351	0.72	69.52	0.82	0.00
Common Snipe	33	0.07	93.94	6.45	0.00
American Robin	37	0.08	24.32	11.11	0.00
Bald Eagle[2, 4]	1	0.00	100.00	100.00	0.00
Black-billed Magpie	1	0.00	100.00	100.00	0.00
Franklin's Gull[3]	74	0.15	100.00	1.35	0.00
American Kestrel[4]	3	0.01	66.67	50.00	0.00
Great Blue Heron	15	0.03	46.67	14.29	0.00

[1]USFWS Species of Habitat Fragmentation Concern, [2]USFWS Bird of Conservation Concern, [3]Level I North Dakota Species of Conservation Priority, [4]Level II North Dakota Species of Conservation Priority

For all species observed flying, 46.21 percent flew below the anticipated RSA, 51.18 percent flew within the anticipated RSA, and 2.61 percent flew above the anticipated RSA (Exhibit 15). A total of 5,716 birds of 23 species were identified flying within the RSA (Table 8). The red-winged blackbird had the highest encounter rate (4.27 birds flying at RSA height/10 min), followed by the yellow-headed blackbird (4.12 birds flying at RSA height/10 min), snow goose (1.13 birds flying at RSA height/10 min), and snow bunting (0.93 birds flying at RSA height/10 min) (Table 8).

It should be noted that these estimates only represent the proportion of observations within the area occupied by turbine rotors and do not directly equate to the probability of a bird colliding with a turbine blade. Species with a high encounter rate are at a higher risk of collision than species with a low encounter rate, but it does not mean that mortality is certain. Other factors such as turbine location or a species ability to detect turbine blades, flight maneuverability, and habitat selection also influence mortality. Values are sensitive to large flocks of birds flying within the RSA; that is, a species will have a high encounter rate even if only seen a few times in large flying flocks. Encounter rate also does not account for migrating behavior of nocturnal migrants.

4.1.6 Special-Status Avian Species

Some 24 of the 91 avian species identified during spring, summer, fall, and winter general avian point count surveys (26.37 percent) are classified as special-status species. Special-status avian species include those listed as threatened or endangered under the Endangered Species Act (ESA)

of 1973, as amended; species proposed by the USFWS as birds of conservation concern (BCC)[2] and species of habitat fragmentation concern[3], and other species identified by the North Dakota Game and Fish Department (NDGFD) as species of conservation priority[3]. These species, including their status, number of individuals, mean use, and frequency within the Study Area are presented in Table 9.

A total of 804 individuals of 24 special-status avian species were identified during the 486 fixed-point count surveys (Table 9). The most numerous avian species were the lesser scaup (*Aythya afinis*) (30.35 percent of all special-status species), western meadowlark (15.17 percent) American white pelican (*Pelecanus erythrorhynchos*) (10.95 percent), Franklin's gull (*Lecucophaeus pipixcan*) (9.2 percent), and northern pintail (*Anas acuta*) (8.21 percent). The remaining 21 species comprised 26.11 percent of the total number of special-status birds observed (Table 9). The most frequently observed special-status species include the western meadowlark (19.55 percent of all surveys), followed by the northern pintail (6.38 percent), upland sandpiper (5.76 percent), and northern harrier (4.73 percent) (Table 9).

No federally listed species were observed during the point count surveys. One bald eagle (*Haliaeetus leucocephalus) was* observed during the survey effort. Nine of the special-status avian species; upland sandpiper, chestnut-collared longspur (*Calcarius ornatus*), grasshopper sparrow (*Ammodramus savannarum*), black tern (*Chlidonias niger*), solitary sandpiper (*Tringa solitaria*), marbled godwit (*Limosa fedoa*), bald eagle, Swainson's hawk (*Buteo swainsonii*) and horned grebe are listed as USFWS BCC. Seven species are listed as USFWS birds of habitat fragmentation concern and include: sharp-tailed grouse, upland sandpiper, northern harrier, bobolink, grasshopper sparrow, chestnut-collared longspur (*Calcarius ornatus*), and sedge wren (*Cistothorus platensis*).

Some 22 of the 24 special status species observed are also classified as either Level I or Level II North Dakota species of conservation priority[4]. The two special status birds that are not classified as species of conservation priority are the sedge wren and solitary sandpiper.

[2] The formal BCC list was developed by USFWS as a result of a 1988 amendment to the Fish and Wildlife Conservation Act. This Act mandated that USFWS "identify species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing under the Endangered Species Act (ESA) of 1973." The goal of the BCC list is to prevent or remove the need for additional ESA bird listings by implementing proactive management and conservation actions and to consult on these species in accordance with Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds.

[3] Species of habitat fragmentation concern are bird species for which a relevant federal, state, tribal, and/or local agency has found that separation of their habitats into smaller blocks reduces connectivity such that the individuals in the remaining habitat segments may suffer from effects such as decreased survival, reproduction, distribution, or use of the area. The USFWS North Dakota Field Office lists some 11 species of birds as species of habitat fragmentation concern.

[4] North Dakota's Wildlife Action Plan focuses on 115 species that are considered Species of Conservation Priority. Information relating to the distribution, abundance, habitat requirements, threats, management goals, and monitoring techniques for each of these species in included in the Wildlife Action Plan. These species are categorized into three levels according to their conservation need; (1) Level I – Species in greatest need of conservation, (2) Level II – Species in need of conservation, but have

Table 9: Special-Status Avian Species Observed during 2017-2018 Avian Point Count Surveys

Species	Number of Birds	Number of Occurrences	Mean Use (No. Birds/10 minutes)	Frequency (% of Surveys Detected)	Species Composition (%)
Lesser Scaup[4]	244	28	0.50	4.32	30.35
Western Meadowlark[4]	122	108	0.25	19.55	15.17
American White Pelican[4]	88	14	0.18	2.88	10.95
Franklin's Gull[3]	74	5	0.15	0.82	9.20
Northern Pintail[4]	66	33	0.14	6.38	8.21
Canvasback[4]	45	20	0.09	3.91	5.60
Sharp-tailed Grouse[1, 4]	33	5	0.07	1.03	4.10
Upland Sandpiper[1, 2, 4]	28	28	0.06	5.76	3.48
Northern Harrier[1, 4]	24	24	0.05	4.73	2.99
Bobolink[1, 4]	17	17	0.03	2.26	2.11
Wilson's Phalarope[3]	15	3	0.03	0.62	1.87
American Avocet[4]	11	6	0.02	1.03	1.37
Grasshopper Sparrow[1, 2, 3]	8	7	0.02	1.44	1.00
Black Tern[2, 3]	7	1	0.01	0.21	0.87
Solitary Sandpiper[2]	7	1	0.01	0.21	0.87
Willet[4]	4	4	0.01	0.82	0.50
American Kestrel[4]	3	3	0.01	0.62	0.37
Marbled Godwit[2, 3]	2	1	0.00	0.21	0.25
Bald Eagle[2, 4]	1	1	0.00	0.21	0.12
Chestnut-collared Longspur[1, 2, 3]	1	1	0.00	0.21	0.12
Horned Grebe[2, 3]	1	1	0.00	0.21	0.12
Prairie Falcon[4]	1	1	0.00	0.21	0.12
Sedge Wren[1]	1	1	0.00	0.21	0.12
Swainson's Hawk[2, 3]	1	1	0.00	0.21	0.12
Total	**218**	**102**	**0.45**	**--**	**100.00**

[1]USFWS Species of Habitat Fragmentation Concern, [2]USFWS Bird of Conservation Concern, [3]Level I North Dakota Species of Conservation Priority, [4]Level II North Dakota Species of Conservation Priority

4.1.7 Sharp-tailed Grouse

While nesting density and distribution for all bird species were of interest, sharp-tailed grouse leks are addressed in the section below due to continued agency interest in their populations.

had support from other wildlife programs, (3) Level III – Species in moderate need of conservation, but are believed to be on the edge of their range in North Dakota.

Despite aerial survey efforts for sharp-tailed grouse in April 2017, no leks were detected during the survey effort. As such, the remaining discussion below is a summary of the survey results for sharp-tailed grouse leks conducted in April 2018 using road-side listing post surveys. Aside from Lek 5, which was outside of the Project Area on adjacent land along the southern boundary of the Project, all leks detected in April 2018 were observed in the east half of the Project Area. These leks were located on large tracts of open grassland and pasture between 0.25 and 0.75 miles away from the nearest road. Lek sizes ranged from 8 to 13 individuals in attendance, with the largest numbers observed at each location being as follows: 8 individuals at Leks 1 and 2; 10 individuals at Lek 3; 13 individuals at Lek 4; and 12 individuals at Lek 5. However, it is likely that the numbers observed during the surveys are lower than actual lek populations given the distance at which some leks were observed, landscape and vegetative features such as rolling hills and scattered shrubbery that could conceal individuals, and the fluidity of attendance throughout the breeding season. As illustrated in Exhibit 16, locations of Leks 1 and 5 were field verified; however, the locations of Leks 2, 3, and 4 were estimated due to limited land access in the area.

Access to the survey routes within the Project Area was limited during the first and second survey periods in early to mid-April due to the accumulation of deep snow along portions of the existing road network within the Project Area. Access to approximately 30 miles and 35 miles of road were available during the survey periods of April 3-5 and April 9-11, respectively. Approximately 53 miles of road were accessible by the third survey period from April 19-21 and 62 miles of road were accessible by the last survey period from April 23-25.

Table 10: Summary of Confirmed Sharp-tailed Grouse Lek Locations

Lek ID	Highest Total	Lek Location Status	Activity Status
1	8	Verified	Active
2	8	Estimated	Active
3	10	Estimated	Active
4	13	Estimated	Active
5	12	Verified	Active

4.1.8 Incidental Observations

Biologists documented six additional species that were not detected during general avian point count surveys. These included the broad-winged hawk (*Buteo platypterus*), brown thrasher (*Toxostoma rufum*), Cooper's hawk (*Accipiter cooperii*), peregrine falcon (*Falco peregrinus*), rough-legged hawk (*Buteo lagopus*), and turkey vulture (*Cathartes aura*). Of these six species, only the peregrine falcon is special-status species, listed as a Level III North Dakota Species of Conservation Priority and Bird Conservation Region 11 Bird of Conservation Concern.

4.2 Eagle Point Count Surveys

Over the spring, winter, summer, and fall eagle point count survey seasons, surveys were conducted at each of the 18 fixed-point count stations twice per month in April 2017 and March 2018 and once per month from May 2017 through February 2018, for a total of 252 hours of survey effort.

A total of two bald eagle were observed for a mean use of <0.001 eagles per hour. All observations of eagles were in flight, and consisted of one juvenile and one adult. All were observed within the Study Area for a combined total of 19 minutes, and were within the elevation range of 0-200m (Table 12). Eagle observations were recorded from point count locations 10 and 14, which are generally located in the southeast quadrant of the Study Area.

Table 11: Summary of Eagle Point Count Surveys

Date	Number Hours	Number Minutes	Eagle(s) Observed?	Point ID	Total Time Observed	Approximate Flight Height
04/10/17	18	1,080	Yes	10	2	3-25m
04/27/17	18	1,080	No	--	--	--
05/15/17	18	1,080	No	--	--	--
06/15/17	18	1,080	No	--	--	--
07/13/17	18	1,080	No	--	--	--
08/07/17	18	1,080	No	--	--	--
09/05/17	18	1,080	No	--	--	--
10/09/17	18	1,080	No	--	--	--
11/09/17	18	1,080	No	--	--	--
12/07/17	18	1,080	No	--	--	--
01/09/18	18	1,080	No	--	--	--
02/13/18	18	1,080	No	--	--	--
03/09/18	18	1,080	No	--	--	--
03/27/18	18	1,080	Yes	14	17	30-50m
TOTAL	**252**	**15,120**	**--**	**--**	**19**	**--**

4.3 Aerial Raptor Nest Survey

Given the survey method employed for the raptor nest Survey Area, nests of some species such as cavity nesters (American kestrel [*Falco sparverius*]) ground nesters (short-eared owl [*Asio flammeus*]), burrowing owl [*Athene cunicularia*], and northern harrier), and woodland nesters in evergreens (accipiters and long-eared owl [*Asio otus*]) could not be effectively located. Survey emphasis was placed on locating nests of eagles, buteos (broad-winged hawks), and accipiters

and owls that nest in deciduous trees. These are the most common species that could be affected by project construction, particularly if it were to occur within the breeding season (February through August). Since the Swainson's hawk generally nests later in the season than other raptor species, nests would not have been detected during the aerial nest survey period. Therefore, it's reasonable to assume that a number of Swainson's hawks actively nest within the Survey Area along with other raptor species. While nesting density and distribution for all raptor species were of interest, bald eagles, were a focus of the survey effort due to their special protection under the Bald and Golden Eagle Protection Act (BGEPA) (16 USC, Section 668) and continued agency interest in their populations.

4.3.1 Nesting Species Composition and Frequency of Occurrence

During the survey effort, a total of 13 raptor nests were recorded (Table 13, Exhibit 12). Eight (62 percent) of the raptor nests were occupied and the remaining five (38 percent) nests were identified as unoccupied. Of the eight nests documented as occupied, five (62.5 percent) were used by red-tailed hawks, two (25 percent) were occupied by great horned owls (*Bubo virginianus*)[5], and one (12.5 percent) was occupied by a bald eagle (Table 12). Five of the active raptor nests (62.5 percent) (red-tailed hawks) were located within the Study Area. The remaining three active nests (37.5 percent) (two great horned owls, one bald eagle) were located outside of the Study Area (Exhibit 17). Of the five nests identified as inactive, three (60 percent) of the nests belonged to bald eagles and two (40 percent) belonged to red-tailed hawks (Table 12).

Red-Tailed Hawk

Red-tailed hawks were the most commonly occurring raptor nests recorded and were observed at seven locations, all of which were found within the Study Area (Exhibit 17). Five of the nests were occupied and two were unoccupied. The density of occupied red-tailed hawk nests within the 69 mi^2 Project Area was estimated at approximately 0.07 nests/mi^2.

All seven of the red-tailed hawk nests were distributed throughout the west half of the Study Area (Exhibit 17). Despite the presence of transmission powerlines in the Study Area, no red-tailed hawk nests identified were located on power poles. Instead, all nests were located in deciduous trees, either in shelterbelts near farmsteads or in isolated tree stands near wetlands.

Bald Eagle

Bald eagles were the second most commonly occurring raptor nest identified with a total of four nests recorded. All but one of these nests were found to be unoccupied (Exhibit 17). All were located in large cottonwood trees near perennial water sources. All nests identified were located in the western half of the Survey Area and two of the four nests (including the lone active nest)

[5] Nest ID #1 was a bald eagle nest used by a great horned owl. For the purposes of this report, this nest was considered to be an inactive bald eagle nest due to the fact that a bald eagle could potentially utilize the nest at a future date.

Table 12: Raptor Nest Survey Results for the Ruso Wind Energy Project

Nest ID	Species	Nest Status	Nest Condition	Substrate	Location		Comment
					Latitude	Longitude	
1	Bald Eagle	Unoccupied	Good	Deciduous Tree	47.98502	-101.1132	Occupied by great horned owl
2	Red-tailed Hawk	Unoccupied	Fair	Deciduous Tree	47.92361	-101.1262	
3	Red-tailed Hawk	Unoccupied	Poor	Deciduous Tree	47.92279	-101.1222	
4	Red-tailed Hawk	Occupied	Good	Deciduous Tree	47.90753	-101.0938	
5	Red-tailed Hawk	Occupied	Good	Deciduous Tree	47.89690	-101.0708	
6	Red-tailed Hawk	Occupied	Good	Deciduous Tree	47.89223	-101.1209	
7	Red-tailed Hawk	Occupied	Good	Deciduous Tree	47.87474	-101.1527	
8	Great Horned Owl	Occupied	Good	Deciduous Tree	47.87232	-101.1836	
9	Bald Eagle	Unoccupied	Good	Deciduous Tree	47.85176	-101.2209	
10	Red-tailed Hawk	Occupied	Good	Deciduous Tree	47.85621	-101.0879	
11	Great Horned Owl	Occupied	Good	Deciduous Tree	47.81653	-101.1846	
12	Bald Eagle	Unoccupied	Good	Deciduous Tree	47.71689	-101.1590	
13	Bald Eagle	Occupied	Good	Deciduous Tree	47.69264	-101.1587	

were located along Lake Audubon. (Exhibit 17). All of the unoccupied bald eagle nests identified were in good condition suggesting that they may have been used in the last several years. The density of occupied bald eagle nests within the 742 mi^2 Survey Area was estimated at approximately 0.005 nests/mi^2. No nests were found within the Study Area.

Great Horned Owl

Two occupied great horned owl nests were observed within the Survey Area, both of which were outside of the Study Area. This does not include the great horned owl nesting in the bald eagle nest (Exhibit 17). Although great horned owls do not build their own nest, they commonly use the nests of other raptor species such as red-tailed hawks.

5.0 DISCUSSION

5.1 General Avian Use

General avian point count surveys yielded a total of 91 bird species. Of those birds observed during the spring, summer, fall, and winter general point count surveys, the red-winged blackbird, yellow-headed blackbird, Canada goose, unidentified blackbirds, and snow goose were the most common species accounting for the majority of all birds observed. These birds are local resident and migratory species commonly associated with grassland and wetland habitats found throughout the Study Area and surrounding region, and are widely distributed across North America. The red-winged blackbird, Canada goose, and yellow-headed blackbird have all been documented as fatalities at other wind energy projects (Derby *et al.* 2007). However, project-related fatalities of these species, should they occur, are unlikely to have population-level impacts because populations for each species are large and they are widely distributed across North America.

While the Canada goose and snow goose were the most commonly observed species among waterfowl, geese and other species of waterfowl are considered to have low risk for turbine-related fatalities either due to demonstrated avoidance behavior and/or few documented fatalities at other wind energy facilities. Research has demonstrated that waterfowl rarely collide with inland wind turbines (Kingsley and Whittam 2007, Gehring 2011). The only sites experiencing regular waterfowl fatalities have been those located on the shores of large, open expanses of water (Erickson *et al.* 2002).

5.2 Special-Status Bird Species Use

No federally listed avian species were observed during spring, summer, fall, or winter avian surveys or as incidental observations within the Study Area. However, 24 of the 91 species (26.37 percent) identified during avian surveys are classified as USFWS BCC, species of habitat fragmentation concern, and/or NDGFD species of conservation priority. While these species are of interest to the USFWS and NDFGD, they are not afforded legal status or protection under state or federal statutes; they are, however, protected under the Migratory Bird Treaty Act (MBTA).

The most numerous special-status bird species observed during the avian point count surveys was the lesser scaup, followed by the western meadowlark, American white pelican, Franklin's gull, and northern pintail. Collectively these species comprised 73.88 percent of all special-status species observed. However, all four species have low mean use rates and only the northern pintail, whose encounter is 0.03 birds flying at the RSA/10min, has an encounter rate above 0. Similarly, all other special status species either have an encounter rate of 0 or were not observed flying at all.

5.2.1 Displacement and Habitat Fragmentation Effects

In addition to direct fatality associated with wind turbine collisions, concerns have been raised that some bird species may avoid areas near turbines after the wind farm is in operation (Drewitt and Langston 2006). For example, at the Buffalo Ridge wind energy facility in Minnesota, densities of male grassland songbirds were lower in Conservation Reserve Program (CRP) grasslands containing turbines than in CRP grasslands without turbines. The authors suggested that the reduced density may be due to avoidance of turbine noise and maintenance activities, and to reduced habitat quality from the presence of access roads and gravel pads surrounding the turbines, although none of these factors were examined in the study (Leddy *et al.* 1999). In addition, research at two sites in North and South Dakota (Shaffer and Johnson 2008) suggests that certain grassland songbird species may avoid turbines by up to 200 m. None of these studies have addressed whether these avoidance effects are temporary (i.e., the birds may habituate to the presence of turbines over time) or permanent.

As many grassland bird species are dependent on open expanses of intact prairie, habitat fragmentation can exacerbate the problem of habitat loss for birds by decreasing patch area and increasing edge habitat. Habitat fragmentation can affect avian species through decreased survival, reproduction, distribution, or use of the area (Robinson *et al.* 1995). Six of the species identified during general avian surveys: upland sandpiper, northern harrier, bobolink, grasshopper sparrow, black tern, and chestnut-collared longspur are listed as USFWS birds of habitat fragmentation concern. Species of habitat fragmentation concern are bird species for which a relevant federal, state, tribal, and/or local agency has found that separation of their habitats into smaller blocks reduces connectivity such that the individuals in the remaining habitat segments may suffer from effects such as decreased survival, reproduction, distribution, or use of the area.

Approximately 67 percent of the Study Area is comprised of cultivated crops, pastureland, hayfields, and other areas that are already fragmented due to roads, trails, and multiple uses within these areas. The remaining portion of the Study Area is comprised of relatively unfragmented areas containing both native and non-native grassland. Potential habitat fragmentation resulting from the Project in these areas will be reduced through avoidance and minimization measures taken during the design, construction, and operational phases of the Project. Key measures will include siting of turbines to avoid native grassland areas to the greatest extent practicable, minimizing disturbance impacts, and implementation of an Integrated Reclamation Plan.

The special-status bird species detected during point count surveys are considered to have a low risk for turbine collision at the Project due to a combination of relatively low mean use rates for most species, infrequent flight within the height of the RSA, and/or few to no records of fatalities at other wind facilities with publicly available results of mortality studies.

In general, impacts from habitat loss, displacement, and habitat fragmentation on special-status bird species and their habitats would be similar in nature and scope to those for

grassland birds. However, these impacts can be more severe for special-status species, since the distribution and abundance of many of these species are limited in the Study Area and surrounding region.

5.3 Sharp-tailed Grouse Use

Little research has been conducted on the response of sharp-tailed grouse to wind energy development; much of the information is extrapolated from other closely related grouse species (Hoffman and Thomas 2007). Prairie grouse species such as the sharp-tailed grouse rarely fly high enough to be at risk for collision with wind turbines; however, prairie grouse are sensitive to habitat alteration, the presence of manmade vertical structures, and noise in their habitat (Pittman *et al.* 2005). Research has shown that lesser prairie-chickens locate their nest sites further from buildings, transmission lines, and improved roads than would be expected at random. Sharp-tailed grouse will abandon nests and leks if construction occurs while those areas are under active use by the birds (UDNR 2002).

5.4 Raptor Use

Despite the observation that most avian fatalities at wind farms are passerines, raptor fatality (including eagles) historically has received the most attention. Raptor fatality at newer wind projects has been low relative to older-generation wind farms, although there is substantial regional variation in raptor fatality rates (Erickson *et al*. 2002; Johnson *et al*. 2002; Kerns and Kerlinger 2004; Jain *et al*. 2007). Raptors constitute approximately 6 percent of reported bird fatalities, but generally have a smaller percentage of birds observed using wind farms during pre-construction surveys (Strickland *et al*. 2011).

High raptor use (greater than 2.0 birds/20 min) has been associated with high raptor mortality at wind farms (Strickland *et al.* 2011). Conversely, raptor mortality appears to be low when raptor use is low (less than 1.0 birds/20 min; Strickland *et al.* 2011), which is the case for spring, summer, fall, and winter raptor use within the Study Area. Mean raptor use within the Study Area for the spring, summer, fall, and winter surveys seasons was low (0.246 birds/10 min and 0.288 birds/10 min, 0.720 birds/10 min, and 0.060 birds/10 min, respectively), suggesting that raptor fatality will be low as well.

The red-tailed hawk and northern harrier were the raptor species with the highest mean use and were also among the most frequently detected raptor species in the Study Area during general avian point count surveys. Both species are commonly associated with agricultural and grassland habitats which provide opportunities for foraging, an activity associated with susceptibility to turbine-collisions (Thelander *et al.* 2003). Red-tailed hawk and northern harrier fatalities have been recorded at other wind projects (Kingsley and Whittman 2005), although northern harriers have few documented mortalities, even in areas with high northern harrier use (Erickson *et al.* 2002). This could possibly be due to the fact that the species generally flies below the RSA, which is supported by the fact that no northern harriers were observed within the RSA during spring avian surveys.

Risks to non-eagle raptors are expected to be low for the Project because topographic features that encourage risky behaviors like slope-soaring and kiting are limited and discontinuous (occurring mostly in the northwest portion of the Study Area). In addition, any project-related fatalities are unlikely to have population-level impacts because red-tailed hawks are common nationwide (Sauer *et al.* 2012).

While bald eagle do occur within the Study Area during spring, their occurrence appeared to be sporadic and in low numbers. Mean eagle use within the Study Area was low (<0.001 eagles per hour), as only two bald eagle were observed flying in a straight path within the RSA of turbines during eagle point count surveys. Risks to bald eagles are expected to be low for the Project due to a combination of relatively low mean use rates, infrequent flight within the height of the RSA, lack of suitable trees for nesting, roosting and perching within the Project site, and/or few to no records of fatalities at other wind facilities with publicly available results of mortality studies.

5.4.1 Nesting Raptors

Three species of raptors; red-tailed hawks, great horned owls, and a bald eagle were documented nesting in the Survey Area, but the red-tailed hawk was the only raptor species documented nesting within the area of potential turbine locations. As previously mentioned, the nearest active bald eagle nest (Nest ID 1) was located approximately 9 miles south of the Project boundary.

The most frequently observed raptor nest within the Survey Area was the red-tailed hawk. The species is commonly associated with agricultural and grassland habitats which provide opportunities for foraging, an activity associated with susceptibility to turbine-collisions (Thelander *et al.* 2003). Results from post-construction mortality monitoring studies indicate that red-tailed hawks (228 records of fatalities; e.g., Grodsky and Drake 2011, Johnson and Erickson 2011) are frequently found as turbine-related fatalities at wind facilities. However, any project-related fatalities are unlikely to have population-level impacts because red-tailed hawks are common nationwide (Sauer *et al.* 2012).

While data on the collision risks of red-tailed tailed hawks and other raptors at wind energy facilities are well documented, currently few data concerning the collision risk of bald eagles nesting near wind energy developments are available. In general, bald eagles have been rarely documented as casualties at wind energy facilities. As of 2012, six substantiated bald eagle fatalities or injuries were documented at wind turbines in the United States and two were reported in Ontario, Canada (Allison 2012, Pagel *et al.* 2013). No known bald eagle fatalities have been recorded at wind energy facilities in the Midwest; however, one was recently reported in fall 2015 at a wind farm in Mercer County, North Dakota, although the exact cause of the eagle's death is still undetermined (Thompson 2015).

While bald eagles nest within the Survey Area, the nesting density for the species is extremely low. The nearest occupied nest of a bald eagle was over 9 miles from proposed turbine

locations. There is little foraging opportunity within and near the Project Area, particularly when compared to foraging habitat available elsewhere in the region. 252 hours of eagle point count surveys have been conducted to date, and only two eagle have been observed within the Project footprint and within the RSA. Therefore, the proposed Project is unlikely to attract migrating and resident bald eagles that may be foraging or nesting in the general region. The available evidence suggests that risk of collision for migrating, foraging, or nesting bald eagles are generally low.

6.0 REFERENCES CITED

Allison, T.D. 2012. Eagles and Wind Energy. Identifying Research Priorities. American Wind Wildlife Institute. Washington D.C. Available online at: https://awwi.org/wp-content/uploads/2013/09/AWWI_White_Paper_Eagles_and_Wind_Energy_May_2012.pdf.

Derby, C., A. Dahl, W. Erickson, K. Bay, and J. Hoban. 2007. Post-Construction Monitoring Report for Avian and Bat Mortality at the NPPD Ainsworth Wind Farm. Prepared for Nebraska Public Power District, Columbus, Nebraska.

Drewitt, A.L., and R.H.W. Langston. 2006. Assessing the Impacts of Wind Farms on Birds. Ibis 148:29-42.

Erickson, W.P., G. Johnson, D. Young, D. Strickland, R. Good, M. Bourassa, K. Bay, and K. Sernka. 2002. Synthesis and Comparison of Baseline Avian and Bat Use, Raptor Nesting and Mortality Information from Proposed and Existing Wind Developments. Technical report prepared by WEST, Inc., for Bonneville Power Administration, Portland, Oregon.

Gehring, J. 2011. Avian Studies for the Crosswinds Proposed Wind Energy Site: Summary of Fall 2010 Field Season. Prepared for Consumer's Energy. Lansing, Michigan.

Grodsky, S.M. and D. Drake. 2011. Assessing Bird and Bat Mortality at the Forward Energy Center. Final Report. Public Service Commission (PSC) of Wisconsin. PSC REF#:152052. Prepared for Forward Energy LLC. Prepared by Department of Forest and Wildlife Ecology, University of Wisconsin-Madison, Madison, Wisconsin.

Hoffman, R.W. and A.E. Thomas. 2007. Columbian Sharp-tailed Grouse (*Tympanuchus phasianellus columbianus*): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available at: http://www.fs.fed.us/r2/projects/scp/assessments/columbiansharptailedgrouse.pdf.

Jain, A., P. Kerlinger, R. Curry, and L. Slobodnik. 2007. Annual Report for the Maple Ridge Wind Power Project Post-Construction Bird and Bat Fatality Study—2006. Prepared by Curry and Kerlinger, LLC for PPM Energy, Horizon Energy, and Technical Advisory Committee for the Maple Ridge Project.

Johnson, G.D., W.P. Erickson, M.D. Strickland, M.F. Shepherd, D.A. Shepherd, and S.A. Sarappo. 2002. Collision mortality of local and migrant birds at a large-scale wind power development on Buffalo Ridge, Minnesota. Wildlife Society Bulletin 30:879-887.

Johnson, G.D. and S.E. Stephens. 2011. Wind Power and Bio Fuels: A Green Dilemma for Wildlife Conservation. Chapter 8. *In:* Energy Development and Wildlife Conservation in Western North America. D. E. Naugle, *ed.* Island Press, Washington, D.C. Pp. 131-155.

Johnson, G.D. and W.P. Erickson. 2011. Avian, Bat and Habitat Cumulative Impacts Associated with Wind Energy Development in the Columbia Plateau Ecoregion of Eastern Washington and Oregon. Prepared by West, Inc. for Klickitat County, Washington.

Kerns, J., and P. Kerlinger. 2004. A Study of Bird and Bat Collision Fatalities at the Mountaineer Wind Energy Center, Tucker County, West Virginia: Annual report for 2003. Technical report prepared by Curry and Kerlinger, LLC for FPL Energy and Mountaineer Wind Energy Center Technical Review Committee.

Kingsley, A. and B. Whittam. 2005. Wind Turbines and Birds – A Background Review for Environmental Assessment. Prepared for Environment Canada/Canadian Wildlife Service.

Kingsley, A. and B. Whittam. 2007. Wind Turbines and Birds: a Background Review for Environmental Assessment. Prepared for Environment Canada /Canadian Wildlife Service. Bird Studies Canada.

Leddy, K.L., K.F. Higgins, and D.E. Naugle. 1999. Effects of Wind Turbines on Upland Nesting Birds in CRP Grasslands. Wilson Bulletin 111:100-104.

Pagel, J.E., K.J. Kritz, B.A. Millsap, R.K. Murphy, E.L. Kershner, and S. Conington. 2013. Bald Eagle and Golden Eagle mortalities at wind energy facilities in the contiguous United States. Journal of Raptor Research 47:311–315.

Pittman, J.C., C.A. Hagen, R.J. Robel, T.M. Loughin, and R.D. Applegate. 2005. Location and success of lesser prairie-chicken nests in relation to vegetation and human disturbance. Journal of Wildlife Management 69:1259-1269.

Ralph, C.J., S. Droege, and J.R. Sauer. 1995. Managing and monitoring birds using point counts: standards and applications *in* C.J. Ralph, J.R. Sauer, and S. Droege, editors. Monitoring Bird Populations by Point Counts. PSW-GTR-149. Albany, Calif. Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture.

Reynolds, R. T., J. M. Scott, and R. A. Nussbaum. 1980. A Variable Circular-plot Method for Estimating Bird Numbers. Condor 82:309–313.

Sauer, J. R., J. E. Hines, J. E. Fallon, K. L. Pardieck, D. J. Ziolkowski, Jr., and W. A. Link. 2012. The North American Breeding Bird Survey, Results and Analysis 1966 - 2011. Version - 07.03.2013 USGS Patuxent Wildlife Research Center, Laurel, Maryland.

Shaffer, J., and D. Johnson. 2008. Displacement Effects of Wind Developments on Grassland Birds in the Northern Great Plains. NWCC Wind Wildlife Conference, October 2008. Milwaukee, Wisconsin.

Strickland, M.D., E.B. Arnett, W.P. Erickson, D.H. Johnson, G.D. Johnson, M.L. Morrison, J.A. Shaffer, and W. Warren-Hicks. 2011. Comprehensive Guide to Studying Wind Energy/Wildlife Interactions. Prepared for the National Wind Coordinating Collaborative, Washington, D.C. Available online at: http://www.nationalwind.org/assets/publications/Comprehensive_Guide_to_Studying_Wind_Energy_Wildlife_Interactions_2011.

Thelander, C.G., K.S. Smallwood, and L. Rugge. 2003. Bird Risk Behaviors and Fatalities at the Altamont Pass Wind Resource Area: Period of Performance: March 1998-December 2000.

Thompson, D. 2015. Bald Eagle Death Could Mean a New Look at Wind Turbine Siting Rules. Prairie Public News. Available online at http://news.prairiepublic.org/post/bald-eagle-death-could-mean-new-look-wind-turbine-siting-rules.

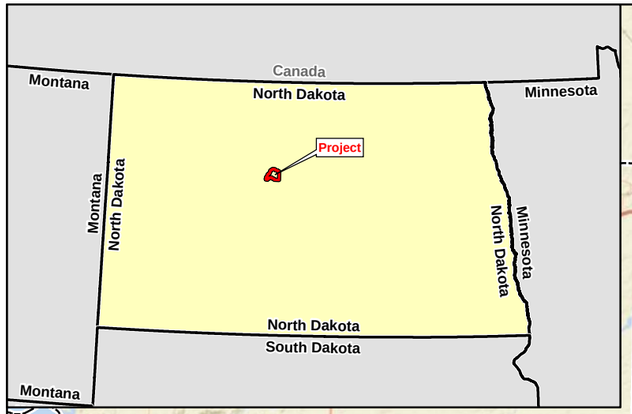
Utah Division of Natural Resources (UDNR). 2002. Strategic Management Plan for Columbia Sharp-tailed Grouse. State of Utah, Division of Natural Resources. Publication 02-19.

U.S. Fish and Wildlife Service (USFWS). 2013. Eagle Conservation Plan Guidance, Module 1 – Land-Based Wind Energy, Version 2. 71 pp. https://www.fws.gov/migratorybirds/pdf/management/eagleconservationplanguidance.pdf.

U.S. Fish and Wildlife Service (USFWS). 2012. Land-Based Wind Energy Guidelines: March 23, 2012. 71 pp. http://www.fws.gov/ecological-services/es-library/pdfs/WEG_final.pdf.

EXHIBITS

© 2017 Westwood Professional Services, Inc.



Renville County
Towner County
Ward County
Pierce County
McHenry County
Benson County
Souris River
Minot
Rugby
Mountrail County
McKenzie County
New Town
Parshall
McLean County
Audubon Lake
Garrison
Sheridan County
Wells County
Dunn County
Mercer County
Hazen
Beulah
Washburn
Oliver County
Burleigh County
Kidder County
Stutsman County
Harvey

Data Source(s): Westwood (2017); ESRI WMS World Streets Basemap Imagery (Accessed 2017).

Legend

- Project Area Boundary
- County Boundary
- Souris River

N

0 10 Miles

Ruso Wind Project

McLean & Ward County, North Dakota

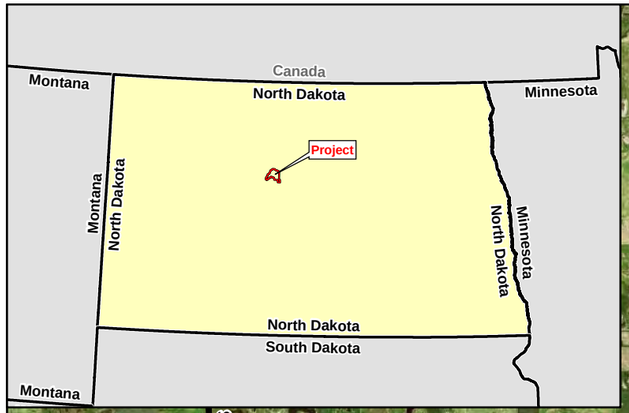
Project Area Vicinity Map

EXHIBIT 1

Westwood
Toll Free (888) 937-5150 westwoodps.com
Westwood Professional Services, Inc.

Map Document: N:\0010625.00\GIS\Avian Survey Report Exhibits\RW_ASR_Ex1_ProjectAreaVicinityMap_171019.mxd 10/19/2017 9:28:51 AM

© 2017 Westwood Professional Services, Inc.



Co Hwy 24
US Hwy 83
MS St
33rd Ave NW
Ward County
McLean County
28th St NW
State Hwy 53
Ward County
McHenry County
Hwy 41
16th Ave N
State Hwy 41
McHenry County
McLean County
Hwy 53
29th St NW
16th Ave NW
15th Ave NW

Data Source(s): Westwood (2017); ESRI WMS World Basemap Imagery (Accessed 2017); Census Bureau (2015).

Legend

- Project Area Boundary
- Major Road

N

0 1.5 Miles

Ruso Wind Project

McLean & Ward County, North Dakota

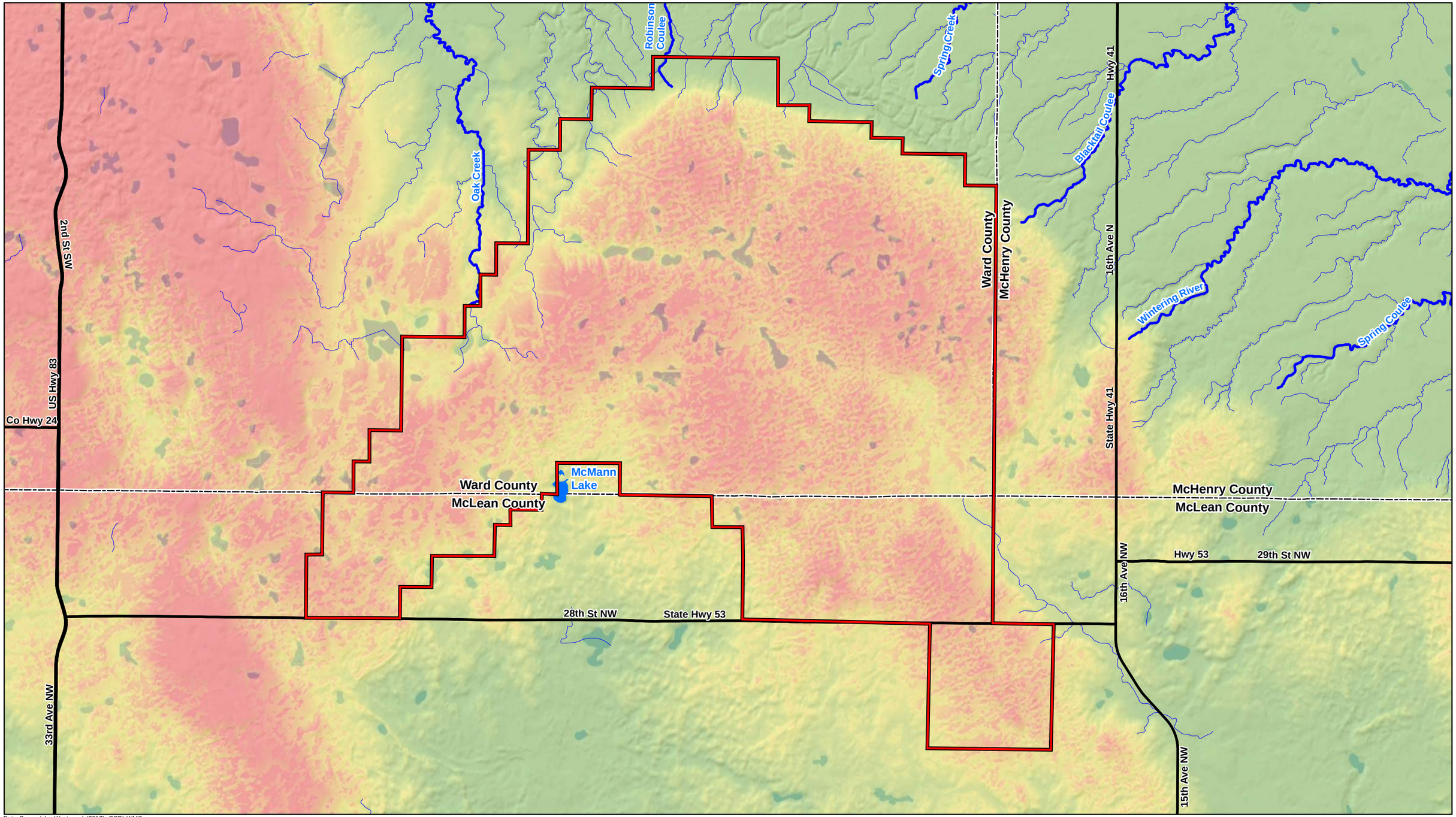
Project Area Site Map

EXHIBIT 2

Westwood
Toll Free (888) 937-5150 westwoodps.com
Westwood Professional Services, Inc.

Map Document: N:\0010625.00\GIS\Avian Survey Report Exhibits\RW_ASR_Ex2_ProjectAreaSiteMap_171019.mxd 10/19/2017 9:30:55 AM

© 2017 Westwood Professional Services, Inc.



Data Source(s): Westwood (2017); ESRI WMS World Shaded Relief Basemap Imagery (Accessed 2017); Census Bureau (2015); USGS NHD Dataset (2013).

Legend

- Study Area Boundary
- County Boundary
- Major Road
- Major Drainage Feature
- Minor Drainage Feature
- McMann Lake

Elevation Range

2,202.8ft

2,005.9ft

N

0 Miles 1.5

Westwood
Toll Free (888) 937-5150 westwoodps.com
Westwood Professional Services, Inc.

Ruso Wind Project

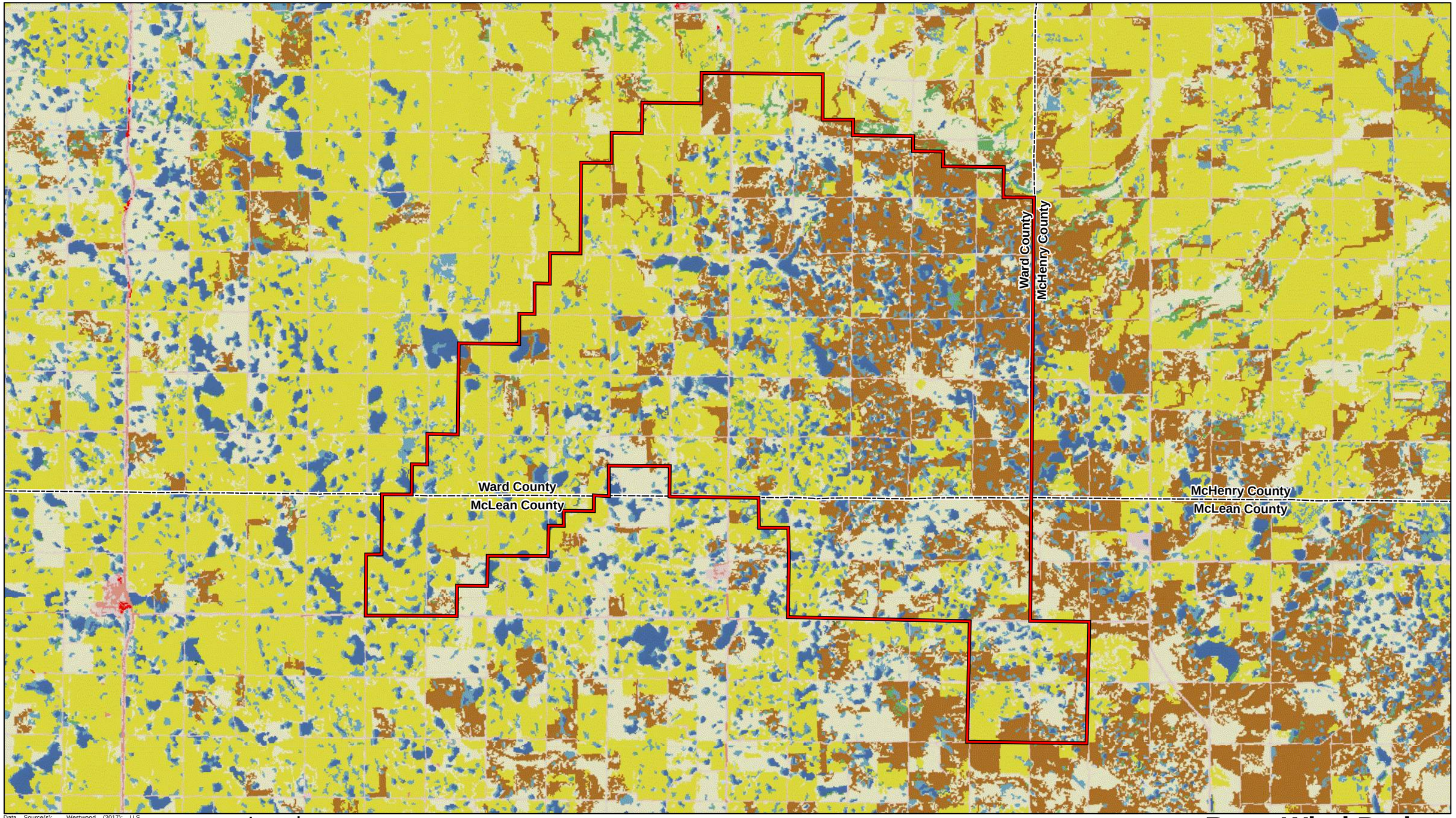
McLean & Ward County, North Dakota

Topography & Major Drainage Features

EXHIBIT 3

Map Document: N:\0010625.00\GIS\Avian Survey Report Exhibits\RW_ASR_Ex3_Topo&Drainage_171019.mxd 10/19/2017 2:32:17 PM

© 2017 Westwood Professional Services, Inc.



Data Source(s): Westwood (2017); U.S. Geological Survey (2011).

Legend

- Study Area Boundary
- County Boundary
- Open Water
- Developed, Open Space
- Developed, Low Intensity
- Developed, Medium Intensity
- Developed, High Intensity
- Barren Land
- Deciduous Forest
- Evergreen Forest
- Grassland/Herbaceous
- Pasture/Hay
- Cultivated Crops
- Woody Wetlands
- Emergent Herbaceous Wetlands

N

0 1.5 Miles

Ruso Wind Project

McLean & Ward County, North Dakota

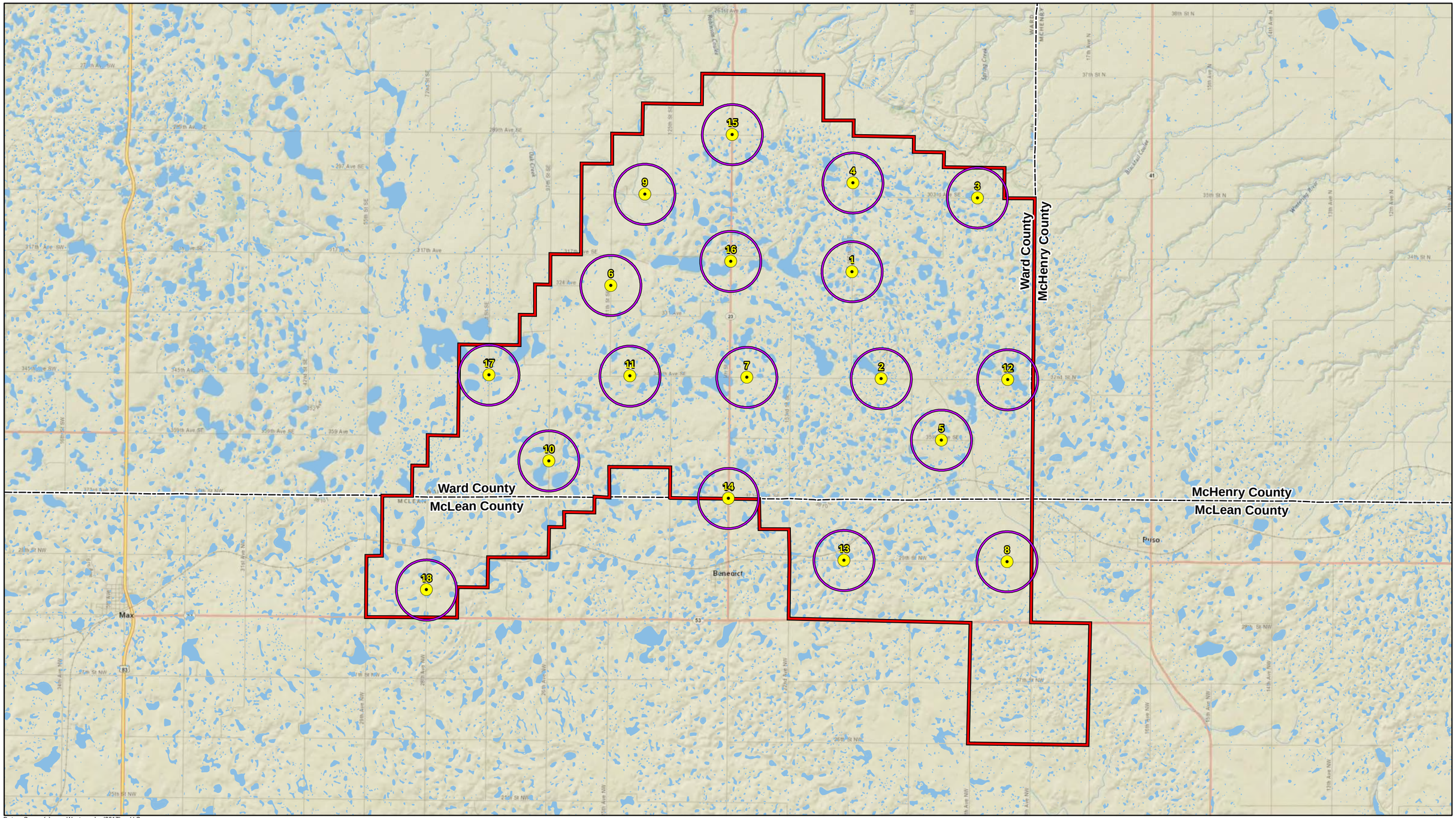
Land Cover Types

EXHIBIT 4

Westwood
Toll Free (888) 937-5150 westwoodps.com
Westwood Professional Services, Inc.

Map Document: N:\0010\625.00\GIS\Avian Survey Report Exhibits\RW_ASR_Ex4_LandCoverTypes_171019.mxd 10/19/2017 2:32:08 PM

© 2017 Westwood Professional Services, Inc.



Data Source(s): Westwood (2017); U.S. Geological Survey (2011); ESRI WMS National Geographic Basemap (Accessed 2017); U.S. Fish and Wildlife Service (2013); Ducks Unlimited (2013).

Legend

- Study Area Boundary
- NWI Wetland
- County Boundary
- General Avian & Eagle Survey Point
- Eagle Survey Point Buffer - 800 Meters

N

0 Miles 1.5

Ruso Wind Project

McLean & Ward County, North Dakota

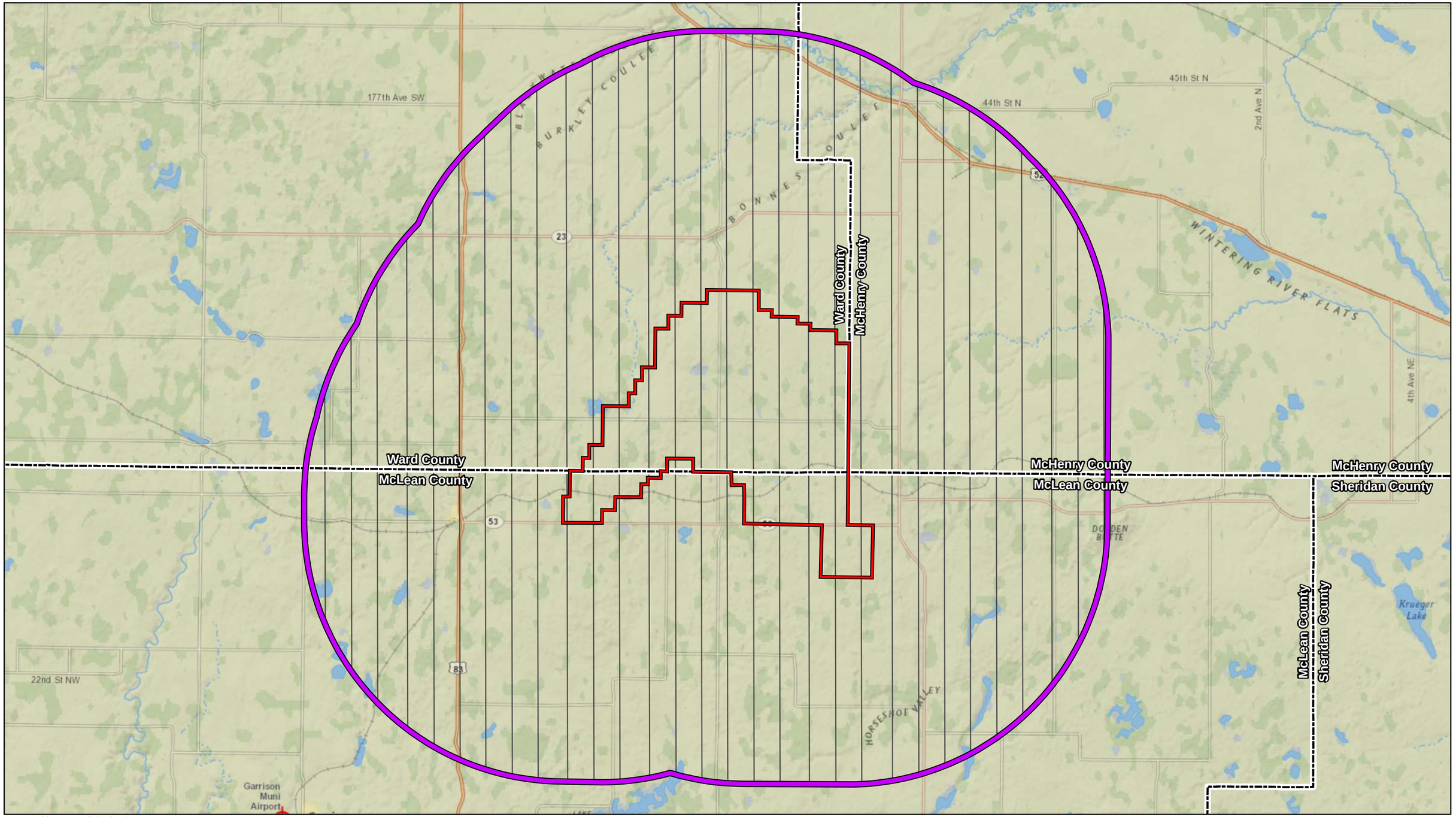
General Avian and Eagle Point Count Survey Locations

EXHIBIT 5

Westwood
Toll Free (888) 937-5150 westwoodps.com
Westwood Professional Services, Inc.

Map Document: N:\0010625.00\GIS\Avian Survey Report Exhibits\RW_ASR_Ex5_AvianPointCounts_171019.mxd 10/19/2017 2:32:34 PM

© 2017 Westwood Professional Services, Inc.



Data Source(s): Westwood (2017); ESRI (2012); ESRI WMS National Geographic World Map (Accessed 2017); U.S. Fish and Wildlife Service (2013); Ducks Unlimited (2013).

Legend

- Study Area Boundary
- County Boundary
- Survey Transect
- 10-Mile Survey Buffer

N

0 Miles 3.5

Westwood
Toll Free (888) 937-5150 westwoodps.com
Westwood Professional Services, Inc.

Ruso Wind Project

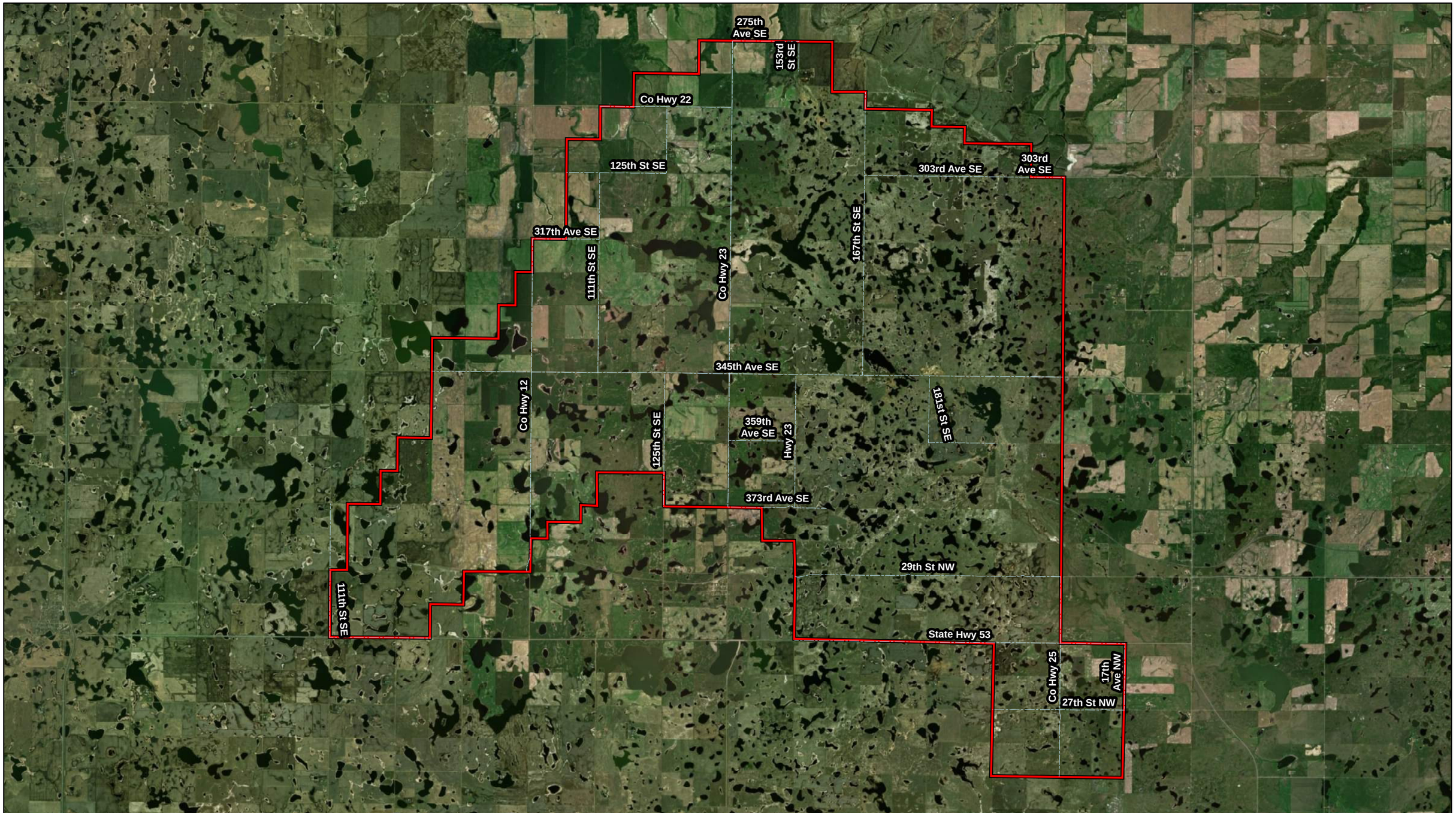
McLean & Ward County, North Dakota

Raptor Nest Survey Area

EXHIBIT 6

Map Document: N:\0010625.00\GIS\Avian Survey Report Exhibits\RW_ASR_Ex6_GeneralRaptorAndBaldEagleNestSurveyArea_171019.mxd 10/19/2017 2:32:33 PM

© 2018 Westwood Professional Services, Inc.



Data Source(s): Westwood (2017); U.S. Geological Survey (2011); ESRI WMS National Geographic Basemap (Accessed 2017); U.S. Fish and Wildlife Service (2013); Ducks Unlimited (2013).

Map Document: N:\0010\0625.00\GIS\Avian Survey Report Exhibits\Annual Report\RW_LekLocations_Ex7.mxd 6/19/2018 8:32:58 AM

Westwood
Toll Free (888) 937-5150 westwoodps.com
Westwood Professional Services, Inc.

Legend

Project Area

Survey Roads

N

0 Miles 1.5

Ruso Wind Project

McLean & Ward County, North Dakota

Sharp-tailed Grouse Survey Roads

Exhibit 7

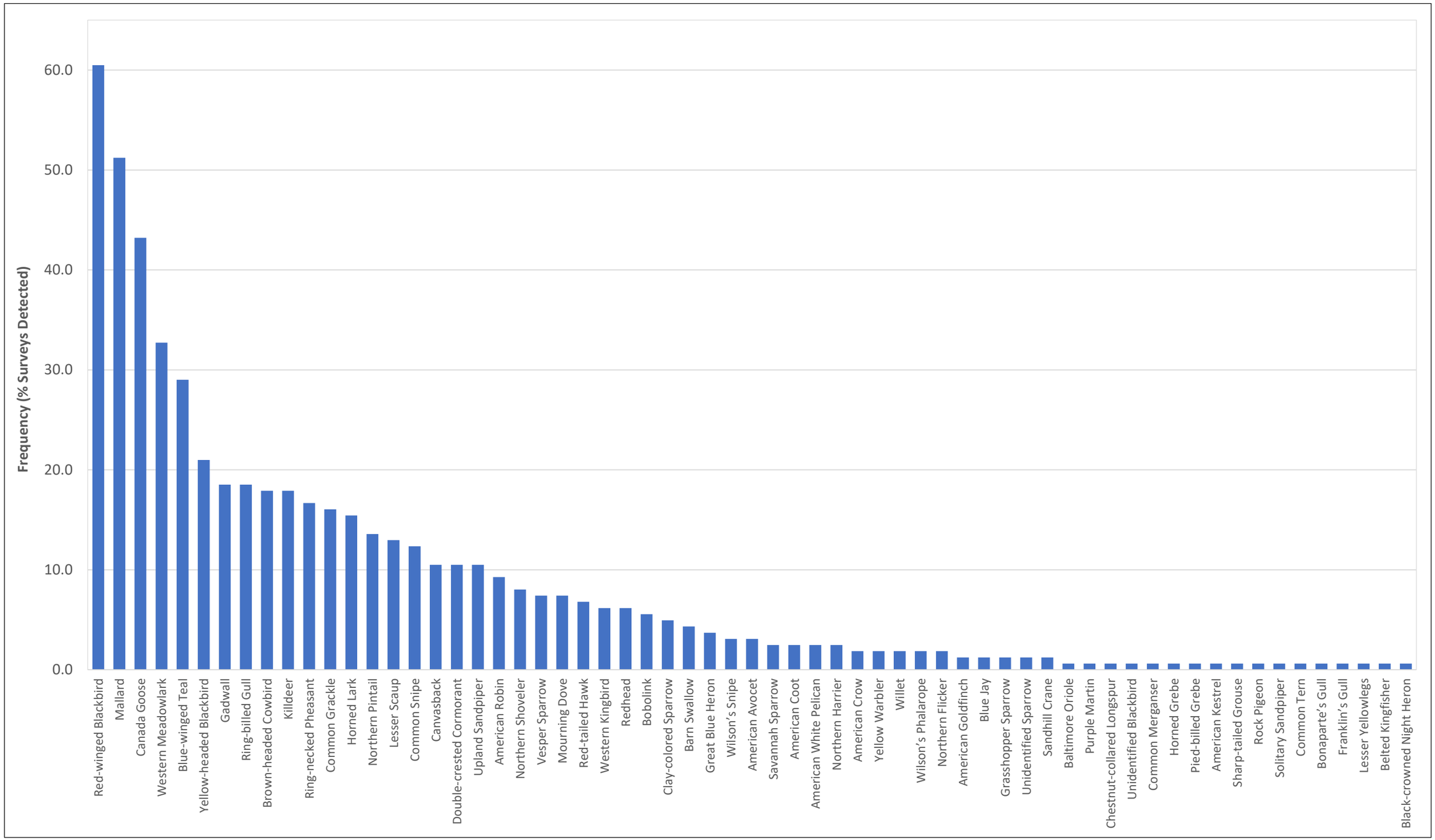


Exhibit 8: Frequency of Birds Observed During Spring General Avian Point Count Surveys

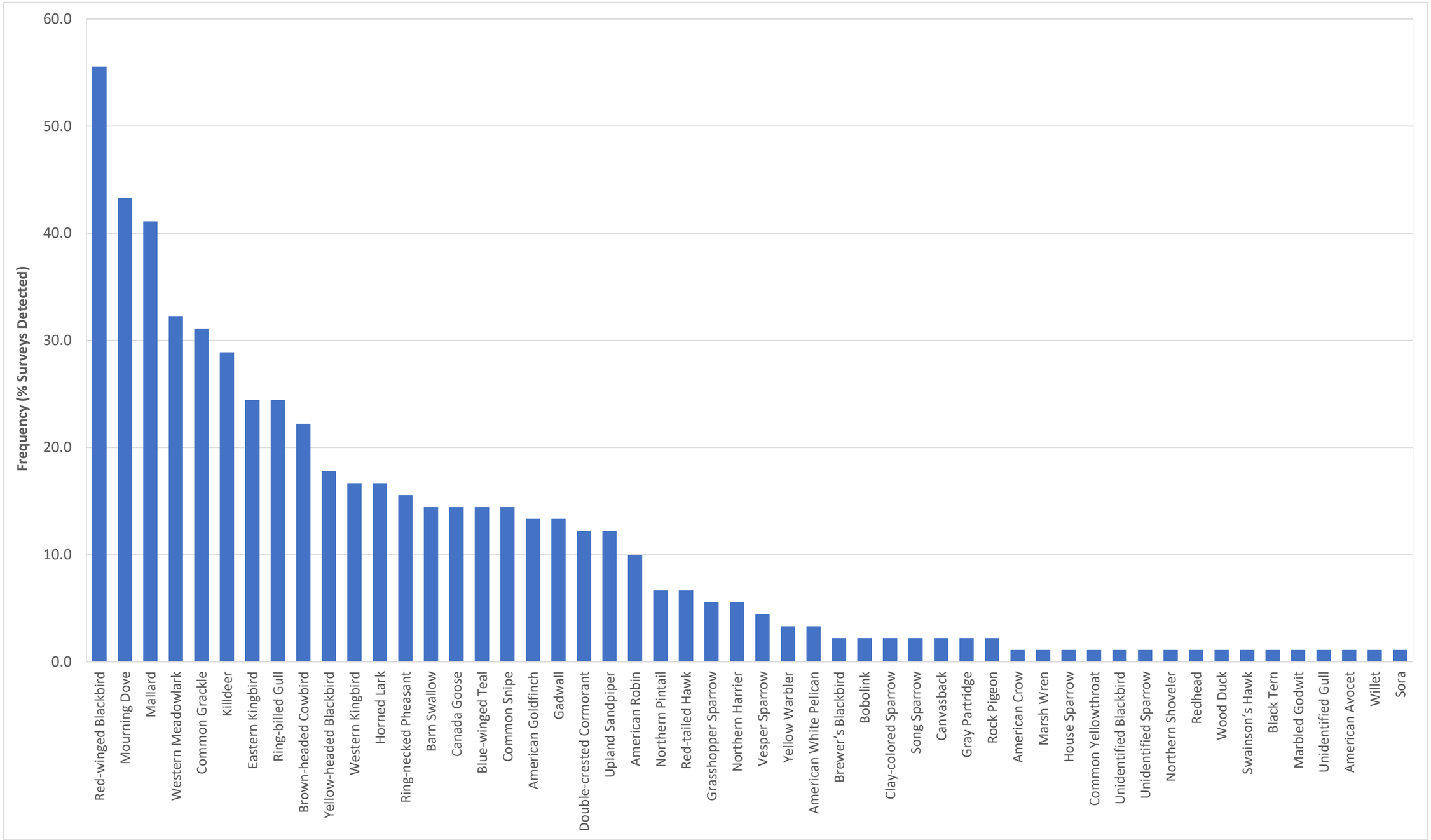


Exhibit 9: Frequency of Birds Observed During Summer General Avian Point Count Surveys

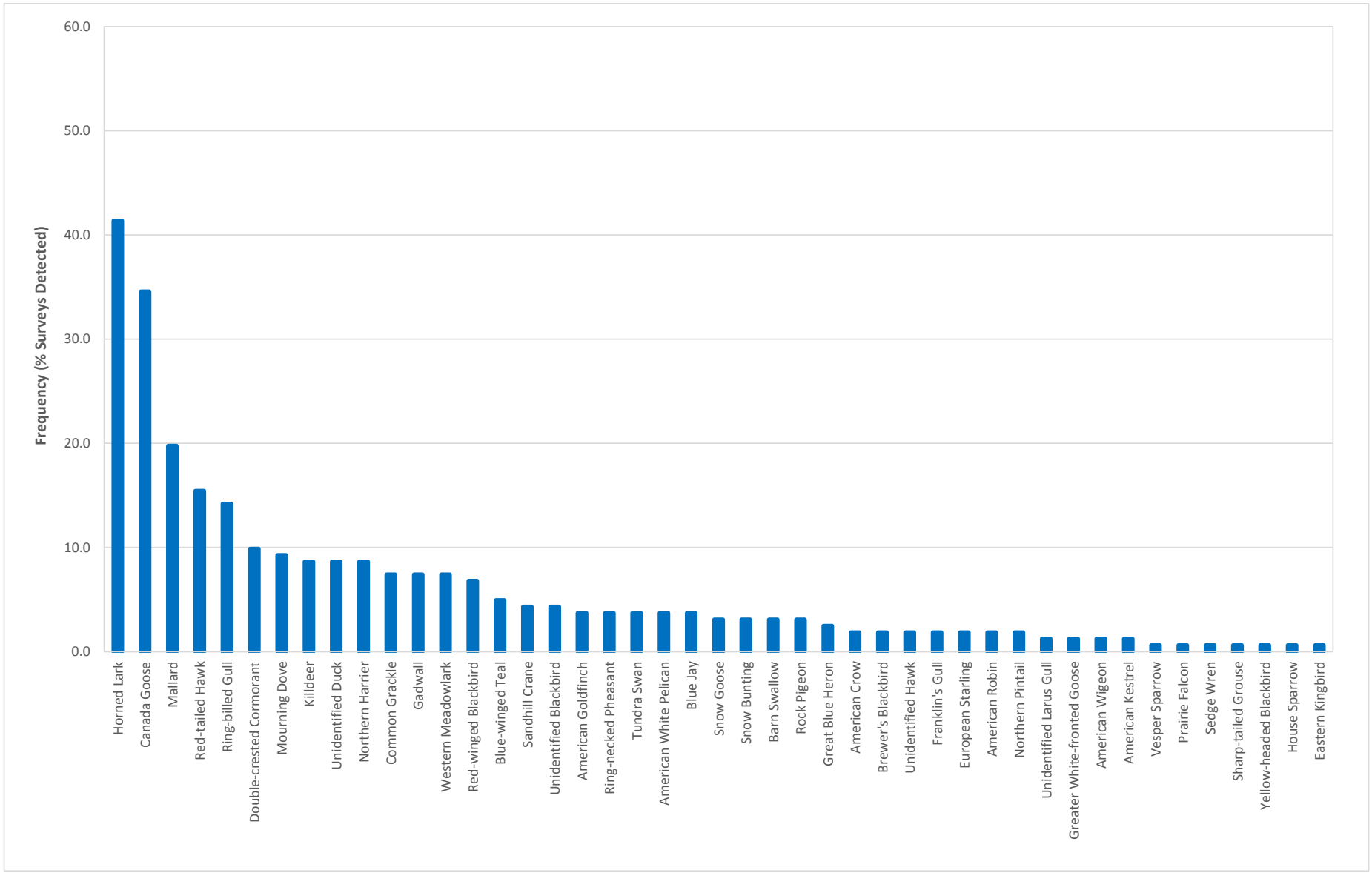


Exhibit 10: Frequency of Birds Observed During Fall General Avian Point Count Surveys

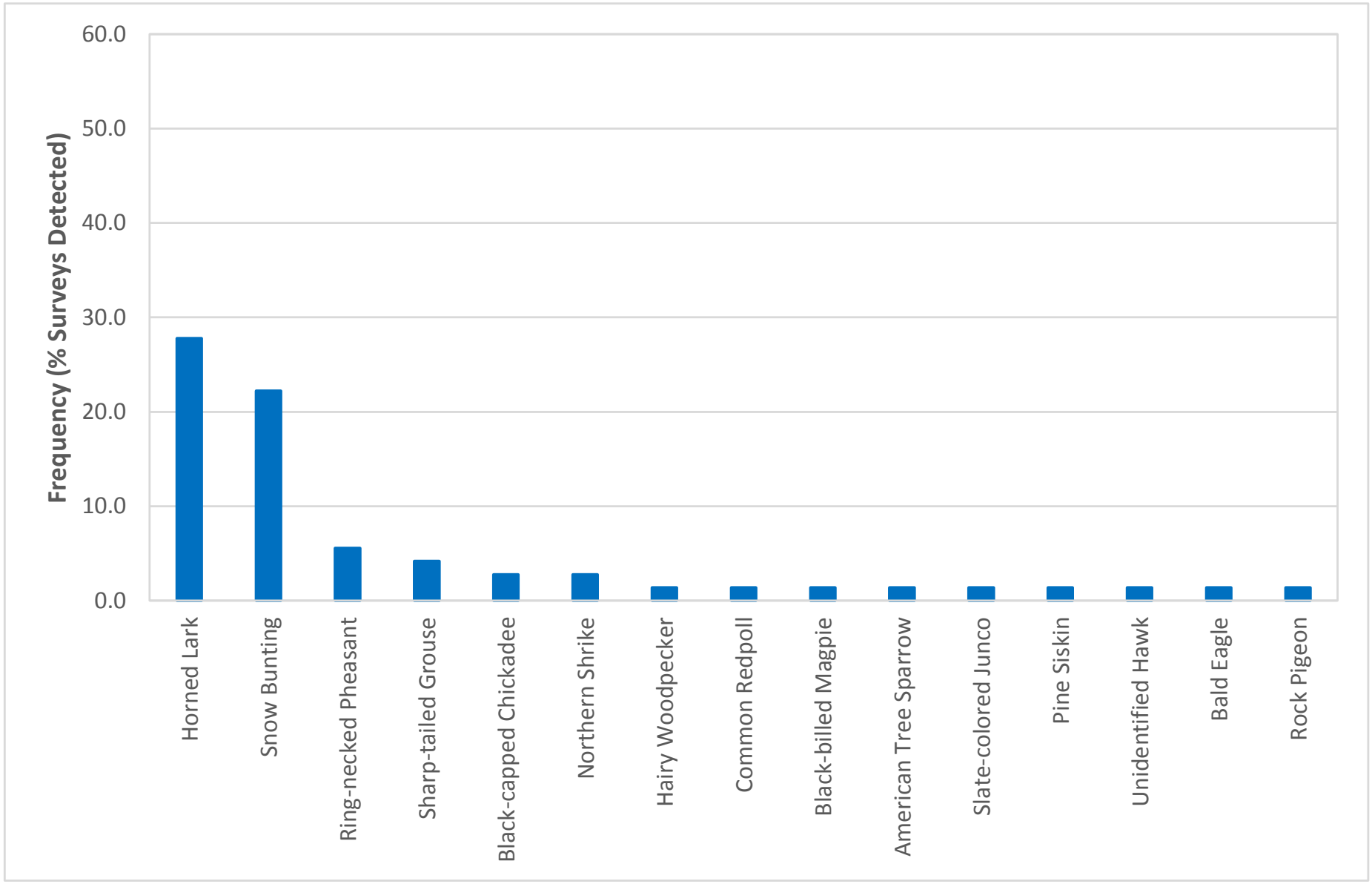
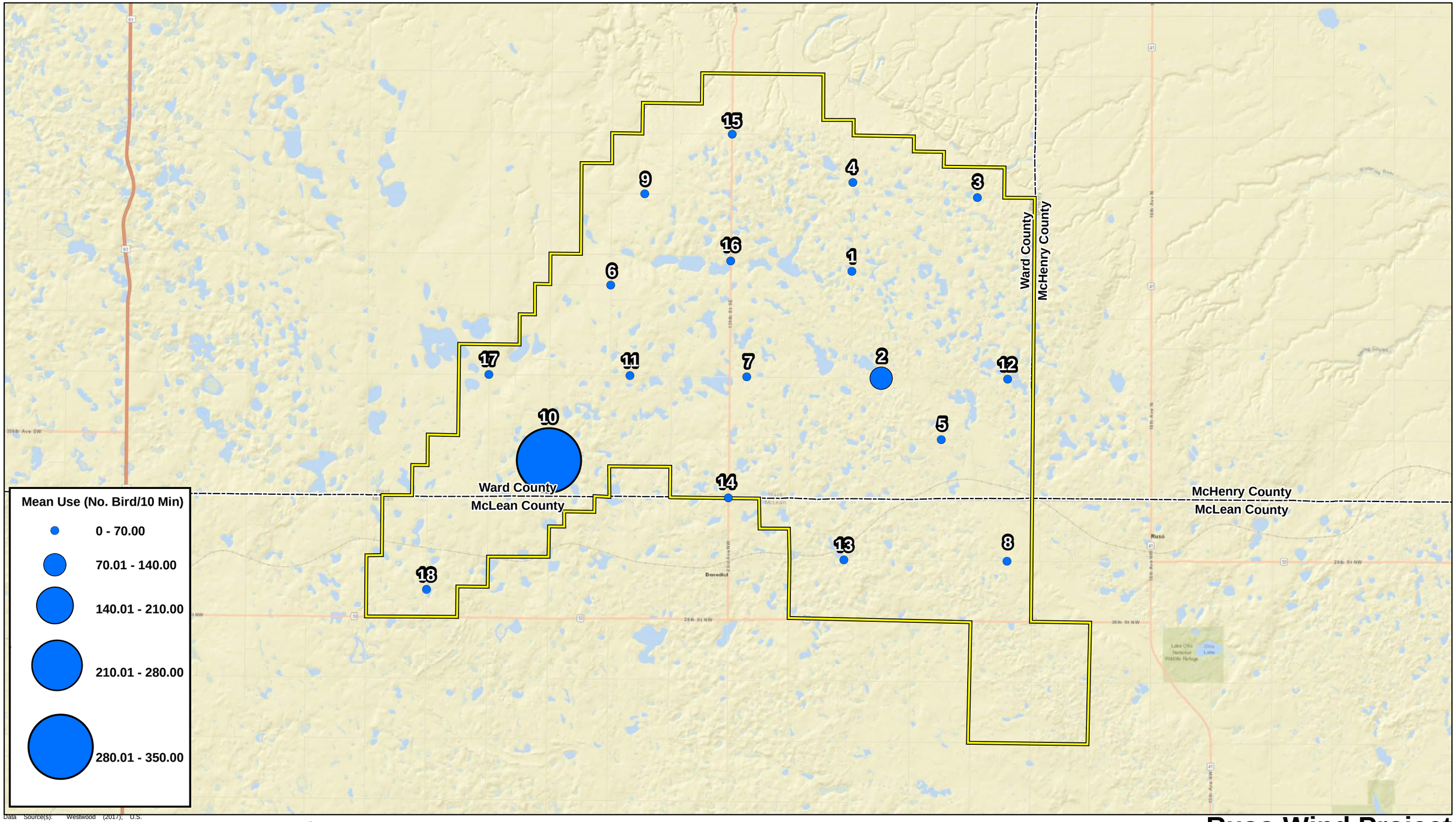


Exhibit 11: Frequency of Birds Observed During Winter General Avian Point Count Surveys

© 2018 Westwood Professional Services, Inc.



Mean Use (No. Bird/10 Min)

- 0 - 70.00
- 70.01 - 140.00
- 140.01 - 210.00
- 210.01 - 280.00
- 280.01 - 350.00

Data Source(s): Westwood (2017); U.S. Geological Survey (2011); ESRI WMS World Streets Basemap (Accessed 2017); U.S. Fish and Wildlife Service (2013); Ducks Unlimited (2013).

Legend

- Study Area Boundary
- County Boundary
- 20 Point Number

N

0 1.5 Miles

Ruso Wind Project

McLean & Ward County, North Dakota

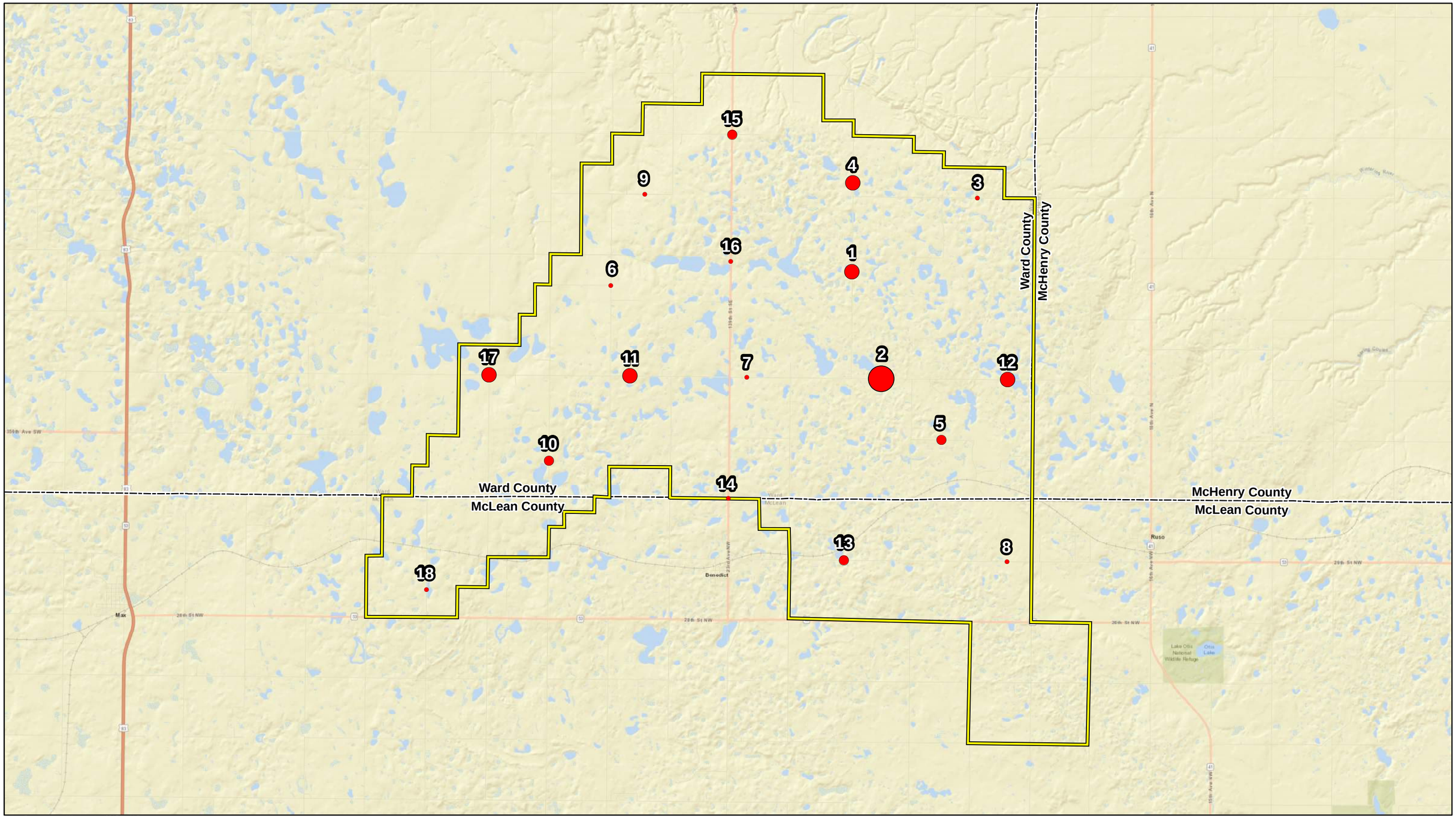
Mean Bird Use by Sample Point for all Surveys Combined

EXHIBIT 12

Westwood
Toll Free (888) 937-5150 westwoodps.com
Westwood Professional Services, Inc.

Map Document: N:\0011625.00\GIS\Avian Survey Report Exhibits\Annual Report\RW_Ex12_MeanBirdUse_181614.mxd 6/19/2018 11:04:08 AM

© 2018 Westwood Professional Services, Inc.



Data Source(s): Westwood (2017); U.S. Geological Survey (2011); ESRI WMS World Streets Basemap (Accessed 2017); U.S. Fish and Wildlife Service (2013); Ducks Unlimited (2013).

Legend

- Study Area Boundary
- County Boundary
- 20 Point Number

Species Richness (No. Species/Survey Point)

- 23 - 28
- 29 - 33
- 34 - 39
- 40 - 44
- 45 - 49

N

0 Miles 1.5

Ruso Wind Project

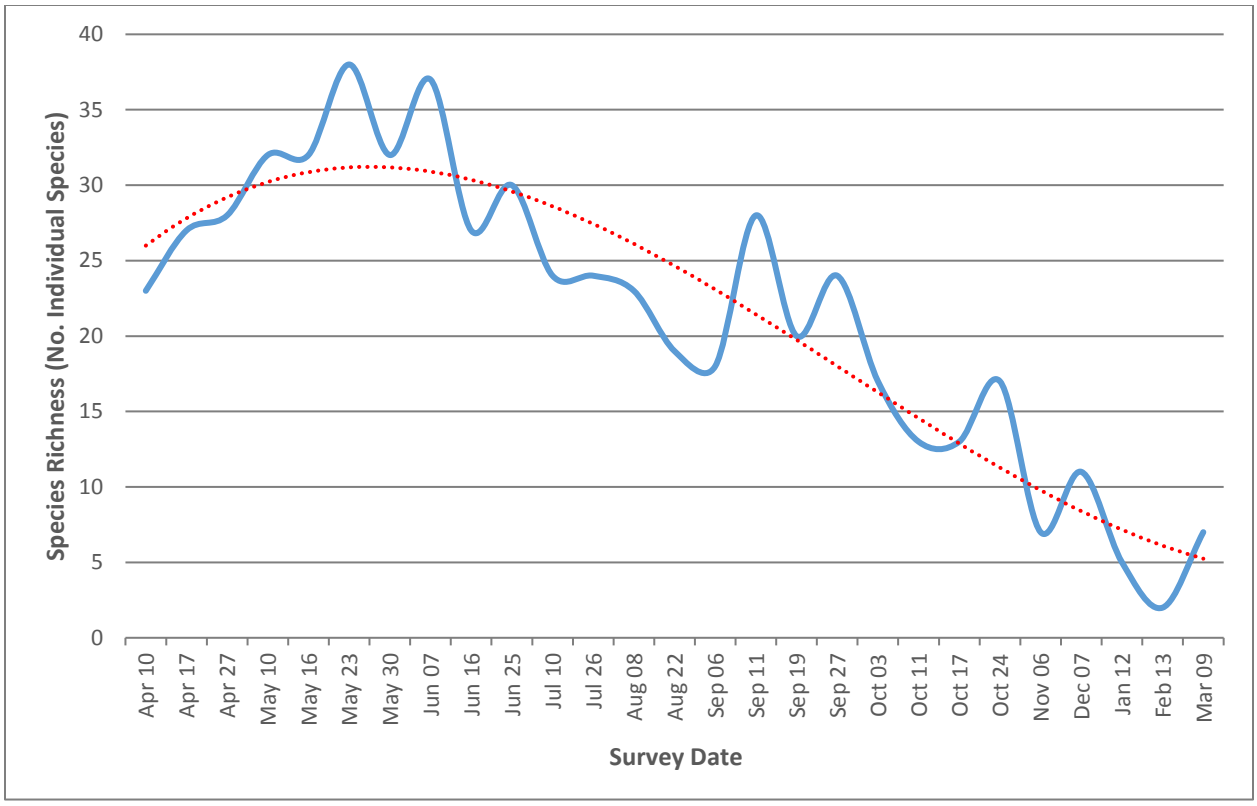
McLean & Ward County, North Dakota

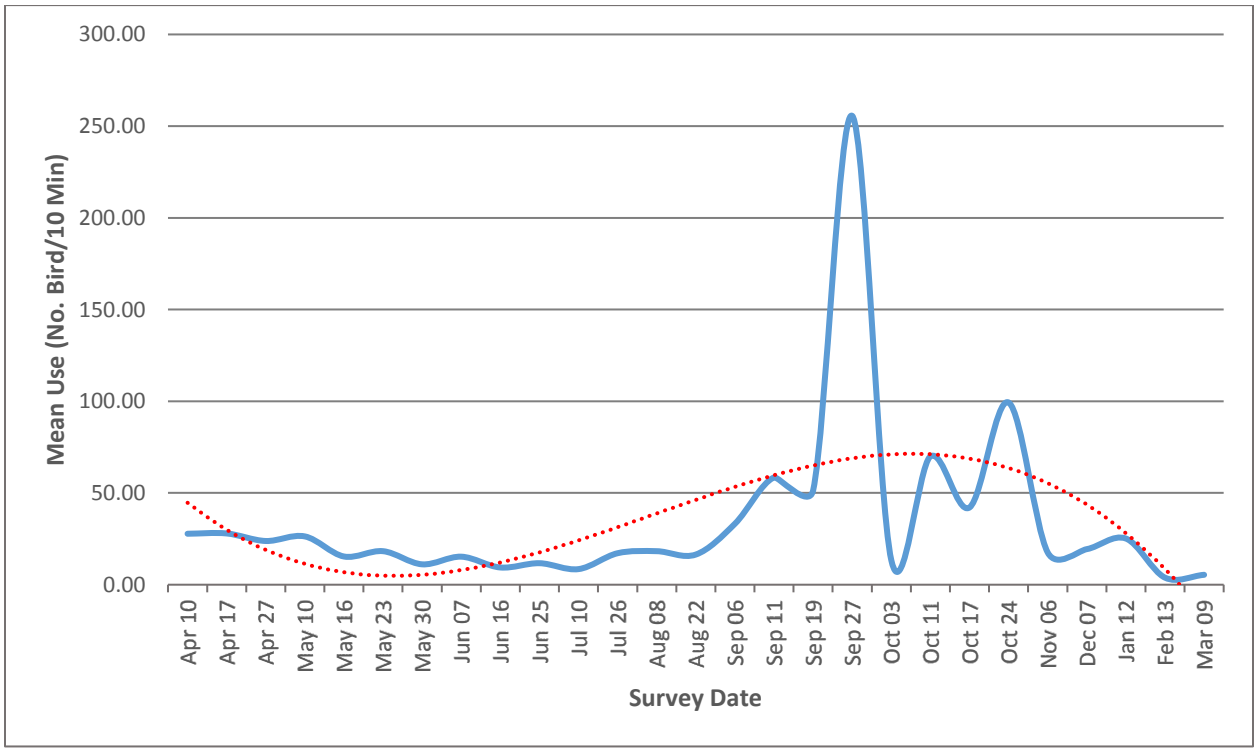
Bird Species Richness by Sample Point for all Surveys Combined

EXHIBIT 13

Westwood
Toll Free (888) 937-5150 westwoodps.com
Westwood Professional Services, Inc.

Map Document: N:\0010625.00\GIS\Avian Survey Report Exhibits\Annual Report\RW_Ex13_SpRichness_181614.mxd 6/19/2018 1:44:03 PM





Exhibits 14 a and b: Mean Use and Species Richness by Survey Period for all Birds Combined during Spring, Summer, Fall and Winter General Avian Point Counts

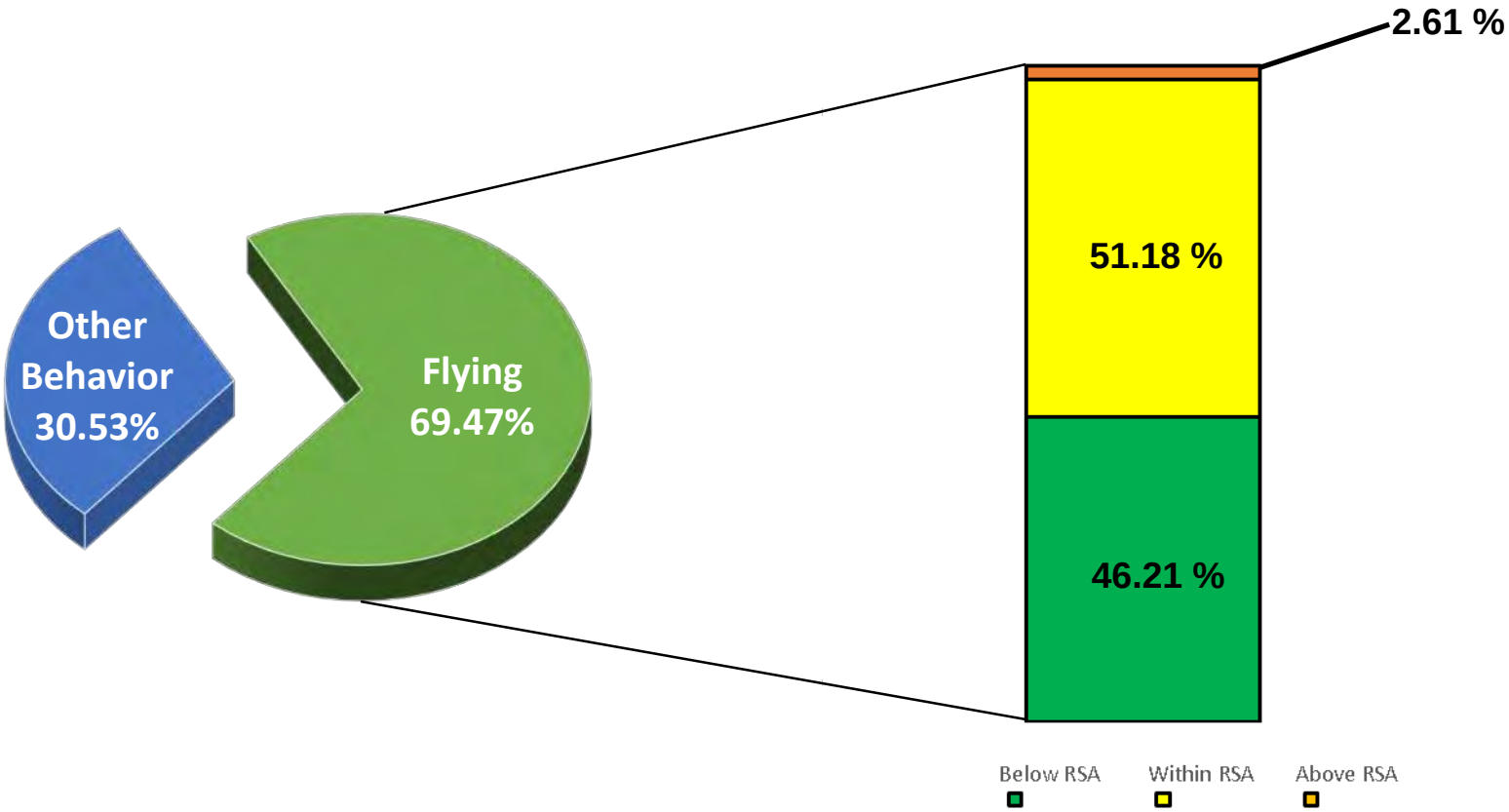
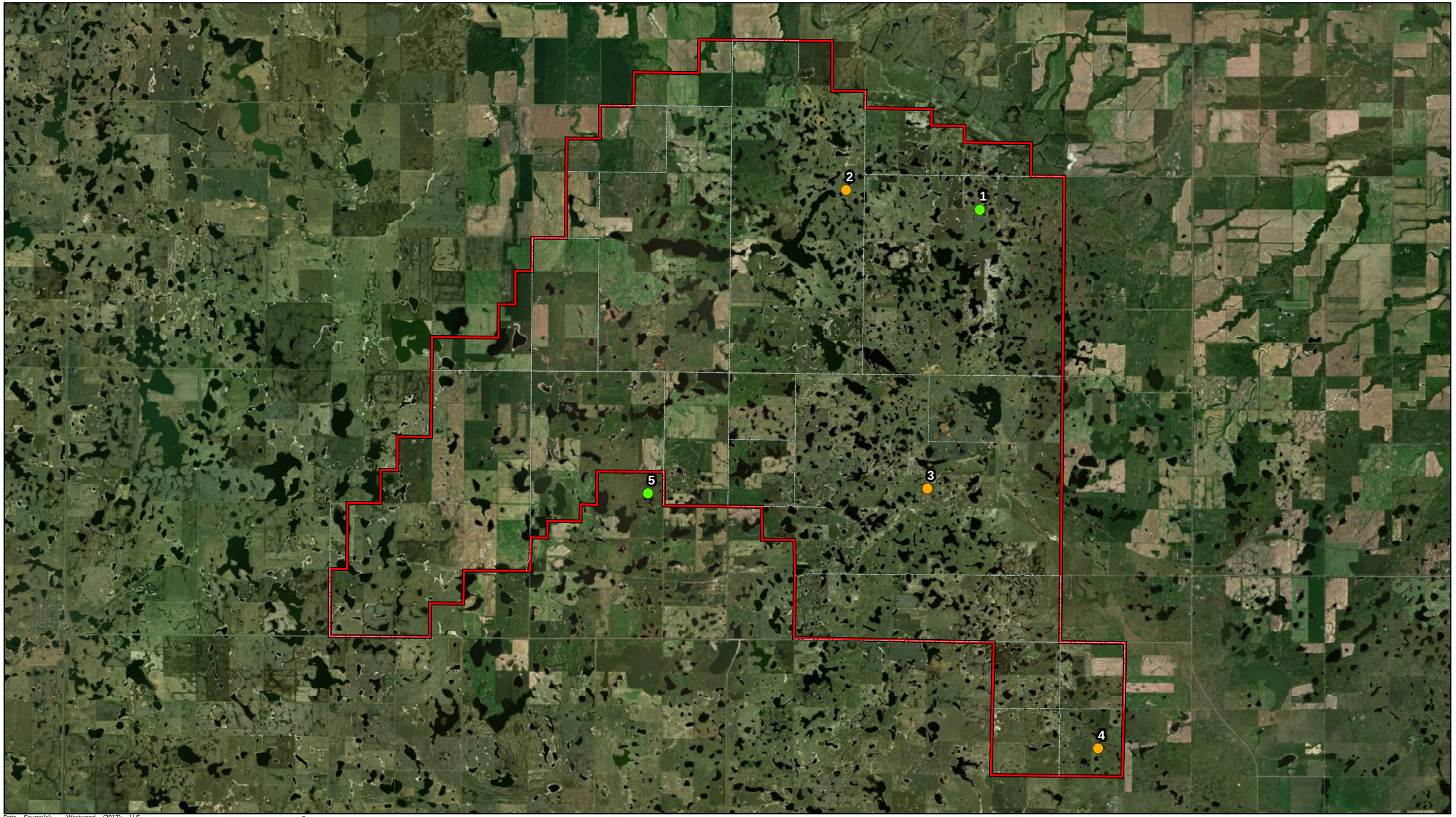


Exhibit 15: Height Data for Birds Observed Flying for all General Avian Point Count Surveys Combined

© 2018 Westwood Professional Services, Inc.



Data Source(s): Westwood (2017); U.S. Geological Survey (2011); ESRI WMS National Geographic Basemap (Accessed 2017); U.S. Fish and Wildlife Service (2013); Ducks Unlimited (2013).

Legend

- Project Area
- Survey Roads
- Estimated Lek Location
- Verified Lek Location

N

0 Miles 1.5

Ruso Wind Project

McLean & Ward County, North Dakota

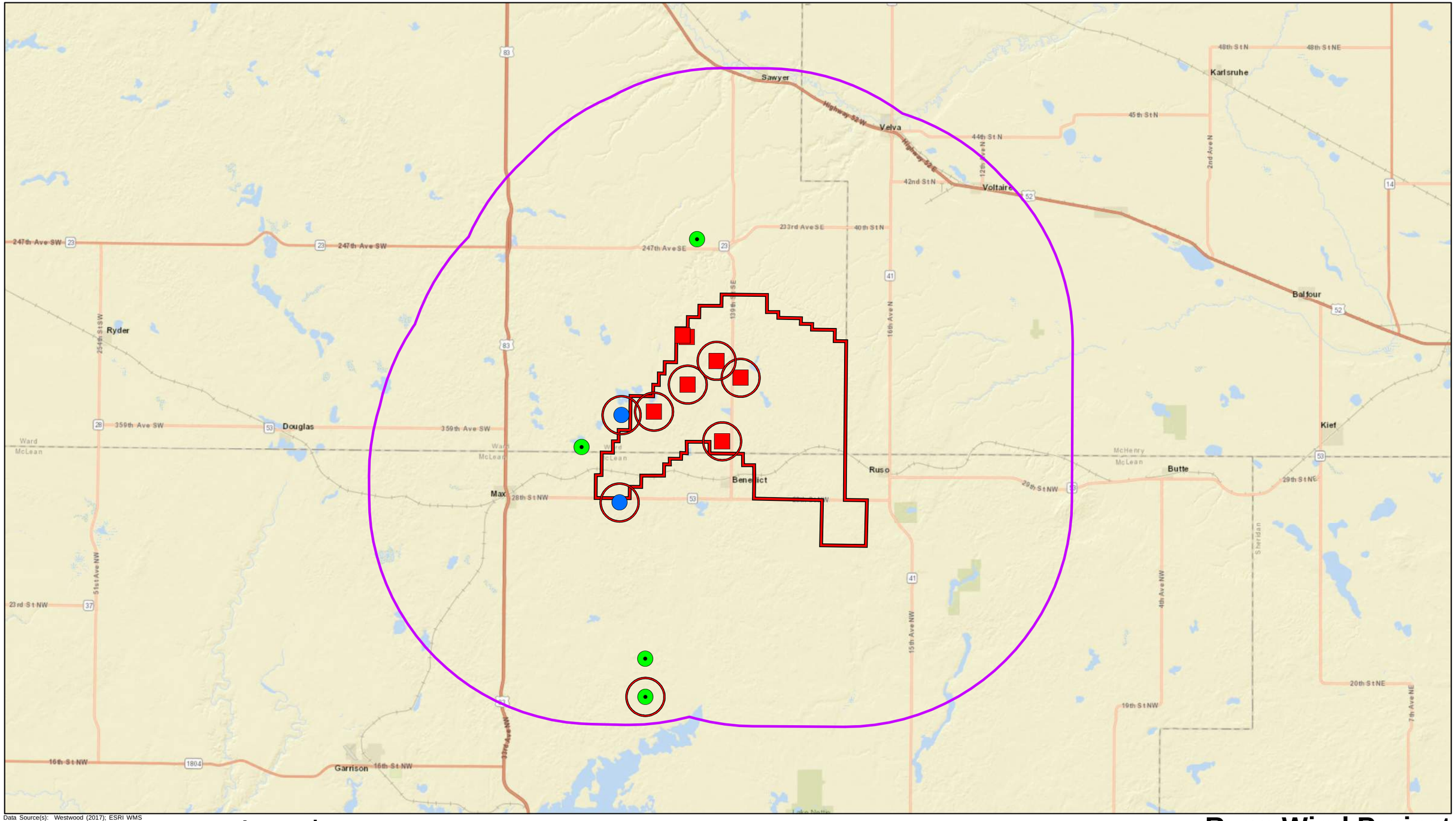
Lek Locations

Exhibit 16

Westwood
Toll Free (888) 937-5150 westwoodps.com
Westwood Professional Services, Inc.

Map Document: N:\0010625.00\GIS\Lek Surveys\RW_LekLocations_180501.mxd 5/8/2018 1:44:37 PM

© 2017 Westwood Professional Services, Inc.



Data Source(s): Westwood (2017); ESRI WMS World Basemap Imagery (Accessed 2017); Census Bureau (2015).

Legend

- Study Area Boundary
- 10-Mile Nest Survey Buffer

Species

- Bald Eagle
- Great-horned Owl
- Red-tailed Hawk
- Active Nest

N

0 Miles 4

Westwood
Toll Free (888) 937-5150 westwoodps.com
Westwood Professional Services, Inc.

Ruso Wind Project

McLean & Ward County, North Dakota

Raptor Nest Survey Area

Exhibit 17

Map Document: N:\0010625.00\GIS\Avian Survey Report Exhibits\RW_ASR_Ex12_NestSurveyArea_171019.mxd 10/19/2017 2:32:02 PM

Appendix H. Grassland Assessment

GRASSLAND ASSESSMENT

Ruso Wind Project

McHenry, McLean, and Ward Counties, North Dakota

Final Report

Prepared for:

Southern Power Company

3535 Colonnade Parkway
Birmingham, Alabama 35243

Prepared by:

Kristen Chodachek and Katherine Moratz

Western EcoSystems Technology, Inc.
4007 State Street, Suite 109
Bismarck, North Dakota 58503

September 13, 2018

Privileged and Confidential - Not For Distribution

STUDY PARTICIPANTS

Western EcoSystems Technology, Inc.

Clayton Derby	Senior Manager/Report Reviewer
Kristen Chodachek	Project Manager/Report Reviewer
Katherine Moratz	Field Biologist/Report Writer
Ann Dahl	GIS Specialist
Katie Wynne	Technical Editor

REPORT REFERENCE

Chodachek, K and K. Moratz. 2018. Grassland Assessment, Ruso Wind Project, McHenry, McLean, and Ward Counties, North Dakota. Draft Report. Prepared for Southern Power Company, Birmingham, Alabama. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. September 13, 2018.

TABLE OF CONTENTS

INTRODUCTION 1

PROJECT AREA 1

METHODS 3

Desktop Review 3

Field Surveys 3

Quality Assurance and Quality Control 4

RESULTS 4

Desktop Review and Field Surveys 4

Geospatial Data 6

REFERENCES 8

LIST OF TABLES

Table 1. Summary of acres and composition* by sod type assessed during field surveys completed June 12 – 15 and 18 – 21, 2018 at the Ruso Wind Project, McHenry, McLean, and Ward counties, North Dakota. 4

Table 2. Summary of grassland acres and composition* by field survey type and sod type assessed during field surveys completed June 12 – 15 and 18 – 21, 2018 at the Ruso Wind Project in McHenry, McLean, and Ward counties, North Dakota. 6

Table 3. Attributes and definitions for the grassland survey shapefile based on the desktop review and field surveys completed June 12 – 15 and 18 – 21, 2018 at the Ruso Wind Project in McHenry, McLean, and Ward counties, North Dakota. 6

LIST OF FIGURES

Figure 1. Location of the Ruso Wind Project in McHenry, McLean, and Ward counties, North Dakota. 2

Figure 2. Sod types assessed during field surveys completed June 12 – 15 and 18 – 21, 2018 at the Ruso Wind Project in McHenry, McLean, and Ward counties, North Dakota. 5

Figure 3. Survey type used during field surveys completed June 12 – 15 and 18 – 21, 2018 at the Ruso Wind Project in McHenry, McLean, and Ward counties, North Dakota. 7

.

INTRODUCTION

Ruso Wind, LLC, a subsidiary of Southern Power Company (Southern) is developing the Ruso Wind Project (Project) in McHenry, McLean, and Ward counties, North Dakota (Figure 1). Southern requested Western EcoSystems Technology, Inc. (WEST) conduct a grassland assessment to inform siting within the proposed Project area. The following criteria were assessed during the desktop review and field surveys: 1) identify sod type (i.e., unbroken native prairie or previously broken grasslands), 2) record grass and forb species composition as potential indicator of quality of grasslands, and 3) document potential Dakota skipper (*Hesperia dacotae*) habitat within proposed development areas during the field survey.

PROJECT AREA

The 47,799.0 acres (ac; 19,344.0 hectares [ha]) Project area is located in McHenry, McLean, and Ward counties, approximately 1.0 mile (1.6 kilometers) north of the town of Ruso, North Dakota (Figure 1). The Project occurs within the Missouri Coteau and Drift Plains Level IV Ecoregions (US Environmental Protection Agency [USEPA] 2017). The Missouri Coteau Level IV Ecoregion is dotted with wetland depressions and is used for tilled agriculture and grazing (USEPA 2017). The Drift Plains Level IV Ecoregion contains many temporary and seasonal wetlands and most of the landscape has been tilled due to its productive soil and relatively level topography (USEPA 2017). Topography is flat to rolling, with elevations ranging from 542.0 – 672.0 meters (1,778.2 – 2,204.7 feet) above sea level (US Geological Survey [USGS] 2017)

Land ownership is primarily private, with some state-managed and federally administered lands occurring in the Project area. Areas of North Dakota State School Land, US Fish and Wildlife Service (USFWS) Waterfowl Production Areas, and USFWS easements are found within the Project (USGS 2018).

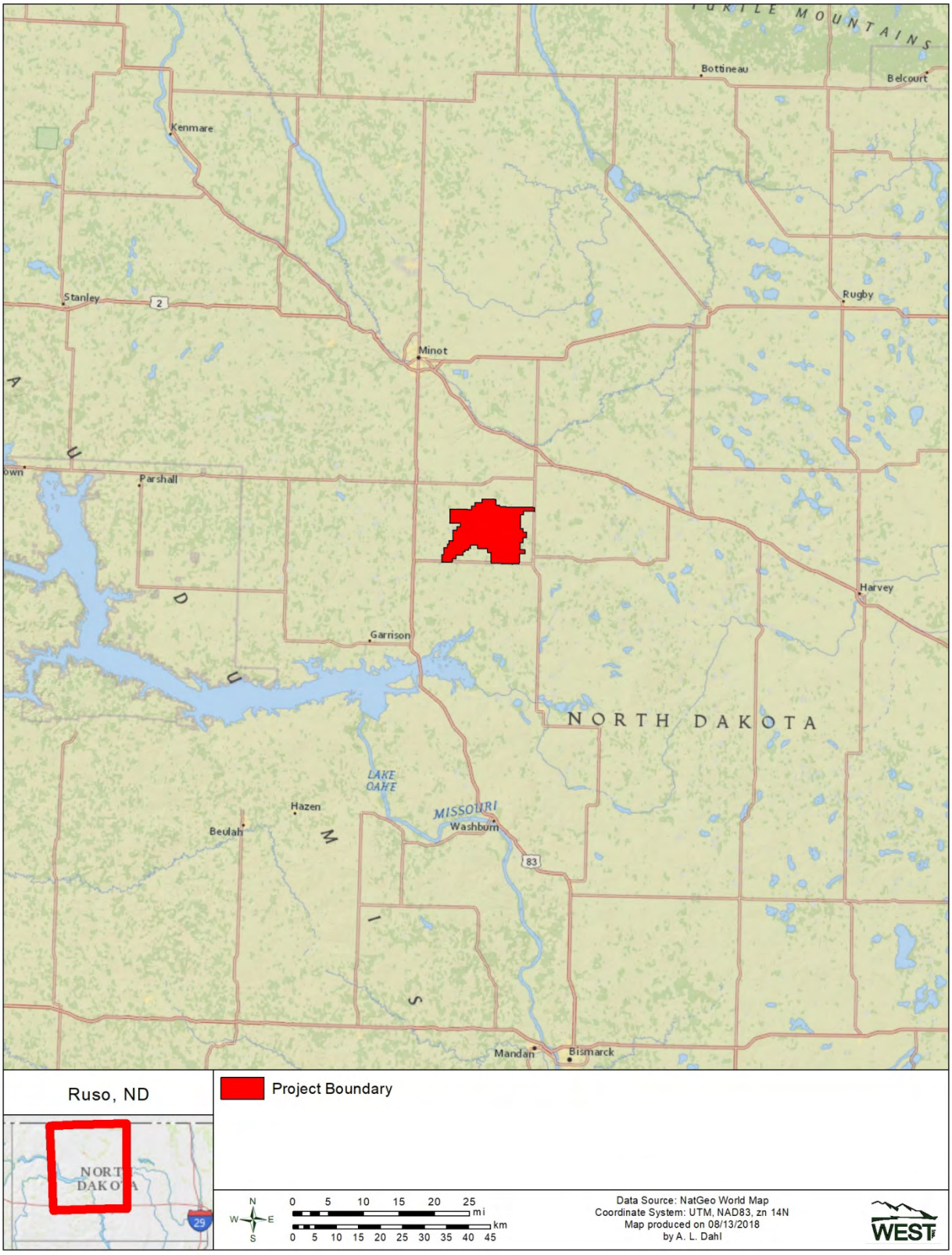


Figure 1. Location of the Ruso Wind Project in McHenry, McLean, and Ward counties, North Dakota.

METHODS

Desktop Review

A desktop review of existing land use/land cover features within the Project area using current aerial photography (US Department of Agriculture [USDA] National Agriculture Imagery Program 2018), existing land cover data (USGS National Land Cover Database 2011, USDA National Agricultural Statistics Service 2017), and North Dakota Game and Fish Department's (NDGFD) Native Habitat layer (NDGFD 2016) was completed using ESRI Software (ArcGIS 10.3.1). This desktop review resulted in a digital data layer land use/land cover polygons. Polygons were classified as grassland (i.e., unbroken native prairie or previously broken grassland) or other (i.e., non-grass areas such as cultivated cropland, roads, barren areas, development, wetlands, etc.). Unbroken native prairie showed no evidence of soil disturbance. Previously broken grasslands were identified based on features such as rock piles; presence, amount, and apparent height of trees and shrubs; field edge changes; straight line features indicating plowing, discing, harvesting, or planting; and any other features indicating human disturbance.

Field Surveys

Field surveys were completed June 12 – 15 and 18 – 21, 2018 to assess and confirm grassland boundaries, land use/land cover, species composition, and sod type. The priority for the field surveys was larger blocks of continuous grassland where access was permitted. Grasslands were visually assessed from public roads and on foot where access was permitted. Grasslands not field surveyed due to road access issues, client request, or health and safety concerns (i.e., unruly livestock) were assigned to the "no access/no survey" category. Grasslands that appeared different than the desktop review were delineated on a map; identified as unbroken native prairie or previously broken grassland and digitized by a Geographic Information System (GIS) specialist at a later date. For each area surveyed, notes regarding the dominant grass type (native versus introduced), forb species composition, grazing status, shrub presence and composition, and presence/absence of scattered rocks were recorded. Photographs were taken to document the condition of grasslands surveyed.

A desktop assessment of potential Dakota skipper habitat was evaluated using HDR Engineering Inc. land use classification GIS model for Dakota skipper (2014). All potential areas identified during the desktop review as well as other suitable grasslands identified during the grassland survey effort were evaluated in the field. Grasslands with potential Dakota skipper habitat were noted on maps and datasheets. Potential habitat included, but was not limited to, areas with big bluestem (*Andopogon gerardii*), little bluestem (*Schizachyrium scoparium*), purple coneflower (*Echinacea angustifolia*), harebell (*Campanula rotundifolia*), and smooth camas (*Zygadenus elegans*; USFWS 2018).

Upon completion of field surveys, the grassland shapefile created during the desktop review was updated using the field survey data. Boundaries, sod type, and land use/land cover categories

were updated as needed and survey type (i.e., visual only, pedestrian, no access/no survey) was added to the shapefile.

Quality Assurance and Quality Control

Quality assurance and quality control measures were implemented at all stages of the study, including desktop review, field studies, data entry, and report writing. All field data sheets were inspected for completeness, accuracy, legibility, and entered into a Microsoft® access database. Any anomalous records from the database were compared to the raw data forms and any errors detected were corrected. Errors, omissions, or problems, were traced back to the raw data forms and rectified. All data sheets and electronic data files were retained for reference.

RESULTS

Desktop Review and Field Surveys

The Project consists of approximately 16,940.3 ac (6,855.5 ha; 35.3%) of potential grassland, of which approximately 12,182.6 ac (4,930.1 ha; 25.5% of the Project) were assessed as unbroken native prairie (Table 1, Figure 2).

Table 1. Summary of acres and composition* by sod type assessed during field surveys completed June 12 – 15 and 18 – 21, 2018 at the Ruso Wind Project, McHenry, McLean, and Ward counties, North Dakota.

Sod Type	Acres	% of Total	% of Project
unbroken native prairie	12,182.6	71.9	25.5
previously broken grassland	4,757.8	28.1	10.0
Total	16,940.3	100	**35.5**

* sum of percentage may not round to 100.0 due to number rounding

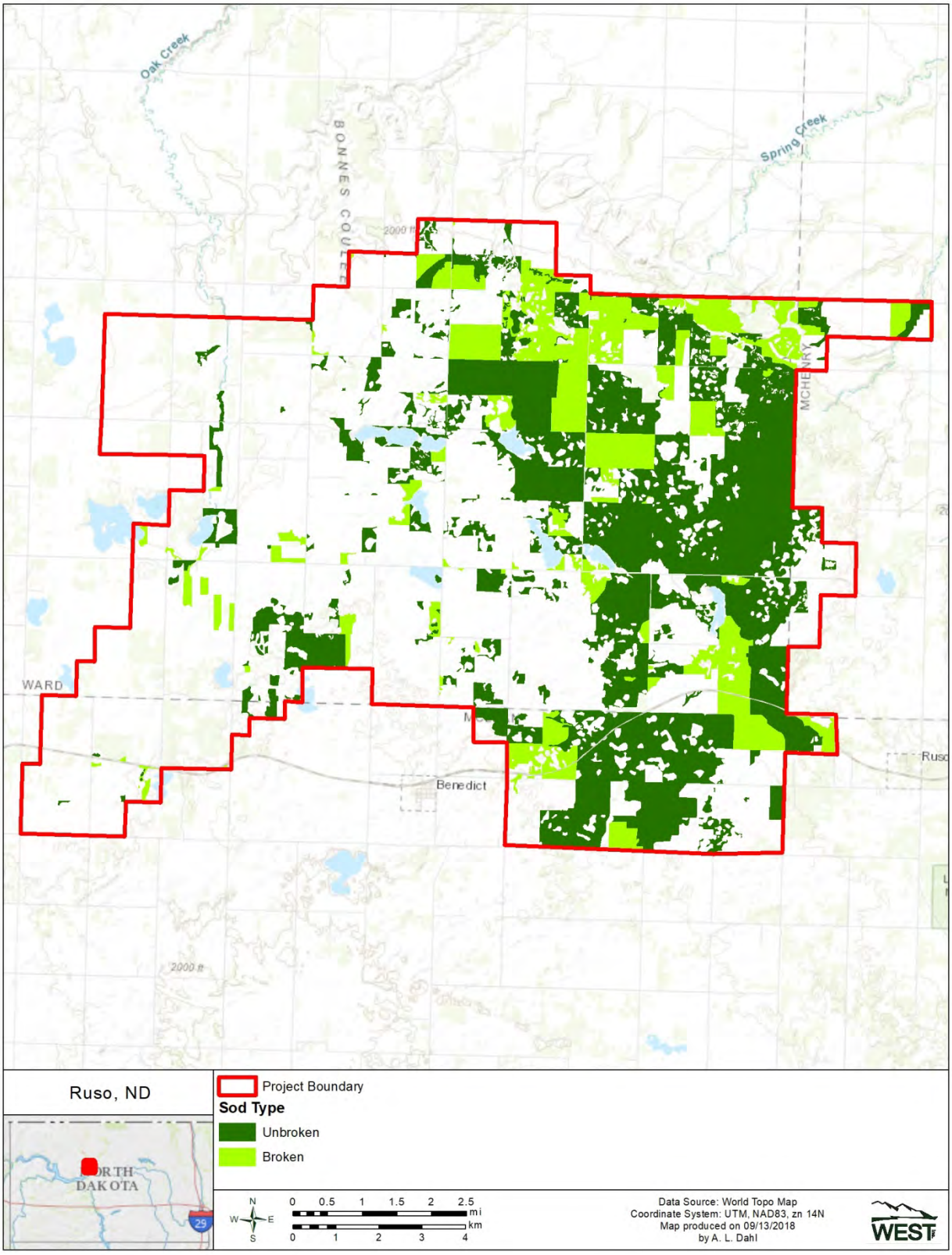


Figure 2. Sod types assessed during field surveys completed June 12 – 15 and 18 – 21, 2018 at the Ruso Wind Project in McHenry, McLean, and Ward counties, North Dakota.

Pedestrian surveys were completed most often (38.1%); followed by visual only surveys from public roads (34.0%; Table 2, Figure 3). Surveys were not completed at 28.0% of the grasslands due to lack of access, exclusion by client request, or health and safety concerns. As such, the sod type determined during the desktop review was assigned (Table 2).

Table 2. Summary of sod type by acres, composition*, and field survey type assessed during field surveys completed June 12 – 15 and 18 – 21, 2018 at the Ruso Wind Project in McHenry, McLean, and Ward counties, North Dakota.

Field Survey Type/Sod Type	Acres	% of Total	% of Project
Pedestrian			
unbroken native grassland	4,743.9	28.0	9.9
previously broken grassland	1,704.8	10.1	3.6
Total	**6,448.6**	**38.1**	**13.5**
Visual only			
unbroken native grassland	3,742.3	22.1	7.8
previously broken grassland	2,010.1	11.9	4.2
Total	**5,752.4**	**34.0**	**12.0**
No access/No survey[1]			
unbroken native grassland	563.6	3.3	1.2
previously broken grassland	4,175.6	24.6	8.7
Total	**4,739.2**	**28.0**	**9.9**
Total	16,940.3	100	**35.4**

* sum of percentage may not round to 100.0 due to number rounding

[1] – Includes grassland areas not field surveyed due to road access issues, client request, or health and safety concerns

Geospatial Data

A shapefile was created based on the grassland assessment to describe grasslands assessed during the desktop review and field surveys. Attribute data are described in Table 3.

Table 3. Attributes and definitions for the grassland survey shapefile based on the desktop review and field surveys completed June 12 – 15 and 18 – 21, 2018 at the Ruso Wind Project in McHenry, McLean, and Ward counties, North Dakota.

Attribute	Definition
rev_final	Land use/land cover designation based on desktop review and field survey (i.e., unbroken native grassland, previously broken grassland, or hay)
sod_type	Sod type based on desktop review and field surveys (i.e., unbroken or previously broken grassland)
assesstype	Field survey type (i.e., pedestrian, visual only, or no access/no survey
acres	Acres of grassland parcel

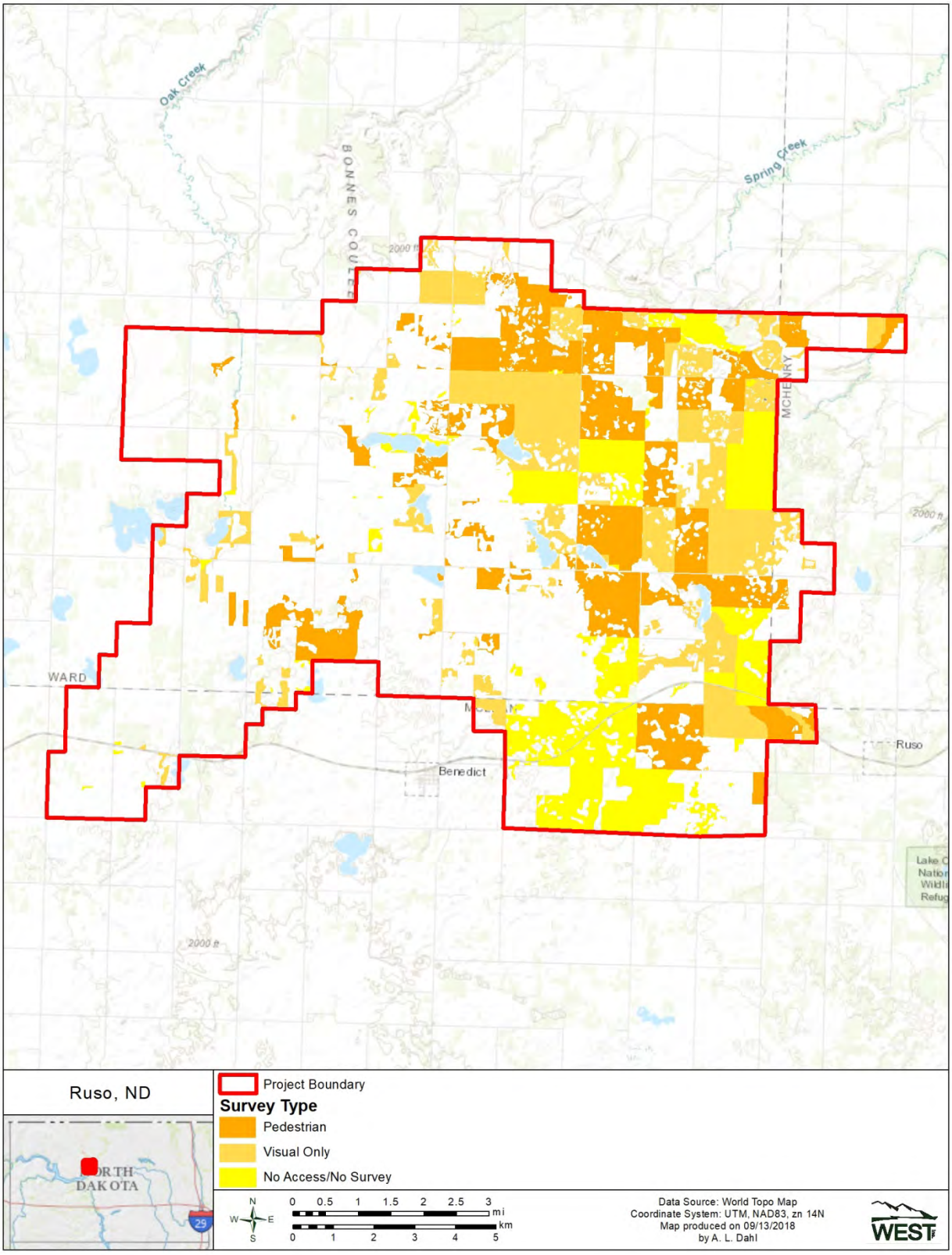


Figure 3. Survey type used during field surveys completed June 12 – 15 and 18 – 21, 2018 at the Ruso Wind Project in McHenry, McLean, and Ward counties, North Dakota.

REFERENCES

ESRI. 2013. World Topographic Map. ArcGIS Resource Center. ESRI, producers of ArcGIS software. ESRI, Redlands, California. Last modified June 6, 2018. Available online: http://www.arcgis.com/home/item.html?id=30e5fe3149c34df1ba922e6f5bbf808f

HDR Engineering, Inc. 2014. Land Use GIS Classification Model.

National Geographic Society (National Geographic). 2018. World Maps. Digital topographic map. PDF topographic map quads. Accessed March 8, 2018. Available online: http://www.natgeomaps.com/trail-maps/pdf-quads

North American Datum (NAD). 1983. Nad83 Geodetic Datum.

North Dakota Game and Fish Department (NDGFD). 2014. Native Grassland Conservation Areas. April 4, 2014. Available online: http://ndgishub.nd.gov/ArcGIS/rest/services/Applications/GNF_SpeciesRangeAndHabitats/MapServer

US Department of Agriculture (USDA). 2018. Imagery Programs - National Agriculture Imagery Program (Naip). USDA, Farm Service Agency (FSA), Aerial Photography Field Office (APFO), Salt Lake City, Utah. Accessed January 2018. Information online: https://www.fsa.usda.gov/programs-and-services/aerial-photography/imagery-programs/index

US Department of Agriculture (USDA) National Agricultural Statistics Service (NASS). 2017. Cropscape - Cropland Data Layer. 2017 North Dakota Data. USDA NASS homepage at: http://www.nass.usda.gov/; Accessed August 2018. Cropscape CDL program data available online at: http://nassgeodata.gmu.edu/CropScape/

US Environmental Protection Agency (USEPA). 2017. Level III and Level IV Ecoregions of the Continental United States. Ecosystems Research, USEPA. Last updated February 8, 2017. Information and maps online: https://www.epa.gov/eco-research/level-iii-and-iv-ecoregions-continental-united-states

US Fish and Wildlife Service. 2018. Dakota Skipper (*Hesperia dacotae*) Fact Sheet. Accessed June 2018. Available online: https://www.fws.gov/midwest/endangered/insects/dask/daskFactSheet.html

US Geological Survey (USGS) Protected Areas Database of the United States (PAD-US). 2018. Protected Areas Data. USGS National Gap Analysis Program (GAP) - Protected Areas Data Portal. Accessed June 2018. Information online: http://gapanalysis.usgs.gov/padus/data/

US Geological Survey (USGS) The National Map. 2017. Elevation Data. Accessed August 2018. Available online: https://viewer.nationalmap.gov/basic/?basemap=b1&category=ned,nedsrc&title=3DEP%20View

US Geological Survey (USGS) National Land Cover Database (NLCD). 2011. National Land Cover Database 2011 (Nlcd 2011). Multi-Resolution Land Characteristics Consortium (MRLC), National Land Cover Database (NLCD). USGS Earth Resources Observation and Science (EROS) Center, Sioux Falls, South Dakota. Available online: http://www.mrlc.gov/nlcd2011.php; Legend: http://www.mrlc.gov/nlcd11_leg.php

Appendix I. 2018 Dakota Skipper Habitat Assessment and Survey Report

2018 Dakota skipper (*Hesperia dacotae*) Habitat Assessment and Survey Report

Ruso Wind Energy Project

McHenry, Ward and McLean Counties, North Dakota
September 12, 2018

Summary

Ruso Wind Partners, LLC, a subsidiary of Southern Power Company (Southern) is developing the Ruso Wind Project (Project) in McHenry, McLean, and Ward counties, North Dakota. Southern requested a habitat assessment and flight survey be conducted for Dakota skipper (*Hesperia dacotae*) in the Project. As such, Western EcoSystems Technology, Inc. (WEST) retained HDR Engineering Inc. (HDR) to conduct the habitat assessment and flight surveys to determine the presence or absence of Dakota skipper during the peak flight period for the Dakota skipper in the Project.

In May 2018, WEST, Inc. was contracted by Southern 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 and Ward counties, North Dakota. WEST retained HDR Engineering, Inc., (HDR) to conduct flight surveys for the presence of Dakota skipper (*Hesperia dacotae*) to comply with the ESA. HDR conducted flight surveys to determine the presence or absence of Dakota skipper during the peak flight period. Surveys focused 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 26 and July 12, 2018. The survey dates fell between the earliest USFWS reports of adult Dakota skipper emergence on June 18, 2018 and the last reported observation of July 19, 2018.

HDR used a three tiered process to identify areas where Dakota skipper flight surveys would be conducted for the Project. The three tiers included:

Tier 1 - Desktop review and field survey for potential Dakota skipper habitat by WEST

Tier 2 - On-site field assessment and verification by HDR.

Tier 3 - On-site flight survey by HDR.

A total of 26 habitat blocks were identified during Tier 1 and Tier 2 for further review of habitat. Habitat verification was conducted June 23 – July 7, 2018. Of the 26 habitat

blocks, a total of four harbored habitat capable of supporting all life cycles of the Dakota skipper. Flight surveys were conducted between June 26 and July 12, 2018. Although flight surveys were conducted in grassland habitats where native plant assemblages were consistent with use by Dakota skippers, no Dakota skippers were observed during the 2018. Therefore, it is assumed that the Dakota Skipper is not present on the blocks where surveys were conducted in 2018 and a take permit is not warranted for the species.

Table of Contents

Introduction 5

Species Background 5

Methods 6

Habitat Assessment Methods 7

Tier 1 Desktop Assessment and Preliminary Field-verification Surveys 7

Tier 2 Flight Season Habitat Identification 7

Tier 3 Flight Surveys 9

Results 10

Habitat Assessments 10

Tier 1 10

Tier 2 13

Tier 3 13

Flight Surveys 18

Site 1 18

Site 2 19

Site 3 19

Site 4 20

Literature Cited 21

Introduction

Ruso Wind Partners, LLC, a subsidiary of Southern Power Company (Southern) is developing the Ruso Wind Project (Project) in McHeny, Ward, and McLean counties, North Dakota. Southern requested a habitat assessment and flight survey be conducted for Dakota skipper (Hesperia dacotae) in the Project. As such, Western EcoSystems Technology, Inc. (WEST) retained HDR Engineering Inc. (HDR) to conduct flight survey for the Dakota skipper in the Project. The objectives of the surveys were to identify potential Dakota skipper habitat and conduct presence absence flight surveys during the peak flight period.

Species Background

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 grass (*Hesperostipa sativa)* needle-and-thread (*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

Southern coordinated the implementation of Dakota skipper habitat assessments and flight surveys for the Project with the USFWS North Dakota Ecological Field Office in Bismarck.

HDR conducted habitat assessments and flight surveys within selected habitat blocks. The habitat assessment evaluated grassland habitats and the native plant assemblages used by the prairie obligate Dakota skipper using a tiered approach. The flight survey methods were conducted following the protocol in the *2018 Dakota Skipper (Hesperia dacotae) North Dakota Survey Protocol USFWS, Region 6*.

Habitat Assessment Methods

HDR implemented qualitative habitat assessments for 26 habitat blocks mapped by WEST biologists or HDR's a custom land-use classification Geographic Information System (GIS) model that identifies Dakota skipper habitat (GIS model). Assessment of habitat conditions occurred in two phases:

Tier 1 Desktop Assessment and Preliminary Field-verification Surveys

Tier 1 consisted of a desktop review and preliminary field-verification surveys conducted by WEST to identify potential Dakota skipper habitat within the Project area. Methods employed by WEST included updating the current "native lands" layer from North Dakota Game and Fish Department based on aerial photographs and existing land cover data. WEST completed field surveys of the grasslands identified in the desktop review to further asses if the grasslands were previously tilled (i.e., broken) or if they appeared to be untilled grasslands (i.e., unbroken native prairie). This survey was conducted from roadsides as well as on foot where access was permitted. During the field survey WEST documented potential Dakota skipper habitat within proposed development areas during the field survey. Any potential habitat for the species (e.g., grassland dominated by native grasses such as little bluestem with coneflower) was documented within the Project. HDR classified the potential Dakota skipper habitat data collected by WEST as Tier 1. All remaining habitat deemed incapable of sustaining any life forms of the Dakota Skipper was considered 'nonhabitat.' Priority was given to areas based on current project configuration. This mapping effort resulted in the identification of 18 habitat blocks affected by portions of the preliminary project configuration (Figure 1).

Tier 2 Flight Season Habitat Identification

During Tier 2, HDR used information prepared by WEST to prioritize additional habitat assessments and to focus flight surveys on habitat blocks affected by the preliminary configuration and capable of supporting Dakota skippers. After all the habitat blocks identified by WEST were reviewed, HDR evaluated additional habitat blocks containing concentrations of habitat identified using a custom land-use classification GIS model. The GIS model synthesizes infrared imagery, recorded locations of Dakota skippers, and habitat information collected by HDR (Dakota skipper sites identified from 2002-2017).

The land-use classification applies a supervised classification to recent Landsat 8 multi-spectral images of the Project area to predict the extent of skipper habitat within a defined boundary. Landsat 8 images are multispectral; they provide imagery where visible light from the blue, green and red spectrum is captured, in addition to light from the near-infrared, shortwave infrared and thermal bands. This allows for a detailed analysis of reflectance patterns. To identify plant community characteristics present during the 2018 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 during Tier I to verify community quality and abundance was consistent with habitats used by the prairie obligate Dakota skipper.

During the second step of the Tier 2 survey, HDR evaluated the extent and overall quality of plant communities occurring within the potential native prairie areas identified during Tier 1 and by the GIS model. An ecologist permitted to conduct surveys for Dakota skippers reviewed the habitat blocks on foot to identify plant community characteristics or pockets of habitat within the landscape prior to conducting flight surveys. The Tier 2 field evaluation identified habitats that exhibited 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), the contiguous nature of the habitat, and an overall subjective ranking of the habitat quality. HDR took photographs of representative habitat blocks and noted the presence or absence of vegetative characteristics 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 blocks 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.

4. Sites that were contiguous in nature as to support a significant habitat source for Dakota Skipper.

Tier 3 Flight Surveys

Survey methods followed the *2018 Dakota Skipper (Hesperia dacotae) North Dakota Survey Protocol USFWS, Region 6*. Surveyors conducting searches for Dakota skipper hold a Native Endangered Species Recovery permit (Number TE64077B-0) obtained from the USFWS.

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 4 habitat blocks exhibiting plant community characteristics indicative of native prairie and under the constraints warranting a Tier 3 survey. Tier 3 blocks were chosen when they exhibited native grasses and an abundance of nectar sources including purple coneflower 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 blocks 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

Tier 1

During the Tier 1 habitat assessment, WEST biologists identified 18 blocks within the Project area that potentially contained native prairie habitat. HDR reviewed all 18 habitat blocks identified by WEST as well as an additional eight habitat blocks identified by the Custom land-use classification GIS model on foot during the last week in June and first week in July 2018. Although small pockets of prairie habitat occurred sparingly at some of these blocks, only four habitat blocks were found that maintained habitat characteristics necessary for the maintenance of all Dakota skipper life forms. The remaining blocks exhibited the following disqualifying habitat characteristics and were eliminated from the flight survey efforts.

1. Although dominated by grasses, some areas were created by side-cast soils from past excavation activities or gravel mining, creation of ditches, or ponds and are dominated by non-native grasses, forbs, and other agricultural weed species.
2. Blocks were dominated by non-native grasses (e.g. smooth brome, reed canary grass, perennial ryegrass, and few native forbs and could not be characterized as native prairie (Photograph 1).
3. Although native grasses occur in these blocks, forb diversity is limited to species characteristic of old fields including; goldenrod (*Solidago* spp.), raspberry (Rubus spp.), and Canada thistle (*Cirsium arvense)*. Native nectar sources used by Dakota skippers (e.g. purple coneflower, black-eyed susan, native locoweeds) occur within the habitat block (Photograph 2).

4. Blocks were overgrown by shrub species or other woody vegetation that fragment existing native prairie communities and render the native grassland non-contiguous or a minor component within the overall site (Photograph 3).

Photograph 1 Habitat block showing dominance by non-native grasses including smooth brome and reed canary grass.

Photograph 2 Habitat block showing some native grasses but otherwise “old field’ characteristics in the plant community

Photograph 3 showing habitat block dominated by shrubby species.

Tier 2

HDR identified a total of four habitat blocks using the preliminary data from the Dakota skipper habitat assessment conducted by WEST, the Custom land-use classification GIS model, and HDR's field habitat review. The habitat blocks occur at the northeast gen-tie parcel in McHenry County, the central portion of the project in Ward County, and southeast portion of the Project area in McLean County (Figure 2).

Tier 3

Flight surveys were conducted at four habitat blocks within the Project where habitat could support each Dakota skipper life forms. Habitat needed for these life forms include minimum characteristics outlined in Tier 1 of this section.

SITE 1

The grassland at the gen-tie block in McHenry County (Site 1) is located at the northeastern corner of the Project area and is situated on rolling topography along a

stream (Figure 2). There is a ridgeline running in a northeast-southwest direction with several slopes that harbor native prairie. The slopes are actively grazed and exhibit well-worn paths from cattle use but slopes maintain habitat characteristics capable of supporting all life forms of the Dakota skipper. Slopes are dominated by native grass species such as little bluestem, side-oats grama, and porcupine grass (Photograph 4). Additionally, native forbs used by Dakota skippers as nectar sources are present in this area.

Photograph 4. Showing habitat characteristics capable of supporting all Dakota skipper life forms at the gen-tie block Site 1.

SITE 2

The grassland block located at the center of the Project in Ward County (Site 2) occurs on slopes that are actively grazed (Figure 2). These grasslands occur on dissected slopes around old farmstead buildings located west of a lake. Although portions of this block are being encroached on by silverberry (*Elaeagnus commutata*), large portions of these slopes maintain habitat characteristics capable of supporting all life forms of the Dakota skipper (Photograph 5). Native grasses and abundance of native forbs provide ample amounts of native grassland habitat that is interspersed with shrubs.

Photograph 5. Showing habitat characteristics capable of supporting all Dakota skipper life forms at Site 2.

SITE 3

A third grassland block is located at the southeast corner of the Project in McLean County (Site 3). This block is oriented along a slope that extends in a northwest/southeastern direction south of an active railroad grade (Figure 2). The slopes face westward and

exhibit numerous large and small pockets of native grasses and forbs. Although silverberry is abundant along these slopes, they are patchy and native grasses and forbs provide abundant nectar sources for all life forms of Dakota skipper (Photograph 6). Although much of the areas east of this ridgeline are also mapped as habitat by the GIS model, shrubs have encroached on a majority of the mapped areas and now crowd out native grassland habitat and the possibility of finding Dakota skippers is precluded by the shrub growth (Photograph 7).

Photograph 6. Showing west-facing slopes and habitat characteristics capable of supporting all Dakota skipper life forms at Site 3**.**

Photograph 7. Showing habitat characteristics capable of supporting all Dakota skipper life forms at Site 3.

SITE 4

The fourth grassland block is also located in the southeast portion of the Project in McLean County (Site 4). This block is a very large grassland with numerous wetlands and rolling topography (Figure 2). Numerous slopes contain an abundance of native grasses and forbs and provide ample habitat for all life forms of the Dakota skipper (Photograph 8). This block is located west of the Site 3 and is also actively grazed.

Photograph 8. Showing habitat characteristics capable of supporting all Dakota skipper life forms at Site 4.

Flight Surveys

HDR conducted flight surveys for Dakota skippers between June 26, 2018 and July 14, 2018. Weather during surveys was generally seasonal to cool with one survey being conducted during overcast skies. No Dakota skippers were observed at any of the four grassland blocks included in the flight survey effort.

Figure 3 documents the location of transects covered during flight surveys in four habitat blocks within the Project area. No Dakota skippers were documented at any of the grassland blocks within the Project.

Site 1

A summary of Site 1 weather conditions are provided in Appendix A. The summary provides information on the date, time of survey, survey length, and weather encountered during each of the survey rounds.

Surveys of Site 1 (Figure 4) evaluated lands that were predominantly grassland and avoided areas that are succumbing to successional growth of shrubs and trees. This block is characterized by dissected slopes with abundant native grasses and forbs. Grazing on

this block is moderate to severe. The westward facing slopes 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 to encroach on native grasslands.

During the first survey, a long dash skipper (*Polites mystic*) was observed at the toe of slope adjacent to the stream, however, no subsequent observations of skippers occurred during the remaining surveys.

Site 2

A summary of Site 2 weather conditions are provided in Appendix A. A survey of grassland dominated areas on this block (Figure 5) found native grasses and forbs affected by heavy grazing pressure. 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 block was overgrown with shrubby species (mainly silverberry) on hilltops and along slopes in the southern portion of the block.

Butterfly activity on this block was low during all three site visits. The most abundant species was the habitat generalist *Colias* sp. Several long-dash and tawny-edged skippers (*Polites themistocles*) were recorded during surveys, however, no target species occurred on the block.

Site 3

A summary of Site 3 weather conditions are provided in Appendix A. A survey of grassland dominated areas within Site 3 (Figure 6) found native grasses and forbs affected by shrub encroachment. Grass species composition was made up of porcupine grass, hairy grama (*Bouteloua hirsuta*), 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)*.. Much of this block is overgrown with shrubby species (silverberry and green ash (*Fraxinus pennsylvanica*)) in patches on hilltops with native prairie being limited to patches on the steepest slopes.

Butterfly activity on this block was low during all three site visits. The only skipper species observed was tawny-edged skippers.

Site 4

A summary of Site 4 weather conditions are provided in Appendix A. A survey of grassland dominated areas within Site 4 (Figure 7) found native grasses and forbs affected some by shrub encroachment. The block is actively grazed but is maintained with a high degree of ecological integrity. Large areas of contiguous native grasses and forbs occur on this block. 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 native species including, prairie rose (*Rosa arkansana*), purple coneflower, Lambert's locoweed, and upright prairie coneflower. Numerous pothole wetlands occur in depressions and slopes or hilltops have abundant nectar sources. Despite the high degree of ecological integrity exhibited the only skipper species observed were tawny-edged skippers.

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.

Lenz, D. 1999. Characterization of Dakota skipper habitat in the Towner-Karlsruhe prairie complex, McHenry County, North Dakota. Unpublished report, U.S. Fish and Wildlife Service. January 25, 1999. 17+pp.

Marone, Gary M. 2002. Field Guide to Butterflies of South Dakota. South Dakota Department of Game, Fish and Parks. pp 396-398.

McCabe, T.L. 1979. Dakota skipper (Lepidoptera: Hesperiidae, Hesperia dacotae (Skinner)) within the Garrison Diversion Unit North Dakota. 46p.

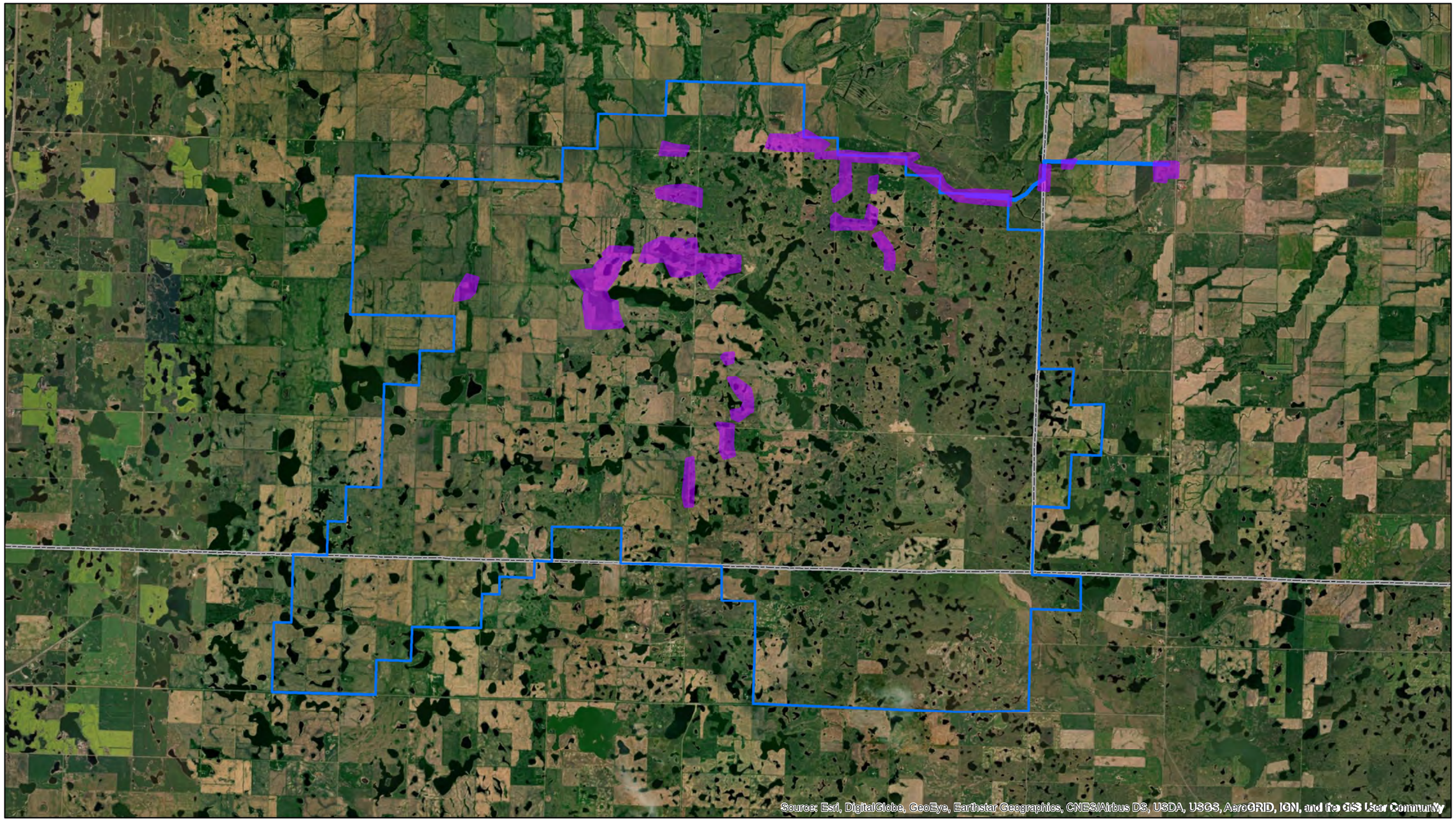
McCabe, T. L. 1981. The Dakota skipper, Hesperia dacotae (Skinner): range and biology, with special reference to North Dakota. J. Lepid. Soc. 35:179-193

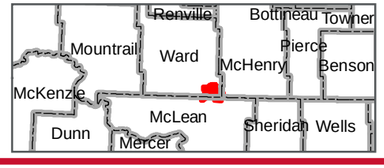
Rigney, C.L. 2013. Habitat characterization and biology of the threatened Dakota skipper (Hesperia dacotae) in Manitoba. Masters of Science. The University of Winnipeg, Winnipeg, Manitoba, Canada. 259p.

Royer, R. A. and Marrone, G.M. 1992. Conservation Status of the Dakota Skipper (Hesperia dacotae) in North and South Dakota. A Report to the United States Department of the Interior Fish and Wildlife Service. Denver, Colorado. 44pp.

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.



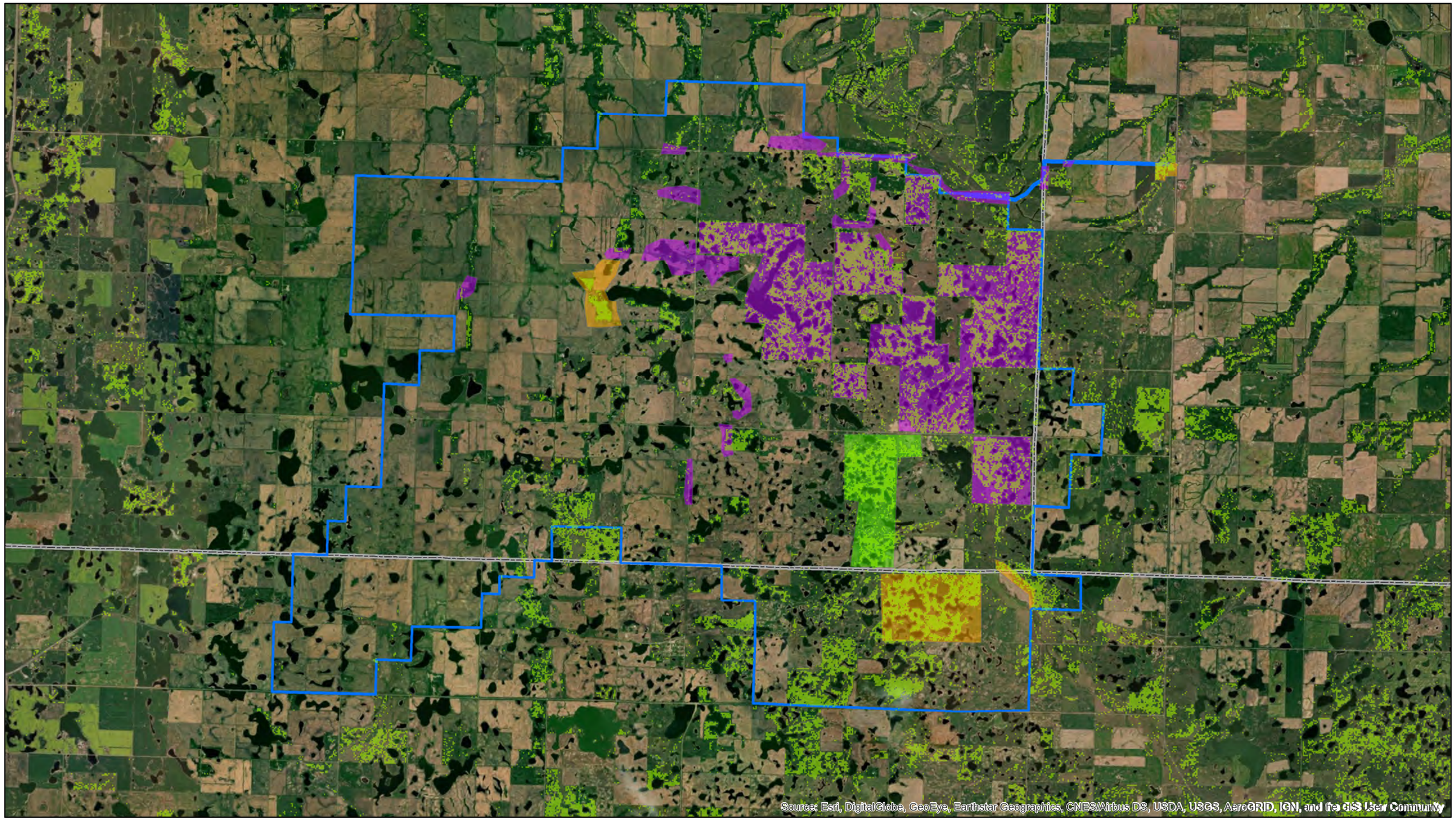


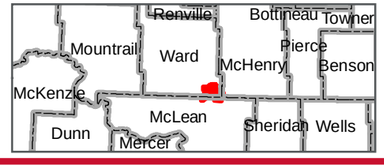
Legend

- Tier 1 Habitat Blocks
- Ruso Combined Parcels Boundary
- County Boundaries

FIGURE 1.
TIER 1 HABITAT REVIEW
RUSO WIND PROJECT
MCCLEAN, WARD AND MCHENRY COUNTIES,
NORTH DAKOTA

PATH: Y:\WEST\10120329_RUSO\7.2_WORK_IN_PROGRESS\MAP_DOCS\FIGURE_1_TIER1_MAPRUSO.MXD - USER: SKRYCH - DATE: 8/17/2018





Legend

Tier 2 Habitat Blocks

Habitat rank

- Habitat falls below minimum requirements for DASK.
- Pockets of habitat present,unable to access safely
- Suitable habitat, flight surveys conducted.
- DASK Habitat Model
- Ruso Combined Parcels Boundary
- County Boundaries

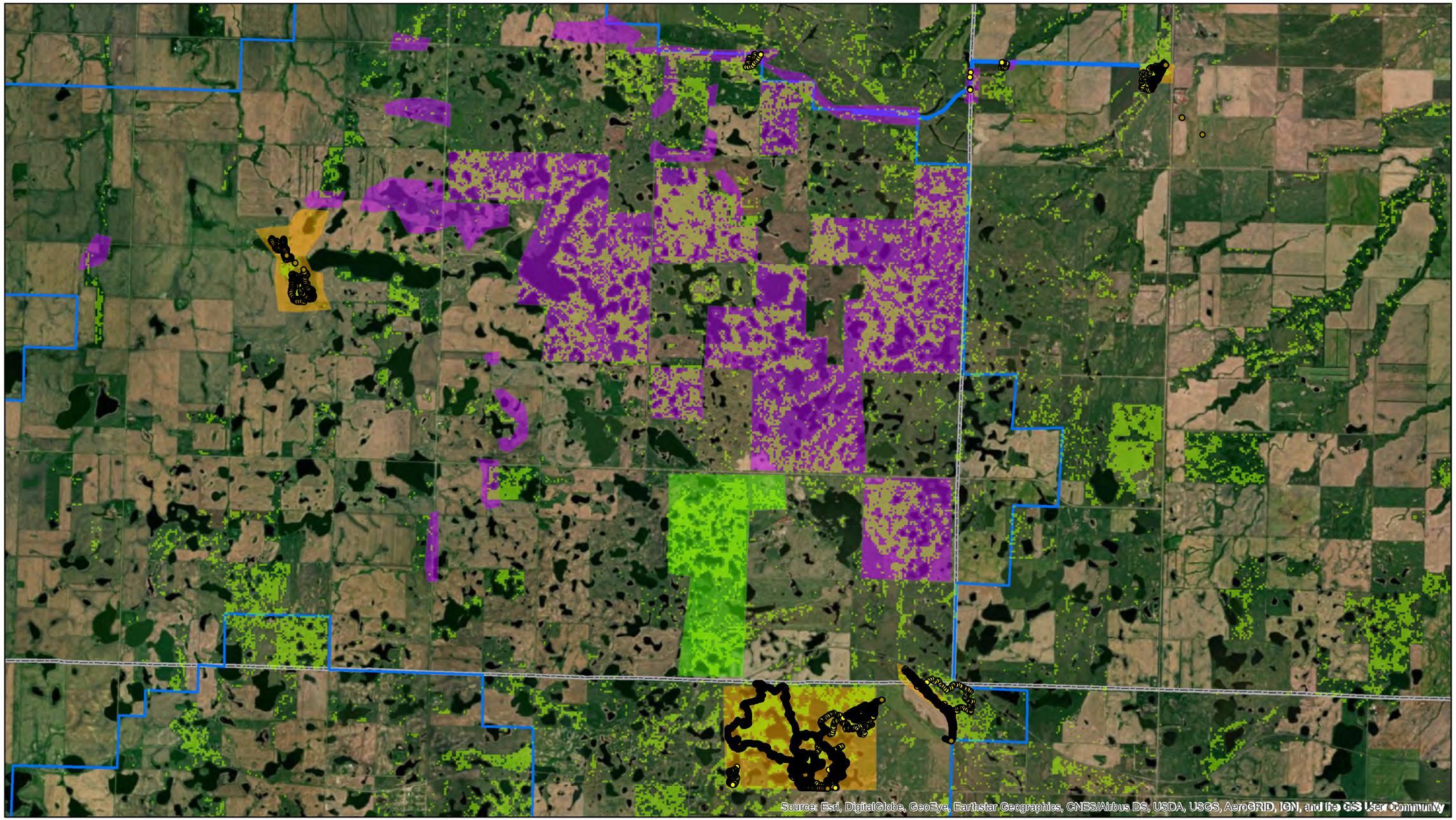
FIGURE 2.

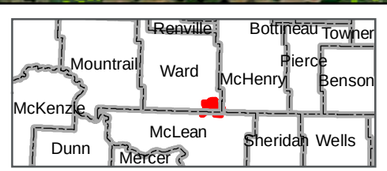
TIER 2 HABITAT REVIEW

RUSO WIND PROJECT

MCCLEAN, WARD AND MCHENRY COUNTIES, NORTH DAKOTA

PATH: \\MSPE-GIS-FILE\GISPROJ\WEST\10120329_RUSO\7.2_WORK_IN_PROGRESS\MAP_DOCS\FIGURE_2_TIER2_MAPRUSO.MXD - USER: SKRYCH - DATE: 8/27/2018





Legend

- TrackLogs
- DASK Habitat Model
- Ruso Combined Parcels Boundary
- County Boundaries

Tier 2 Habitat Blocks

Habitat rank

- Habitat falls below minimum requirements for DASK.
- Pockets of habitat present,unable to access safely
- Suitable habitat, flight surveys conducted.

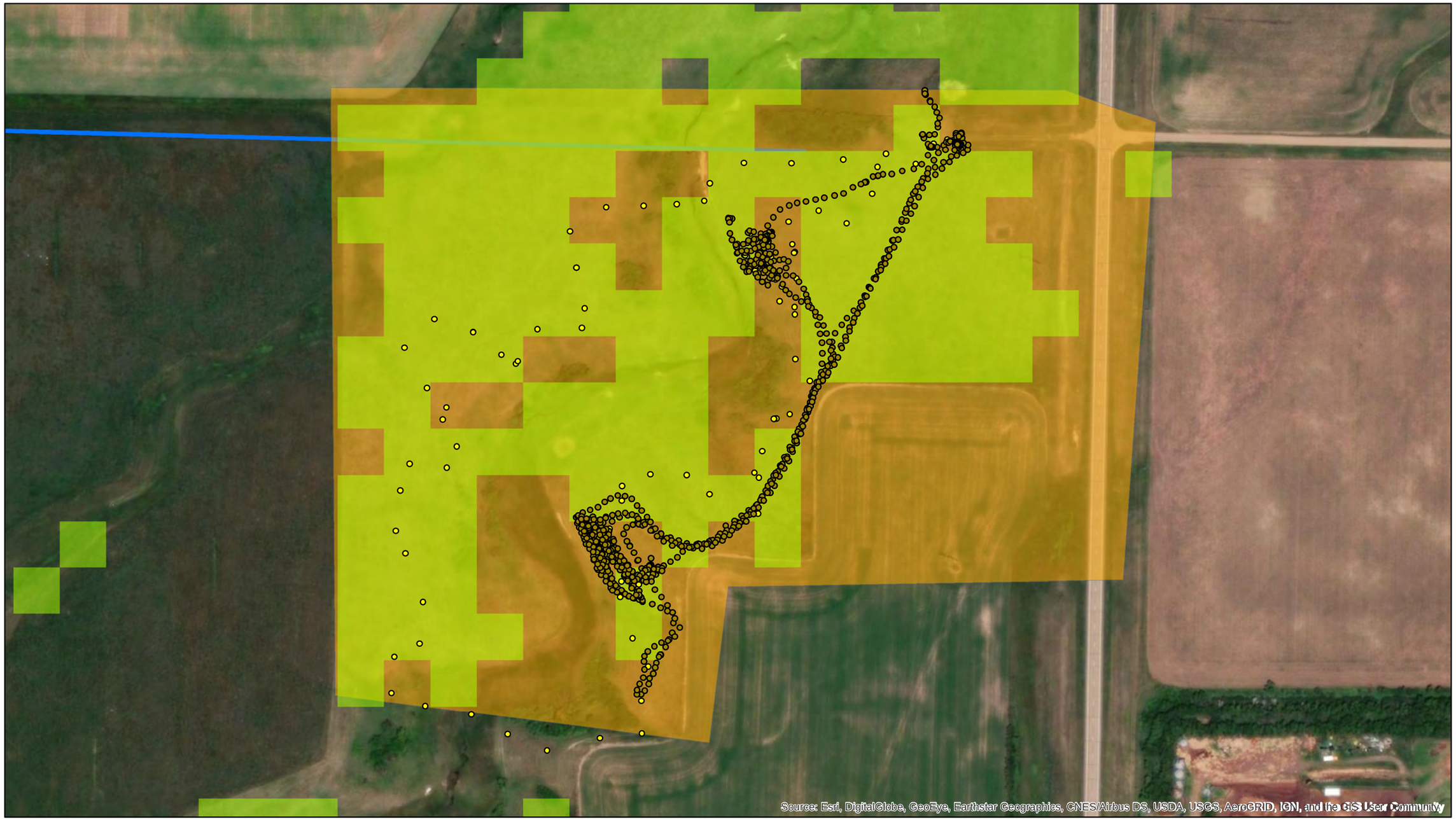
FIGURE 3.

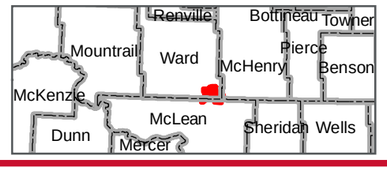
TIER 3 FLIGHT SURVEYS

RUSO WIND PROJECT

MCCLEAN, WARD AND MCHENRY COUNTIES, NORTH DAKOTA

PATH: \\MSPE-GIS-FILE\GISPROJ\WEST\10120329_RUSO\7.2_WORK_IN_PROGRESS\MAP_DOCS\FIGURE_3_TIER3_MAPRUSO.MXD - USER: SKRYCH - DATE: 9/10/2018





Legend

- TrackLogs
- DASK Habitat Model
- Ruso Combined Parcels Boundary
- County Boundaries

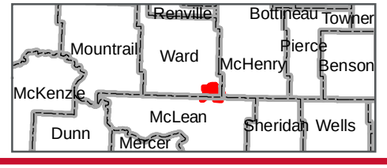
Tier 2 Habitat Blocks

Habitat rank

- Habitat falls below minimum requirements for DASK.
- Pockets of habitat present,unable to access safely
- Suitable habitat, flight surveys conducted.

FIGURE 4.
TIER 3 FLIGHT SURVEYS - SITE 1
RUSO WIND PROJECT
MCHENRY COUNTY,
NORTH DAKOTA

PATH: \\MSPE-GIS-FILE\GISPROJ\WEST\10120329_RUSO\7.2_WORK_IN_PROGRESS\MAP_DOCS\FIGURE_4_SITE1_MAPRUSO.MXD - USER: SKRYCH - DATE: 9/10/2018



Legend

- TrackLogs
- DASK Habitat Model
- Ruso Combined Parcels Boundary
- County Boundaries

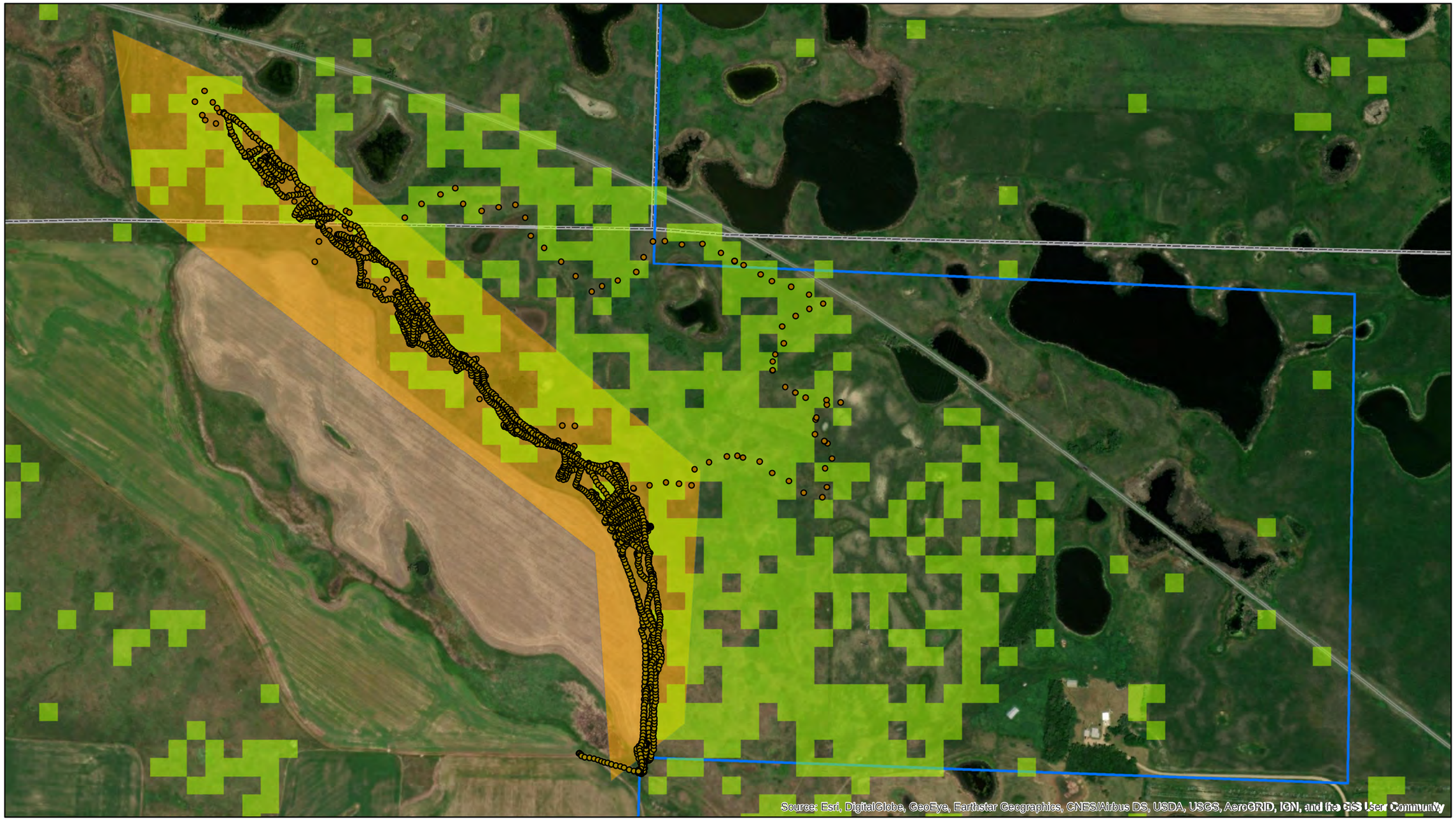
Tier 2 Habitat Blocks

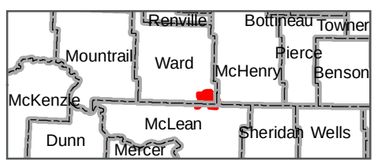
Habitat rank

- Habitat falls below minimum requirements for DASK.
- Pockets of habitat present,unable to access safely
- Suitable habitat, flight surveys conducted.

FIGURE 5.
TIER 3 FLIGHT SURVEYS - SITE 2
RUSO WIND PROJECT
WARD COUNTY,
NORTH DAKOTA

PATH: \\MSPE-GIS-FILE\GISPROJ\WEST\10120329_RUSO\7.2_WORK_IN_PROGRESS\MAP_DOCS\FIGURE_5_SITE2_MAPRUSO.MXD - USER: SKRYCH - DATE: 9/10/2018





Legend

- TrackLogs
- DASK Habitat Model
- Ruso Combined Parcels Boundary
- County Boundaries

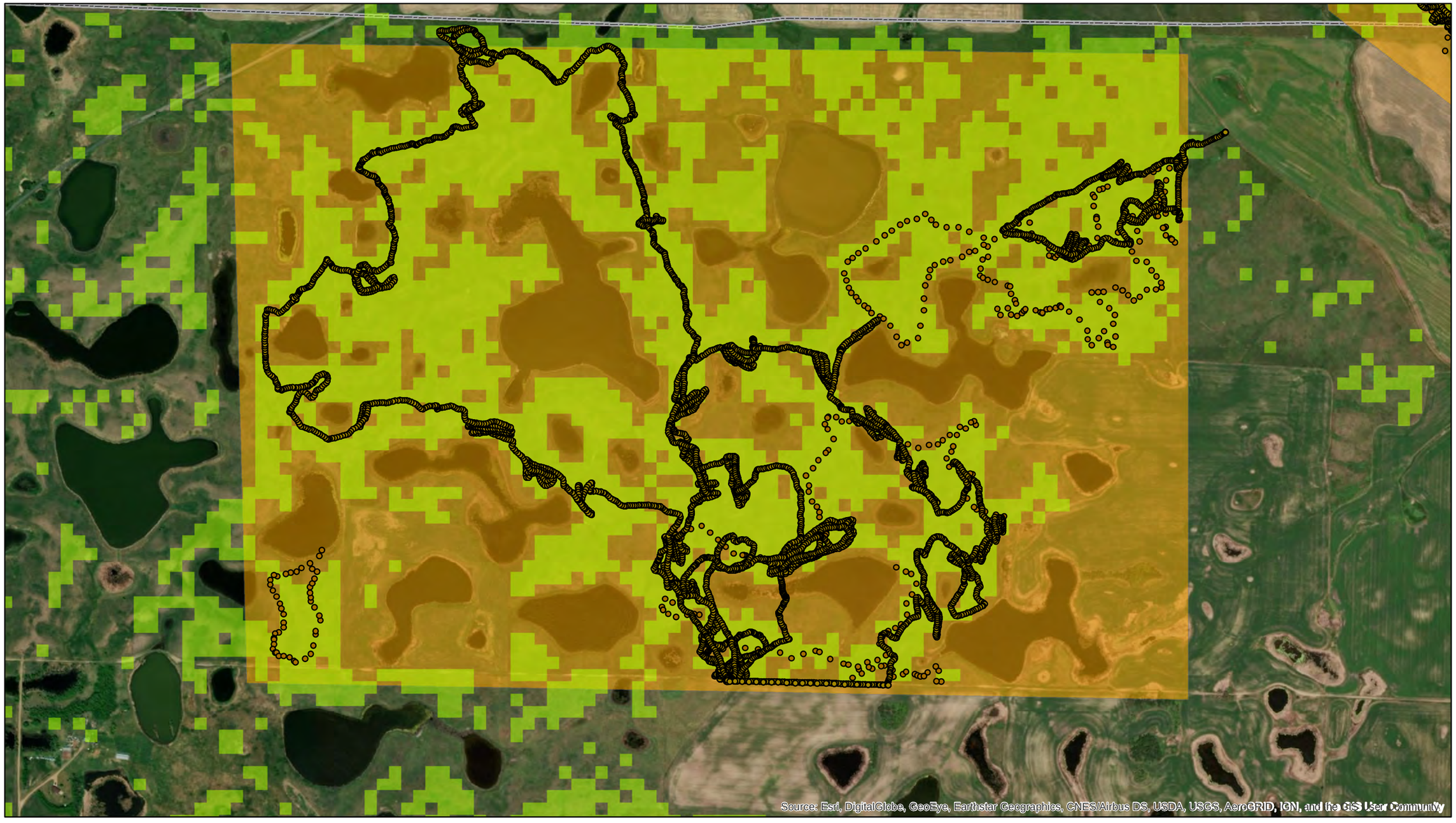
Tier 2 Habitat Blocks

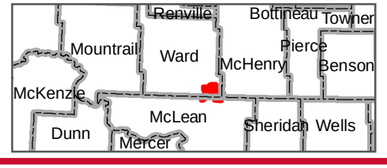
Habitat rank

- Habitat falls below minimum requirements for DASK.
- Pockets of habitat present,unable to access safely
- Suitable habitat, flight surveys conducted.

FIGURE 6.
TIER 3 FLIGHT SURVEYS - SITE 3
RUSO WIND PROJECT
MCLEAN COUNTY,
NORTH DAKOTA

PATH: \\MSPE-GIS-FILE\GISPROJ\WEST\10120329_RUSO\7.2_WORK_IN_PROGRESS\MAP_DOCS\FIGURE_6_SITE3_MAPRUSO.MXD - USER: SKRYCH - DATE: 9/10/2018





Legend

- TrackLogs
- DASK Habitat Model
- Ruso Combined Parcels Boundary
- County Boundaries

Tier 2 Habitat Blocks

Habitat rank

- Habitat falls below minimum requirements for DASK.
- Pockets of habitat present,unable to access safely
- Suitable habitat, flight surveys conducted.

FIGURE 7.
TIER 3 FLIGHT SURVEYS - SITE 4
RUSO WIND PROJECT
MCLEAN COUNTY,
NORTH DAKOTA

PATH: Y:\WEST\10120329_RUSO\7.2_WORK_IN_PROGRESS\MAP_DOCS\FIGURE_7_SITE4_MAPRUSO.MXD - USER: SKRYCH - DATE: 9/10/2018

Appendix A

Flight Survey Conditions

SITE-1 WEATHER CONDITIONS

Survey 1
McHenry County, North Dakota

Date	June 28, 2018		
Surveyor	Scott Krych		
Time	10:00 a.m. –11:58 a.m.	1 hr 58 min	
Weather			
10:00 a. m.	Temp. 80°F	Wind = 8-12 NE	%Clear = 100
11:58 a.m.	Temp. 83°F	Wind = 8-12 NE	%Clear = 100
Survey 2			
Date	July 1, 2018		
Surveyor	Scott Krych		
Time	3:02 p.m. –4:47 p.m.	1 hr 45 min	
Weather			
3:00 p.m.	Temp. 75°F	Wind = 13-17 NW	%Clear = 50
4:47 p.m.	Temp. 75°F	Wind = 13-17 NW	%Clear = 50
Survey 3			
Date	July 3, 2018		
Surveyor	Scott Krych		
Time	10:00 a.m.-11:05 a.m.	1 hr 05 min	
Weather			
10:00 a. m	Temp. = 77°F	Wind = 4-8 NE	%Clear = 80-100
11:05 a.m.	Temp. = 77°F	Wind = 4-8 NE	%Clear = 10-100

Primary Target Species Observed: None

SITE-2 WEATHER CONDITIONS

Survey 1
Ward County, North Dakota

Date	June 28, 2018		
Surveyor	Scott Krych		
Time	12:30 p.m. –3:34 p.m.	3 hr 04 min	
Weather			
12:30 p. m.	Temp. 80°F	Wind = 8-12 NE	%Clear = 100
3:34 p.m.	Temp. 83°F	Wind = 8-12 NE	%Clear = 100
Survey 2			
Date	July 1, 2018		
Surveyor	Scott Krych		
Time	10:42 p.m. –2:24 p.m.	3 hr 42 min	
Weather			
10:42 a.m.	Temp. 75°F	Wind = 13-17 NW	%Clear = 50
1:07 p.m.	Temp. 75°F	Wind = 13-17 NW	%Clear = 50
Survey 3			
Date	July 3, 2018		
Surveyor	Scott Krych		
Time	11:34 a.m.-4:05 p.m.	4 hr 31 min	
Weather			
11:34 a. m	Temp. = 75°F	Wind = 4-8 NE	%Clear = 80-100
4:05 p.m.	Temp. = 78°F	Wind = 4-8 NE	%Clear = 10-100

Primary Target Species Observed: None

SITE-3 WEATHER CONDITIONS

Survey 1
McLean County, North Dakota

Date	June 30, 2018		
Surveyor	Scott Krych		
Time	10:05 a.m. –2:13 p.m.	4 hr. 08 min.	
Weather			
10:05 a. m.	Temp. 73°F	Wind = 13-17 NW	%Clear = 100
2:13 p.m.	Temp. 75°F	Wind = 13-18 NW	%Clear = 100
Survey 2			
Date	July 1, 2018		
Surveyor	Scott Krych		
Time	10:42 a.m. –6:24 p.m.	7 hr 42 min	
Weather			
10:42 a.m.	Temp. 71°F	Wind = 10-14 W	%Clear = 20
6:24 p.m.	Temp. 75°F	Wind = 12-17 NW	%Clear = 20
Survey 3			
Date	July 5, 2018		
Surveyor	Scott Krych		
Time	10:00 a.m.-5:23 p.m.	7 hr 23 min	
Weather			
10:00 a. m	Temp. = 75°F	Wind = 4-8 NE	%Clear = 80
5:23 p.m.	Temp. = 78°F	Wind = 4-8 NE	%Clear = 60-80

Primary Target Species Observed: None

SITE-4 WEATHER CONDITIONS

Survey 1
McLean County, North Dakota

Date	June 30, 2018		
Surveyor	Scott Krych		
Time	2:25 p.m. –5:34 p.m.	3 hr. 09 min.	
Weather			
2:25 p. m.	Temp. 75°F	Wind = 13-17 NW	%Clear = 50
5:34 p.m.	Temp. 75°F	Wind = 13-18 NW	%Clear = 70
Survey 2			
Date	July 6, 2018		
Surveyor	Scott Krych		
Time	10:05 a.m. –6:24 p.m.	8hr 19 min	
Weather			
10:05 a.m.	Temp. 82°F	Wind = 0-5 N	%Clear = 100
6:24 p.m.	Temp. 91°F	Wind = 0-5 N	%Clear = 100
Survey 3			
Date	July 8, 2018		
Surveyor	Scott Krych		
Time	10:10 a.m.-5:44 p.m.	7 hr 34 min	
Weather			
10:10 a. m	Temp. = 91°F	Wind = 0-5 N	%Clear = 100
5:44 p.m.	Temp. = 92°F	Wind = 0-5 N	%Clear = 70-90

Primary Target Species Observed: None, No Dakota skippers observed

Appendix J. Communication Tower Study

Wind Power GeoPlanner™

Communication Tower Study

Ruso Wind Partners, LLC

Prepared on Behalf of
Southern Power Company

October 25, 2018

COMSEARCH®
A CommScope Company

Table of Contents

1. Introduction - 1 -

2. Summary of Results - 1 -

3. Discussion of Separation Distances - 4 -

4. Conclusions - 4 -

5. Contact Us - 5 -

1. Introduction

This Communication Tower Study was performed for the Ruso Wind project in Ward County, North Dakota to identify the tower structures as well as FCC-licensed communication antennas that exist in the project area. This information is useful in the planning stages of the wind energy facilities to identify turbine setbacks and to prevent disruption to the services provided by the tenants on the towers. This data can be used in support of the wind energy facilities communications needs in addition to avoiding any potential impact to the current communications services provided in the region.

2. Summary of Results

The communication towers and antennas in the study area were derived from a variety of sources including the FCC's Antenna Structure Registration (ASR) database, Universal Licensing System (ULS), national and regional tower owner databases, and the local planning and zoning boards. The data[1] was imported into GIS software and the structures mapped in the wind energy area of interest. Each tower location is identified with a unique ID number associated with detailed structure and contact information provided in a spreadsheet attachment.

Two tower structures and two communication antennas were identified within the Ruso Wind project area using the data sources described in our methodology above. Both structures found were registered with the FCC, one of which contains both communication antennas identified.

Detailed information about the tower structures and communication antennas is provided in Table 1 and Table 2 including location coordinates, structure height above ground level, and owner-operator name[2].

A discussion of turbine setback distances is provided in section three.

[1] Comsearch makes no warranty as to the accuracy of the data included in this report beyond the date of the report. The data provided in this report is governed by Comsearch's data license notification and agreement located at http://www.comsearch.com/files/data_license.pdf.

[2] Please note that this report analyzes all known operators on the towers from data sources available to Comsearch. Unidentified operators may exist on the towers due to unlicensed or federal government systems, mobile phone operators with proprietary locations, erroneous data on the FCC license, and other factors beyond our control.

Tower ID	ASR Number	Owner	Structure Height AGL (m)	Latitude (NAD83)	Longitude (NAD83)
Tower001	1250108	SRT COMMUNICATIONS, INC.	103.6	47.87022222	-101.01511111
Tower002	1039842	BASIN ELECTRIC POWER COOPERATIVE	52.0	47.92194444	-101.08000000

Table 1: Summary of Tower Structures

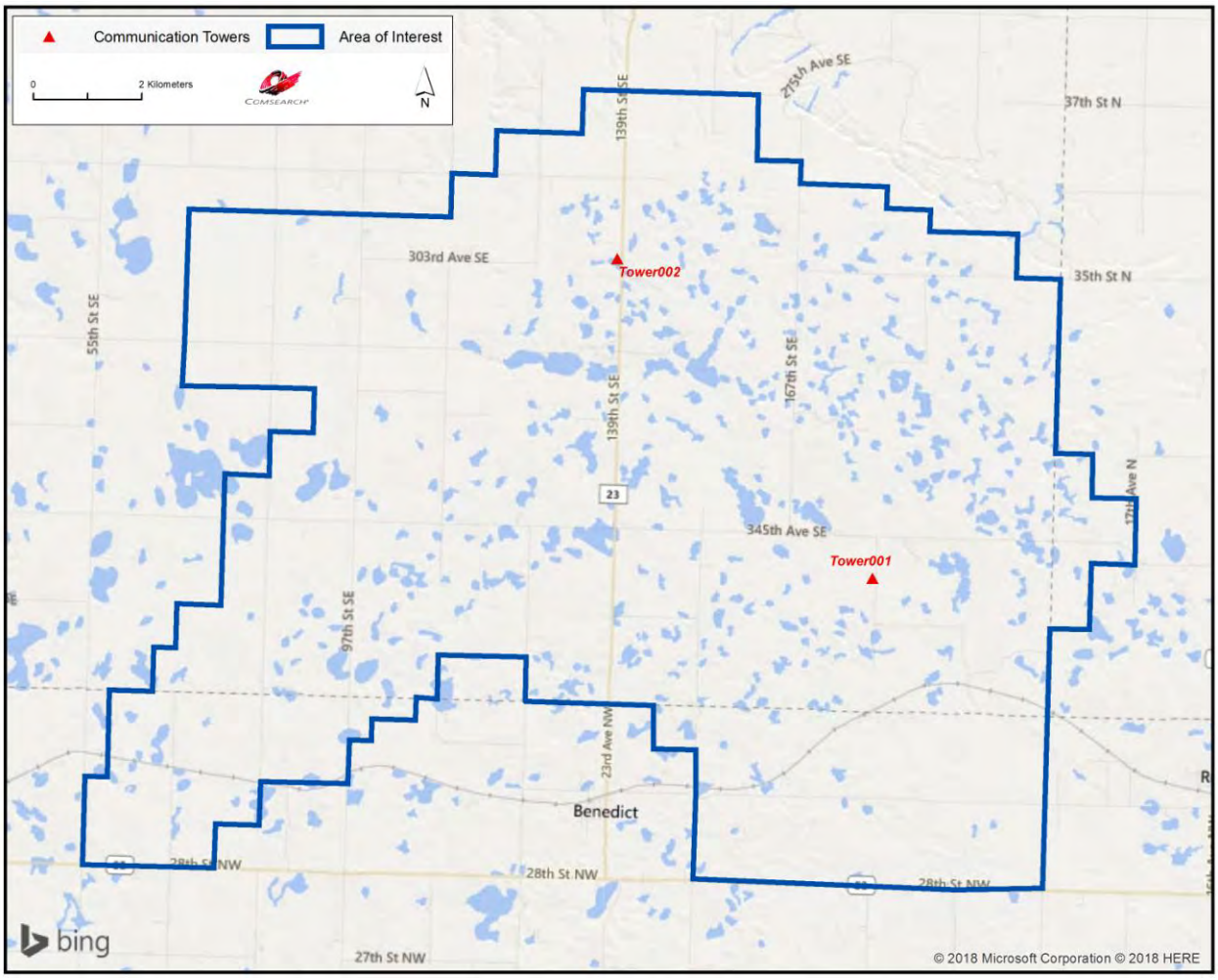


Figure 1: Towers within the Area of Interest

ID	Tower ID	Callsign	Service Type	Licensee	Antenna Height AGL (m)	Latitude (NAD83)	Longitude (NAD83)
1	Tower002	WQKW536	Microwave	Basin Electric Power Cooperative	28.96/50.9/41.76	47.92194444	-101.08000000
2	Tower002	WQEL788	Land Mobile	Basin Electric Power Cooperative	51.80	47.92194444	-101.08000000

Table 2: Summary of Communication Antennas

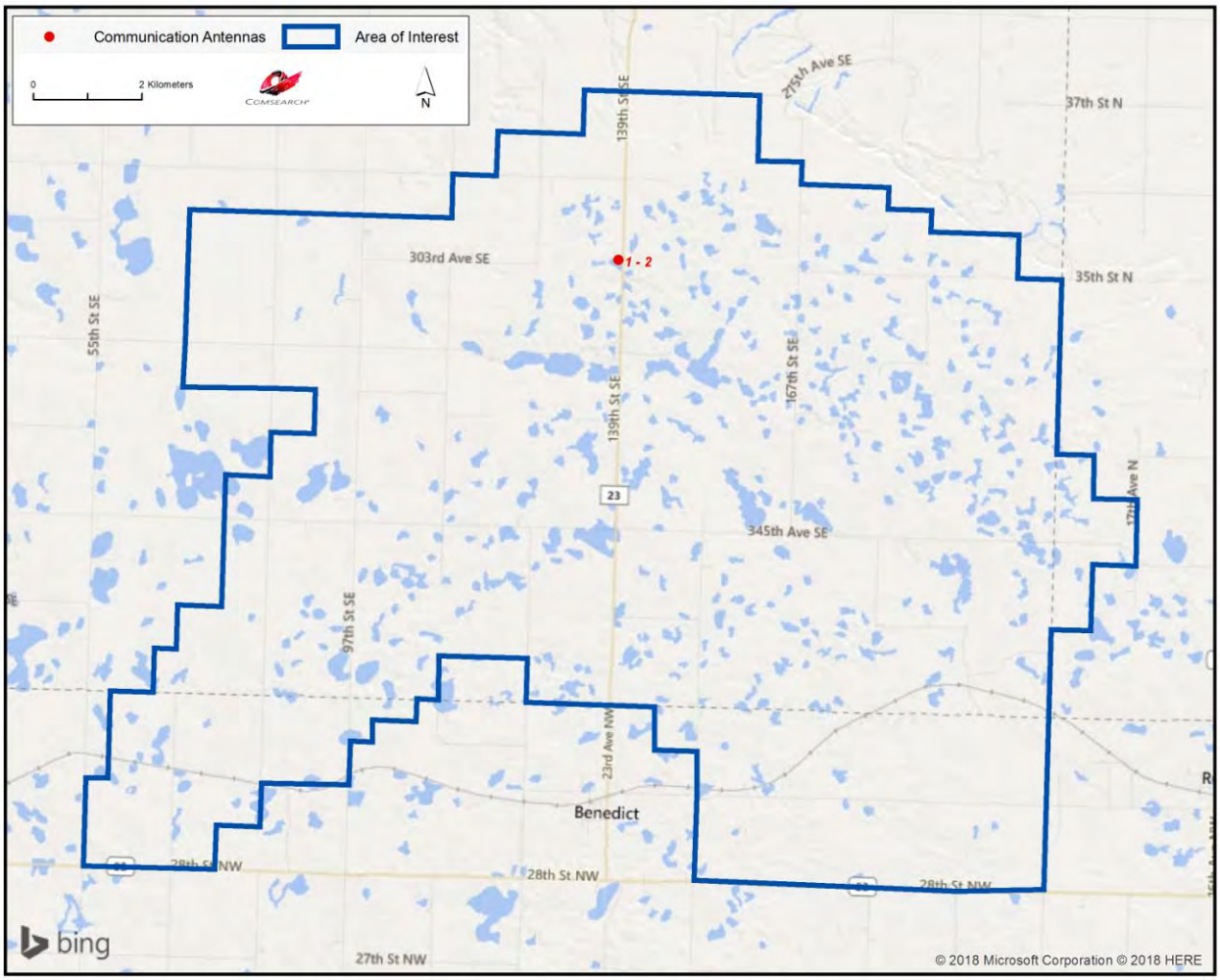


Figure 2: Communication Antennas within the Area of Interest

3. Discussion of Separation Distances

In planning the wind energy turbine locations, a conservative approach would dictate not locating any turbines in close proximity to existing tower structures to avoid any possible impact to the communications services provided by the structures. Reasonable distance between communication towers and wind turbine towers is a function of two things: (1) the physical turning radius of the wind turbine blades and (2) the characteristics of the communication systems on the communication tower.

Since wind turbine blades can rotate 360º, the first consideration of separation distance to other structures is clearance of the blades. If the blade radius is 50 meters, then a separation distance greater than 50 meters is necessary. From a practical standpoint, a setback distance greater than the maximum height of the turbine is necessary to insure a "fall" safety zone in the unlikely event of a turbine tower failure. Setback requirements for "fall" safety are typically specified by the local zoning ordinances.

The required separation distance based on the characteristics of the communication systems will vary depending on the type of communication antennas that are installed on the tower. For example, AM broadcast antennas should be separated by distances that allow for normal coverage which can extend up to 3 kilometers. For land mobile and mobile phone systems, setback distances are based on FCC interference emission limits from electrical devices in the land mobile and mobile phone frequency bands.

Finally, the tower structures identified could be a potential benefit in support of communications network needs for the wind energy facility. An example would be the implementation of a Supervisory Control and Data Acquisition (SCADA) system that monitors and provides communications access to the wind energy facility.

4. Conclusions

Our study identified two tower structures and two communication antennas within the project area. They are used for microwave and land mobile services in the area.

5. Contact Us

For questions or information regarding the Communication Tower Study, please contact:

Contact person: David Meyer
Title: Senior Manager
Company: Comsearch
Address: 19700 Janelia Farm Blvd., Ashburn, VA 20147
Telephone: 703-726-5656
Fax: 703-726-5595
Email: dmeyer@comsearch.com
Web site: www.comsearch.com

Appendix K. AM and FM Radio Report

Wind Power GeoPlanner™

AM and FM Radio Report

Ruso Wind Partners, LLC

Prepared on Behalf of
Southern Power
Company

October 24, 2018

COMSEARCH®
A CommScope Company

Table of Contents

1. Introduction - 1 -

2. Summary of Results - 1 -

3. Impact Assessment - 5 -

4. Recommendations - 5 -

5. Contact - 5 -

1. Introduction

Comsearch analyzed AM and FM radio broadcast stations whose service could potentially be affected by the proposed Ruso Wind Partners project in Ward, McLean, and McHenry Counties, North Dakota.

2. Summary of Results

AM Radio Analysis
Comsearch found six database records[1] for AM stations within approximately 30 kilometers of the project, as shown in Table 1 and Figure 1. These records represent three distinct licensed stations, KHRT, KRRZ, and KCJB, which broadcast out of Minot, North Dakota, to the northwest of the project area. All three stations are licensed separately for daytime and nighttime operations.

ID	Call Sign	Status[2]	Frequency (kHz)	Transmit ERP[3] (kW)	Operation Time	Latitude (NAD 27)	Longitude (NAD 27)	Required Separation Distance[4] (km)	Distance to Project AOI (km)
1	KHRT	LIC	1320	2.5	Daytime	48.196667	-101.233333	0.23	29.47
2	KHRT	LIC	1320	0.31	Nighttime	48.196667	-101.233333	0.23	29.47
3	KRRZ	LIC	1390	5.0	Daytime	48.212500	-101.241667	0.22	31.34
4	KRRZ	LIC	1390	1.0	Nighttime	48.212500	-101.241667	0.22	31.34
5	KCJB	LIC	910	5.0	Daytime	48.202500	-101.348333	3.00	32.82
6	KCJB	LIC	910	5.0	Nighttime	48.202500	-101.348333	3.00	32.82

Table 1: AM Radio Stations within 30 Kilometers of Project Area

[1] Comsearch makes no warranty as to the accuracy of the data included in this report beyond the date of the report. The data presented in this report is derived from the AM/FM station's FCC license and governed by Comsearch's data license notification and agreement located at http://www.comsearch.com/files/data_license.pdf. The coordinates provided for AM station KVWC were adjusted slightly based on aerial imagery.

[2] LIC = Licensed and operational station; APP = Application for construction permit; CP=Construction permit granted; CP MOD = Modification of construction permit.

[3] ERP = Transmit Effective Radiated Power.

[4] The required separation distance is based on the lesser of 10 wavelengths or 3 kilometers for directional antennas and 1 wavelength for non-directional antennas.

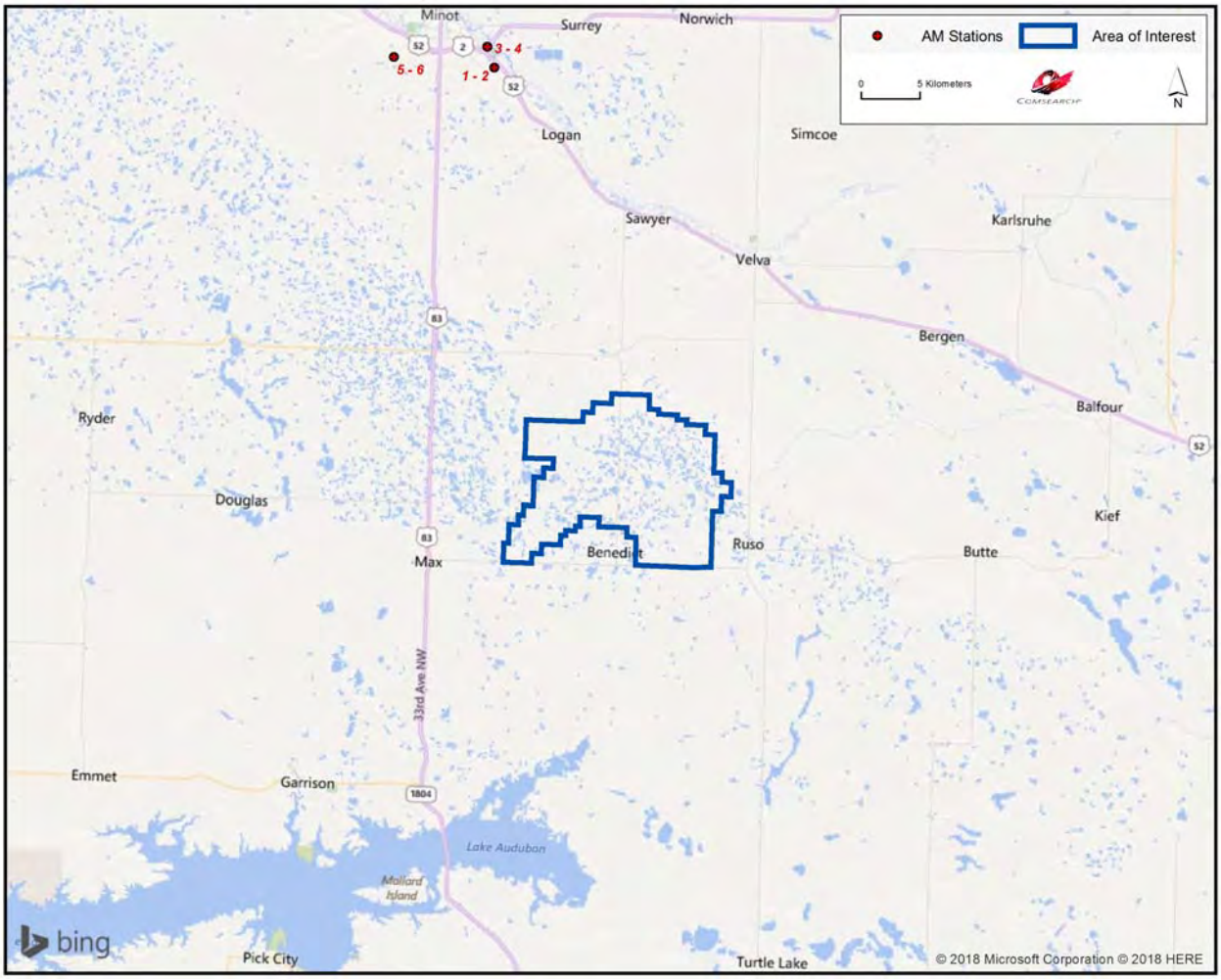


Figure 1: AM Radio Stations within 30 Kilometers of Project Area

FM Radio Analysis

Comsearch determined that there were fourteen database records for FM stations within 30 kilometers of the Ruso Wind Partners project, as shown in Table 2 and Figure 2. While all of these stations are currently licensed and operating, two, KSAF-LP and KFLK-LP, are low-power stations that broadcast with limited range.

ID	Call Sign	Status[5]	Service[6]	Frequency (MHz)	Transmit ERP[7] (kW)	Latitude (NAD 27)	Longitude (NAD 27)	Distance to Project AOI (km)
1	KTZU	LIC	FM	94.9	100.0	48.051111	-101.339722	17.87
2	KWGO	LIC	FM	102.9	100.0	48.051111	-101.339722	17.87
3	KYYX	LIC	FM	97.1	100.0	48.050556	-101.341389	17.90
4	KMPR	LIC	FM	88.9	50.0	48.050833	-101.390000	20.47
5	KIZZ	LIC	FS	93.7	1.1	48.053083	-101.434306	23.19
6	KYYX	LIC	FS	97.1	1.1	48.053083	-101.434306	23.19
7	KMXA-FM	LIC	FS	99.9	1.1	48.053083	-101.434306	23.19
8	KZPR	LIC	FS	105.3	1.1	48.053083	-101.434306	23.19
9	KIZZ	LIC	FM	93.7	100.0	48.053056	-101.434444	23.20
10	KZPR	LIC	FM	105.3	100.0	48.053056	-101.434444	23.20
11	KNDL	LIC	FM	100.7	52.0	48.053889	-101.434167	23.24
12	KHRT-FM	LIC	FM	106.9	50.0	48.163333	-101.298611	27.47
13	KSAF-LP	LIC	FL	104.1	0.085	48.216667	-101.293889	33.07
14	KFLK-LP	LIC	FL	95.9	0.046	48.221667	-101.287222	33.50

Table 2: FM Radio Stations within 30 Kilometers of Project Area

[5] LIC = Licensed and operational station; APP = Application for construction permit; CP=Construction permit granted; CP MOD = Modification of construction permit.

[6] FM = FM broadcast station; FX = FM translator station; FL = Low-power FM station; FS = FM auxiliary (backup) station; FB = FM booster station.

[7] ERP = Transmit Effective Radiated Power.

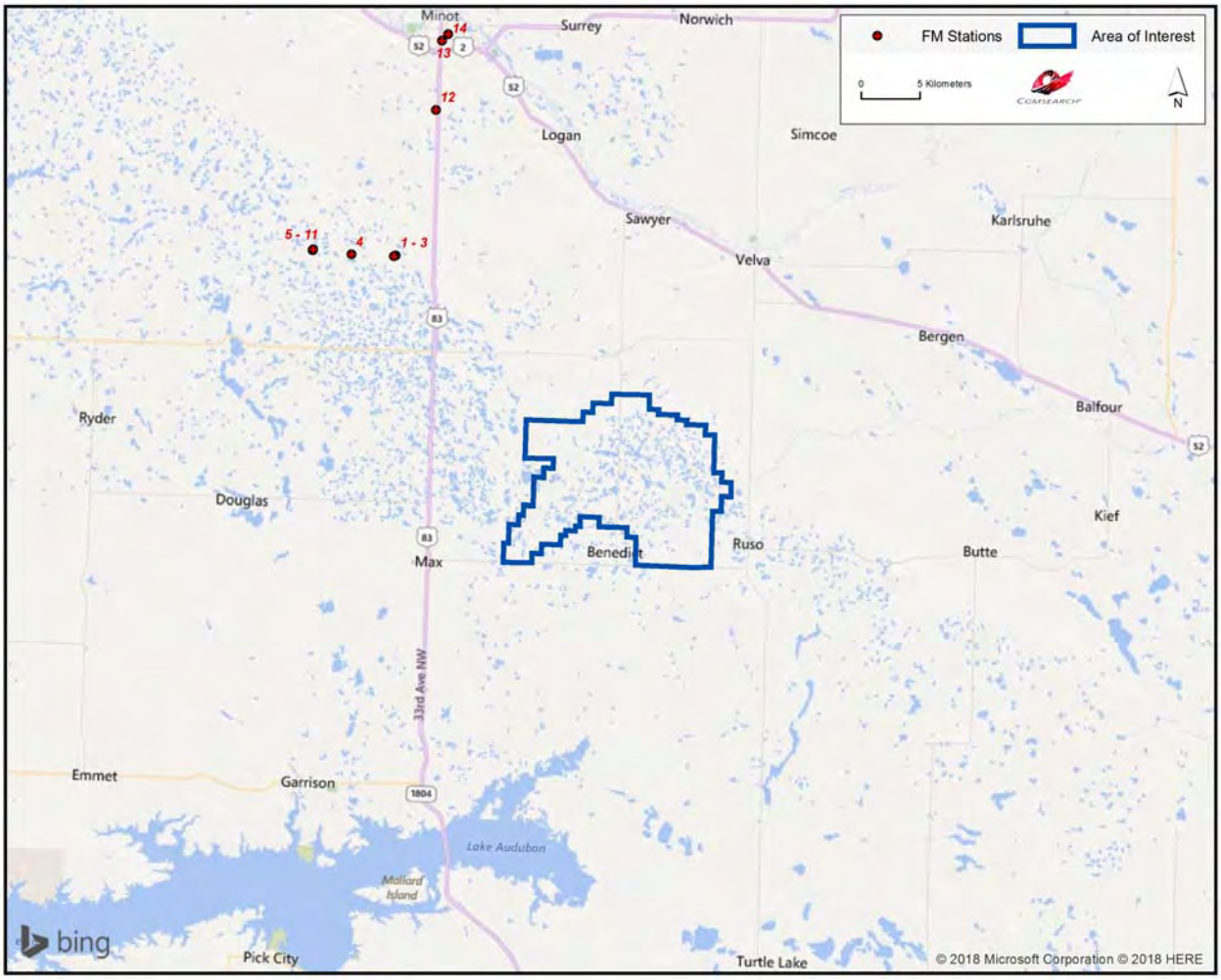


Figure 2: FM Radio Stations within 30 Kilometers of Project Area

3. Impact Assessment

The exclusion distance for AM broadcast stations varies as a function of the antenna type and broadcast frequency. For directional antennas, the exclusion distance is calculated by taking the lesser of 10 wavelengths or 3 kilometers. For non-directional antennas, the exclusion distance is simply equal to 1 wavelength. Potential problems with AM broadcast coverage are only anticipated when AM broadcast stations are located within their respective exclusion distance limit from wind turbine towers. The closest AM station to the Ruso Wind Partners project, KHRT, is approximately 29.4 kilometers from limit of the project area. As there were no stations found within 3 kilometers of the project, which is the maximum possible exclusion distance based on a directional AM antenna broadcasting at 1000 KHz or less, the project should not impact the coverage of local AM stations.

The coverage of FM stations is generally not susceptible to interference caused by wind turbines, especially when large objects, such as wind turbines, are sited in the *far field* region of the radiating FM antenna in order to avoid the risk of distorting the antenna's radiation pattern. The closest operational FM stations to the Ruso Wind Partners project, WTZU and KWGO, are more than 17.8 kilometers from the project area. At this distance, there should be adequate separation to avoid radiation pattern distortion.

4. Recommendations

Since no impact on the licensed and operational AM or FM broadcast stations was identified in our analysis, no recommendations or mitigation techniques are required for this project.

5. Contact

For questions or information regarding the AM and FM Radio Report, please contact:

Contact person:	David Meyer
Title:	Senior Manager
Company:	Comsearch
Address:	19700 Janelia Farm Blvd., Ashburn, VA 20147
Telephone:	703-726-5656
Fax:	703-726-5595
Email:	dmeyer@comsearch.com
Web site:	www.comsearch.com

Appendix L. Off-Air TV Analysis

Wind Power GeoPlanner™

Off-Air TV Analysis

Ruso Wind Partners, LLC

Prepared on Behalf of
Southern Power
Company

October 24, 2018

COMSEARCH®
A CommScope Company

Table of Contents

1. Introduction - 1 -

2. Summary of Results - 1 -

3. Impact Assessment - 5 -

4. Recommendations - 5 -

5. Contact - 6 -

1. Introduction

Off-air television stations broadcast signals from terrestrially-based facilities directly to television receivers. Comsearch identified those off-air stations whose service could potentially be affected by the proposed Ruso Wind Partners project in Ward, McLean, and McHenry Counties, North Dakota. Comsearch then examined the coverage of the stations and the communities in the area that could potentially have degraded television reception due to the location of the proposed wind turbines.

2. Summary of Results

The proposed wind energy project area and local communities are depicted in Figure 1, below.

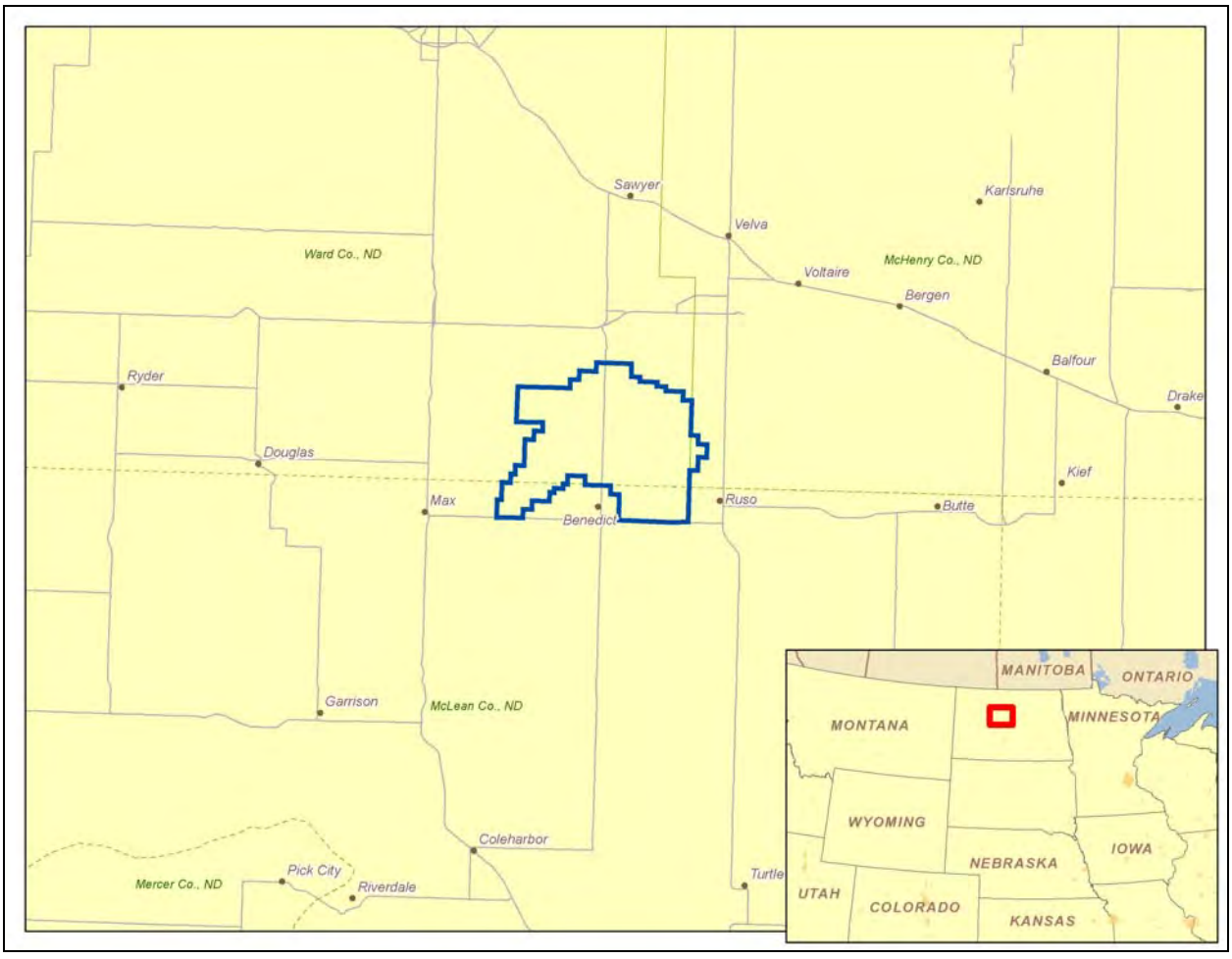


Figure 1: Wind Farm Project Area and Local Communities

To begin the analysis, Comsearch compiled all off-air television stations[1] within 150 kilometers of the project area of interest (AOI). TV stations at a distance of 150 kilometers or less are the most likely to provide off-air coverage to the project area and neighboring communities. These stations are listed in Table 1, below, and a plot depicting their locations is provided in Figure 2. There are a total of fifty-three database records for stations within approximately 150 kilometers of the limits of the project AOI. Of these stations, only fifteen are currently licensed and operating, four of which are low-power stations or translators. Translator stations are low-power stations that receive signals from distant broadcasters and retransmit the signal to a local audience. These stations serve local audiences and have limited range, which is a function of their transmit power and the height of their transmit antenna.

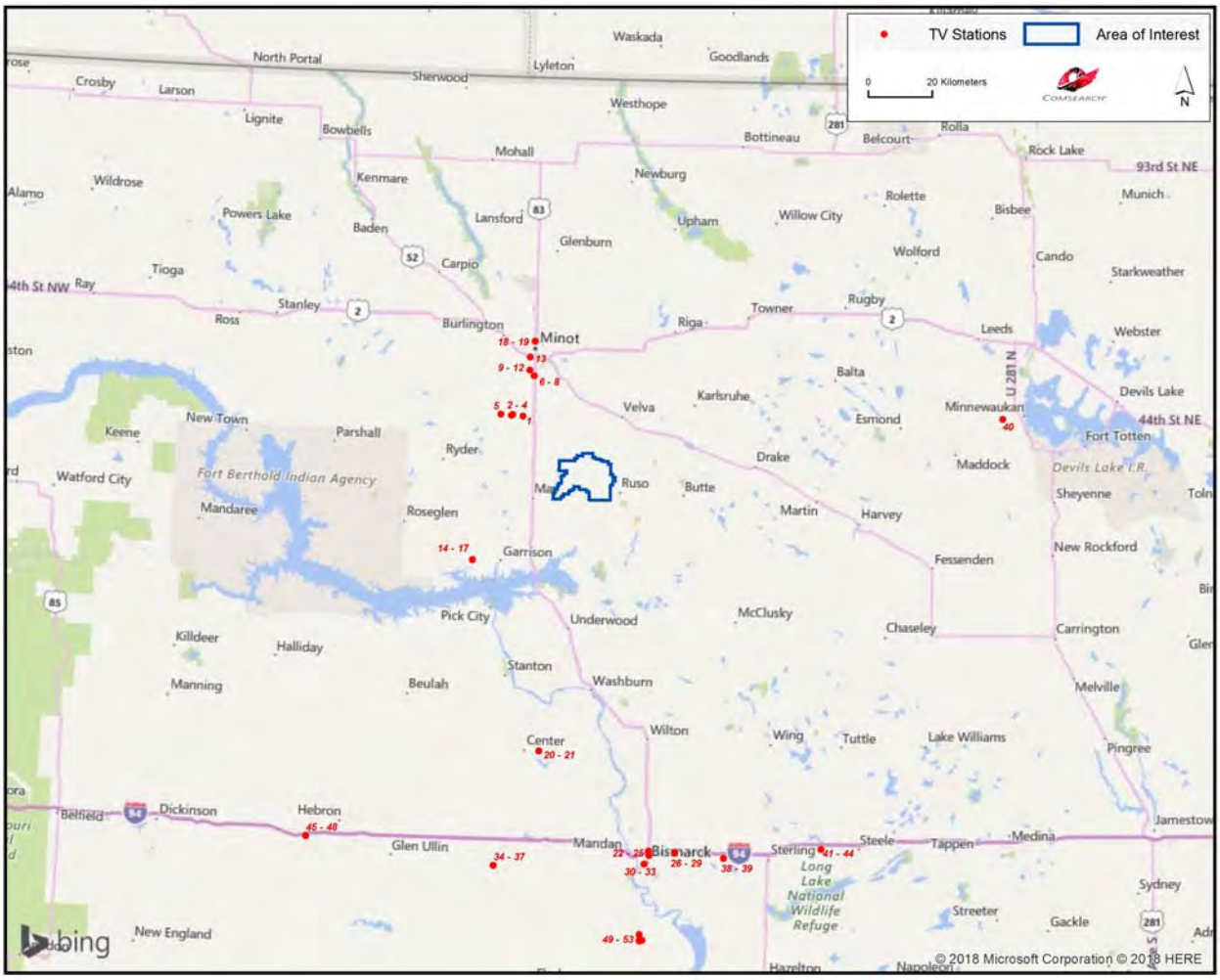


Figure 2: Plot of Off-Air TV Stations within 150 Kilometers of Project Area

[1] Comsearch makes no warranty as to the accuracy of the data included in this report beyond the date of the report. The data presented in this report is derived from the TV station's FCC license and governed by Comsearch's data license notification and agreement located at http://www.comsearch.com/files/data_license.pdf.

ID	Call Sign	Status	Service[2]	Channel	Transmit ERP[3] (kW)	Latitude (NAD 83)	Longitude (NAD 83)	Distance to Center of Project (km)
1	KXMC-TV	LIC	DT	13	16.1	48.050000	-101.342778	27.45
2	KMCY	LIC	DT	14	40.0	48.053056	-101.385278	30.07
3	K23MB-D	CP	LD	23	15.0	48.050556	-101.390833	30.22
4	KSRE	LIC	DT	40	146.0	48.050556	-101.390833	30.22
5	KNDM	LIC	DT	24	50.0	48.053889	-101.434722	33.07
6	K21GQ	LIC	TX	21	10.0	48.163333	-101.299167	35.51
7	K21GQ	CP	LD	21	2.5	48.163333	-101.299167	35.51
8	K27LX-D	CP	LD	27	15.0	48.163333	-101.299167	35.51
9	K30NA-D	CP	LD	30	5.0	48.179361	-101.318722	37.77
10	K32KW-D	CP	LD	32	5.0	48.179361	-101.318722	37.77
11	K33MQ-D	CP	LD	33	5.0	48.179361	-101.318722	37.77
12	K38OK-D	CP	LD	38	5.0	48.179361	-101.318722	37.77
13	KMOT	LIC	DT	10	7.69	48.215556	-101.318611	41.33
14	K21MK-D	CP	LD	21	5.0	47.644806	-101.534417	43.52
15	K27MH-D	CP	LD	27	5.0	47.644806	-101.534417	43.52
16	K43OI-D	CP	LD	43	5.0	47.644806	-101.534417	43.52
17	K48OE-D	CP	LD	48	5.0	47.644806	-101.534417	43.52
18	K42IM-D	CP	LD	35	1.0	48.260833	-101.299861	45.36
19	K42IM-D	LIC	LD	42	1.0	48.260833	-101.299861	45.36
20	K44LO-D	CP	LD	44	5.0	47.113139	-101.235028	86.38
21	K50MW-D	CP	LD	50	5.0	47.113139	-101.235028	86.38
22	K34LO-D	CP	LD	34	5.0	46.840250	-100.775667	118.01
23	K43JQ-D	LIC	LD	43	1.6	46.840250	-100.775667	118.01
24	K28MS-D	CP	LD	28	15.0	46.827222	-100.774722	119.45
25	K46DY	LIC	TX	46	8.7	46.827194	-100.774833	119.45
26	K24JZ-D	CP	LD	24	1.0	46.835722	-100.669556	120.28
27	K25NX-D	CP	LD	25	1.0	46.835722	-100.669556	120.28
28	K39LJ-D	CP	LD	39	1.0	46.835722	-100.669556	120.28
29	K45LQ-D	CP	LD	45	1.0	46.835722	-100.669556	120.28
30	K19KD-D	CP	LD	19	5.0	46.802944	-100.794056	121.84
31	K32LE-D	CP	LD	32	5.0	46.802944	-100.794056	121.84

[2] Definitions of service and status codes:
DT – Digital television broadcast station
DX – Digital auxiliary (backup) facility
TX – Translator station
LD – Low power digital television broadcast station
DC – Class A digital television broadcast station
LIC – Licensed and operational station
CP – Construction permit granted
CP MOD – Modification of construction permit
APP – Application for construction permit, not yet operational

[3] ERP = Transmit Effective Radiated Power

ID	Call Sign	Status	Service[2]	Channel	Transmit ERP[3] (kW)	Latitude (NAD 83)	Longitude (NAD 83)	Distance to Center of Project (km)
32	K36MX-D	CP	LD	36	5.0	46.802944	-100.794056	121.84
33	K40NK-D	CP	LD	40	5.0	46.802944	-100.794056	121.84
34	K29KA-D	CP	LD	29	1.75	46.788250	-101.408222	124.24
35	K36LL-D	CP	LD	36	1.75	46.788250	-101.408222	124.24
36	K42KI-D	CP	LD	42	1.75	46.788250	-101.408222	124.24
37	K47NG-D	CP	LD	47	1.75	46.788250	-101.408222	124.24
38	K14OF-D	CP	LD	14	15.0	46.824083	-100.468778	126.20
39	K48MT-D	CP	LD	48	15.0	46.824083	-100.468778	126.20
40	KMDE	LIC	DT	25	134.0	48.063278	-99.336167	131.24
41	K19JD-D	CP	LD	19	1.0	46.853333	-100.071833	137.13
42	K27LR-D	CP	LD	27	1.0	46.853333	-100.071833	137.13
43	K33LK-D	CP	LD	33	1.0	46.853333	-100.071833	137.13
44	K41MG-D	CP	LD	41	1.0	46.853333	-100.071833	137.13
45	K24KA-D	CP	LD	24	1.5	46.853167	-102.178167	141.63
46	K27KZ-D	CP	LD	27	1.5	46.853167	-102.178167	141.63
47	K33LM-D	CP	LD	33	1.5	46.853167	-102.178167	141.63
48	K49LY-D	CP	LD	49	1.5	46.853167	-102.178167	141.63
49	KFYR-TV	LIC	DT	31	500.0	46.605639	-100.807333	143.35
50	KXMB-TV	LIC	DT	12	19.1	46.589722	-100.806111	145.12
51	KBME-TV	LIC	DT	22	97.3	46.589722	-100.800833	145.17
52	KNDB	LIC	DT	26	50.0	46.589722	-100.794444	145.24
53	KBMY	LIC	DT	17	75.0	46.587500	-100.805833	145.36

Table 1: Off-Air TV Stations within 150 Kilometers of Project Area

3. Impact Assessment

Based on a contour analysis of the licensed stations within 150 kilometers of the Ruso Wind Partners project, it was determined that five of the full-power digital stations, identified below in Table 2, may have their reception disrupted in and around the project. The areas primarily affected would include TV service locations within 10 kilometers of the wind energy project that have clear line-of-sight (LOS) to a proposed wind turbine but not to the respective station. After the wind turbines are installed, communities and homes in these locations may have degraded reception of these stations. This is due to multipath interference caused by signal scattering as TV signals are reflected by the rotating wind turbine blades and mast.

However, based on the low number of full-power TV channels available in the immediate vicinity of the project area, it is unlikely that off-air television stations are the primary mode of television service for the local communities. TV cable service, where available, and direct broadcast satellite service (DBS) are more likely the dominant modes of service delivery.

ID	Call Sign	Status	Service[4]	Channel	Transmit ERP[5] (kW)	Latitude (NAD 83)	Longitude (NAD 83)	Distance to Center of Project (km)
1	KXMC-TV	LIC	DT	13	16.1	48.050000	-101.342778	27.45
2	KMCY	LIC	DT	14	40.0	48.053056	-101.385278	30.07
4	KSRE	LIC	DT	40	146.0	48.050556	-101.390833	30.22
5	KNDM	LIC	DT	24	50.0	48.053889	-101.434722	33.07
13	KMOT	LIC	DT	10	7.69	48.215556	-101.318611	41.33

Table 2: Licensed Off-Air TV Stations Subject to Degradation

4. Recommendations

While TV signals are reflected by wind turbines, which can cause multipath interference to the TV receiver, modern digital TV receivers have undergone significant improvements to mitigate the effects of signal scattering. When used in combination with a directional antenna, it becomes even less likely that signal scattering from wind farms will cause interference to digital TV reception.

Nevertheless, signal scattering could still impact certain areas currently served by the TV station mentioned above, especially those that would have line-of-sight to at least one wind turbine but not to the station antenna. In the unlikely event that interference is observed in any of the TV

[4] Definitions of service and status codes:
DT – Digital television broadcast station
LIC – Licensed and operational station

[5] ERP = Transmit Effective Radiated Power

service areas, it is recommended that a high-gain directional antenna be used, preferably outdoors, and oriented towards the signal origin in order to mitigate the interference.
Both cable service and direct broadcast satellite service will be unaffected by the presence of the wind turbine facility and may be offered to those residents who can show that their off-air TV reception has been disrupted by the presence of the wind turbines after they are installed.

5. Contact

For questions or information regarding the Off-Air TV Analysis, please contact:

Contact person:	David Meyer
Title:	Senior Manager
Company:	Comsearch
Address:	19700 Janelia Farm Blvd., Ashburn, VA 20147
Telephone:	703-726-5656
Fax:	703-726-5595
Email:	dmeyer@comsearch.com
Web site:	www.comsearch.com

Appendix M. Land Mobile & Emergency Services Report

Wind Power GeoPlanner™

Land Mobile & Emergency Services Report

Ruso Wind Partners, LLC

Prepared on Behalf of Southern Power Company

October 24, 2018

COMSEARCH®
A CommScope Company

Table of Contents

1. Introduction - 1 -

2. Summary of Results - 2 -

3. Impact Assessment - 5 -

4. Recommendations - 6 -

5. Contact - 6 -

1. Introduction

An assessment of the emergency services in the Ruso Wind Partners project area was performed by Comsearch to identify potential impact from the planned turbines. We evaluated the registered frequencies for the following types of first responder entities: police, fire, emergency medical services, emergency management, hospitals, public works, transportation and other state, county, and municipal agencies. We also identified all industrial and business land mobile radio (LMR) systems and commercial E911 operators within the proposed wind energy facility boundaries. This information is useful in the planning stages of the wind energy facility because the data can be used in support of facility communications needs and to evaluate any potential impact on the emergency services provided in that region. An overview of the project area, which is located in Ward, McLean, and McHenry Counties, North Dakota, appears in Figure 1.

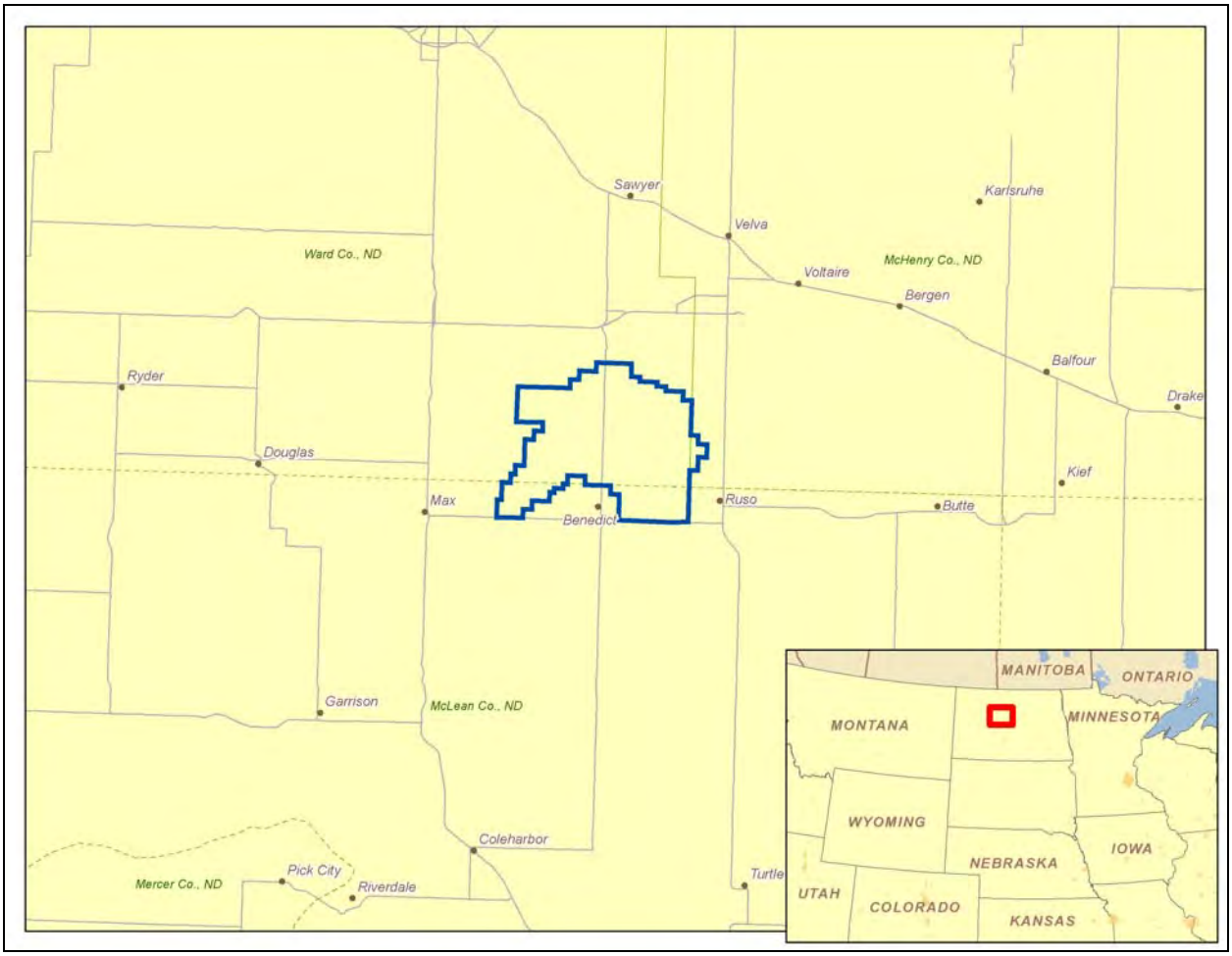


Figure 1: Area of Interest (AOI)

2. Summary of Results

Our land mobile and emergency services incumbent data[1] was derived from the FCC's Universal Licensing System (ULS) and the FCC's Public Safety & Homeland Security bureau. We identified both site-based licenses as well as regional area-wide licenses designated for public safety use.

Site-Based Licenses

The site-based licenses were imported into GIS software and geographically mapped relative to the wind energy project area of interest as defined by the customer. Each site on the map was given an ID number and associated with site information in a data table. A depiction of the fixed-site licenses in and around the project area appears in Figure 2.

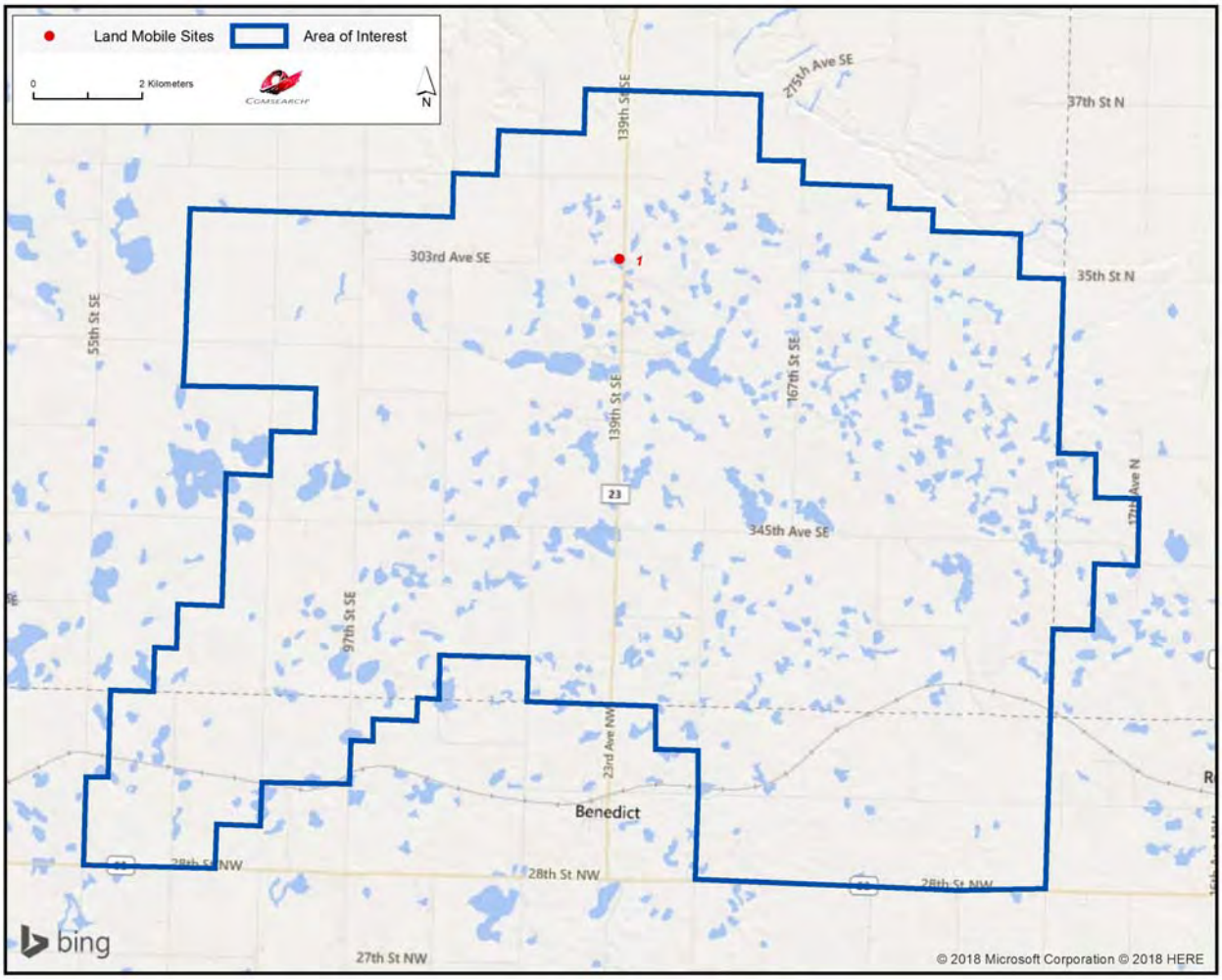


Figure 2: Land Mobile & Emergency Service Sites in Area of Interest

Figure 2 identifies one site-based license in and around the Ruso Wind Partners project area of interest. Specific information about this site is provided in Table 1.

ID	Call Sign	Frequency Band (MHz)	Licensee	Antenna Height AGL (m)	Latitude (NAD83)	Longitude (NAD83)	Distance to Center of AOI (km)
1	WQEL788	450-470	Basin Electric Power Cooperative	51.8	47.921944	-101.080000	4.44

Table 1: Land Mobile & Emergency Service Sites in Area of Interest

Area-Wide Licenses

The regional area-wide licenses were compiled from FCC data sources and identified for each county in the wind energy project area. The Ruso Wind Partners project is located in Ward, McLean, and McHenry Counties, North Dakota, part of Public Safety Region #32, which contains all of the counties in North Dakota. Regional public safety operations are overseen by the entity listed below.

Michael Lynk
Chairperson, Public Safety Region #32
Director, North Dakota State Radio
Fraine Barracks Lane, Bldg. 35
Bismarck, North Dakota 58503
phone: 701-328-8150
email: mlynk@nd.gov

The chairperson for Region #32 serves as the representative for all public safety entities in the area and is responsible for coordinating current and future public safety use in the wireless spectrum. In the bands licensed by the FCC for area-wide first responders, which include 220 MHz, 700 MHz, 800 MHz and 4.9 GHz, as well as the traditional Part 90 public safety pool of frequencies, nine licenses were found for the State of North Dakota, one for the County of McHenry, three for the County of McLean, and four for the County of Ward (see Table 2). These area-wide licenses are designated for mobile use only.

ID	Licensee	Area of Operation	Frequency Band (MHz)
1	American National Red Cross	Statewide: North Dakota	25-50
2	Burlington Fire Department	Countywide: Ward	150-174
3	Garrison Memorial Hospital	Countywide: McLean	150-174

[1] Comsearch makes no warranty as to the accuracy of the data included in this report beyond the date of the report. The data presented in this report is derived from the land mobile station's FCC license and governed by Comsearch's data license notification and agreement located at http://www.comsearch.com/files/data_license.pdf

ID	Licensee	Area of Operation	Frequency Band (MHz)
4	McHenry County Sheriff's Office	Countywide: McHenry	150-174
5	McLean County Emergency Management	Countywide: McLean	150-174
6	Mercer County Sheriff's Department	Countywide: McLean	450-470
7	Metro Area Ambulance Service, Inc.	Statewide: North Dakota	150-174
8	Minot, City of	Countywide: Ward	150-174
9	Minot Police Department	Statewide: North Dakota	450-470, 2450-2500
10	National Ski Patrol System, Inc.	Statewide: North Dakota	150-174
11	North Dakota, State of	Statewide: North Dakota	0-10, 150-174, 450-470
12	North Dakota Department of Health	Statewide: North Dakota	150-174
13	North Dakota Department of Transportation	Statewide: North Dakota	150-174, 4940-4990
14	North Dakota Division of State Radio Communications	Statewide: North Dakota	150-174, 450-470
15	North Dakota EMS Association	Statewide: North Dakota	450-470
16	Ward, County of	Countywide: Ward	150-174
17	Ward County Sheriff's Department	Countywide: Ward	150-174

Table 2: Regional Licenses

E911 Operators

Wireless operators are granted area-wide licenses from the FCC to deploy their cellular networks, which often include handsets with E911 capabilities. Since mobile phone market boundaries differ from service to service, we disaggregated the carriers' licensed areas down to the county level. We have identified the type of service for each carrier in McHenry, McLean, and Ward Counties, North Dakota in Table 3.

Mobile Phone Carrier	Service[2]		
	McHenry County, North Dakota	McLean County, North Dakota	Ward County, North Dakota
AT&T	AWS, Cellular, PCS, WCS, 700 MHz	AWS, Cellular, PCS, WCS, 700 MHz	AWS, Cellular, PCS, WCS, 700 MHz
Commnet Wireless	PCS	PCS	PCS
DISH Network	AWS, 700 MHz	AWS, 700 MHz	AWS, 700 MHz
Infrastructure Networks	-	700 MHz	700 MHz
Kurian, Beaulah T.	AWS	-	AWS
Nemont Telephone (Sagebrush Cellular)	-	700 MHz	700 MHz
Sprint	PCS	PCS	PCS
Standing Rock Telecommunications	PCS	PCS	PCS
T-Mobile	AWS, PCS, 700 MHz	AWS, PCS, 700 MHz	AWS, PCS, 700 MHz
Verizon	AWS, Cellular, PCS, 700 MHz	AWS, Cellular, PCS, 700 MHz	AWS, Cellular, PCS, 700 MHz

Table 3: Mobile Phone Carriers in Area of Interest with E911 Service

3. Impact Assessment

The first responder, industrial/business land mobile sites, area-wide public safety, and commercial E-911 communications as described in this report are typically unaffected by the presence of wind turbines, and we do not anticipate any significant harmful effect to these services in the Ruso Wind Partners project area. Although each of these services operates in different frequency ranges and provides different types of service including voice, video and

[2] AWS: Advanced Wireless Service at 1.7/2.1 GHz
CELL: Cellular Service at 800 MHz
PCS: Personal Communication Service at 1.9 GHz
WCS: Wireless Communications Service at 2.3 GHz
700 MHz: Lower 700 MHz Service

data applications, there is commonality among these different networks in regards to the impact of wind turbines on their service. Each of these networks is designed to operate reliably in a non-line-of-sight (NLOS) environment. Many land mobile systems are designed with multiple base transmitter stations covering a large geographic area with overlap between adjacent transmitter sites in order to provide handoff between cells. Therefore, any signal blockage caused by the wind turbines does not materially degrade the reception because the end user is likely receiving signals from multiple transmitter locations. Additionally, the frequencies of operation for these services have characteristics that allow the signal to propagate through wind turbines. As a result, very little, if any, change in their coverage should occur when the wind turbines are installed.

When planning the wind energy turbine locations in the area of interest, a conservative approach would dictate not locating any turbines within 77.5 meters of land mobile fixed-base stations to avoid any possible impact to the communications services provided by these stations. This distance is based on FCC interference emissions from electrical devices in the land mobile frequency bands. As long as the turbines are located more than 77.5 meters from the land mobile stations, they will meet the setback distance criteria for FCC interference emissions in the land mobile bands.

4. Recommendations

In the event that a public safety entity believes its coverage has been compromised by the presence of the wind energy facility, it has many options to improve its signal coverage to the area through optimization of a nearby base station or even adding a repeater site. Utility towers, meteorological towers or even the turbine towers within the wind project area can serve as the platform for a base station or repeater site.

5. Contact

For questions or information regarding the Land Mobile & Emergency Services Report, please contact:

Contact person:	David Meyer
Title:	Senior Manager
Company:	Comsearch
Address:	19700 Janelia Farm Blvd., Ashburn, VA 20147
Telephone:	703-726-5656
Fax:	703-726-5595
Email:	dmeyer@comsearch.com
Web site:	www.comsearch.com

Appendix N. Microwave Study

Wind Power GeoPlanner™

Microwave Study

Ruso Wind Partners, LLC

Prepared on Behalf of
Southern Power
Company

March 21, 2018

COMSEARCH
A CommScope Company

Table of Contents

1. Introduction - 1 -

2. Project Overview - 1 -

3. Fresnel Zone Analysis - 2 -

4. Conclusion - 5 -

5. Contact - 5 -

1. Introduction

Microwave bands that may be affected by the installation of wind turbine facilities operate over a wide frequency range (900 MHz – 23 GHz). Comsearch has developed and maintains comprehensive technical databases containing information on licensed microwave networks throughout the United States. These systems are the telecommunication backbone of the country, providing long-distance and local telephone service, backhaul for cellular and personal communication service, data interconnects for mainframe computers and the Internet, network controls for utilities and railroads, and various video services. This report focuses on the potential impact of wind turbines on licensed, proposed and applied non-federal government microwave systems.

2. Project Overview

Project Information

Name: Ruso Wind Partners, LLC
County: Ward
State: North Dakota

Number of Turbines: TBD
Blade Diameter: 132-150 meters
Hub Height: 82-100 meters

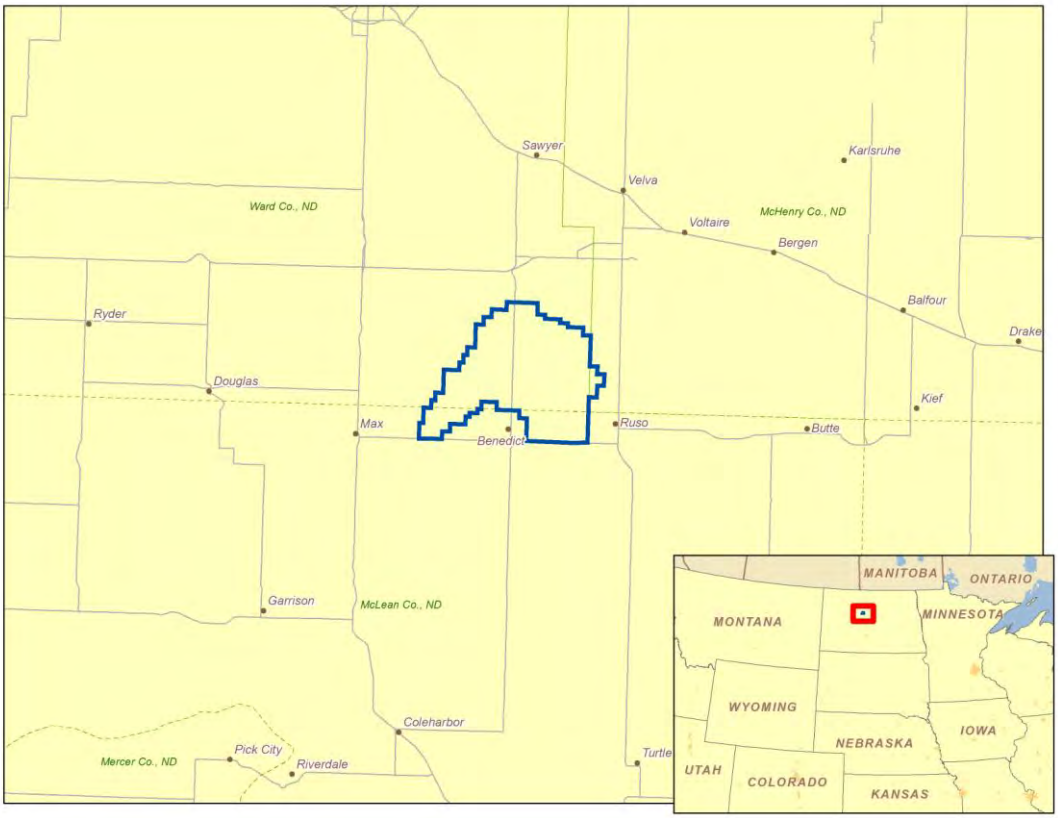


Figure 1: Area of Interest

3. Fresnel Zone Analysis

Methodology

Our obstruction analysis was performed using Comsearch's proprietary microwave database, which contains all non-government licensed, proposed and applied paths from 0.9 - 23 GHz[1]. First, we determined all microwave paths that intersect the area of interest[2] and listed them in Table 1. These paths and the area of interest that encompasses the planned turbine locations are shown in Figure 2.

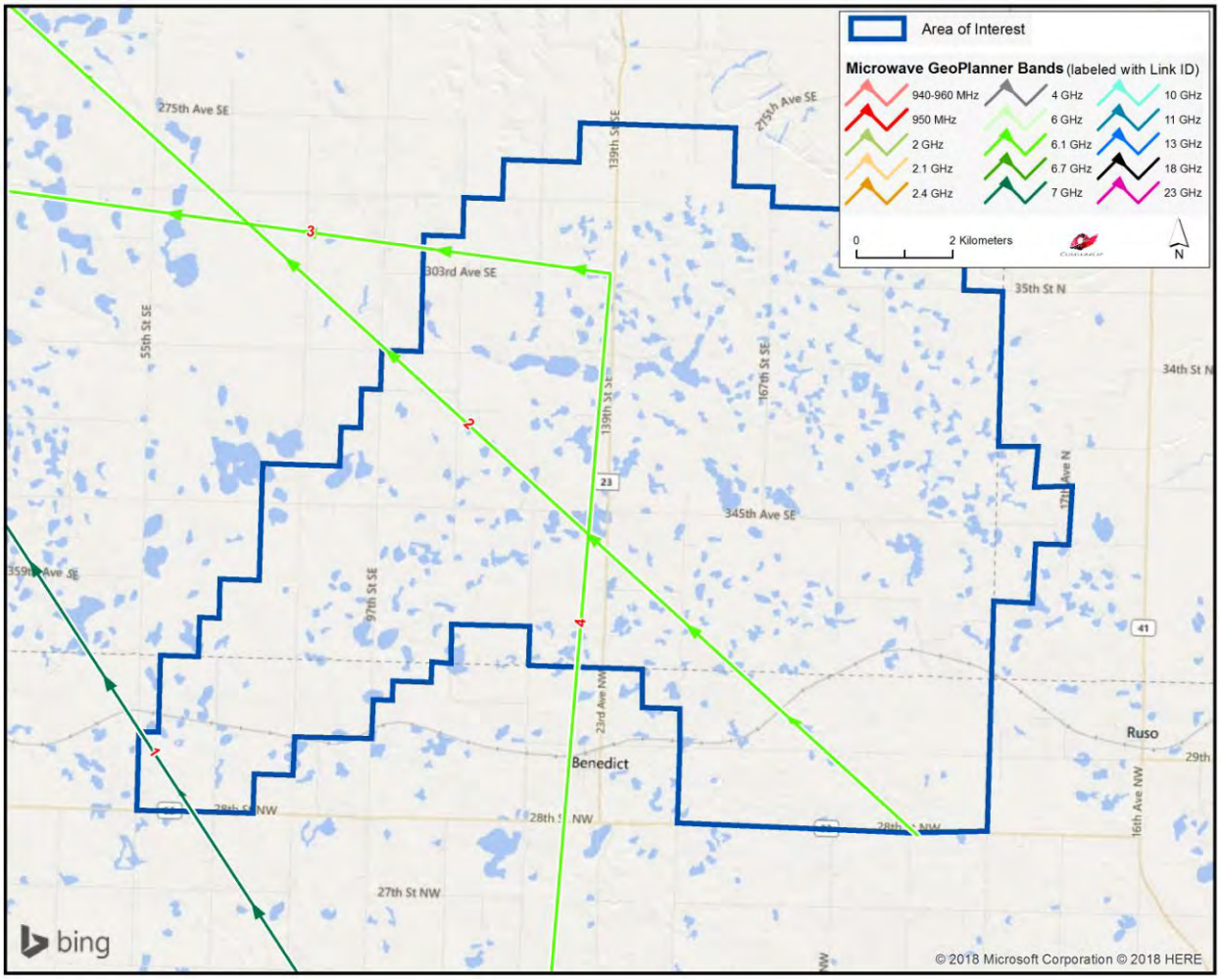


Figure 2: Microwave Paths that Intersect the Area of Interest

[1] Please note that this analysis does not include unlicensed microwave paths or federal government paths that are not registered with the FCC.

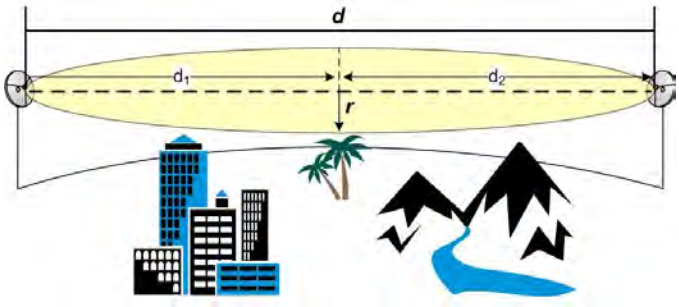
[2] We use FCC-licensed coordinates to determine which paths intersect the area of interest. It is possible that as-built coordinates may differ slightly from those on the FCC license.

ID	Status	Callsign 1	Callsign 2	Band	Path Length (km)	Licensee
1	Licensed	WPSF812	RXONLY	7 GHz	71.59	Legacy Broadcasting, LLC
2	Licensed	WPYP792	WPYP793	Lower 6 GHz	39.48	Prairie Public Broadcasting, Inc.
3	Licensed	WQKW536	WQRB869	Lower 6 GHz	12.58	Basin Electric Power Cooperative
4	Licensed	WQRC288	WQKW536	Lower 6 GHz	52.76	Basin Electric Power Cooperative

Table 1: Summary of Microwave Paths that Intersect the Area of Interest
(See enclosed mw_geopl.xlsx for more information and GP_dict_matrix_description.xls for detailed field descriptions)

Next, we calculated a Fresnel Zone for each path based on the following formula:

$$r \cong 17.3 \sqrt{\frac{n}{F_{GHz}} \left(\frac{d_1 d_2}{d_1 + d_2} \right)}$$



Where,
- r = Fresnel Zone radius at a specific point in the microwave path, meters
- n = Fresnel Zone number, 1
- F_{GHz} = Frequency of microwave system, GHz
- d_1 = Distance from antenna 1 to a specific point in the microwave path, kilometers
- d_2 = Distance from antenna 2 to a specific point in the microwave path, kilometers

The calculated Fresnel Zone shows the narrow area of signal swath and is calculated for each microwave path in the project area. In general, this is the area where the planned wind turbines should be avoided, if possible. A depiction of the individual Fresnel Zones is shown in Figure 3, and is also included in the shapefiles[3,4].

[3] The ESRI® shapefiles enclosed are in NAD 83 UTM Zone 14 projected coordinate system.

[4] Comsearch makes no warranty as to the accuracy of the data included in this report beyond the date of the report. The data provided in this report is governed by Comsearch's data license notification and agreement located at http://www.comsearch.com/files/data_license.pdf.

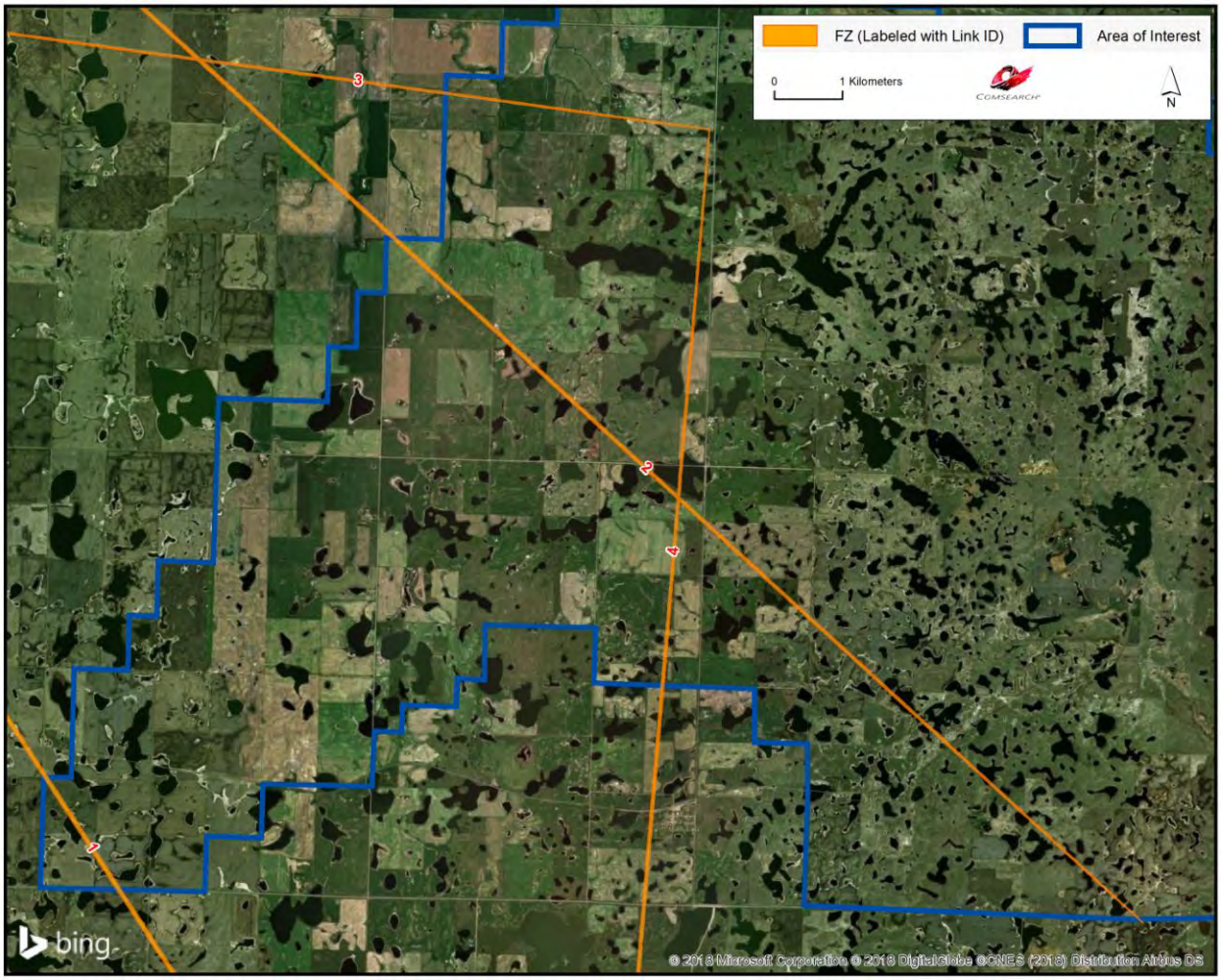


Figure 3: Fresnel Zones in the Area of Interest

Discussion of Potential Obstructions

Total Microwave Paths	Paths with Affected Fresnel Zones	Total Turbines	Turbines intersecting Fresnel Zones
4	N/A	N/A	N/A

For this project, turbine locations were not provided; thus we could not determine if any potential obstructions exist between the planned wind turbines and the incumbent microwave paths. If the latitude and longitude values for turbine locations are provided, Comsearch can identify where a potential conflict might exist.

4. Conclusion

Our study identified four microwave paths intersecting the Ruso Wind project area. The Fresnel Zones for these microwave paths were calculated and mapped. We recommend that all turbines be sited in locations that will not obstruct the Fresnel Zones.

5. Contact

For questions or information regarding the Microwave Study, please contact:

Contact person: David Meyer
Title: Senior Manager
Company: Comsearch
Address: 19700 Janelia Farm Blvd., Ashburn, VA 20147
Telephone: 703-726-5656
Fax: 703-726-5595
Email: dmeyer@comsearch.com
Web site: www.comsearch.com

Appendix O. Obstruction Evaluation & Airspace Analysis

Ruso Wind Partners, LLC

Southern Power Company

McLean, McHenry, and Ward Counties, North Dakota

Obstruction Evaluation & Airspace Analysis

August 29, 2018

Capitol Airspace Group

capitolairspace.com

(703) 256 - 2485

5400 Shawnee Road, Suite 304
Alexandria, VA 22312
703-256-2485
capitolairspace.com

Summary

Capitol Airspace conducted an obstruction evaluation and airspace analysis for the Ruso Wind Partners, LLC project in McLean, McHenry, and Ward Counties, North Dakota. The purpose for this analysis was to identify obstacle clearance surfaces established by the Federal Aviation Administration (FAA) that could limit the placement of 591 foot above ground level (AGL) wind turbines. At the time of this analysis, individual wind turbine locations had not been identified. This analysis assessed height constraints overlying an approximately 77 square mile study area (red outline, ***Figure 1***) to aid in identifying optimal wind turbine locations.

14 CFR Part 77.9 requires that all structures exceeding 200 feet AGL be submitted to the FAA so that an aeronautical study can be conducted. The FAA's objective in conducting aeronautical studies is to ensure that proposed structures do not have an effect on the safety of air navigation and the efficient utilization of navigable airspace by aircraft. The end result of an aeronautical study is the issuance of a determination of 'hazard' or 'no hazard' that can be used by the proponent to obtain necessary local construction permits. It should be noted that the FAA has no control over land use in the United States and cannot enforce the findings of its studies.

Height constraints overlying the Ruso Wind Partners, LLC project range from 2,549 to 2,949 feet above mean sea level (AMSL) and are associated with instrument approach procedures, minimum vectoring altitude sectors, and minimum instrument flight rules (IFR) altitude sectors. Proposed wind turbines that exceed these surfaces would require an increase to instrument approach procedure minimum altitudes, and minimum vectoring/IFR altitudes. If the FAA determines that one or the sum of these impacts would affect a significant volume of operations, it could result in determinations of hazard.

United States Geological Survey (USGS) elevation data indicates that these surfaces could limit 591 foot AGL wind turbines in the northern and southeastern sections of the study area.

A military training route overlies the Ruso Wind Partners, LLC project. Although impact on this route cannot result in FAA determinations of hazard it could result in military objections to proposed wind development.

The Ruso Wind Partners, LLC project is located within line of sight of multiple radar surveillance systems. Impact on radar surveillance systems can result in the issuance of determinations of hazard regardless of the lack of impact on the other surfaces described in this report.

This study did not consider electromagnetic interference on communications or navigation systems.

Capitol Airspace applies FAA defined rules and regulations applicable to obstacle evaluation, instrument procedures assessment and visual flight rules (VFR) operations to the best of its ability and with the intent to provide the most accurate representation of limiting airspace surfaces as possible. Capitol Airspace maintains datasets obtained from the FAA which are updated on a 56 day cycle. The results of this analysis/map are based on the most recent data available as of the date of this report. Limiting airspace surfaces depicted in this report are subject to change due to FAA rule changes and regular procedure amendments. Therefore, it is of the utmost importance to obtain FAA determinations of no hazard prior to making substantial financial investments in this project.

Methodology

Capitol Airspace studied the proposed project based on location information provided by Southern Power Company. Using this information, Capitol Airspace generated graphical overlays to determine proximity to airports (***Figure 1***), published instrument procedures, enroute airways, FAA minimum vectoring altitude and minimum instrument flight rules (IFR) altitude charts, as well as military airspace and military training routes.

Capitol Airspace evaluated all 14 CFR Part 77 imaginary surfaces, published instrument approach and departure procedures, visual flight rules operations, FAA minimum vectoring altitudes, minimum IFR altitudes, and enroute operations. All formulas, headings, altitudes, bearings and coordinates used during this study were derived from the following documents and data sources:

- 14 CFR Part 77 Safe, Efficient Use, and Preservation of the Navigable Airspace
- FAA Order 7400.2L Procedures for Handling Airspace Matters
- FAA Order 8260.3D United States Standard for Terminal Instrument Procedures
- FAA Order 8260.58A United States Standard for Performance Based Navigational (PBN) Instrument Procedure Design
- United States Government Flight Information Publication, US Terminal Procedures
- National Airspace System Resource Aeronautical Data

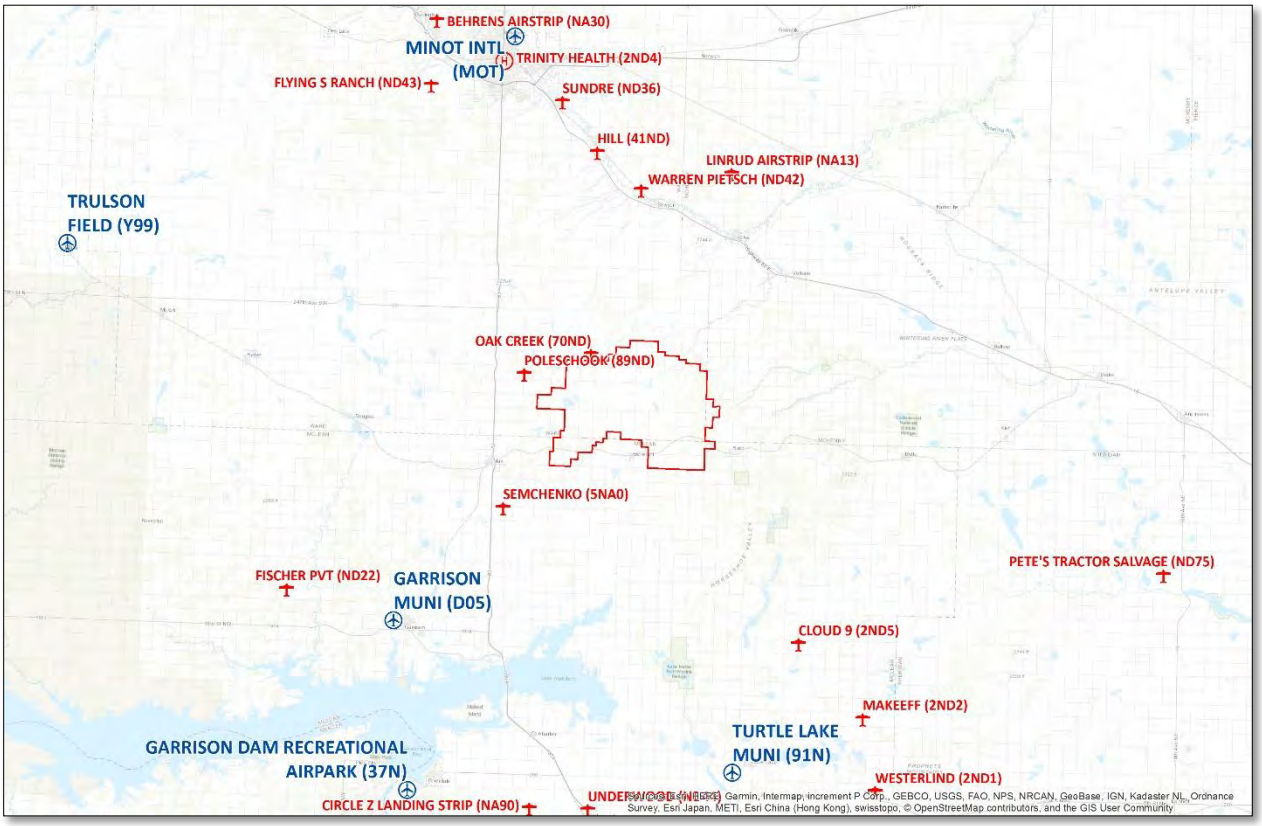


Figure 1: Public-use (blue) and private-use (red) airports in proximity to the Ruso Wind Partners, LLC project

Study Findings

14 CFR Part 77 Imaginary Surfaces

The FAA uses level and sloping imaginary surfaces to determine if a proposed structure is an obstruction to air navigation. Structures that are identified as obstructions are then subject to a full aeronautical study and increased scrutiny. However, exceeding a Part 77 imaginary surface does not automatically result in the issuance of a determination of hazard. Proposed structures must have airspace impacts that constitute a substantial adverse effect in order to warrant the issuance of determinations of hazard.

Public-use airport 14 CFR Part 77.17(a)(2) and 77.19/21/23 imaginary surfaces do not overlie the Ruso Wind Partners, LLC project (e.g., ***Figure 2***). However, at 591 feet AGL, proposed wind turbines will exceed 77.17(a)(1) – a height of 499 feet AGL at the site of the object – and will be identified as obstructions regardless of location.

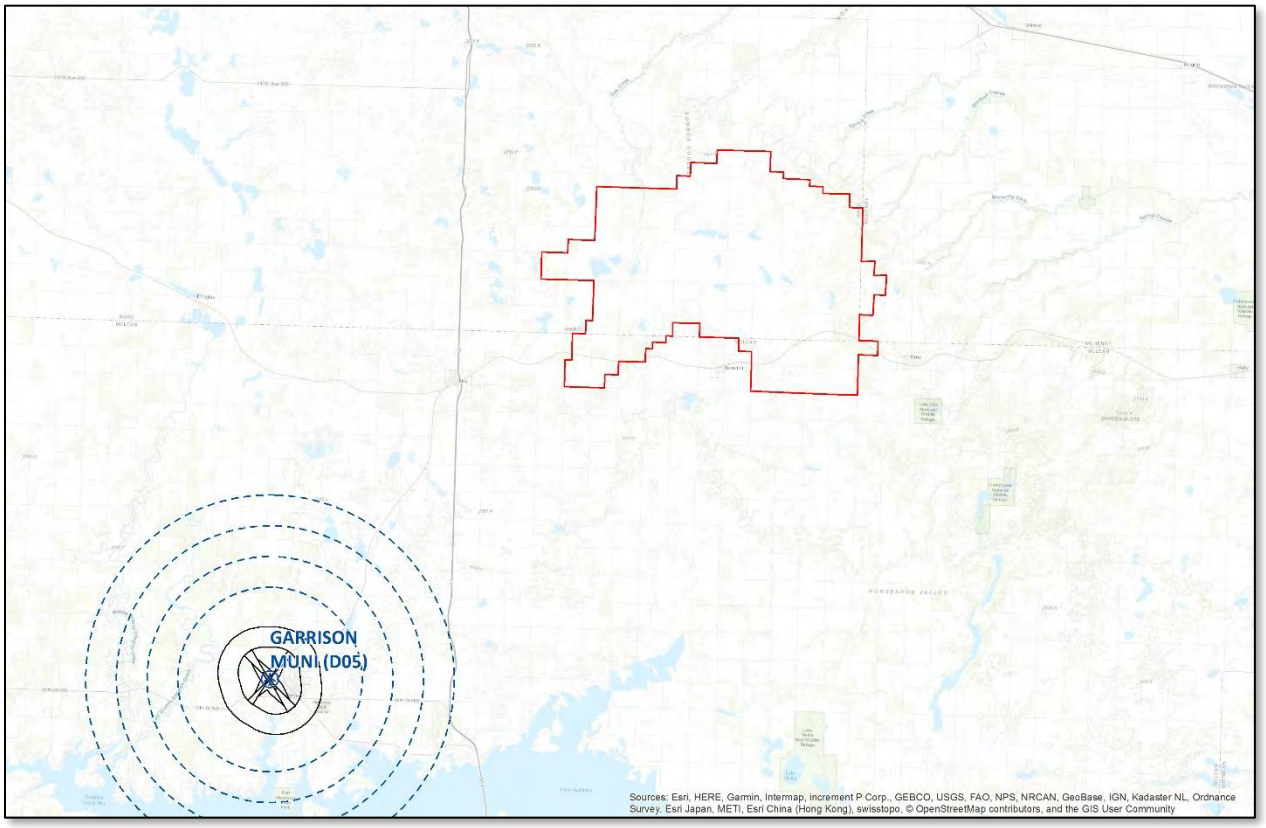


Figure 2: Garrison Municipal Airport (D05) 77.17(a)(2) (dashed blue) and 77.19 (black) imaginary surfaces

Visual Flight Rules (VFR) Traffic Pattern Airspace

VFR traffic pattern airspace is used by pilots operating during visual meteorological conditions. The airspace dimensions are based upon the category of aircraft which, in turn, is based upon the approach speed of the aircraft. 14 CFR Part 77.17(a)(2) and 77.19 (as applied to a *visual* runway) imaginary surfaces establish the obstacle clearance surface heights within VFR traffic pattern airspace.

VFR traffic pattern airspace (e.g., ***Figure 3***) does not overlie the Ruso Wind Partners, LLC project and should not limit 591 foot AGL wind turbines within the defined study area.

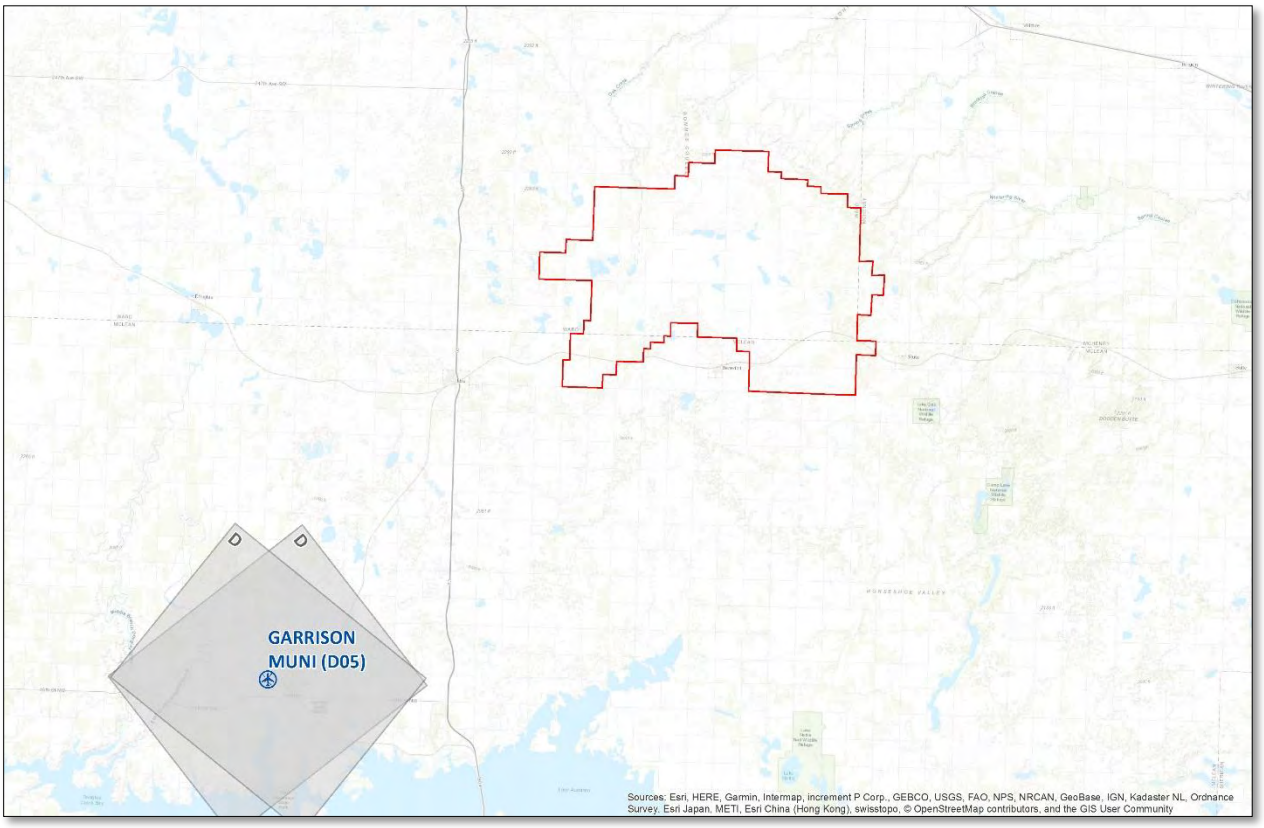


Figure 3: VFR traffic pattern airspace in proximity to the Ruso Wind Partners, LLC project

Visual Flight Rules (VFR) Routes

During periods of marginal weather – low cloud ceilings and one statute mile visibility – pilots often operate below the floor of controlled airspace. Operating under these weather conditions requires pilots to remain within one statute mile of recognizable landmarks such as roads, rivers, and railroad tracks. The FAA protects for known and regularly used VFR routes by limiting structure heights within two statute miles of these routes to no greater than 14 CFR Part 77.17(a)(1) – a height of 499 feet AGL at the site of the object.

The Ruso Wind Partners, LLC project is located in proximity to transmission lines and railroads that may be used as VFR routes (***Figure 4***). However, operational data describing the usage of VFR routes is not available. If the FAA determines that these potential VFR routes are flown regularly, it could limit wind development in excess of 499 feet AGL and within two statute miles of these landmarks (hatched orange, ***Figure 4***).

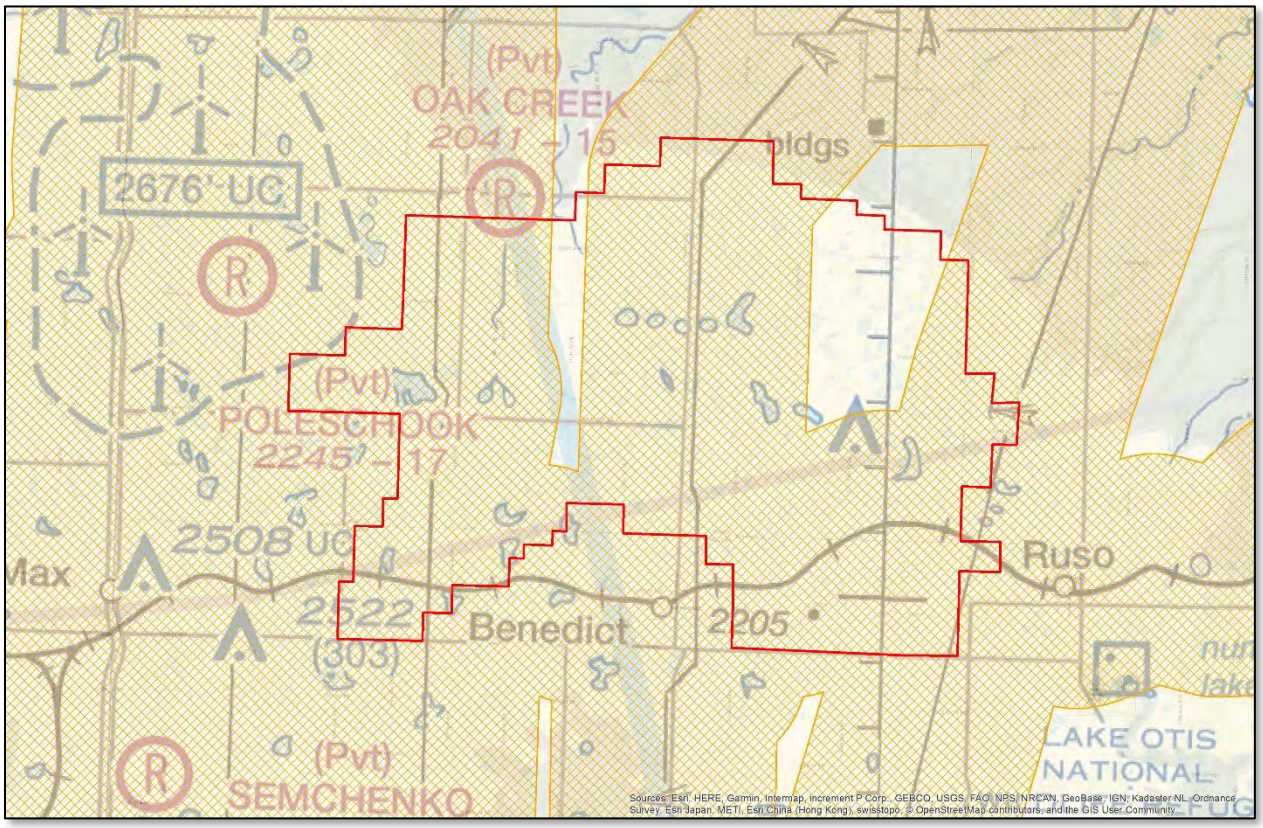


Figure 4: Potential VFR routes in proximity to the Ruso Wind Partners, LLC project

Instrument Departures

In order to ensure that aircraft departing during marginal weather conditions do not fly into terrain or obstacles, the FAA publishes instrument departure procedures that provide obstacle clearance to pilots as they transition between the terminal and enroute environments. These procedures contain specific routing and minimum climb gradients to ensure clearance from terrain and obstacles.

Proposed structures that exceed instrument departure procedure obstacle clearance surfaces would require an increase to instrument departure procedure minimum climb gradients. If the FAA determines that this impact would constitute a substantial adverse effect, it could be used as the basis for determinations of hazard.

Instrument departure procedure obstacle clearance surfaces (e.g., ***Figure 5***) are in excess of other lower surfaces and should not limit 591 foot AGL wind turbines within the defined study area.

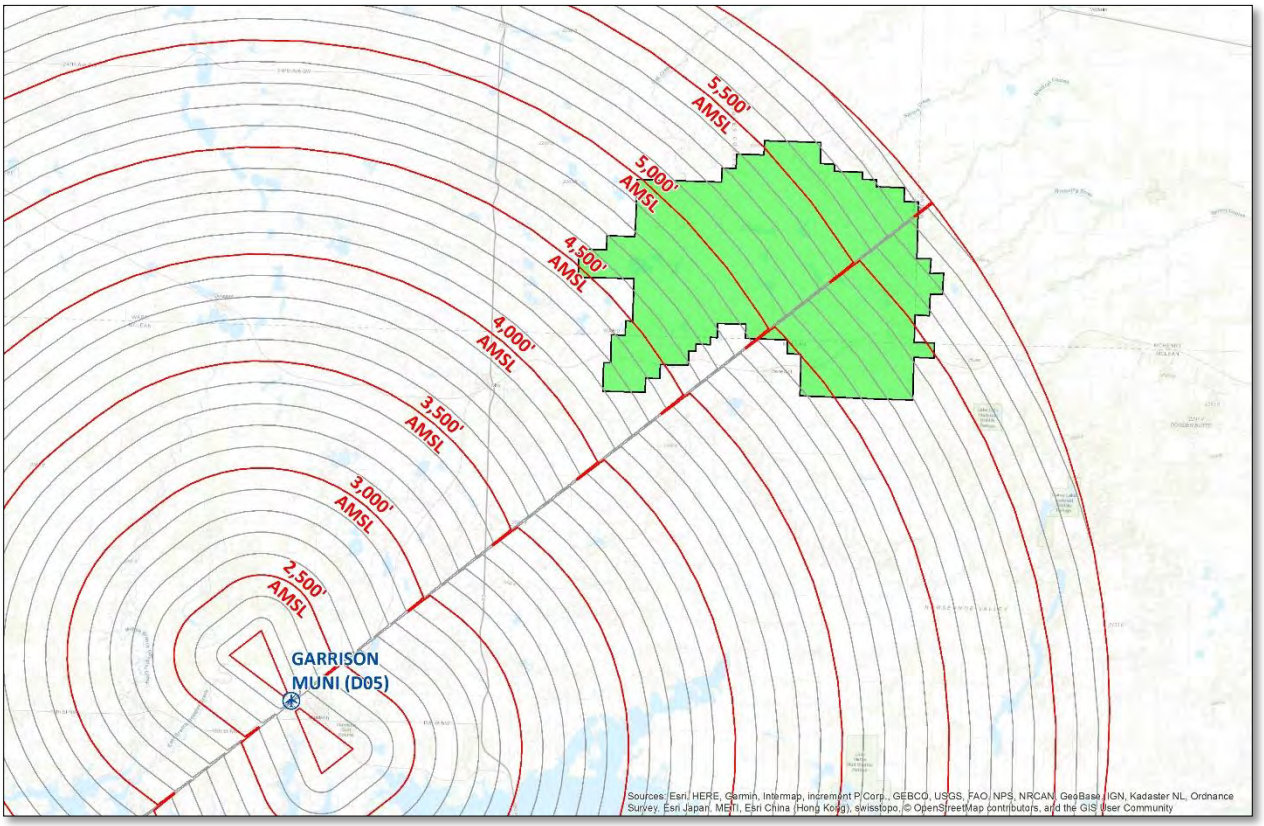


Figure 5: Garrison Municipal Airport (D05) obstacle departure procedure assessment

Instrument Approaches

Pilots operating during periods of reduced visibility and low cloud ceilings rely on terrestrial and satellite based navigational aids (NAVAIDS) in order to navigate from one point to another and to locate runways. The FAA publishes instrument approach procedures that provide course guidance to on-board avionics that aid the pilot in locating the runway. Capitol Airspace assessed a total of 12 published instrument approach procedures at two public-use airports in proximity to the Ruso Wind Partners, LLC project:

Minot International (MOT)
ILS or Localizer Approach to Runway 31
RNAV (GPS) Approach to Runway 08
RNAV (GPS) Approach to Runway 13
RNAV (GPS) Approach to Runway 26
RNAV (GPS) Approach to Runway 31
Localizer/DME Back Course Approach to Runway 13
VOR Approach to Runway 08
VOR Approach to Runway 13
VOR Approach to Runway 26
VOR Approach to Runway 31

Garrison Municipal (D05)
RNAV (GPS) Approach to Runway 13
RNAV (GPS) Approach to Runway 31

Proposed structures that exceed instrument approach procedure obstacle clearance surfaces would require an increase to instrument approach procedure minimum altitudes. Increases to these altitudes, especially critical *decision altitudes (DA)* and *minimum descent altitudes (MDA)*, can directly impact the efficiency of an instrument approach procedure. If the FAA determines that this impact would affect a significant volume of operations it could be used as the basis for determinations of hazard.

Minot International Airport (MOT)

ILS or Localizer Approach to Runway 31

The *HEKTA* hold-in-lieu of procedure turn minimum holding altitude (MHA) is 3,700 feet AMSL. The associated obstacle clearance surface (***Figure 6***) is 2,700 feet AMSL and is one of the lowest height constraints overlying the eastern section of the study area. USGS elevation data indicates that this surface could limit 591 foot AGL wind turbines in the northeastern section of the study area (red areas, ***Figure 6***).

Localizer/DME Back Course Approach to Runway 13

The *HEKTA* missed approach holding pattern MHA is 3,700 feet AMSL. The associated obstacle clearance surface is 2,700 feet AMSL and is one of the lowest height constraints overlying the eastern section of the study area. USGS elevation data indicates that this surface could limit 591 foot AGL wind turbines in the northeastern section of the study area.

It is possible that the FAA would increase the *HEKTA* MHA in order to accommodate 591 foot AGL wind turbines. This mitigation option is available and is subject to FAA approval.

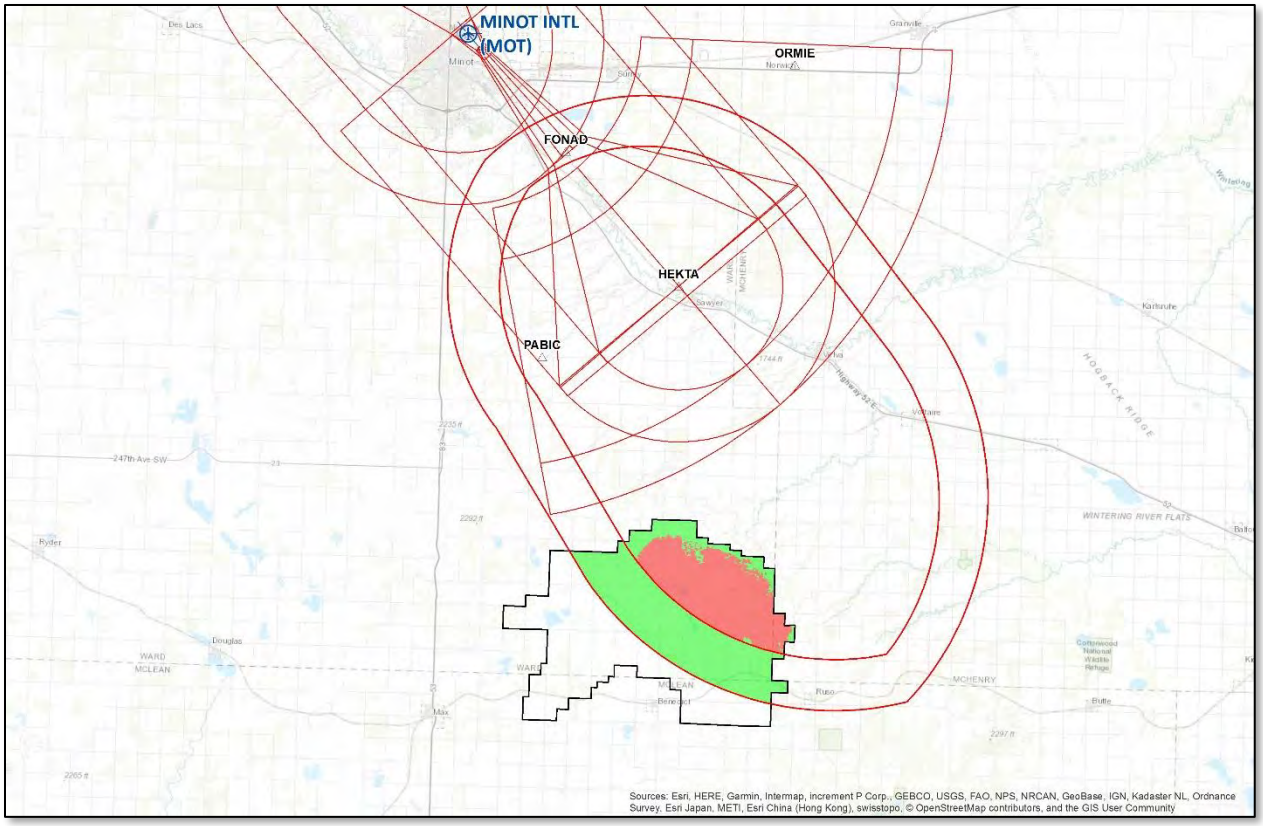


Figure 6: Minot International Airport (MOT) ILS Approach to Runway 31

Enroute Airways

Enroute airways provide pilots a means of navigation when flying from airport to airport and are defined by radials between VHF omni-directional ranges (VORs). The FAA publishes minimum altitudes for airways to ensure clearance from obstacles and terrain. The FAA requires that each airway have a minimum of 1,000 feet of obstacle clearance in non-mountainous areas and normally 2,000 feet in mountainous areas.

Proposed structures that exceed enroute airway obstacle clearance surfaces would require an increase to minimum obstruction clearance altitudes (MOCA) and/or minimum enroute altitudes (MEA). If the FAA determines that this impact would constitute a substantial adverse effect, it could be used as the basis for determinations of hazard.

Enroute airway obstacle clearance surfaces (e.g., ***Figure 7***) are in excess of other lower surfaces and should not limit 591 foot AGL wind turbines within the defined study area.

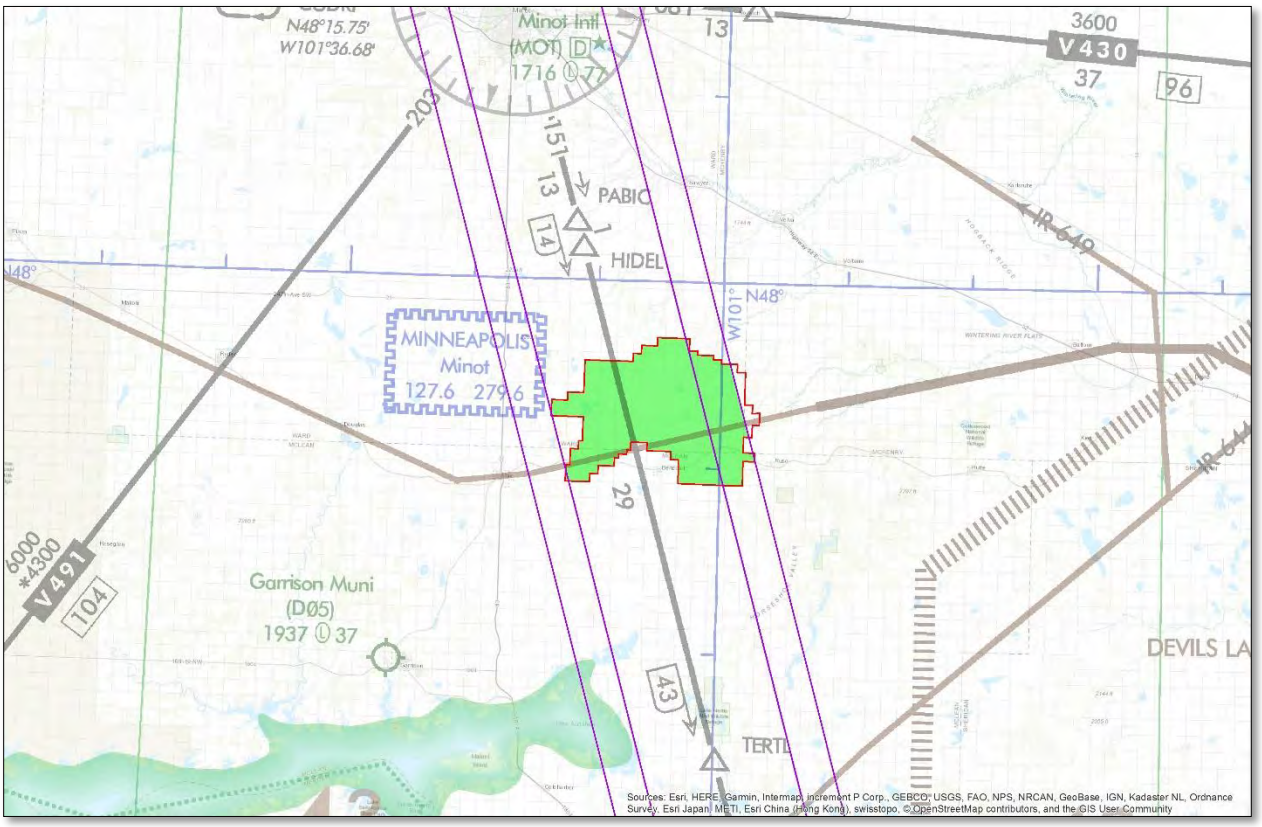


Figure 7: Low altitude enroute chart L-14 with V15 obstacle evaluation areas (purple)

Minimum Vectoring/IFR Altitudes

The FAA publishes minimum vectoring altitude (MVA) and minimum instrument flight rules (IFR) altitude charts that define sectors with the lowest altitudes at which air traffic controllers can issue radar vectors to aircraft based on obstacle clearance. The FAA requires that sectors have a minimum of 1,000 feet of obstacle clearance in non-mountainous areas and normally 2,000 feet in mountainous areas.

Proposed structures that exceed minimum vectoring/IFR altitude sector obstacle clearance surfaces would require an increase to the altitudes usable by air traffic control for vectoring aircraft. If the FAA determines that this impact would affect a significant volume of operations (*as few as one per week*), it could result in determinations of hazard.

Bismarck (BIS) Terminal Radar Approach Control (TRACON)

Sector E (Multiple Charts)

The MVA is 3,700 feet AMSL. The associated obstacle clearance surface (hatched purple, ***Figure 8***) is 2,749 feet AMSL and is one of the lowest height constraints overlying the southeastern section of the study area. USGS elevation data indicates that this surface could limit 591 foot AGL wind turbines in this area (red areas, ***Figure 8***).

Minneapolis (ZMP) Air Route Traffic Control Center (ARTCC)

Sector PDVL01

The minimum IFR altitude is 3,500 feet AMSL. The associated obstacle clearance surface (hatched purple, ***Figure 9***) is 2,549 feet AMSL and is the lowest height constraint overlying the northern section of the study area. USGS elevation data indicates that this surface could limit 591 foot AGL wind turbines in this area (red area, ***Figure 9***).

Sector PDVL05

The minimum IFR altitude is 3,900 feet AMSL. The associated obstacle clearance surface (hatched blue, ***Figure 9***) is 2,949 feet AMSL and is one of the lowest height constraints overlying the central section of the study area. However, USGS elevation data indicates that this surface should not limit 591 foot AGL wind turbines within the defined study area.

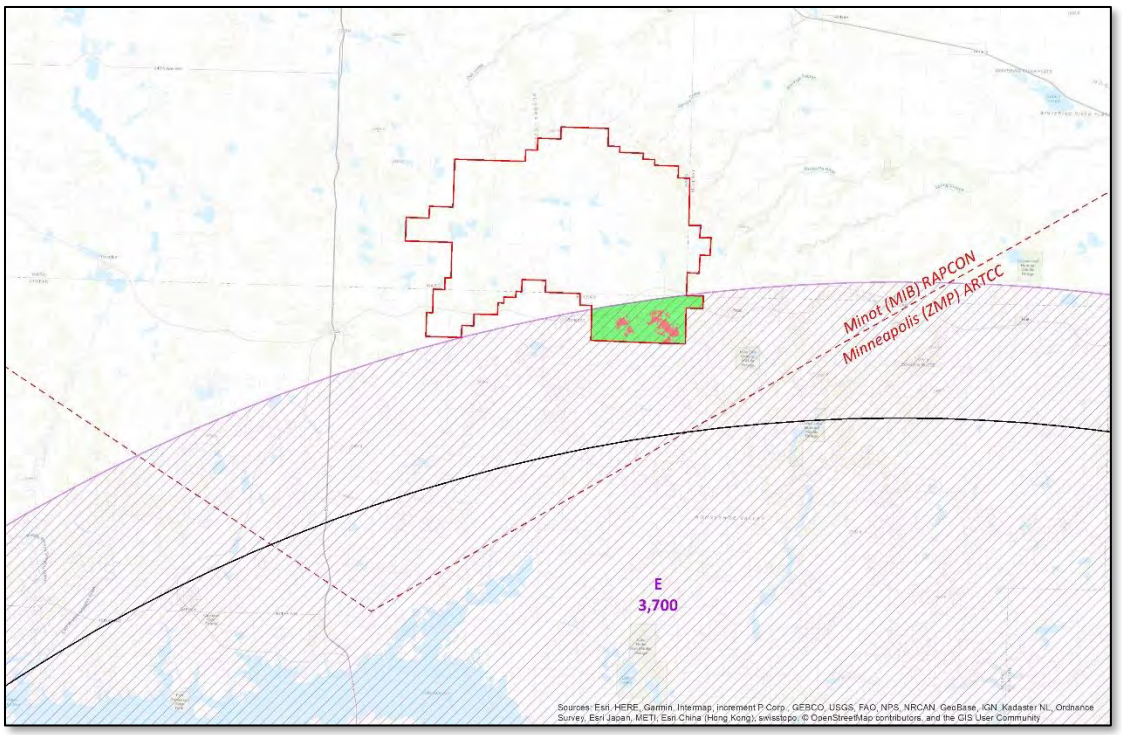


Figure 8: Bismarck (BIS) TRACON minimum vectoring altitude sectors (black) with Sector E obstacle evaluation area (hatched purple)

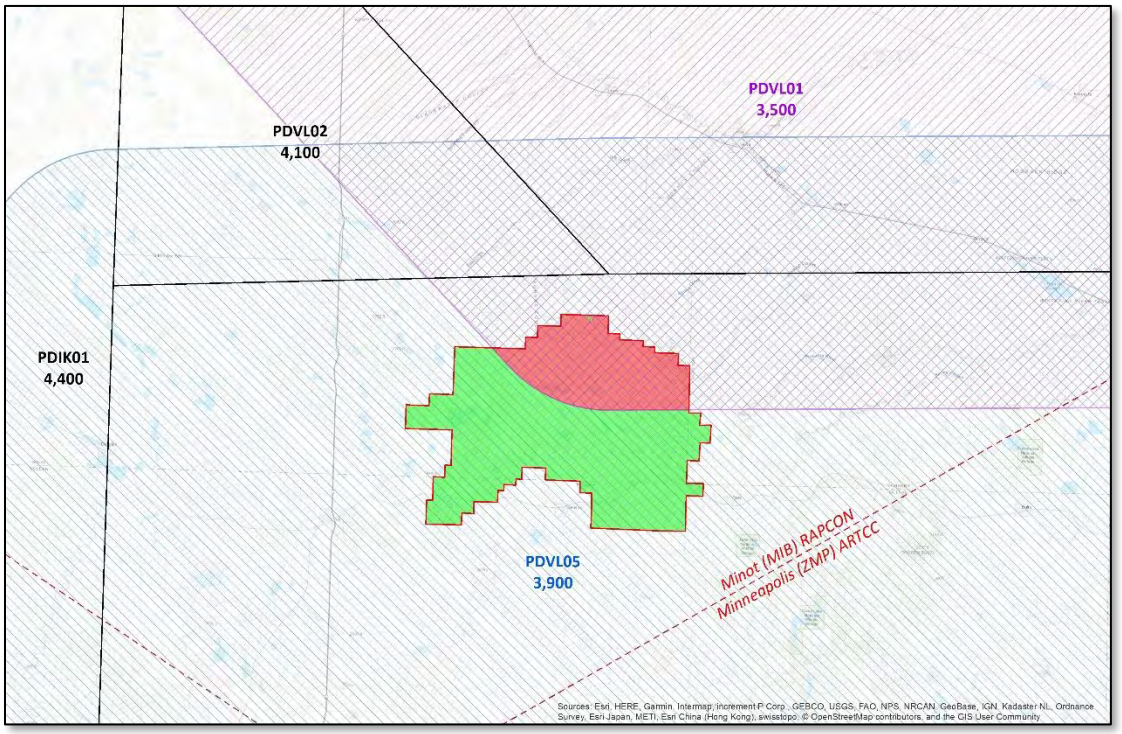


Figure 9: Minneapolis (ZMP) ARTCC minimum IFR altitude sectors (black) with Sector PDVL01 (hatched purple) and Sector PDVL05 (hatched blue) obstacle evaluation areas

Military Airspace and Training Routes

Since the FAA does not protect for military airspace or training routes, impact on their operations cannot result in a determination of hazard. However, the FAA will notify the military of proposed wind turbines located within these segments of airspace. If the planned development area is located on federal land, impact on military airspace or training routes may result in the denial of permits by the Bureau of Land Management.

Instrument flight rules (IR) routes overlying the Ruso Wind Partners, LLC project (***Figure 10***):

Minot Air Force Base (AFB)

Route/Airspace	*Minimum Altitude*
IR-678	600 feet AGL

Considering the low altitude associated with IR-678, it is possible that wind development could have an impact on its operations. If Minot AFB uses this route regularly, it may result in military objections to proposed wind development.

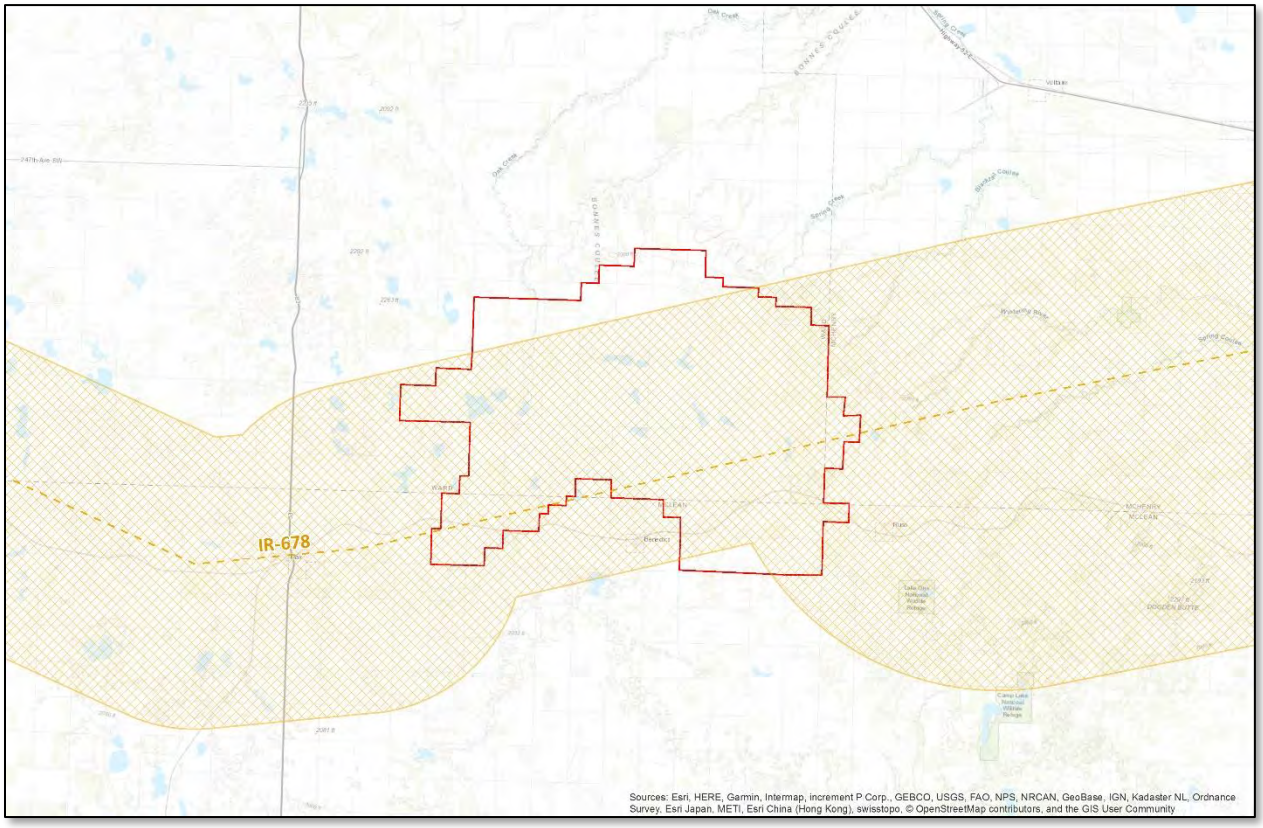


Figure 10: IR-678 and the Ruso Wind Partners, LLC project

Radar Surveillance Systems

Various radar systems support air traffic control operations as well as weather detection. Proposed wind turbines that within radar line of sight (RLOS) are "visible" to radars and could create unwanted clutter resulting in false radar returns and decrease in radar sensitivity. If the FAA determines that these radar effects would impact air traffic control operations, the FAA may conduct further review to identify potential safety hazards and the associated risks to the National Airspace System. The additional analysis may extend the FAA's timeline for review of proposed wind turbines and could ultimately result in determinations of hazard.

Radar System	LOS
Bismarck Airport Surveillance Radar Model-8 (ASR-8)	No
Minot Air Force Base (AFB) Digital Airport Surveillance Radar (DASR)	Yes
Bismarck Weather Surveillance Radar Model 1988 Doppler (WSR-88D)	No
Minot AFB WSR-88D	Yes
North Platte WSR-88D	No

Table 1: Preliminary RLOS analysis results

The preliminary RLOS analysis results indicate that 591 foot AGL wind turbines would be visible to the Minot AFB DASR (left, ***Figure 11***) and WSR-88D (right, ***Figure 11***). Wind turbines within RLOS could create unwanted primary returns (clutter) and dropped primary targets in the vicinity of proposed wind turbines. If the FAA determines that this impact would constitute a substantial adverse effect, it could be used as the basis for determinations of hazard regardless of the lack of impact on the physical airspace surfaces described in this report.

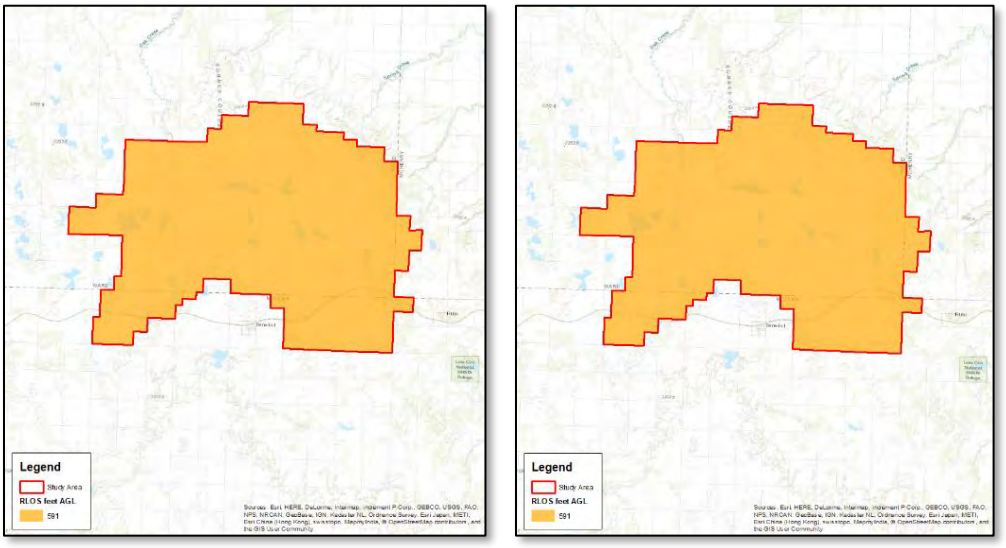


Figure 11: Minot AFB DASR (left) WSR-88D (right) RLOS results at 591 feet AGL (orange)

Conclusion

At 591 feet AGL, proposed wind turbines will exceed 14 CFR Part 77.17(a)(1) – a height of 499 feet AGL at the site of the object – and will be identified as obstructions regardless of location. However, heights in excess of 499 feet AGL are feasible provided proposed wind turbines do not exceed FAA obstacle clearance surfaces.

Obstacle clearance surfaces overlying the Ruso Wind Partners, LLC project range from 2,549 to 2,949 feet AMSL (***Figure 12***) and are associated with Minot International Airport (MOT) instrument approach procedures (***Figure 6***), a Bismarck (BIS) TRACON minimum vectoring altitude sector (***Figure 8***), and Minneapolis (ZMP) ARTCC minimum IFR altitude sectors (***Figure 9***). Proposed wind turbines that exceed these surfaces would require an increase to instrument approach procedure minimum altitudes and minimum vectoring/IFR altitudes. If the FAA determines that one or the sum of these impacts would affect a significant volume of operations, it could result in determinations of hazard.

USGS elevation data indicates that Minot International Airport instrument approach procedures, Bismarck (BIS) TRACON minimum vectoring altitude Sector E, and Minneapolis (ZMP) ARTCC minimum IFR altitude Sector PDVL01 could limit 591 foot AGL wind turbines in northern, eastern, and southeastern sections of the study area (red areas, ***Figure 13***).

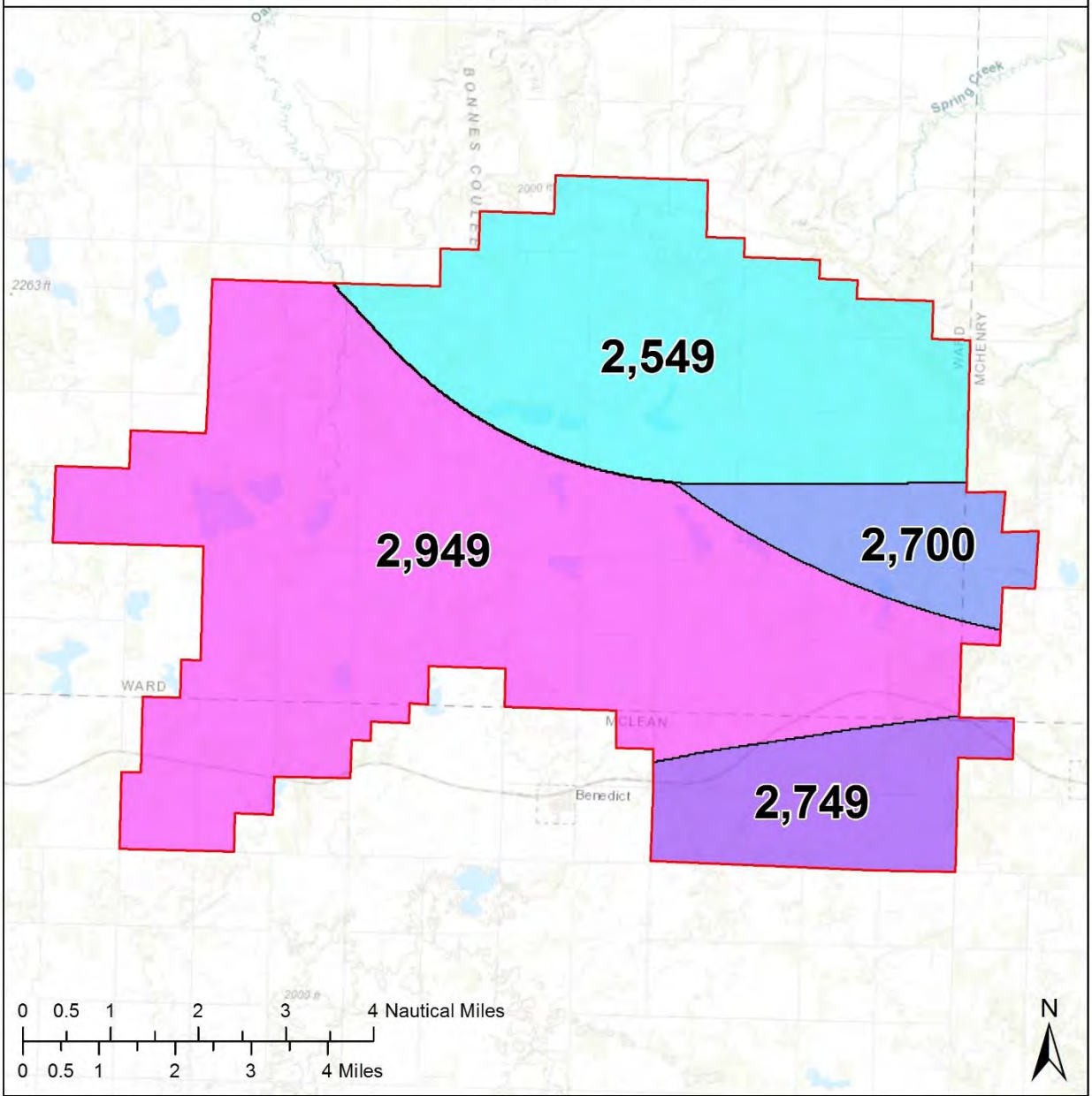
Military training route IR-678 overlies the Ruso Wind Partners, LLC project (***Figure 10***). Although impact on this route cannot result in determinations of hazard, it could result in military objections to proposed wind development.

At 591 feet AGL, proposed wind turbines would be in line of sight of Minot AFB radar surveillance systems (***Figure 11***). Proposed wind turbines that create unwanted clutter resulting in false radar returns and a decrease in radar sensitivity could impact air traffic control operations. The FAA may conduct additional analysis to identify potential safety hazards and the associated risks to the National Airspace System. The additional analysis may add time to the FAA's review of proposed wind turbines that could ultimately result in determinations of hazard.

The AGL Clearance Map (***Figure 13***) is based on USGS National Elevation Dataset (NED) 1/3 Arc Second data which has a vertical accuracy of generally +/- 7 meters. Therefore, the AGL Clearance Map should only be used for general planning purposes and not exact structure siting. In order to avoid determinations of hazard, proposed structure heights should adhere to the height constraints depicted in the Composite Map (***Figure 12***).

If you have any questions regarding the findings of this study, please contact ***Rick Coles*** or ***Nick Lee*** at (703) 256-2485.

Proposed structures that exceed 14 CFR Part 77.17(a)(1) - a height of 499 feet AGL at the site of the object - will be identified as obstructions regardless of location.



Obstacle Clearance Surface
Height - AMSL Feet

- 2,549
- 2,700
- 2,749
- 2,949

All heights above mean sea level (AMSL)

Ruso Wind Partners, LLC Project
Composite Height Constraint Map

Plot Date:
28 August 2018

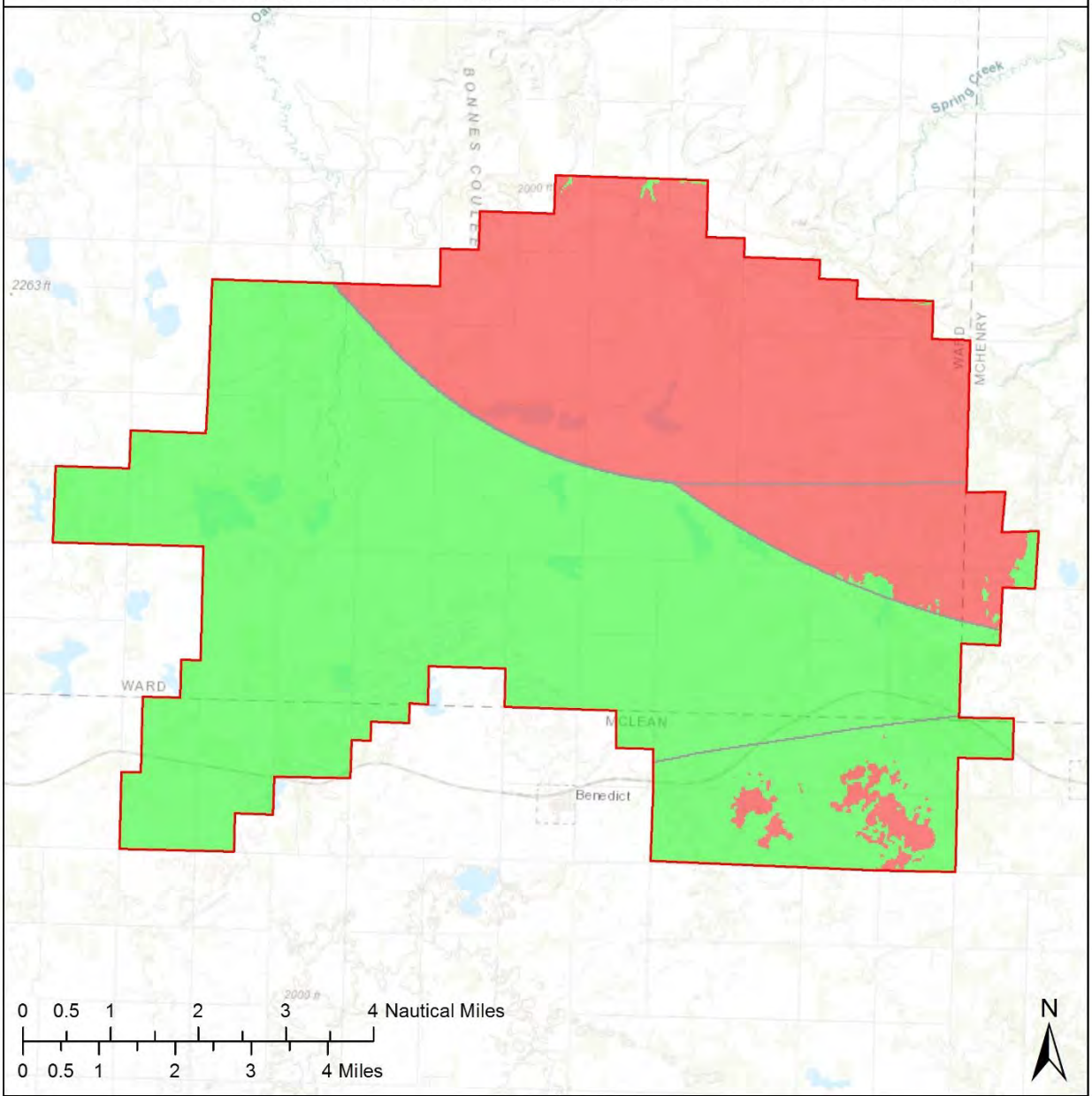
Figure 12

Coordinate System:
NAD 1983 UTM Zone 14N

Nick Lee

Capitol Airspace Group

The USGS 1/3 Arc Second Digital Elevation Model (DEM) data used to create this map has a vertical accuracy of +/- 7 meters. This map should only be used for general planning purposes and not exact structure siting.



Clearance

Height - AGL Feet

< 591

≥ 591

Ruso Wind Partners, LLC Project
Above Ground Level (AGL) Clearance Map

Plot Date:
28 August 2018

Coordinate System:
NAD 1983 UTM Zone 14N

Nick Lee

Figure 13

Capitol Airspace Group

Appendix P. Wetland Mapping Survey

Wetland Mapping Survey

Ruso Wind Project

McHenry, McLean, and Ward Counties, North Dakota

Final Report

October 5 – 19 and November 29 – December 3, 2018

Prepared for

Ruso Wind, LLC

3535 Colonnade Parkway
Birmingham, Alabama 35243

Prepared by:

Kristen Chodachek and Alex Brazeal

Western EcoSystems Technology, Inc.
2007 State Street, Suite 109
Bismarck, North Dakota 58503

December 14, 2018

Privileged and Confidential - Not For Distribution

STUDY PARTICIPANTS

Western EcoSystems Technology, Inc.

Clayton Derby	Senior Manager/Report Reviewer
Kristen Chodachek	Project Manager/Report Reviewer
Alex Brazeal	Field Biologist/Report Writer
Katherine Moratz	Field Biologist
Julie Dickey	Field Biologist
Melissa Wolfe	Field Biologist
Alex Hunley	Field Biologist
Grant Gardner	GIS Specialist
Sofia Agudelo	Technical Editor/Report Reviewer

REPORT REFERENCE

Chodachek, K and Brazeal, A. 2018. Wetland Mapping Survey, Ruso Wind Project, McHenry, McLean, and Ward Counties, North Dakota. Final Report: October 5 – 19 and November 29 – December 3, 2018. Prepared for Ruso Wind, LLC, Birmingham, Alabama. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. December 14, 2018.

TABLE OF CONTENTS

INTRODUCTION 1

PROJECT AREA 1

METHODS 3

Desktop Review 3

Field Surveys 3

Quality Assurance and Quality Control 3

RESULTS 6

Desktop Review and Field Surveys 6

Geospatial Data 6

REFERENCES 9

LIST OF TABLES

Table 1. Attributes and definitions for the wetland mapping survey shapefile based on field surveys conducted from October 5 – 19 and November 29 – December 3, 2018 at the Ruso Wind Project in McHenry, McLean, and Ward Counties, North Dakota. 6

LIST OF FIGURES

Figure 1. Location of the Ruso Wind Project in McHenry, McLean, and Ward counties, North Dakota. 2

Figure 2. Overview of the wetland survey areas at the Ruso Wind Project in McHenry, McLean, and Ward counties, North Dakota. 4

Figure 3. Results of the desktop wetland mapping survey at the Ruso Wind Project in McHenry, McLean, and Ward counties, North Dakota. 5

Figure 4. Results of the wetland mapping surveys conducted October 5 – 19 and November 29 – December 3, 2018, at the Ruso Wind Project in McHenry, McLean, and Ward counties, North Dakota. 7

Figure 5. Survey type used during field surveys conducted October 5 – 19 and November 29 – December 3, 2018, at the Ruso Wind Project in McHenry, McLean, and Ward counties, North Dakota. 8

LIST OF APPENDICES

Appendix A. Summary of wetland vegetation recorded during field surveys conducted October 5 – 19 and November 29 – December 3, 2018 at the Ruso Wind Project in McHenry, McLean, and Ward counties, North Dakota 10

.

INTRODUCTION

Ruso Wind, LLC, a subsidiary of Southern Power Company (Southern) is developing the Ruso Wind Project (Project) in McHenry and Ward counties, North Dakota (Figure 1). Ruso Wind, LLC requested Western EcoSystems Technology, Inc. (WEST) conduct a desktop and field wetland mapping survey within the proposed Project area. The objective of the mapping survey was to identify wetlands within the Project area to aid in siting Project infrastructure.

PROJECT AREA

The 47,799.0 acres (ac; 19,344.0 hectares [ha]) Project area is located in McHenry, McLean, and Ward counties, approximately 1.0 mile (1.6 kilometers) north of the town of Ruso, North Dakota (Figure 1). The Project occurs within the Missouri Coteau and Drift Plains Level IV Ecoregions (US Environmental Protection Agency [USEPA] 2017). The Missouri Coteau Level IV Ecoregion is dotted with wetland depressions and is used for tilled agriculture and grazing (USEPA 2017). The Drift Plains Level IV Ecoregion contains many temporary and seasonal wetlands and most of the landscape has been tilled due to its productive soil and relatively level topography (USEPA 2017). Topography is flat to rolling, with elevations ranging from 1,778.2–2,204.7 feet (ft; 542.0–672.0 meters [m]) above sea level (US Geological Survey [USGS] 2016).

Land ownership is primarily private, with some state-managed and federally administered lands occurring in the Project area. Areas of North Dakota State School Land, US Fish and Wildlife Service (USFWS) Waterfowl Production Areas, and USFWS easements are found within the Project (USGS 2018).

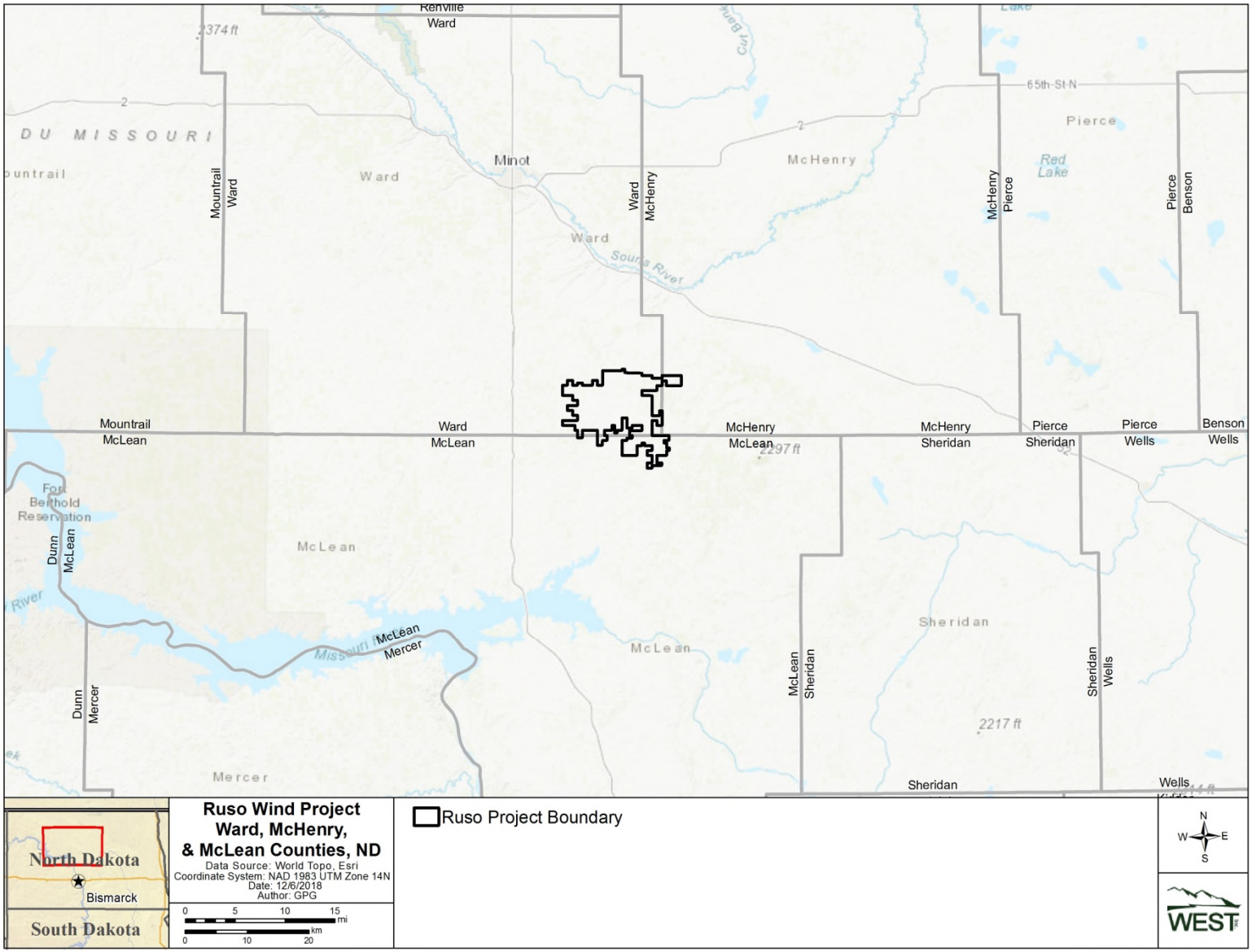


Figure 1. Location of the Ruso Wind Project in McHenry, McLean, and Ward counties, North Dakota.

METHODS

The survey area focused on two proposed turbine layouts with a buffer radius of 76.2-m (250-ft) on each turbine and the proposed transmission line with a 22.9 m (75.0 ft) buffer on either side (Figure 2).

Desktop Review

WEST completed a desktop review of existing wetlands within the survey area using current aerial photography (US Department of Agriculture National Agriculture Imagery Program 2017), national wetland inventory (NWI) data (USFWS NWI 2014), and national hydrography dataset (USGS National Hydrography Dataset 2014), resulting in a digital data layer of wetland boundaries in ArcGIS Software (ArcGIS 10.5.1.; Figure 3).

Field Surveys

Wetland mapping surveys were conducted from October 5 – 19 and November 29 – December 3, 2018, to identify and confirm the presence or absence and extent of wetlands within the survey area initially identified during the desktop evaluation. Wetlands were evaluated on foot where access was permitted or from roadsides or close proximity to the wetland where access was not permitted.

Wetlands were identified based on two parameters: hydrology and wetland vegetation. An area with either standing water or other indicators of wetland hydrology (i.e., saturated soils, water marks) and/or greater than 50.0% coverage of wetland vegetation (e.g., cattails or sedges) was mapped as a wetland. The wetland boundary was mapped following wetland/upland vegetation breaks, slope, and other hydrology indicators. All other areas not mapped as wetland were considered uplands (i.e., areas containing upland vegetation and lacking hydrological indicators). Mapping and data were collected using a tablet with Collector for ArcGIS (ESRI 2018) with a Trimble® R1 Global Positioning System receiver rated to 1.6-ft (0.5-m) accuracy. If either wetland vegetation or hydrology indicators were not present, biologists used their professional judgement along with the desktop review to determine whether or not an area be classified as a wetland. Photographs were taken at each wetland surveyed and are available upon request.

Quality Assurance and Quality Control

Quality assurance and quality control measures were implemented at all stages of the wetland mapping survey, including desktop review, field surveys, and report writing. All photographs and electronic data files were retained for reference.

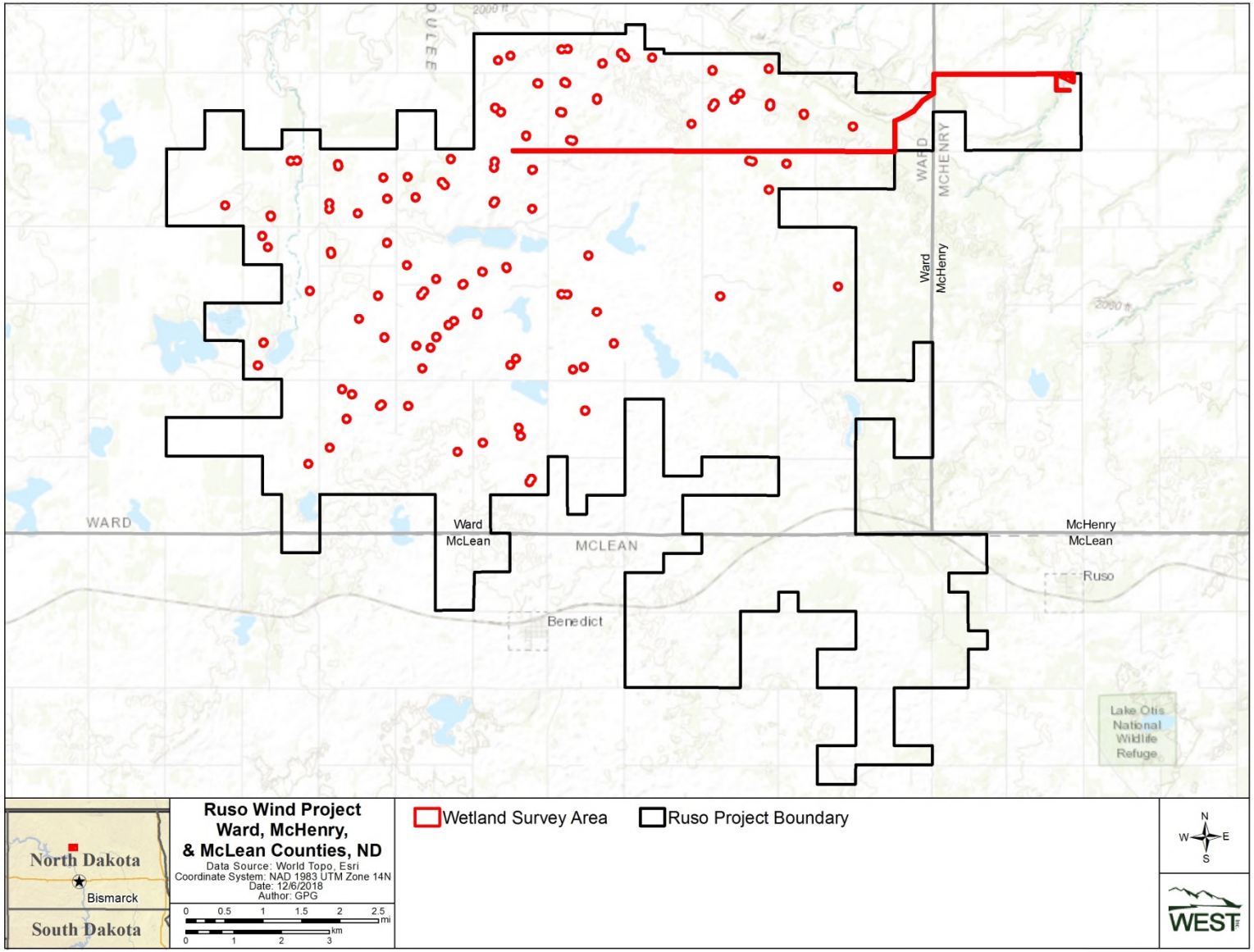


Figure 2. Overview of the wetland survey areas at the Ruso Wind Project in McHenry, McLean, and Ward counties, North Dakota.

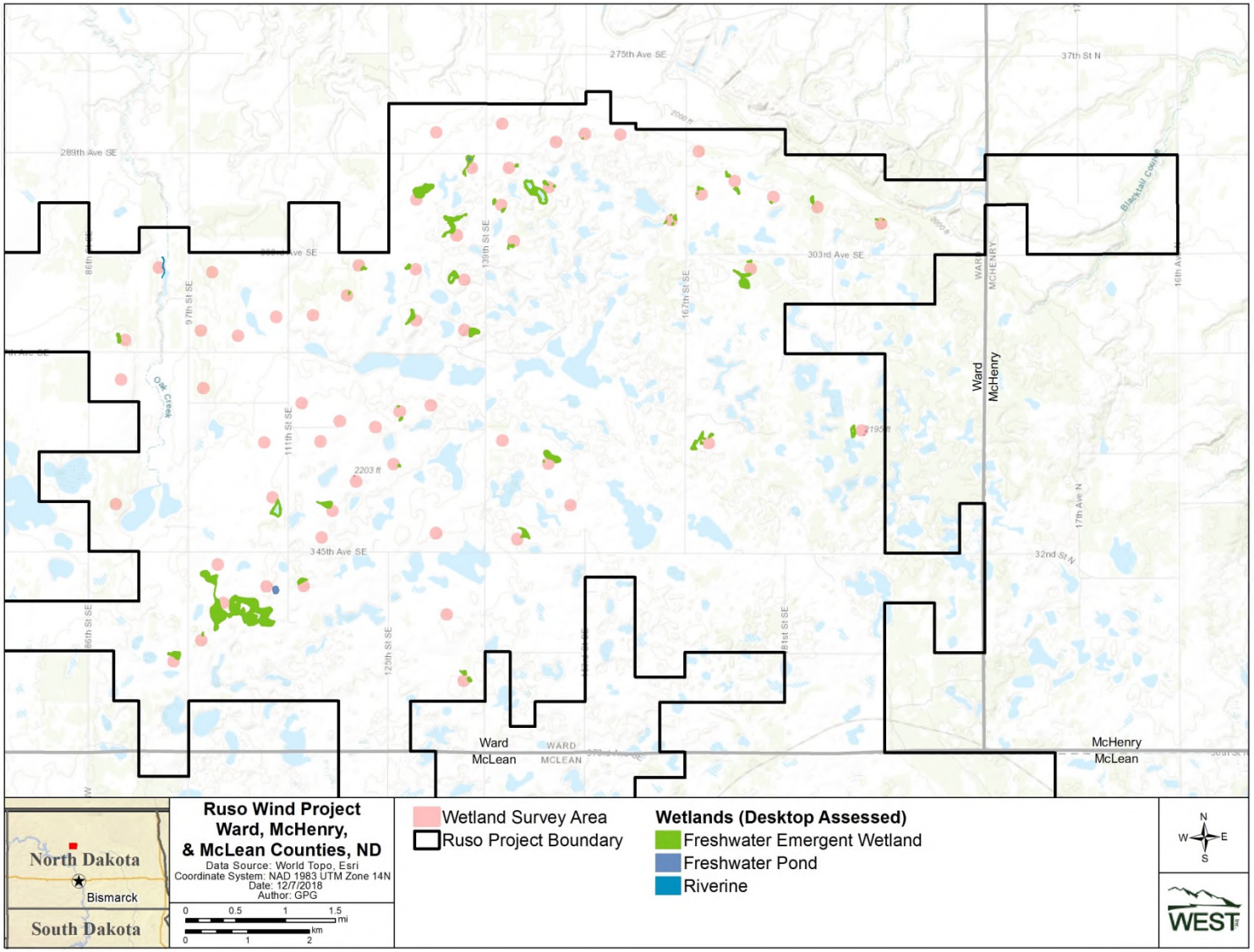


Figure 3. Results of the desktop wetland mapping survey at the Ruso Wind Project in McHenry, McLean, and Ward counties, North Dakota.

RESULTS

Desktop Review and Field Surveys

The survey area consisted of 234.92 ac (95.07 ha) of wetlands. Freshwater emergent wetland was the only wetland type mapped within the survey area (Figure 4). The majority of wetlands were mapped on foot (i.e., walk-in; Figure 5).

The most common wetland vegetation recorded during wetland mapping surveys was broadleaf cattail (*Typha latifolia*), followed by reed canary grass (*Phalaris arundinacea*) and sow thistle (*Sonchus arvensis*; Appendix A). Broadleaf cattail was recorded at 97.6% of the 42 wetlands (Appendix A). Vegetation surrounding mapped wetlands included cropland or introduced cool season grasses (i.e., smooth brome [*Bromus inermis*], intermediate wheat grass [*Thinopyrum intermedium*]).

Primary hydrologic field indicators included surface water, saturated soils, and water marks, were used in determining wetland boundaries during the wetland mapping survey.

Geospatial Data

A shapefile was created based on the wetland survey to describe wetlands assessed during the desktop review and field surveys. Attribute data are described in Table 1.

Table 1. Attributes and definitions for the wetland mapping survey shapefile based on field surveys conducted from October 5 – 19 and November 29 – December 3, 2018 at the Ruso Wind Project in McHenry, McLean, and Ward Counties, North Dakota.

Attribute	Definition
WETLAND_TY	Wetland type (i.e., Freshwater Emergent, Freshwater Pond, Lake, No Wetland)
Evaluation	Survey type (i.e., Walk-In, Visual)
Acres	Area of wetland polygon in acres.

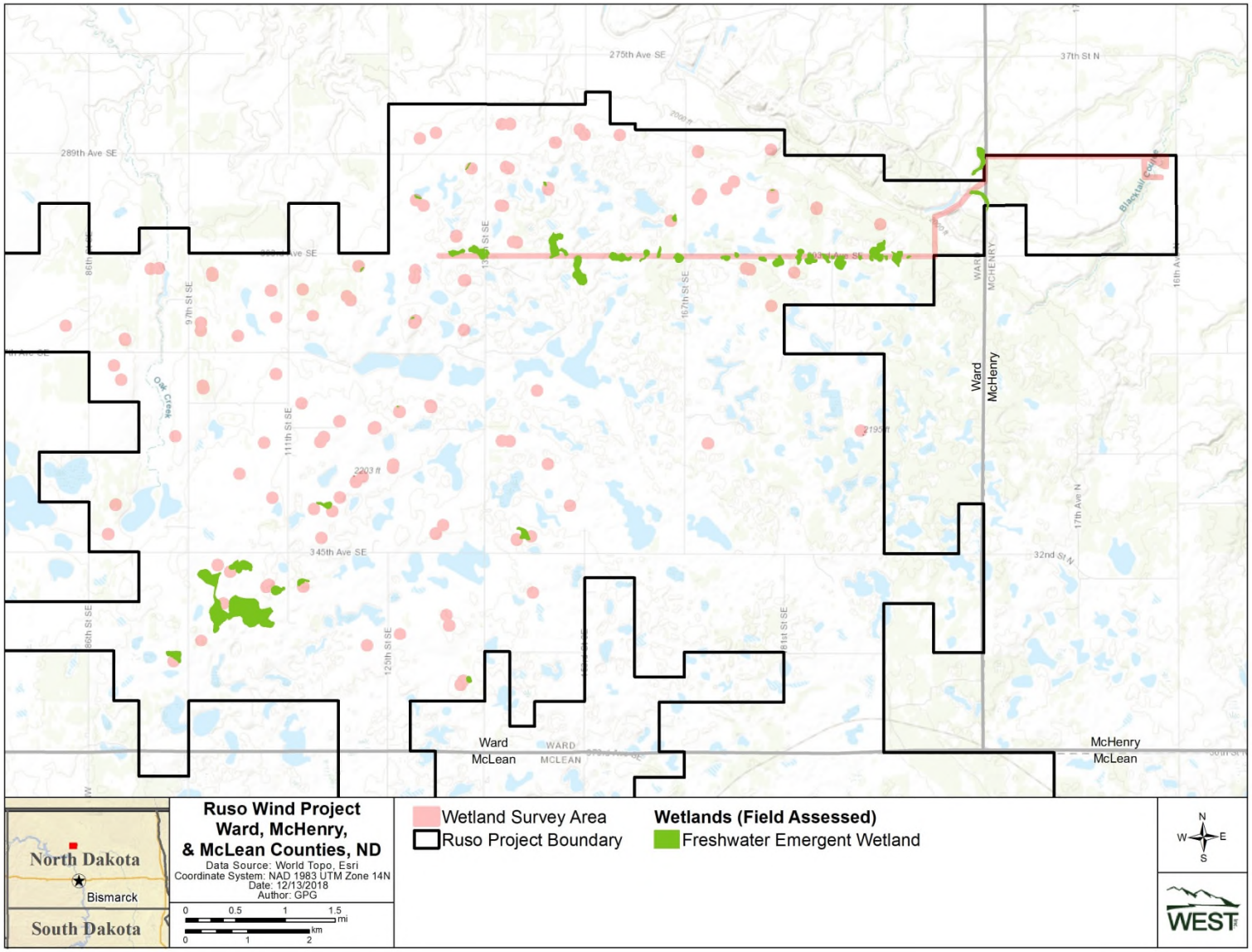


Figure 4. Results of the wetland mapping surveys conducted October 5 – 19 and November 29 – December 3, 2018, at the Ruso Wind Project in McHenry, McLean, and Ward counties, North Dakota.

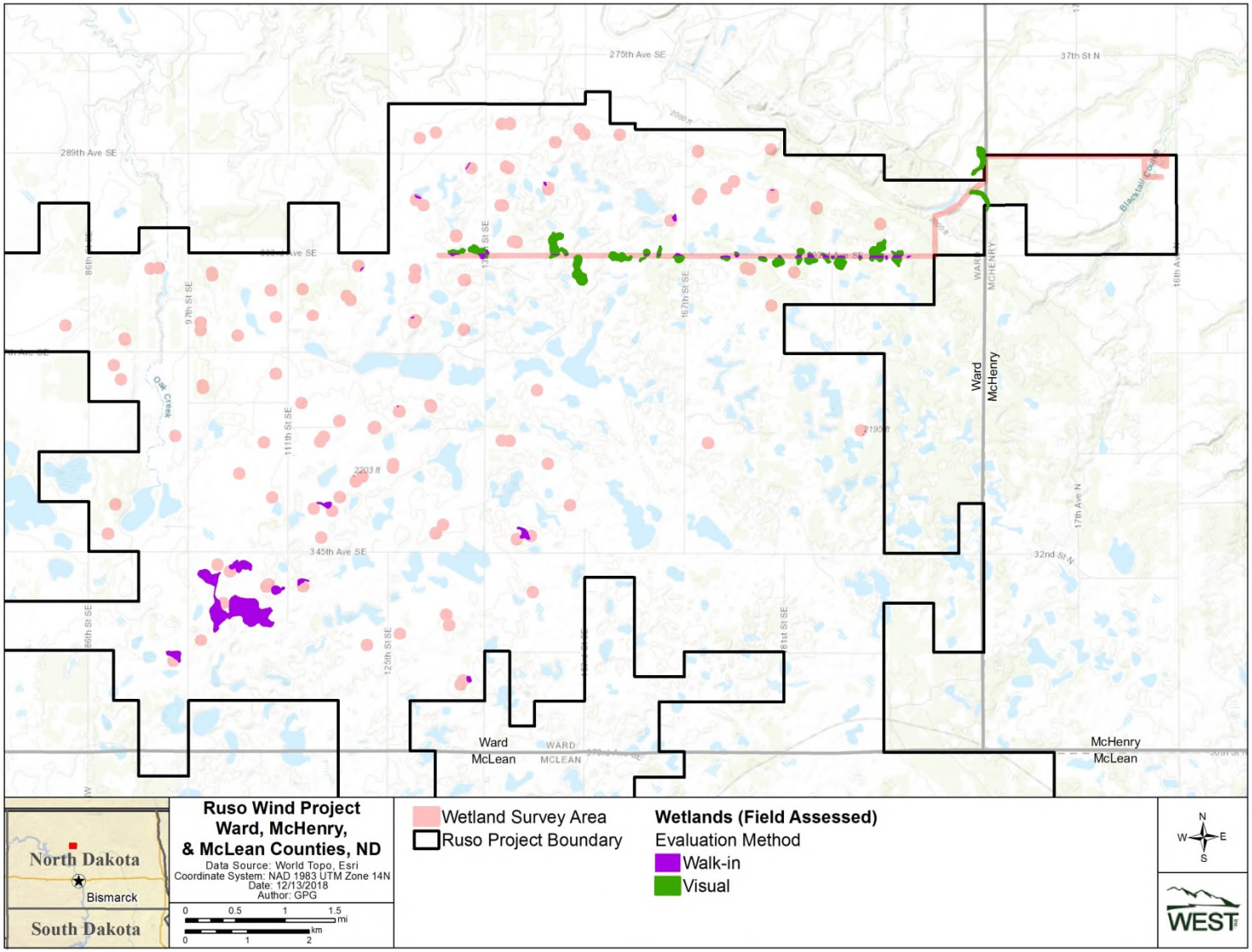


Figure 5. Survey type used during field surveys conducted October 5 – 19 and November 29 – December 3, 2018, at the Ruso Wind Project in McHenry, McLean, and Ward counties, North Dakota.

REFERENCES

ArcGIS. Arcgis Version 10.5. Gis Software. ESRI, Redlands, California.

ESRI. 2013. World Topographic Map. ArcGIS Resource Center. ESRI, producers of ArcGIS software. ESRI, Redlands, California. Last modified June 6, 2018. Available online: http://www.arcgis.com/home/item.html?id=30e5fe3149c34df1ba922e6f5bbf808f

ESRI. 2018. World Imagery and Aerial Photos. ArcGIS Resource Center. Environmental Systems Research Institute (ESRI), producers of ArcGIS software. Redlands, California. Information online: http://www.arcgis.com/home/webmap/viewer.html?useExisting=1

North American Datum (NAD). 1983. Nad83 Geodetic Datum.

US Department of Agriculture (USDA). 2017. Imagery Programs - National Agriculture Imagery Program (Naip). USDA - Farm Service Agency (FSA). Aerial Photography Field Office (APFO), Salt Lake City, Utah. Accessed August 2017. Information online: http://www.fsa.usda.gov/programs-and-services/aerial-photography/imagery-programs/index

US Environmental Protection Agency (USEPA). 2017. Level Iii and Level Iv Ecoregions of the Continental United States. Ecosystems Research, USEPA. Last updated February 8, 2017. Information and maps online: https://www.epa.gov/eco-research/level-iii-and-iv-ecoregions-continental-united-states

US Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI). 2014. Wetlands Inventory Data. Updated September 30, 2014. Digital data and information available online at: http://www.fws.gov/wetlands/data/

US Geological Survey (USGS). 2014. National Hydrography Dataset (Nhd). USGS NHD Extracts. Accessed June 2014. Information available online at: http://nhd.usgs.gov/

US Geological Survey (USGS). 2016. National Elevation Dataset (Ned). Raster digital data. USGS, Sioux Falls, South Dakota. Accessed October 2016. Information online: http://nationalmap.gov

US Geological Survey (USGS). 2018. Protected Areas Data. USGS National Gap Analysis Program (GAP) - Protected Areas Data Portal. Accessed May 2018. Information online: http://gapanalysis.usgs.gov/padus/data/

Appendix A. Summary of wetland vegetation recorded during field surveys conducted October 5 – 19 and November 29 – December 3, 2018 at the Ruso Wind Project in McHenry, McLean, and Ward counties, North Dakota

Appendix A. Summary of wetland vegetation[1] recorded during field surveys conducted October 5 – 19 and November 29 – December 3, 2018 at the Ruso Wind Project in McHenry, McLean, and Ward counties, North Dakota

Wetland ID	Evaluation Method	Wetland Type	Primary Vegetation	Secondary Vegetation	Tertiary Vegetation
	Walk-in	Freshwater emergent wetland	Broadleaf Cattail	Curly Dock	Curly Dock
	Walk-in	Freshwater emergent wetland	Broadleaf Cattail	Foxtail Barley	Reed Canary Grass
	Walk-in	Freshwater emergent wetland	Broadleaf Cattail	Prairie Cord Grass	Reed Canary Grass
	Walk-in	Freshwater emergent wetland	Broadleaf Cattail	Prairie Cord Grass	Reed Canary Grass
	Walk-in	Freshwater emergent wetland	Broadleaf Cattail	Reed Canary Grass	Hardstem Bulrush
	Walk-in	Freshwater emergent wetland	Broadleaf Cattail	Reed Canary Grass	*
	Walk-in	Freshwater emergent wetland	Broadleaf Cattail	Reed Canary Grass	Prairie Cord Grass
	Walk-in	Freshwater emergent wetland	Broadleaf Cattail	Reed Canary Grass	Prairie Cord Grass
	Walk-in	Freshwater emergent wetland	Broadleaf Cattail	Reed Canary Grass	Smartweed
	Walk-in	Freshwater emergent wetland	Broadleaf Cattail	Reed Canary Grass	Smartweed
	Walk-in	Freshwater emergent wetland	Broadleaf Cattail	Reed Canary Grass	Smartweed
	Walk-in	Freshwater emergent wetland	Broadleaf Cattail	Reed Canary Grass	Smartweed
	Walk-in	Freshwater emergent wetland	Broadleaf Cattail	Reed Canary Grass	Smartweed
	Walk-in	Freshwater emergent wetland	Broadleaf Cattail	Reed Canary Grass	Sow Thistle
	Walk-in	Freshwater emergent wetland	Broadleaf Cattail	Reed Canary Grass	Sow Thistle
	Walk-in	Freshwater emergent wetland	Broadleaf Cattail	Reed Canary Grass	Sow Thistle
	Walk-in	Freshwater emergent wetland	Broadleaf Cattail	Reed Canary Grass	Sow Thistle
	Walk-in	Freshwater emergent wetland	Broadleaf Cattail	Reed Canary Grass	Sow Thistle
	Walk-in	Freshwater emergent wetland	Broadleaf Cattail	Reed Canary Grass	Sow Thistle
	Walk-in	Freshwater emergent wetland	Broadleaf Cattail	Reed Canary Grass	Sow Thistle
	Walk-in	Freshwater emergent wetland	Broadleaf Cattail	Reed Canary Grass	Sow Thistle
	Walk-in	Freshwater emergent wetland	Broadleaf Cattail	Reed Canary Grass	Sow Thistle
	Walk-in	Freshwater emergent wetland	Broadleaf Cattail	Reed Canary Grass	Sow Thistle
	Walk-in	Freshwater emergent wetland	Broadleaf Cattail	Reed Canary Grass	Sow Thistle
	Walk-in	Freshwater emergent wetland	Broadleaf Cattail	Reed Canary Grass	Sow Thistle

[1] – Vegetation only recorded for walk-in surveys

* – No wetland vegetation observed when denoted by *

Appendix A continued. Summary of wetland vegetation[1] recorded during field surveys conducted October 5 – 19 and November 29 – December 3, 2018 at the Ruso Wind Project in McHenry, McLean, and Ward counties, North Dakota

Wetland ID	Evaluation Method	Wetland Type	Primary Vegetation	Secondary Vegetation	Tertiary Vegetation
	Walk-in	Freshwater emergent wetland	Broadleaf Cattail	Reed Canary Grass	Sow Thistle
	Walk-in	Freshwater emergent wetland	Broadleaf Cattail	Reed Canary Grass	Sow Thistle
	Walk-in	Freshwater emergent wetland	Broadleaf Cattail	Reed Canary Grass	Sow Thistle
	Walk-in	Freshwater emergent wetland	Broadleaf Cattail	Reed Canary Grass	Sow Thistle
	Walk-in	Freshwater emergent wetland	Broadleaf Cattail	Reed Canary Grass	Sow Thistle
	Walk-in	Freshwater emergent wetland	Broadleaf Cattail	Reed Canary Grass	*
	Walk-in	Freshwater emergent wetland	Broadleaf Cattail	Reed Canary Grass	*
	Walk-in	Freshwater emergent wetland	Broadleaf Cattail	Reed Canary Grass	*
	Walk-in	Freshwater emergent wetland	Broadleaf Cattail	Reed Canary Grass	*
	Walk-in	Freshwater emergent wetland	Broadleaf Cattail	Sago Pondweed	Reed Canary Grass
	Walk-in	Freshwater emergent wetland	Broadleaf Cattail	Smartweed	Curly Dock
	Walk-in	Freshwater emergent wetland	Curly Dock	Broadleaf Cattail	*
	Walk-in	Freshwater emergent wetland	Sago Pondweed	Broadleaf Cattail	Reed Canary Grass
	Walk-in	Freshwater emergent wetland	Smartweed	Broadleaf Cattail	*
	Walk-in	Freshwater emergent wetland	Smartweed	Reed Canary Grass	Broadleaf Cattail
	Visual	Freshwater emergent wetland	*	*	*
	Visual	Freshwater emergent wetland			
	Visual	Freshwater emergent wetland			
	Visual	Freshwater emergent wetland			
	Visual	Freshwater emergent wetland			
	Visual	Freshwater emergent wetland			
	Visual	Freshwater emergent wetland			
	Visual	Freshwater emergent wetland			
	Visual	Freshwater emergent wetland			
	Visual	Freshwater emergent wetland			
	Visual	Freshwater emergent wetland			
	Visual	Freshwater emergent wetland			

[1] – Vegetation only recorded for walk-in surveys

* – No wetland vegetation observed when denoted by *

Appendix A continued. Summary of wetland vegetation[1] recorded during field surveys conducted October 5 – 19 and November 29 – December 3, 2018 at the Ruso Wind Project in McHenry, McLean, and Ward counties, North Dakota

Wetland ID	Evaluation Method	Wetland Type	Primary Vegetation	Secondary Vegetation	Tertiary Vegetation
	Visual	Freshwater emergent wetland			
	Visual	Freshwater emergent wetland			
	Visual	Freshwater emergent wetland			
	Visual	Freshwater emergent wetland			
	Visual	Freshwater emergent wetland			
	Visual	Freshwater emergent wetland			
	Visual	Freshwater emergent wetland			
	Visual	Freshwater emergent wetland			
	Visual	Freshwater emergent wetland			
	Visual	Freshwater emergent wetland			
	Visual	Freshwater emergent wetland			
	Visual	Freshwater emergent wetland			
	Visual	Freshwater emergent wetland			
	Visual	Freshwater emergent wetland			
	Visual	Freshwater emergent wetland			
	Visual	Freshwater emergent wetland			
	Visual	Freshwater emergent wetland			
	Visual	Freshwater emergent wetland			
	Visual	Freshwater emergent wetland			
	Visual	Freshwater emergent wetland			
	Visual	Freshwater emergent wetland			
	Visual	Freshwater emergent wetland			
	Visual	Freshwater emergent wetland			
	Visual	Freshwater emergent wetland			
	Visual	Freshwater emergent wetland			

[1] – Vegetation only recorded for walk-in surveys

* – No wetland vegetation observed when denoted by *

Appendix Q. Shadow Flicker Analysis

Shadow Flicker Analysis

Ruso Wind Partners, LLC

Ruso Wind Project
Project No. 112086

Revision 1
12/21/2018

Shadow Flicker Analysis

prepared for

Ruso Wind Partners, LLC
Ruso Wind Project
Ruso, North Dakota

Project No. 112086

Revision 1
12/21/2018

prepared by

Burns & McDonnell Engineering Company, Inc.
Kansas City, Missouri

COPYRIGHT © 2018 BURNS & McDONNELL ENGINEERING COMPANY, INC.

TABLE OF CONTENTS

Page No.

1.0 INTRODUCTION 1-1
1.1 Study Overview 1-1
1.2 Project Overview 1-1
1.3 Shadow Flicker Overview 1-1
1.4 Site Visit 1-2

2.0 MODELING PARAMETERS AND INPUTS 2-1
2.1 Modeling Overview 2-1
2.2 Turbine Coordinates 2-1
2.3 Turbine Dimensions 2-1
2.4 Receptors 2-2
2.5 Terrain 2-2
2.6 Obstacles 2-2
2.7 Turbine Operation 2-3
2.8 Flicker Relevance 2-4
2.9 Sun Angle 2-4
2.10 Environment 2-4

3.0 RESULTS 3-1

APPENDIX A - WIND TURBINE COORDINATES

APPENDIX B - MODELING INPUTS

APPENDIX C - FLICKER RESULTS BY RECEPTOR

APPENDIX D - SHADOW FLICKER DURATION MAP

APPENDIX E - SHADOW FLICKER CALENDAR

LIST OF TABLES

Page No.

Table 2-1: Turbine Model Dimensions 2-2
Table 3-1: Summary of Results 3-1
Table A-1: Wind Turbine Coordinates for Project A-1
Table A-2: Wind Turbine Coordinates for Existing Projects A-3
Table B-1: On-Site Frequency Distribution at 80 magl B-1
Table B-2: On-Site Frequency Distribution at 108 magl B-2
Table B-3: Monthly Sunshine Probability for Ruso, North Dakota B-3
Table B-4: Wind Turbine Power Curves B-4
Table C-1: Flicker Results by Receptor C-1

LIST OF FIGURES

Page No.

Figure B-1: Monthly Sunshine Probability Data for Ruso, North Dakota B-3
Figure D-1: Shadow Flicker Duration Map, Project Only D-1
Figure D-2: Shadow Flicker Duration Map, w/Existing Projects D-2
Figure E-1: Shadow Flicker Calendar, Project Only E-1
Figure E-2: Shadow Flicker Calendar, w/Existing Projects E-2

LIST OF ABBREVIATIONS

Abbreviation	Term/Phrase/Name
Burns & McDonnell	Burns & McDonnell Engineering Company, Inc.
Developer	Ruso Wind Partners, LLC
FAA	Federal Aviation Administration
hr	Hour
kg/m^3	Kilograms per cubic meter
m	Meter
m/s	Meters per second
magl	Meters above ground level
MW	Megawatt
Project	Ruso Wind Project
Project Site	Location of Project in Ward County, North Dakota
Study	Shadow Flicker Analysis
yr	Year

DISCLAIMERS

This report may have been prepared under, and only be available to parties that have executed, a Confidentiality Agreement with Developer. Any party to whom the contents are revealed or may come into possession of this document is required to request of Developer if such Confidentiality Agreement exists. Any entity in possession of, or that reads or otherwise utilizes information herein, is assumed to have executed or otherwise be responsible and obligated to comply with the contents of such Confidentiality Agreement. Any entity in possession of this document shall hold and protect its contents, information, forecasts, and opinions contained herein in confidence and not share with others without prior written authorization from Developer.

In preparation of this report, Burns & McDonnell has relied upon information provided by Developer and other third-party sources. While there is no reason to believe that the information provided is inaccurate or incomplete in any material respect, Burns & McDonnell has not independently verified such information and cannot guarantee or warranty its accuracy or completeness.

Burns & McDonnell's estimates, analyses, and recommendations contained in this report are based on professional experience, qualifications, and judgment. Burns & McDonnell has no control over weather; cost and availability of labor, material, and equipment; labor productivity; energy or commodity pricing; demand or usage; population demographics; market conditions; changes in technology; and other economic or political factors affecting such estimates, analyses, and recommendations. Therefore, Burns & McDonnell makes no guarantee or warranty (actual, expressed, or implied) that actual results will not vary, perhaps significantly, from the estimates, analyses, and recommendations contained herein.

Burns & McDonnell has not been engaged to render legal services. The services Burns & McDonnell provides occasionally require the review of legal documents, statutes, cases, regulatory guides, and related matters. The opinions, analysis, and representations made in this report should not be construed to be legal advice or legal opinion concerning any document produced or reviewed. These documents and the decisions made in reliance of these documents may have serious legal consequences. Legal advice, opinion, and counsel must be sought from a competent and knowledgeable attorney.

This report is for the sole use, possession, and benefit of Developer for the limited purpose as provided in the agreement between Developer and Burns & McDonnell. Any use or reliance on the contents, information, conclusions, or opinions expressed herein by any other party or for any other use is strictly prohibited and is at that party's sole risk. Burns & McDonnell assumes no responsibility or liability for any unauthorized use.

1.0 INTRODUCTION

1.1 Study Overview

Burns & McDonnell Engineering Company, Inc. ("Burns & McDonnell") was retained by Ruso Wind Partners, LLC (the "Developer") to conduct a shadow flicker analysis (the "Study") for the proposed Ruso Wind Project (the "Project"). The objective of the Study was to estimate the annual frequency of shadow flicker on occupied residences caused by Project wind turbines. No attempt was made in this Study to examine or opine on health effects related to shadow flicker.

1.2 Project Overview

The proposed Ruso Wind Project will be located in Ward County, North Dakota, approximately 7 miles northwest of the city of Ruso and approximately 22 miles southeast of the city of Minot, North Dakota. The Project will include a total of 53 wind turbines, including a quantity of 42 Siemens Gamesa SG4.5-145 wind turbines and 11 Siemens Gamesa SWT-2.415-108 wind turbines, respectively. The SG4.5-145 wind turbine has a hub height of 107.5 meters and an aggregate nameplate capacity of approximately 4.5 megawatts ("MW"), although it can be operated at up to 4.8 MW. The SWT-2.415-108 wind turbine has a hub height of 80 meters and an aggregate nameplate capacity of approximately 2.415 MW.

A map showing the general location and configuration of the Project Site is included in Appendix A. For purposes of this Study, a total of 66 turbine positions were evaluated (including 13 alternates), although only up to 53 turbines are expected to be installed. All 13 alternate turbines were modeled as the SG4.5-145 turbine model.

Two additional wind projects are located near the Project Site, including the existing Prairie Wind 1 Wind Farm and the New Frontier Wind Farm, which was under construction at the time of this writing. Both neighboring projects were modeled for purposes of this Study, as described in greater detail in Section 2.2 below.

1.3 Shadow Flicker Overview

Shadow flicker occurs when wind turbine blades pass in front of the sun to create recurring shadows on an object. Such shadows occur only under very specific conditions, including sun position, wind direction, time of day, and other similar factors.

The intensity of shadow flicker varies significantly with distance, and as separation between a turbine and receptor increases, shadow flicker intensity correspondingly diminishes. Shadow flicker intensity for distances greater than 10 rotor diameters is generally low and considered imperceptible. At such

distances, shadow flicker most commonly occurs at sunrise or sunset, when cast shadows are sufficiently long.

Shadow flicker impacts are not currently regulated in applicable state or federal law, nor are there requirements in the current McLean, McHenry or Ward County, North Dakota ordinances with regard to limitations on shadow flicker durations. This report identifies those receptors that may experience shadow flicker more than 30 hours per year, although it is noted that this threshold is presented as a typical industry benchmark for similar studies and not as a suggested limitation.

1.4 Site Visit

Burns & McDonnell did not visit the Project Site as part of this Study. The contents of this evaluation are based exclusively upon desktop analysis by Burns & McDonnell.

2.0 MODELING PARAMETERS AND INPUTS

2.1 Modeling Overview

Shadow flicker was modeled at the Project Site using WindPRO, an industry-leading software package for the design and planning of wind energy projects. This package models the sun's path with respect to every turbine location during every minute over a complete year. Any shadow flicker caused by each turbine is then aggregated for each receptor for the entire year.

The following sections are summaries of the inputs utilized in the WindPRO model for this Study.

2.2 Turbine Coordinates

Shadow flicker intensity is partially dependent upon the distance from a receptor to the turbine causing the shadow. The Developer-provided coordinates of each turbine are presented in Appendix A and the location of each turbine is presented graphically in Appendix D. For purposes of this Study, a total of 66 turbines positions were evaluated (including 13 alternates), although only up to 53 turbines are expected to be installed.

Wind turbines from the neighboring Prairie Wind 1 and New Frontier projects were also included in this Study. Based on publicly-available information, Prairie Wind 1 (located northwest of the Project Site) is an existing wind farm with a quantity of 80 General Electric GE1.5-77 wind turbines, although Federal Aviation Association ("FAA") filings indicated a quantity of 82 wind turbines; each Prairie Wind 1 wind turbine was modeled with a hub height of 80 meters and a rotor diameter of 77 meters. Similarly, and also based on publicly available information, New Frontier (located southeast of the Project Site) was under construction at the time of this writing and will include a quantity of 26 Vestas V126-3.45 wind turbines, although FAA filings indicated a quantity of 44 wind turbines; each New Frontier wind turbine was modeled with a hub height of 87 meters and a rotor diameter of 126 meters. An additional quantity of 126 wind turbines were modeled, representing the adjacent Prairie Wind 1 (82 turbines) and New Frontier (44 turbines) wind projects. The location of these additional turbines was taken from the FAA filings from each project and is expected to be a highly conservative estimate of each due to the number of additional turbines that were modeled.

2.3 Turbine Dimensions

The size of a wind turbine, including both hub height and rotor diameter, contributes to the length and width of the shadows that may be cast by that turbine. The Project will include up to 53 wind turbines

when constructed. Table 2-1 presents the turbine models and their respective dimensions that were modeled as part of this Study.

Table 2-1: Turbine Model Dimensions

Turbine Model	Hub Height [m]	Rotor Diameter [m]
SG4.5-145 (Project)	107.5	145
SWT-2.415-108 (Project)	80	108
GE1.5-77 (Prairie Wind 1)	80	77
V126-3.45 (New Frontier)	87	126

2.4 Receptors

A quantity of 68 receptors were modeled at the Project Site. The Developer-provided coordinates of each receptor are presented in Appendix C and the location of each receptor is presented graphically in Appendix D. Burns & McDonnell did not provide an independent verification of the location or occupied status of these receptors.

Each receptor was modeled in "green house" mode within the WindPRO model. This approach provides a conservative estimate of the amount of time when shadow flicker could occur by modeling each receptor as having windows on all sides and effectively causing the home to be susceptible to flicker effects in all directions.

2.5 Terrain

The WindPRO model utilizes topography data to place turbines and receptors at the proper elevations. This information is also used by the model to consider any natural land features between a turbine and a receptor that may block shadows from being seen at a receptor.

Publicly-available terrain data was downloaded from the National Elevation Dataset, a product of the United States Geological Survey. The 10-meter resolution digital elevation model was exported at 10-foot intervals for use in the WindPRO model. Elevations were assigned by Burns & McDonnell to each turbine and each receptor using this data.

2.6 Obstacles

Obstacles located between a receptor and a turbine, such as trees or buildings, may significantly reduce or eliminate the duration and/or intensity of shadow flicker. Burns & McDonnell included obstacles for six (6) Developer-identified receptors, per Developer, in the WindPRO model including trees and

outbuildings. Such receptors are indicated by an asterisk (*) in Appendix C. No obstacles were considered or modeled for any other receptors.

WindPRO models obstacles utilizing a cubic volume, where each obstacle is assigned a height, width, depth, and porosity level. The obstacles near the applicable receptors were reviewed by Burns & McDonnell and the type and characteristics of each obstacle were visually estimated using publicly-available desktop aerial imagery. Trees were assumed to be 12 meters tall, while barns and other outbuildings were assumed to be either 4 or 6 meters tall, depending on the size of the structure. Only obstacles in reasonably close proximity to a receptor were considered (i.e., those that might be expected to influence flicker durations).

Burns & McDonnell did not make any in-person verifications regarding the existence, size, or influence of obstacles. The obstacles were modeled exclusively through desktop analysis of publicly-available aerial imagery.

2.7 Turbine Operation

Shadow flicker is contingent upon the movement of the turbine blades. Shadow flicker can only occur when the turbine is in operation (i.e., when the turbine blades are rotating). Moreover, shadow flicker is generally most notable when a turbine is facing a receptor, as this results in the widest-possible shadow being cast. To more accurately reflect the periods of operation of each Project wind turbine, on-site hub-height wind data was provided by the Developer and used to indicate the periods when the turbines are inactive due to wind speeds below the turbine cut-in speed or above the turbine cut-out speed, at which time the turbine rotor is not in motion and no shadow flicker will occur.

Project Site-specific wind data was also utilized to model the actual orientation of the turbines relative to each receptor. The Developer-provided wind data includes data collected by an on-site meteorological mast, as shown in Appendix B. This data was presented at 80 meters and 108 meters above ground level ("magl"), respectively. The data presented at 108 magl was used for modeling purposes to conservatively estimate the duration of shadow flicker a receptor may receive.

Power curves for the proposed turbines were provided by the Developer. These power curves were added to the WindPRO model to more accurately reflect the turbine's operational characteristics. The Developer-provided power curves are shown in Appendix B. Power curves for the neighboring projects (Prairie Wind 1 and New Frontier) are also included in Appendix B and were derived based off of past project experience of Burns & McDonnell.

2.8 Flicker Relevance

At distances beyond 10 rotor diameters, shadow flicker effects are generally considered low, as shadows diffuse and become imperceptible. Thus, a distance equal to 10 times the rotor diameter of each turbine (i.e., 1080 meters and 1450 meters for each turbine type, respectively) was modeled as the maximum distance at which shadow flicker was considered relevant; receptors greater than this distance from a given turbine were not evaluated. The proximity of this buffer relative to each receptor is presented graphically in Appendix D.

2.9 Sun Angle

The sun's path with respect to each turbine location is calculated by the WindPRO model to determine the cast shadow paths during every minute over a complete year. However, at very low sun angles, the light must pass through more atmosphere and becomes too diffused to form a coherent shadow. Thus, a value of three (3) degrees was utilized for the height at which the sun would not cause noticeable flicker.

2.10 Environment

Shadow flicker is only caused when the sun is shining. Sunshine probability data was obtained by Burns & McDonnell from www.city-data.com, as shown in Appendix B. This data represents the percentage of hours each month that the sun is expected to be shining during daylight hours, with consideration given for cloud cover, rainy days, fog, or other similar occurrences that may diminish the potential occurrence or severity of shadow flicker.

3.0 RESULTS

Using the inputs and parameters defined in Section 2.0, the WindPRO model was used to calculate shadow flicker for the receptors at the Project Site. Table 3-1 presents a summary of these results, while detailed tables are included within Appendix C that present shadow flicker durations by receptor, including estimated hours per year. Flicker caused by the neighboring Prairie Wind 1 and New Frontier projects is excluded in the results presented in Table 3-1 below, as the results focus on the flicker caused exclusively by the Project; however, the flicker caused by these neighboring projects is presented in Appendix C. Additionally, maps are provided in Appendix D which illustrate the shadow flicker vectors (in hours per year) caused by each Project turbine.

Table 3-1: Summary of Results

Layout	No. of Turbines	No. of Receptors	No. of Receptors, Flicker ≥ 30 hr/yr	No. of Receptors, Flicker = 0 hr/yr
42 x SG4.5-145 11 x SWT-2.415-108	66	68	4	46

The following is a set of key observations from the results of the Study:

- With the current layout, 4 of the 68 known receptors exceed 30 hours per year of shadow flicker, while 46 of the 66 known receptors experienced no flicker at all. Refer to Appendix C for a complete listing of results.
- The majority of observed shadow flicker on each receptor occurs during early morning and/or late afternoon and evening hours, as shown in Appendix E.
- For purposes of this Study, a total of 66 turbine positions were evaluated, although Burns & McDonnell understands that only up to 53 turbines are expected to be installed. Depending on the turbine location(s) that are eliminated, flicker durations at impacted receptors are likely to decrease from those presented herein.
- The Study was performed using a conservative modeling approach with Project Site-specific conditions. For example, the Study modeled each receptor as a “green house”, meaning each receptor was modeled as having windows on all sides and effectively causing the home to be susceptible to flicker effects in all directions. Further, the Project Site was modeled as if no obstacles were present, including trees or buildings, which may significantly reduce or eliminate the duration and/or intensity of shadow flicker at a receptor. Due to the conservative approach of the Study, the actual duration and intensity of shadow flicker experienced at each receptor is expected to be less than those reported in the Study.

- Notwithstanding any shadow flicker which may occur at the Project Site, mitigation techniques may be utilized to reduce these effects. Common techniques include planting vegetation, awning installation, and/or reduced turbine operation.
- A quantity of 4 receptors experience an increase in shadow flicker when considering the neighboring projects. However, none of these receptors has any shadow flicker caused by the Project turbines, and in each case, shadow flicker caused by the neighboring turbines is less than 30 hours per year.

The following is an overview of the shadow flicker characteristics at receptors where obstacles were considered but impacts were not fully mitigated:

- REC-24 is receiving shadow flicker from turbine T-29 to the southwest and from turbines T-33, T-34 and T-35 to the south. While there are groupings of trees to the north and south of receptor REC-24 that were modeled as obstacles, the area to the south is largely exposed to these sources. Thus, no reduction in flicker duration was observed when considering obstacles at this receptor.
- REC-28 is receiving shadow flicker from turbine T-22 to the southwest and turbine T-28 to the southeast. The obstacles modeled at REC-28 exist north of the receptor, largely exposing the area to the south to shadow flicker. Thus, no reduction in flicker duration was observed when considering obstacles at this receptor.
- REC-41 is receiving shadow flicker from turbine T-03 to the northwest and alternate turbine ALT-02 to the southwest. While obstacles are located generally on all sides of receptor REC-41, it is largely exposed to shadow flicker to the northwest from turbine T-03. A reduction in flicker duration of approximately 29 hours per year was observed when considering obstacles at this receptor.
- REC-50 is receiving shadow flicker from turbine T-13 and turbine T-15 to the southeast and alternate turbine ALT-04 to the northwest. While obstacles are located north, east, and west of receptor REC-50, it is largely exposed to shadow flicker to the southeast from turbines T-13 and T-15. A reduction in flicker duration of approximately 7 hours per year was observed when considering obstacles at this receptor.

APPENDIX A - WIND TURBINE COORDINATES

Table A-1: Wind Turbine Coordinates for Project

Turbine Number	Easting [m]	Northing [m]	Turbine Model
T-01	338,487	5,305,224	SG4.5-145
T-02	338,614	5,305,694	SG4.5-145
T-03	338,837	5,308,371	SG4.5-145
T-04	339,286	5,309,501	SG4.5-145
T-05	339,488	5,303,137	SG4.5-145
T-06	340,075	5,307,579	SG4.5-145
T-07	340,282	5,309,362	SG4.5-145
T-08	340,318	5,304,055	SG4.5-145
T-09	340,629	5,306,141	SG4.5-145
T-10	341,060	5,304,342	SG4.5-145
T-11	341,219	5,309,098	SG4.5-145
T-12	341,614	5,304,295	SG4.5-145
T-13	342,242	5,305,719	SG4.5-145
T-14	342,500	5,308,909	SG4.5-145
T-15	342,620	5,306,044	SG4.5-145
T-16	342,623	5,309,428	SG4.5-145
T-17	343,242	5,307,077	SG4.5-145
T-18	343,542	5,309,245	SG4.5-145
T-19	343,687	5,311,489	SG4.5-145
T-20	343,716	5,310,405	SG4.5-145
T-21	343,746	5,307,162	SG4.5-145
T-22	343,898	5,305,227	SG4.5-145
T-23	344,318	5,308,366	SG4.5-145
T-24	344,340	5,309,179	SG4.5-145
T-25	344,509	5,310,982	SG4.5-145
T-26	344,885	5,306,563	SG4.5-145
T-27	345,067	5,310,992	SG4.5-145
T-28	345,085	5,304,964	SG4.5-145
T-29	345,151	5,311,683	SG4.5-145
T-30	345,210	5,309,801	SG4.5-145
T-31	345,473	5,307,357	SG4.5-145
T-32	345,615	5,306,167	SG4.5-145
T-33	345,848	5,311,386	SG4.5-145
T-34	346,345	5,311,482	SG4.5-145
T-35	346,915	5,311,457	SG4.5-145

Turbine Number	Easting [m]	Northing [m]	Turbine Model
T-36	348,199	5,310,461	SG4.5-145
T-37	348,740	5,310,658	SG4.5-145
T-38	348,960	5,309,236	SG4.5-145
T-39	349,292	5,308,636	SG4.5-145
T-40	349,360	5,310,383	SG4.5-145
T-41	349,675	5,309,168	SG4.5-145
T-42	350,064	5,310,184	SG4.5-145
T-43	339,946	5,303,464	SWT-2.415-108
T-44	340,073	5,308,593	SWT-2.415-108
T-45	340,239	5,304,680	SWT-2.415-108
T-46	341,154	5,305,742	SWT-2.415-108
T-47	341,262	5,307,734	SWT-2.415-108
T-48	341,664	5,307,254	SWT-2.415-108
T-49	341,817	5,305,545	SWT-2.415-108
T-50	341,929	5,305,074	SWT-2.415-108
T-51	342,821	5,306,820	SWT-2.415-108
T-52	344,231	5,309,889	SWT-2.415-108
T-53	345,729	5,310,612	SWT-2.415-108
ALT-01	337,888	5,308,606	SG4.5-145
ALT-02	338,761	5,307,711	SG4.5-145
ALT-03	340,663	5,308,367	SG4.5-145
ALT-04	341,043	5,306,633	SG4.5-145
ALT-05	342,270	5,306,949	SG4.5-145
ALT-06	342,621	5,303,307	SG4.5-145
ALT-07	343,117	5,306,228	SG4.5-145
ALT-08	343,518	5,308,503	SG4.5-145
ALT-09	344,117	5,302,636	SG4.5-145
ALT-10	344,979	5,310,374	SG4.5-145
ALT-11	349,353	5,311,161	SG4.5-145
ALT-12	350,685	5,306,573	SG4.5-145
ALT-13	351,086	5,309,911	SG4.5-145

Notes:
[1] All coordinates presented in WGS 84 UTM Zone 14N (meters)
[2] All coordinates provided by Developer in "Ruso Layout 21 Coordinates and Picture 121918.xlsx" on December 19, 2018

Table A-2: Wind Turbine Coordinates for Existing Projects

Turbine Number	Easting [m]	Northing [m]	Turbine Model
PW-01	329,204	5,321,495	GE1.5-77
PW-02	332,659	5,311,916	GE1.5-77
PW-03	333,319	5,311,943	GE1.5-77
PW-04	333,758	5,311,705	GE1.5-77
PW-05	333,721	5,312,507	GE1.5-77
PW-06	333,204	5,313,544	GE1.5-77
PW-07	332,497	5,313,799	GE1.5-77
PW-08	332,169	5,314,055	GE1.5-77
PW-09	331,650	5,313,824	GE1.5-77
PW-10	331,583	5,314,957	GE1.5-77
PW-11	331,031	5,315,990	GE1.5-77
PW-12	331,184	5,317,101	GE1.5-77
PW-13	331,869	5,317,059	GE1.5-77
PW-14	331,584	5,317,733	GE1.5-77
PW-15	332,174	5,317,546	GE1.5-77
PW-16	331,451	5,313,022	GE1.5-77
PW-17	330,895	5,314,002	GE1.5-77
PW-18	330,342	5,314,906	GE1.5-77
PW-19	329,626	5,315,246	GE1.5-77
PW-20	329,697	5,315,737	GE1.5-77
PW-21	330,212	5,316,093	GE1.5-77
PW-22	329,418	5,317,558	GE1.5-77
PW-23	329,565	5,317,967	GE1.5-77
PW-24	329,075	5,316,124	GE1.5-77
PW-25	327,876	5,316,267	GE1.5-77
PW-26	326,580	5,315,752	GE1.5-77
PW-27	325,904	5,316,000	GE1.5-77
PW-28	325,774	5,315,135	GE1.5-77
PW-29	326,404	5,314,390	GE1.5-77
PW-30	325,052	5,314,459	GE1.5-77
PW-31	324,740	5,314,570	GE1.5-77
PW-32	331,526	5,311,869	GE1.5-77
PW-33	331,536	5,312,538	GE1.5-77
PW-34	330,712	5,312,567	GE1.5-77
PW-35	330,556	5,312,210	GE1.5-77

Turbine Number	Easting [m]	Northing [m]	Turbine Model
PW-36	333,028	5,313,294	GE1.5-77
PW-37	331,059	5,311,063	GE1.5-77
PW-38	330,517	5,311,415	GE1.5-77
PW-39	328,834	5,310,907	GE1.5-77
PW-40	329,218	5,310,435	GE1.5-77
PW-41	329,142	5,312,578	GE1.5-77
PW-42	328,396	5,312,805	GE1.5-77
PW-43	327,993	5,312,767	GE1.5-77
PW-44	329,424	5,313,123	GE1.5-77
PW-45	330,123	5,313,507	GE1.5-77
PW-46	330,105	5,309,897	GE1.5-77
PW-47	330,082	5,309,241	GE1.5-77
PW-48	329,543	5,308,614	GE1.5-77
PW-49	328,411	5,308,620	GE1.5-77
PW-50	327,508	5,308,898	GE1.5-77
PW-51	327,192	5,309,683	GE1.5-77
PW-52	327,962	5,310,547	GE1.5-77
PW-53	327,371	5,310,668	GE1.5-77
PW-54	326,906	5,310,813	GE1.5-77
PW-55	328,017	5,307,450	GE1.5-77
PW-56	327,386	5,307,054	GE1.5-77
PW-57	327,991	5,306,569	GE1.5-77
PW-58	326,735	5,306,290	GE1.5-77
PW-59	328,723	5,305,526	GE1.5-77
PW-60	328,851	5,304,557	GE1.5-77
PW-61	332,550	5,310,681	GE1.5-77
PW-62	333,367	5,310,804	GE1.5-77
PW-63	333,748	5,310,759	GE1.5-77
PW-64	333,408	5,311,332	GE1.5-77
PW-65	332,564	5,310,287	GE1.5-77
PW-66	333,078	5,309,782	GE1.5-77
PW-67	333,776	5,309,490	GE1.5-77
PW-68	332,860	5,308,774	GE1.5-77
PW-69	333,758	5,308,538	GE1.5-77
PW-70	332,637	5,308,605	GE1.5-77

Turbine Number	Easting [m]	Northing [m]	Turbine Model
PW-71	332,306	5,307,911	GE1.5-77
PW-72	331,531	5,308,104	GE1.5-77
PW-73	331,729	5,306,920	GE1.5-77
PW-74	333,229	5,307,663	GE1.5-77
PW-75	334,050	5,307,336	GE1.5-77
PW-76	334,751	5,307,236	GE1.5-77
PW-77	329,268	5,320,798	GE1.5-77
PW-78	329,960	5,321,174	GE1.5-77
PW-79	330,501	5,321,501	GE1.5-77
PW-80	332,827	5,312,628	GE1.5-77
PW-81	329,743	5,309,725	GE1.5-77
PW-82	329,743	5,309,725	GE1.5-77
NF-01	353,259	5,308,575	V126-3.45
NF-02	354,546	5,308,338	V126-3.45
NF-03	353,667	5,307,933	V126-3.45
NF-04	352,856	5,307,922	V126-3.45
NF-05	354,088	5,307,872	V126-3.45
NF-06	354,686	5,307,333	V126-3.45
NF-07	354,351	5,306,882	V126-3.45
NF-08	353,754	5,306,759	V126-3.45
NF-09	353,266	5,306,574	V126-3.45
NF-10	352,851	5,306,482	V126-3.45
NF-11	353,887	5,305,762	V126-3.45
NF-12	353,094	5,305,515	V126-3.45
NF-13	355,628	5,305,352	V126-3.45
NF-14	356,152	5,305,084	V126-3.45
NF-15	356,592	5,305,042	V126-3.45
NF-16	353,647	5,304,971	V126-3.45
NF-17	352,793	5,304,775	V126-3.45
NF-18	355,363	5,304,632	V126-3.45
NF-19	353,353	5,304,335	V126-3.45
NF-20	355,980	5,304,096	V126-3.45
NF-21	355,049	5,303,731	V126-3.45
NF-22	357,602	5,303,675	V126-3.45
NF-23	358,874	5,303,402	V126-3.45

Turbine Number	Easting [m]	Northing [m]	Turbine Model
NF-24	359,316	5,303,330	V126-3.45
NF-25	357,108	5,303,226	V126-3.45
NF-26	355,905	5,303,219	V126-3.45
NF-27	359,805	5,303,192	V126-3.45
NF-28	355,478	5,303,123	V126-3.45
NF-29	352,997	5,303,122	V126-3.45
NF-30	358,500	5,302,964	V126-3.45
NF-31	358,039	5,302,638	V126-3.45
NF-32	354,222	5,302,449	V126-3.45
NF-33	352,706	5,302,449	V126-3.45
NF-34	359,159	5,302,397	V126-3.45
NF-35	357,435	5,302,324	V126-3.45
NF-36	356,301	5,302,272	V126-3.45
NF-37	354,959	5,302,224	V126-3.45
NF-38	353,868	5,302,093	V126-3.45
NF-39	358,753	5,301,999	V126-3.45
NF-40	355,943	5,301,997	V126-3.45
NF-41	355,538	5,301,770	V126-3.45
NF-42	357,949	5,301,658	V126-3.45
NF-43	357,032	5,301,606	V126-3.45
NF-44	354,625	5,301,518	V126-3.45

Notes:
[1] All coordinates presented in WGS 84 UTM Zone 14N (meters)
[2] All coordinates identified by Burns & McDonnell using FAA DNH filings as of December 11, 2018

APPENDIX B - MODELING INPUTS

Table B-1: On-Site Frequency Distribution at 80 magl

Bin	Wind Direction [degrees]											
[m/s]	0	30	60	90	120	150	180	210	240	270	300	330
0	9	5	4	5	6	6	11	8	9	10	14	13
1	8	26	27	24	10	14	4	8	9	9	6	4
2	22	39	47	39	21	17	13	15	16	18	13	15
3	66	83	93	64	43	38	24	27	38	27	22	30
4	95	120	143	104	70	67	33	38	45	47	37	62
5	112	150	144	121	85	73	46	52	52	45	54	74
6	110	147	147	110	94	80	55	62	69	55	68	100
7	113	132	138	100	138	87	56	78	76	62	85	92
8	103	104	116	112	102	97	55	86	71	70	100	104
9	98	69	78	85	96	90	54	94	78	89	113	108
10	86	40	41	69	87	88	56	96	85	108	102	122
11	67	33	14	67	69	72	72	91	83	104	115	102
12	47	27	8	62	59	67	86	66	89	104	104	60
13	30	15	2	32	33	65	95	74	97	89	77	49
14	14	11	0	7	31	51	97	77	83	56	54	34
15	7	3	1	3	25	36	102	63	55	58	29	22
16	7	0	1	1	15	22	87	38	31	29	15	11
17	5	0	0	0	12	12	44	22	13	14	5	6
18	4	0	0	0	5	9	11	8	6	9	2	2
19	1	0	0	0	2	5	2	2	3	4	1	1
20	1	0	0	0	2	4	2	1	0	1	0	0
21	0	0	0	0	0	1	2	0	0	0	0	0
22	0	0	0	0	0	1	1	0	0	0	0	0
23	0	0	0	0	0	1	1	0	0	0	0	0
24	0	0	0	0	0	1	1	0	0	1	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0	0	0	0
32	0	0	0	0	0	0	0	0	0	0	0	0
33	0	0	0	0	0	0	0	0	0	0	0	0
34	0	0	0	0	0	0	0	0	0	0	0	0
35	0	0	0	0	0	0	0	0	0	0	0	0
Sum	**1009**	**1005**	**1004**	**1005**	**1006**	**1006**	**1011**	**1008**	**1009**	**1010**	**1014**	**1013**

Notes:
[1] All data provided by Developer via "Ruso 80m T421 120518.tab"
[2] All data presented at 80 magl

Table B-2: On-Site Frequency Distribution at 108 magl

Bin	Wind Direction [degrees]											
[m/s]	0	30	60	90	120	150	180	210	240	270	300	330
0	9	5	4	4	6	6	11	9	8	10	14	14
1	8	23	25	27	12	15	3	7	9	9	6	5
2	19	32	46	31	21	16	12	13	20	15	14	12
3	52	80	84	61	35	33	25	27	29	32	23	29
4	78	117	120	102	70	58	35	36	39	46	29	52
5	105	131	137	108	73	70	47	46	58	46	53	61
6	100	143	134	116	82	78	49	55	63	53	61	78
7	109	117	142	101	120	83	52	72	72	57	73	94
8	92	108	118	107	105	91	54	85	68	58	88	88
9	92	75	92	84	84	89	51	80	80	74	91	101
10	95	53	55	62	92	74	48	78	78	89	92	109
11	81	42	30	75	74	71	57	86	76	95	96	110
12	65	36	10	57	62	61	76	69	74	86	105	87
13	39	23	5	35	56	56	83	62	75	96	97	62
14	24	10	1	23	32	56	79	65	79	69	65	43
15	13	8	1	7	27	50	78	66	67	57	48	30
16	12	3	1	2	23	33	81	58	52	48	31	20
17	6	0	1	1	14	24	74	42	28	33	16	9
18	3	0	0	0	8	12	56	29	17	16	5	5
19	4	0	0	0	6	14	23	14	7	10	3	2
20	2	0	0	0	2	6	5	6	5	7	1	1
21	1	0	0	0	1	3	3	3	2	2	0	0
22	1	0	0	0	0	2	2	1	1	1	0	0
23	0	0	0	0	0	1	2	0	0	0	0	0
24	0	0	0	0	0	1	1	0	1	0	0	0
25	0	0	0	0	0	0	1	0	0	0	0	0
26	0	0	0	0	0	1	1	0	0	1	0	0
27	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0
31	0	0	0	0	0	0	0	0	0	0	0	0
32	0	0	0	0	0	0	0	0	0	0	0	0
33	0	0	0	0	0	0	0	0	0	0	0	0
34	0	0	0	0	0	0	0	0	0	0	0	0
35	0	0	0	0	0	0	0	0	0	0	0	0
Sum	**1009**	**1005**	**1004**	**1004**	**1006**	**1006**	**1011**	**1009**	**1008**	**1010**	**1014**	**1014**

Notes:
[1] All data provided by Developer via "Ruso 108m T421 120518.tab"
[2] All data presented at 108 magl

Figure B-1: Monthly Sunshine Probability Data for Ruso, North Dakota

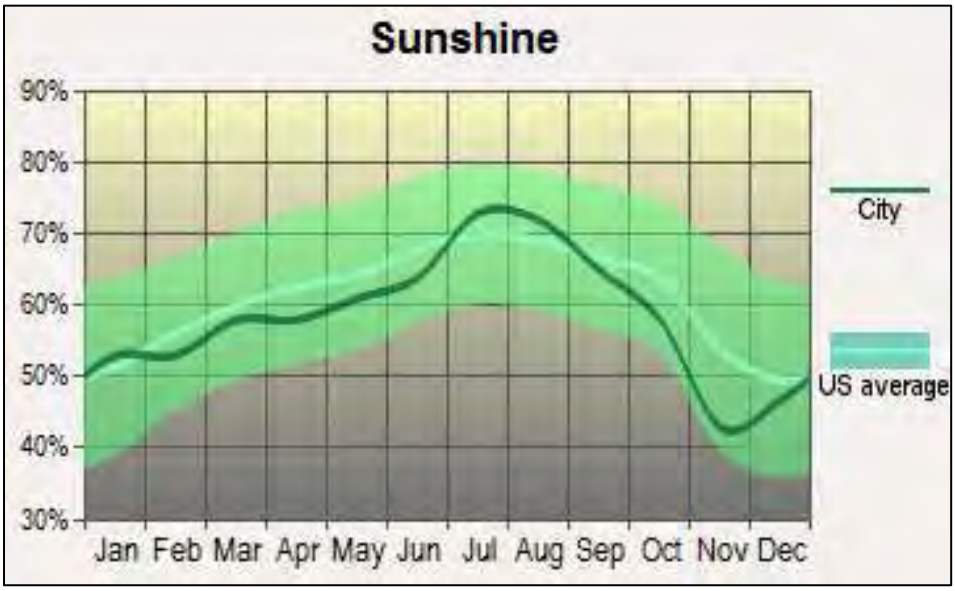


Table B-3: Monthly Sunshine Probability for Ruso, North Dakota

Month	Probability
January	54%
February	54%
March	59%
April	59%
May	62%
June	64%
July	73%
August	73%
September	65%
October	58%
November	43%
December	47%

Notes:
[1] Data source: http://www.city-data.com/city/Ruso-North-Dakota.html
[2] Data location: Ruso, North Dakota
[3] Data in Table B-3 estimated by Burns & McDonnell from source data in Figure B-1

Table B-4: Wind Turbine Power Curves

Wind Speed [m/s]	SG4.5-145 Power [kW]	SWT2.415-108 Power [kW]	GE1.5-77 Power [kW]	V126-3.45 Power [kW]
0.0	0	0	0	0
1.0	0	0	0	0
2.0	0	0	0	0
3.0	50	30	0	26
4.0	224	131	37	166
5.0	518	275	119	370
6.0	944	502	230	665
7.0	1,535	821	384	1,079
8.0	2,305	1,241	593	1,618
9.0	3,165	1,748	858	2,295
10.0	3,845	2,161	1,123	3,016
11.0	4,150	2,303	1,320	3,380
12.0	4,192	2,356	1,424	3,448
13.0	4,198	2,396	1,471	3,450
14.0	4,200	2,415	1,493	3,450
15.0	4,200	2,415	1,500	3,450
16.0	4,200	2,415	1,500	3,450
17.0	4,200	2,415	1,500	3,450
18.0	4,200	2,300	1,500	3,450
19.0	4,197	2,300	1,500	3,450
20.0	4,187	2,300	1,500	3,450
21.0	4,158	2,300	1,500	3,450
22.0	4,098	2,300	1,500	3,450
23.0	4,007	2,300	1,500	3,450
24.0	3,892	2,300	1,500	3,450
25.0	3,770	2,300	1,500	3,450
26.0	3,656	0	0	0
27.0	3,562	0	0	0

Notes:
[1] Power curves for air density of 1.15 kg/m3 and site-specific TI band
[2] All data for SG4.5-145 provided by Developer via "SG 4.5-145 FLEXIBLE RATING Performance Specification"
[3] All data for SWT-2.415-108 provided by Developer via "Attachment D SWT-2.415-108 Technical Specification"
[4] All data for GE1.5-77 estimated by Burns & McDonnell using typical specifications for turbine model
[5] All data for V126-3.45 estimated by Burns & McDonnell using typical specifications for turbine model

APPENDIX C - FLICKER RESULTS BY RECEPTOR

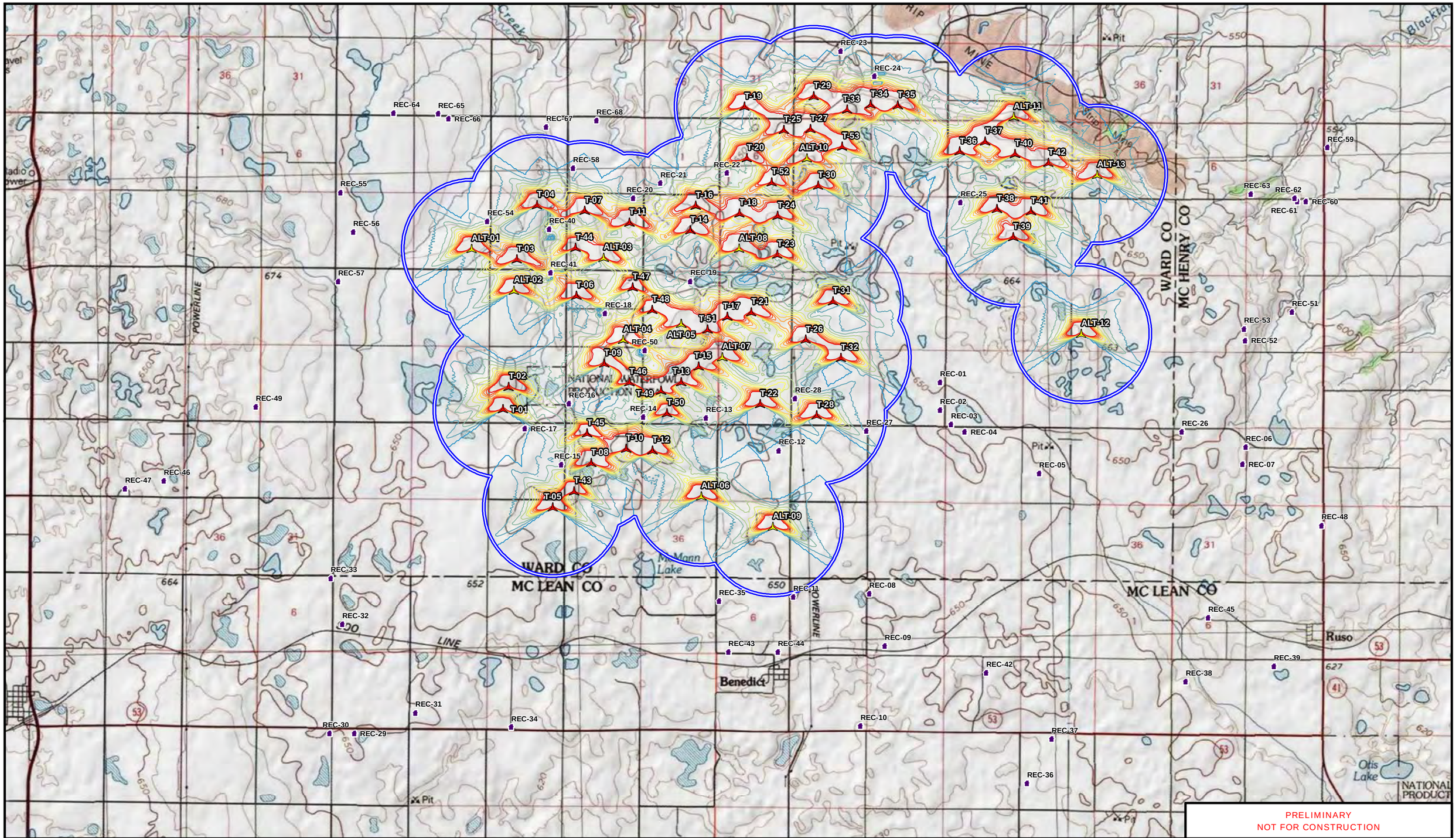
Table C-1: Flicker Results by Receptor

Receptor Name	Easting [m]	Northing [m]	Flicker Duration Project Only [hours/year]	Flicker Duration w/ Existing Projects [hours/year]
REC-01	347,694	5,305,600	0.0	0.0
REC-02	347,680	5,305,020	0.0	0.0
REC-03	347,909	5,304,719	0.0	0.0
REC-04	348,191	5,304,549	0.0	0.0
REC-05	349,744	5,303,649	0.0	0.0
REC-06	354,097	5,304,122	0.0	0.0
REC-07	354,025	5,303,758	0.0	0.0
REC-08	346,117	5,301,187	0.0	0.0
REC-09	346,418	5,300,083	0.0	0.0
REC-10	345,875	5,298,412	0.0	0.0
REC-11	344,515	5,301,154	0.0	0.0
REC-12	344,273	5,304,235	0.0	0.0
REC-13	342,749	5,304,953	16.7	16.7
REC-14	341,433	5,305,000	21.1	21.1
REC-15	339,687	5,304,032	24.2	24.2
REC-16	339,876	5,305,312	8.0	8.0
REC-17	338,934	5,304,801	0.0	0.0
REC-18*	340,669	5,307,195	28.1	28.1
REC-19	342,477	5,307,833	21.0	21.0
REC-20	341,313	5,309,608	16.8	16.8
REC-21	341,888	5,309,910	12.2	12.2
REC-22	343,294	5,310,095	21.1	21.1
REC-23	345,735	5,312,611	0.0	0.0
REC-24*	346,436	5,312,071	36.6	36.6
REC-25	348,199	5,309,381	16.5	16.5
REC-26	352,761	5,304,467	0.0	5.6
REC-27	346,120	5,304,608	8.7	8.7
REC-28*	344,636	5,305,323	38.9	38.9
REC-29	335,222	5,298,453	0.0	0.0
REC-30	334,701	5,298,469	0.0	0.0
REC-31	336,517	5,298,866	0.0	0.0
REC-32	335,014	5,300,760	0.0	0.0
REC-33	334,792	5,301,735	0.0	0.0
REC-34	338,530	5,298,525	0.0	0.0
REC-35	342,951	5,301,098	0.0	0.0

Receptor Name	Easting [m]	Northing [m]	Flicker Duration Project Only [hours/year]	Flicker Duration w/ Existing Projects [hours/year]
REC-36	349,361	5,297,133	0.0	0.0
REC-37	349,894	5,298,060	0.0	0.0
REC-38	352,737	5,299,208	0.0	0.0
REC-39	354,601	5,299,496	0.0	0.0
REC-40*	339,527	5,308,985	10.7	10.7
REC-41*	339,544	5,308,074	39.7	39.7
REC-42	348,546	5,299,477	0.0	0.0
REC-43	343,128	5,300,014	0.0	0.0
REC-44	344,170	5,299,994	0.0	0.0
REC-45	353,242	5,300,541	0.0	0.0
REC-46	331,315	5,303,851	0.0	0.0
REC-47	330,497	5,303,698	0.0	0.0
REC-48	355,658	5,302,436	0.0	15.2
REC-49	333,282	5,305,371	0.0	0.0
REC-50*	341,489	5,306,401	56.5	56.5
REC-51	355,125	5,306,943	0.0	0.0
REC-52	354,129	5,306,364	0.0	0.0
REC-53	354,113	5,306,604	0.0	23.6
REC-54	338,231	5,309,173	21.6	21.6
REC-55	335,152	5,309,844	0.0	0.0
REC-56	335,405	5,309,006	0.0	0.0
REC-57	335,070	5,307,972	0.0	3.6
REC-58	340,057	5,310,258	7.5	7.5
REC-59	355,938	5,310,385	0.0	0.0
REC-60	355,465	5,309,261	0.0	0.0
REC-61	355,286	5,309,260	0.0	0.0
REC-62	355,227	5,309,338	0.0	0.0
REC-63	354,309	5,309,437	0.0	0.0
REC-64	336,302	5,311,491	0.0	0.0
REC-65	337,238	5,311,459	0.0	0.0
REC-66	337,459	5,311,353	0.0	0.0
REC-67	339,506	5,311,135	0.0	0.0
REC-68	340,572	5,311,251	0.0	0.0

Notes:
[1] All coordinates presented in WGS 84 UTM Zone 14N (meters)
[2] All coordinates provided by Developer in "Ruso Homes - REVISED 2018-12-04" on December 4, 2018
[3] * indicates receptor that was analyzed with obstacles

APPENDIX D - SHADOW FLICKER DURATION MAP



LEGEND

- Wind Turbine, Alternate
- Wind Turbine, Primary
- Receptor
- Wind Turbine Buffer - 1080/1450 meters

Shadow Flicker Vectors [hours per year]
0 10 20 30 40 50 60 70 80 90 100

REFERENCE

0 0.75 1.5 MILES

0 0.75 1.5 KILOMETERS

N

SK MB ND MT MN SD

PRELIMINARY
NOT FOR CONSTRUCTION

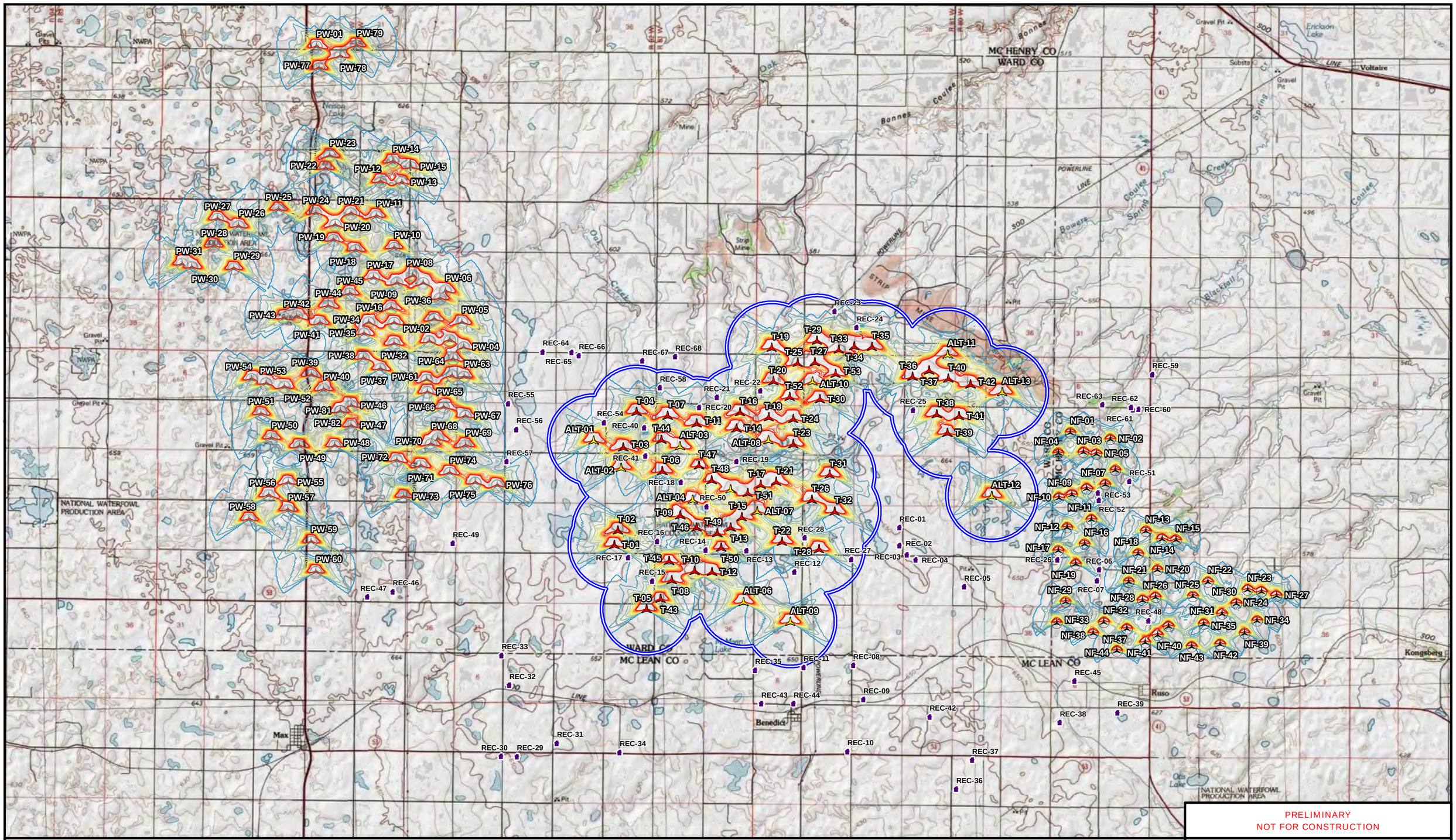
RUSO WIND PROJECT
Shadow Flicker Duration by Turbine, Ruso Only

LOCATION:	Ward County, North Dakota
CLIENT:	Ruso Wind Partners, LLC
PROJ. NO.:	112086
CREATED:	12/21/2018

BURNS McDONNELL
www.burnsmcd.com

Path: Z:\Clients\BTS\SOUTHERNPOWER.1102\86_RusoWind\Studies\GeospatialData\FiresArcDocs\111860_RusoWind_FlickerStudy.mxd • Coordinate System: NAD 1983 StatePlane North Dakota North FIPS 3301 Feet • Units: Foot US

COPYRIGHT © 2018 BURNS & McDONNELL ENGINEERING COMPANY, INC. | PROPRIETARY & CONFIDENTIAL



LEGEND

- Wind Turbine, Alternate
- Wind Turbine, Primary
- Wind Turbine, Prairie Wind 1
- Wind Turbine, Frontier
- Receptor
- Wind Turbine Buffer - 1080/1450 meters

Shadow Flicker Vectors [hours per year]

0 10 20 30 40 50 60 70 80 90 100

REFERENCE

0 1 2 MILES

0 1 2 KILOMETERS

N

SK MB MT ND MN SD

PRELIMINARY
NOT FOR CONSTRUCTION

RUSO WIND PROJECT
Shadow Flicker Duration by Turbine, Neighboring

LOCATION:	Ward County, North Dakota
CLIENT:	Ruso Wind Partners, LLC
PROJ. NO.:	112086
CREATED:	12/21/2018

BURNS McDONNELL
www.burnsmcd.com

Path: Z:\Clients\BTS\SOUTHERNPOWER.112086_RusoWind\Studies\GeospatialData\FiresArcDocs\111860_RusoWind_FlickerStudy.mxd • Coordinate System: NAD 1983 StatePlane North Dakota North FIPS 3301 Feet • Units: Foot US

COPYRIGHT © 2018 BURNS & McDONNELL ENGINEERING COMPANY, INC. | PROPRIETARY & CONFIDENTIAL

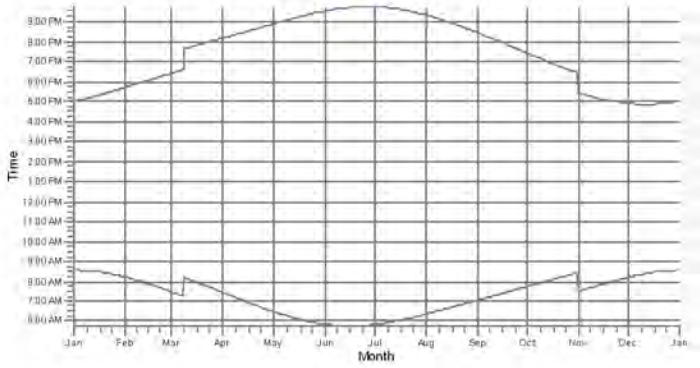
APPENDIX E - SHADOW FLICKER CALENDAR

Licensed user:
Burns & McDonnell Engineering Company Inc.
9400 Ward Parkway
US-KANSAS CITY, MO 64114
(816) 333 9400
Andrew Glenski / aglenski@burnsmcd.com
Calculated:
12/21/2018 10:12 AM/3.0.654

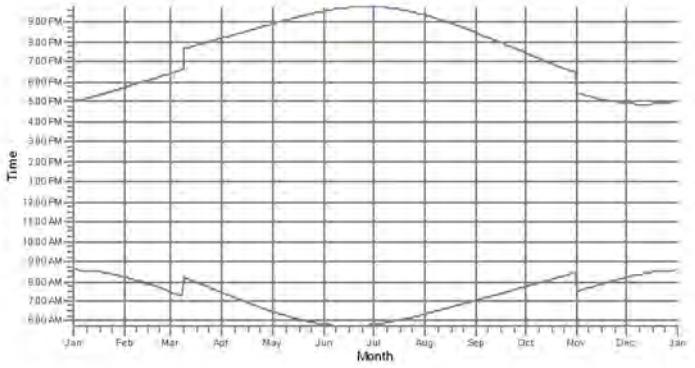
SHADOW - Calendar, graphical

Calculation: RUSO WIND PARTNERS, LLC - RUSO WIND PROJECT - TURBINECOORD.V2 RECEPTORCOORD.V0 OBSTACLES.V0 OROGRAPHY.V1 RESULTS.V3A

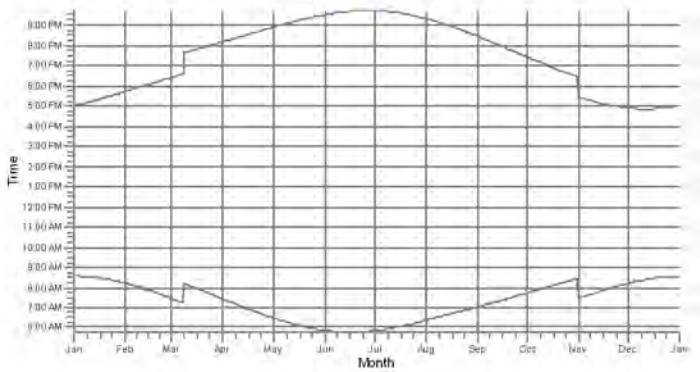
A: REC-01



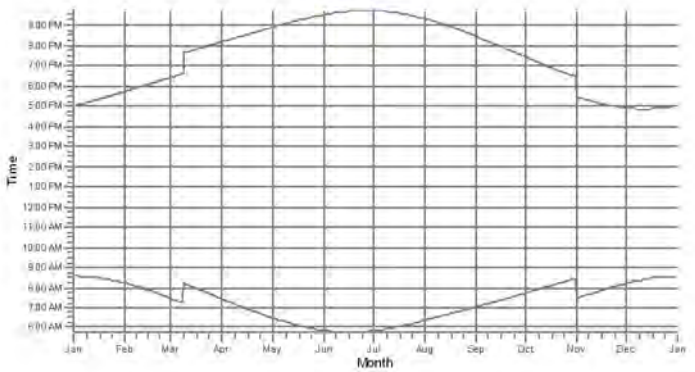
B: REC-02



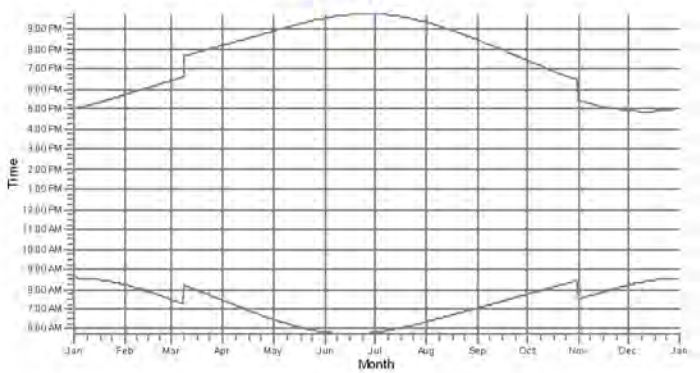
C: REC-03



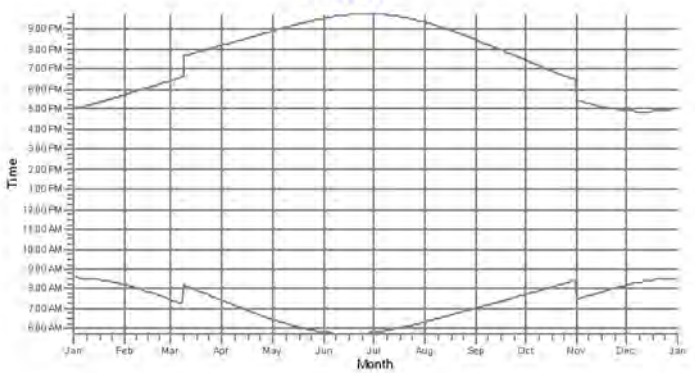
D: REC-04



E: REC-05



F: REC-06



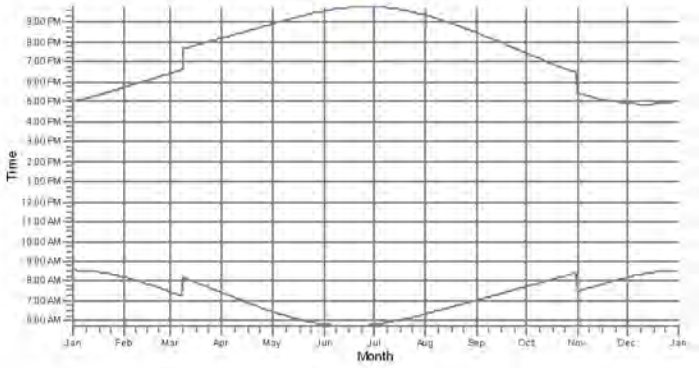
WTGs

Licensed user:
Burns & McDonnell Engineering Company Inc.
9400 Ward Parkway
US-KANSAS CITY, MO 64114
(816) 333 9400
Andrew Glenski / aglenski@burnsmcd.com
Calculated:
12/21/2018 10:12 AM/3.0.654

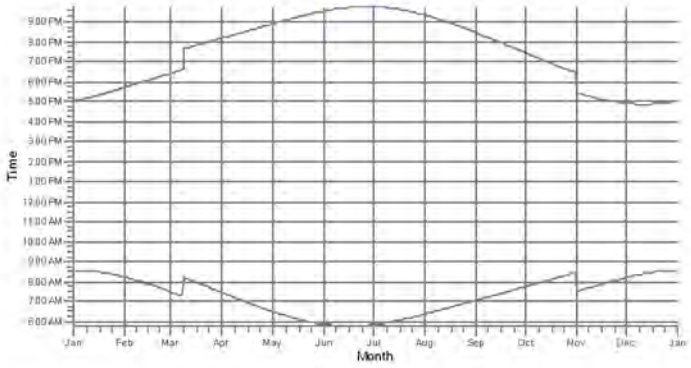
SHADOW - Calendar, graphical

Calculation: RUSO WIND PARTNERS, LLC - RUSO WIND PROJECT - TURBINECOORD.V2 RECEPTORCOORD.V0 OBSTACLES.V0 OROGRAPHY.V1 RESULTS.V3A

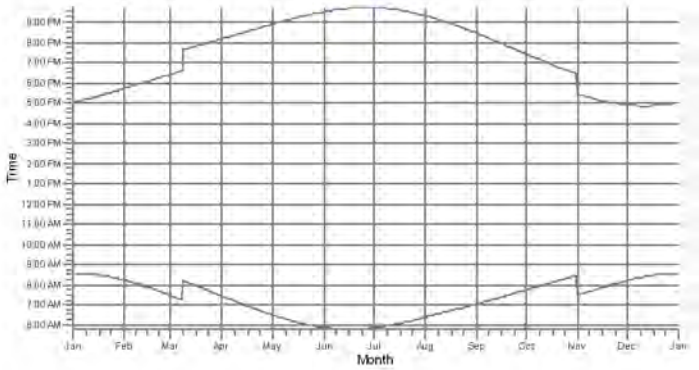
G: REC-07



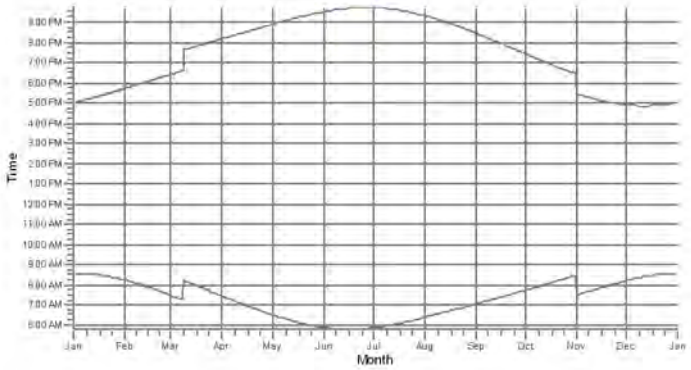
H: REC-08



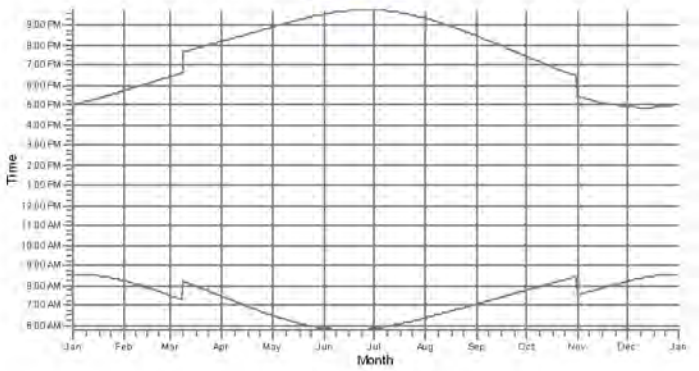
I: REC-09



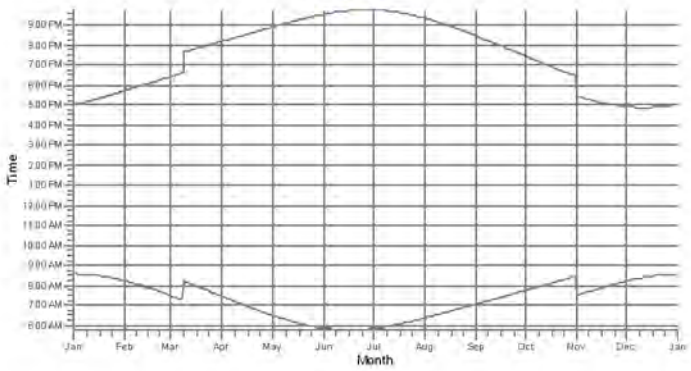
J: REC-10



K: REC-11



L: REC-12



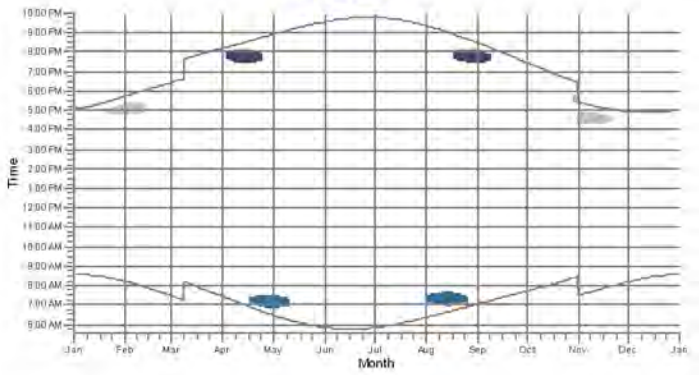
WTGs

Licensed user:
Burns & McDonnell Engineering Company Inc.
9400 Ward Parkway
US-KANSAS CITY, MO 64114
(816) 333 9400
Andrew Glenski / aglenski@burnsmcd.com
Calculated:
12/21/2018 10:12 AM/3.0.654

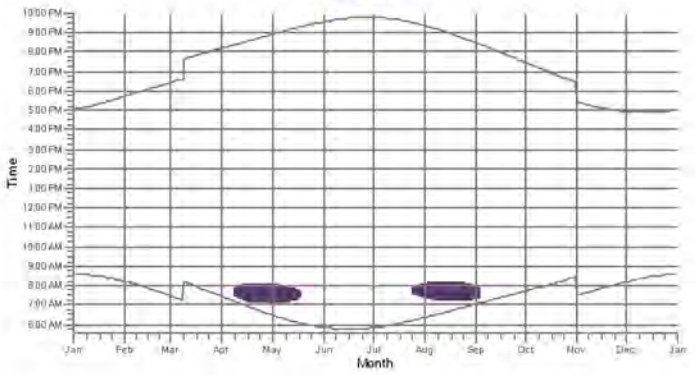
SHADOW - Calendar, graphical

Calculation: RUSO WIND PARTNERS, LLC - RUSO WIND PROJECT - TURBINECOORD.V2 RECEPTORCOORD.V0 OBSTACLES.V0 OROGRAPHY.V1 RESULTS.V3A

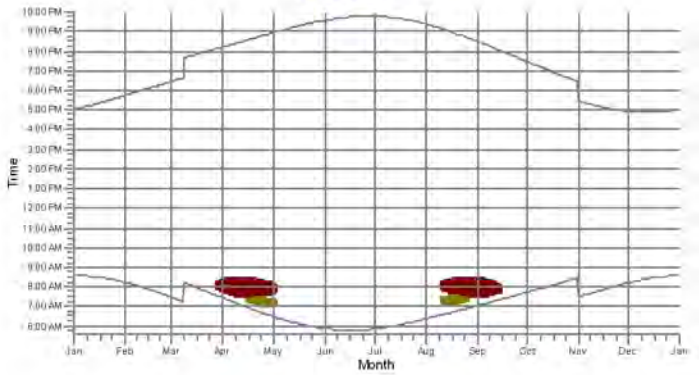
M: REC-13



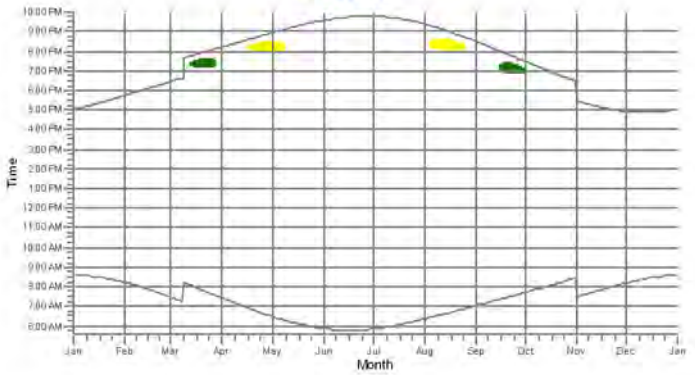
N: REC-14



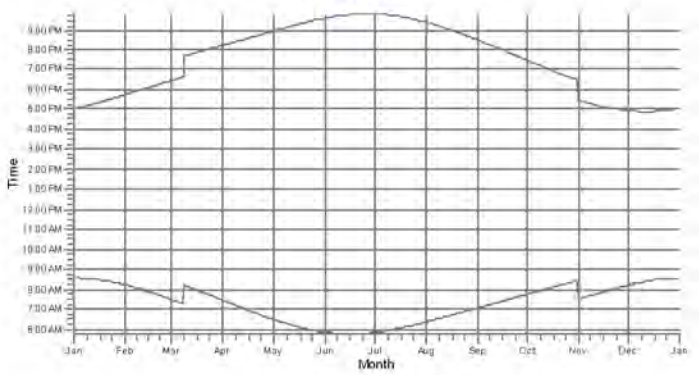
O: REC-15



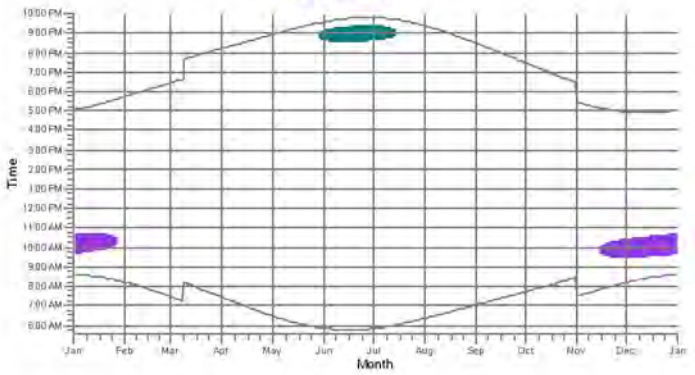
P: REC-16



Q: REC-17



R: REC-18



WTGs

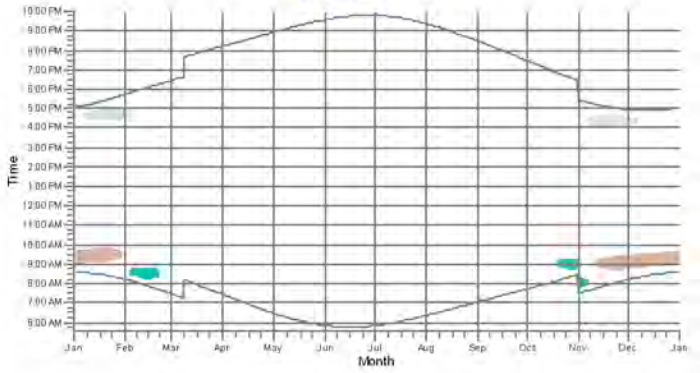
1: T-01	6: T-06	10: T-10	22: T-22	63: T-50
2: T-02	8: T-08	12: T-12	46: ALT-04	

Licensed user:
Burns & McDonnell Engineering Company Inc.
9400 Ward Parkway
US-KANSAS CITY, MO 64114
(816) 333 9400
Andrew Glenski / aglenski@burnsmcd.com
Calculated:
12/21/2018 10:12 AM/3.0.654

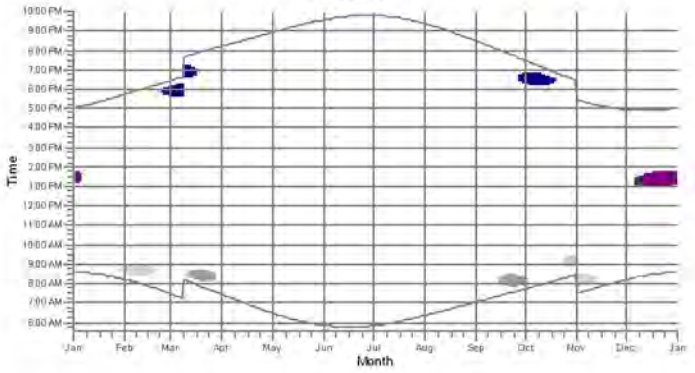
SHADOW - Calendar, graphical

Calculation: RUSO WIND PARTNERS, LLC - RUSO WIND PROJECT - TURBINECOORD.V2 RECEPTORCOORD.V0 OBSTACLES.V0 OROGRAPHY.V1 RESULTS.V3A

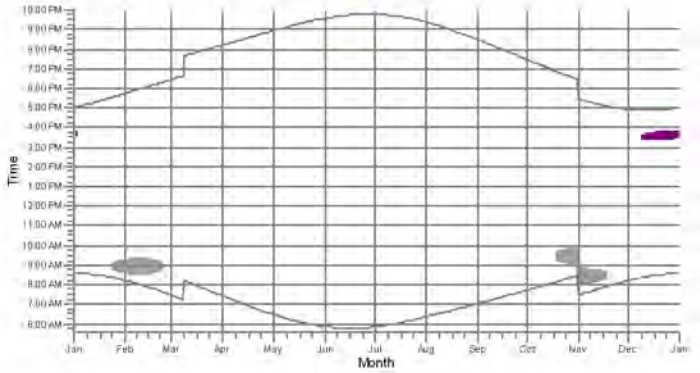
S: REC-19



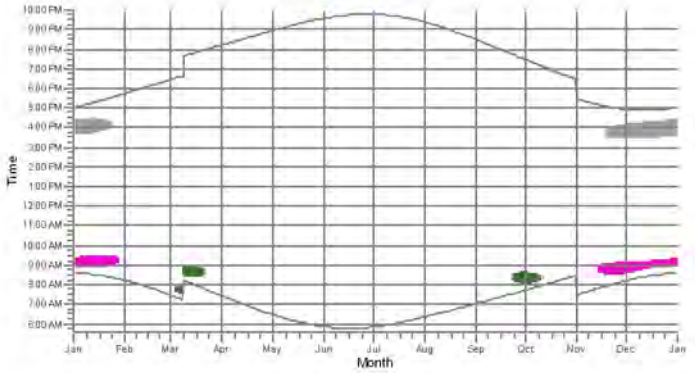
T: REC-20



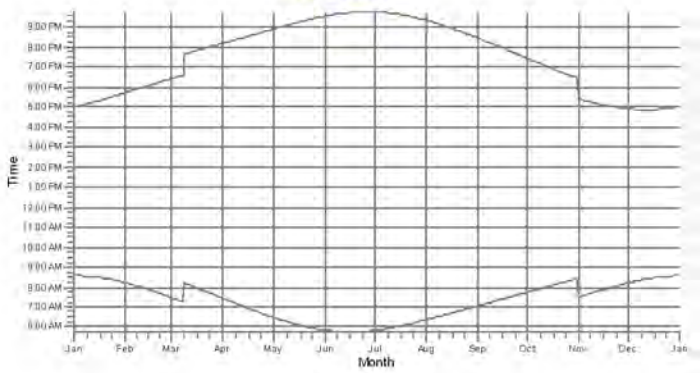
U: REC-21



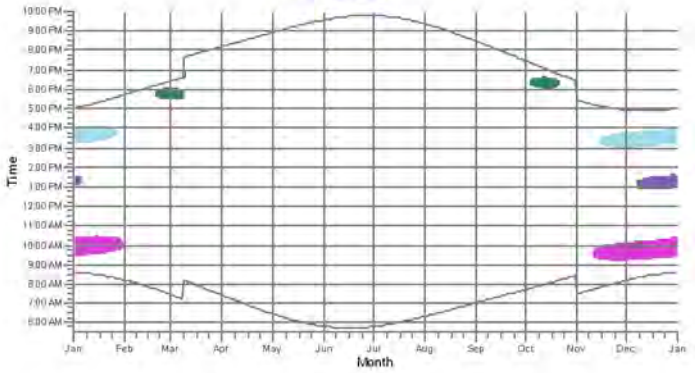
V: REC-22



W: REC-23



X: REC-24



WTGs

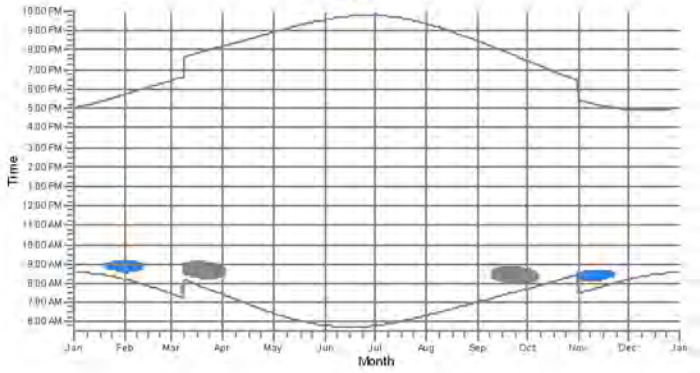
7: T-07	14: T-14	17: T-17	24: T-24	33: T-33	35: T-35	65: T-52		
11: T-11	16: T-16	21: T-21	29: T-29	34: T-34	61: T-48			

Licensed user:
Burns & McDonnell Engineering Company Inc.
9400 Ward Parkway
US-KANSAS CITY, MO 64114
(816) 333 9400
Andrew Glenski / aglenski@burnsmcd.com
Calculated:
12/21/2018 10:12 AM/3.0.654

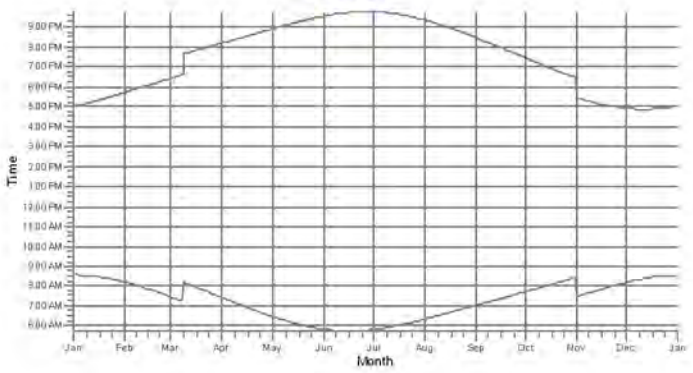
SHADOW - Calendar, graphical

Calculation: RUSO WIND PARTNERS, LLC - RUSO WIND PROJECT - TURBINECOORD.V2 RECEPTORCOORD.V0 OBSTACLES.V0 OROGRAPHY.V1 RESULTS.V3A

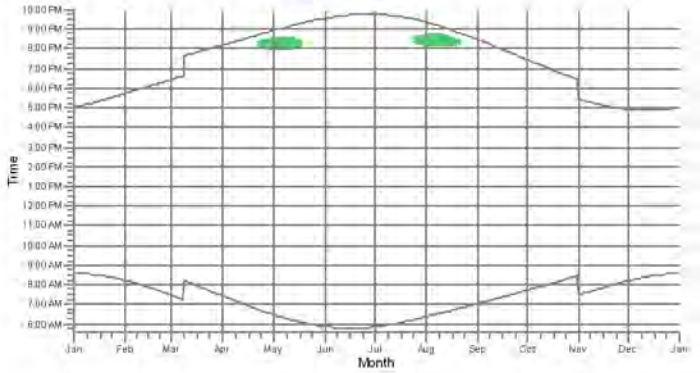
Y: REC-25



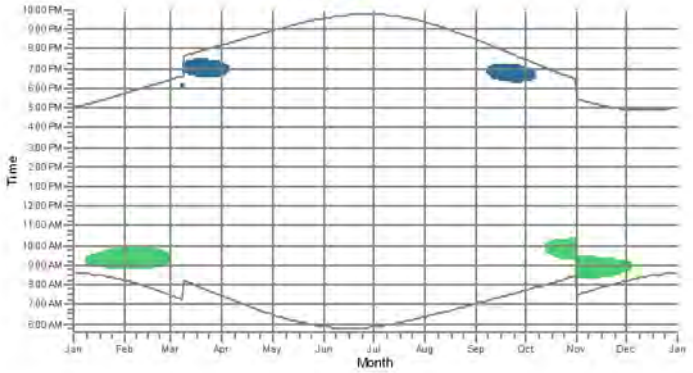
Z: REC-26



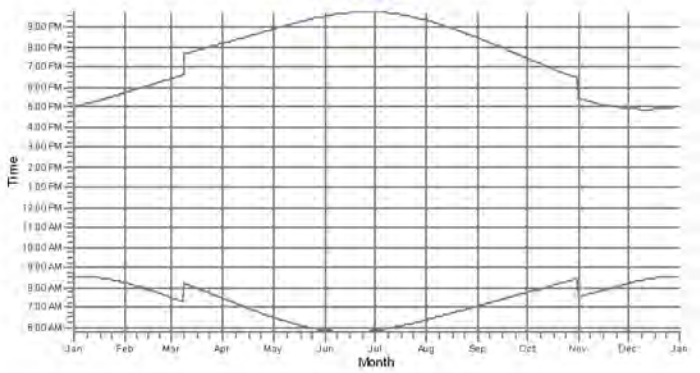
AA: REC-27



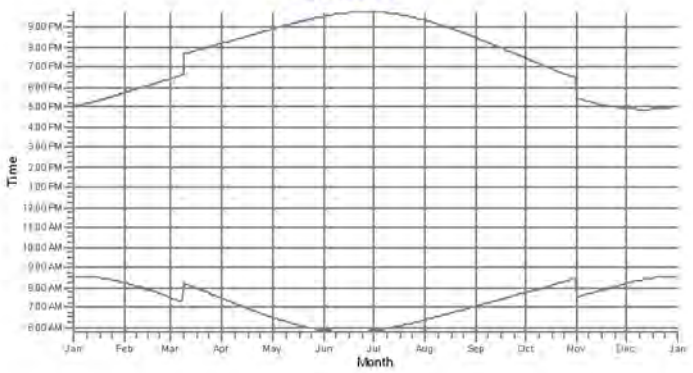
AB: REC-28



AC: REC-29



AD: REC-30



WTGs

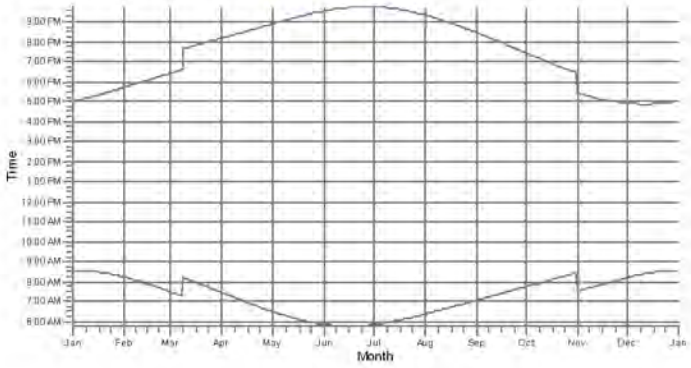
22: T-22 28: T-28 38: T-38 39: T-39

Licensed user:
Burns & McDonnell Engineering Company Inc.
9400 Ward Parkway
US-KANSAS CITY, MO 64114
(816) 333 9400
Andrew Glenski / aglenski@burnsmcd.com
Calculated:
12/21/2018 10:12 AM/3.0.654

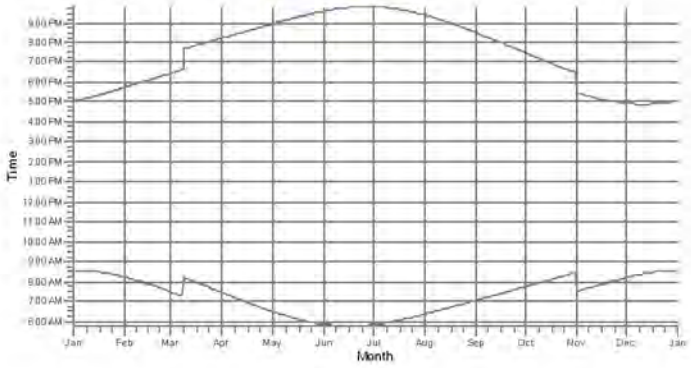
SHADOW - Calendar, graphical

Calculation: RUSO WIND PARTNERS, LLC - RUSO WIND PROJECT - TURBINECOORD.V2 RECEPTORCOORD.V0 OBSTACLES.V0 OROGRAPHY.V1 RESULTS.V3A

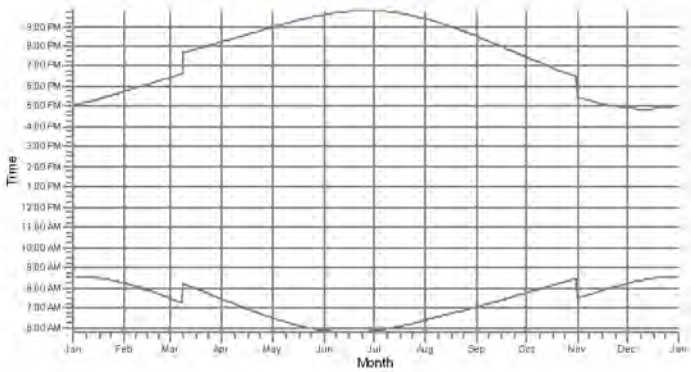
AE: REC-31



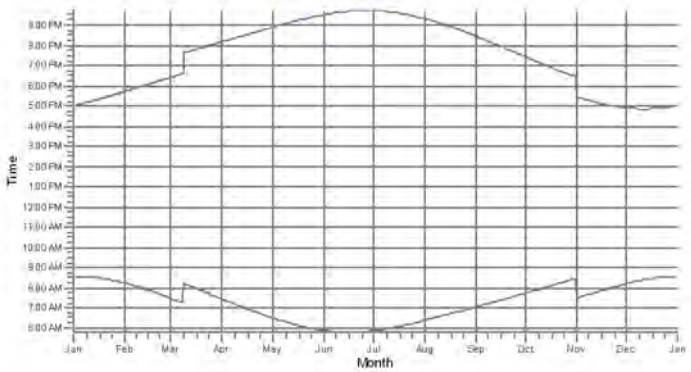
AF: REC-32



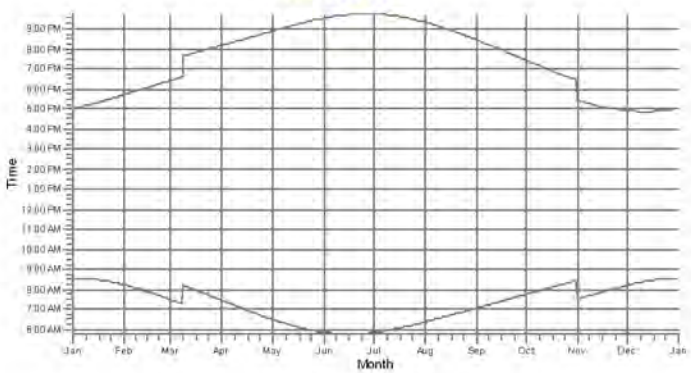
AG: REC-33



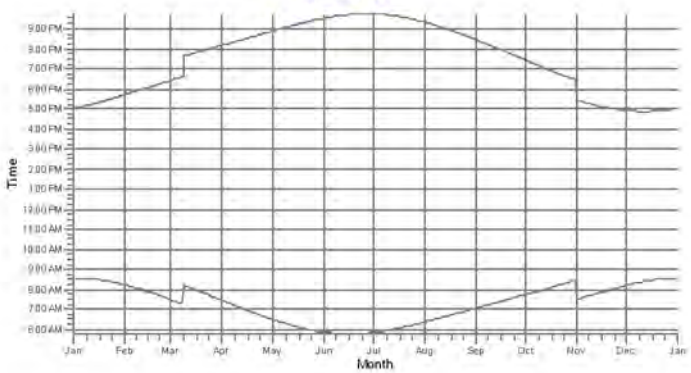
AH: REC-34



AI: REC-35



AJ: REC-36



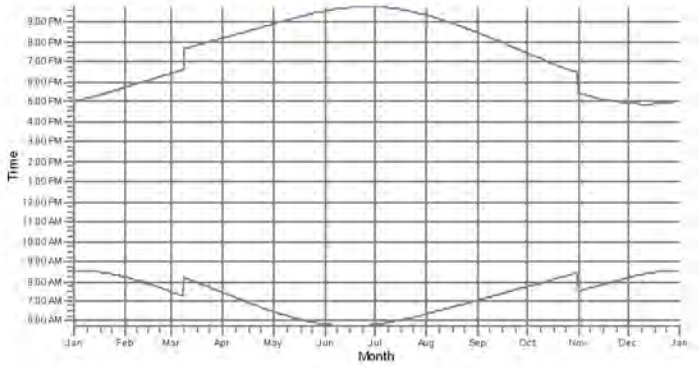
WTGs

Licensed user:
Burns & McDonnell Engineering Company Inc.
9400 Ward Parkway
US-KANSAS CITY, MO 64114
(816) 333 9400
Andrew Glenski / aglenski@burnsmcd.com
Calculated:
12/21/2018 10:12 AM/3.0.654

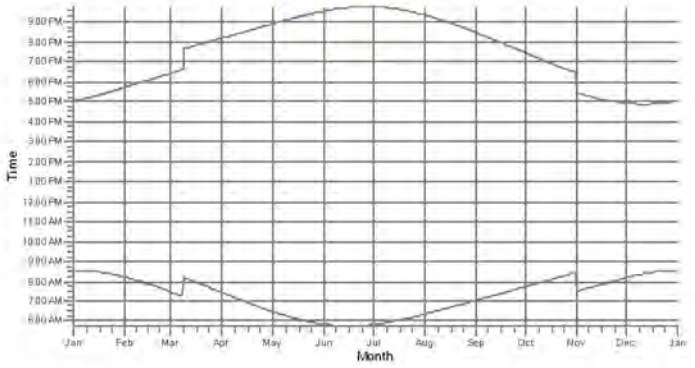
SHADOW - Calendar, graphical

Calculation: RUSO WIND PARTNERS, LLC - RUSO WIND PROJECT - TURBINECOORD.V2 RECEPTORCOORD.V0 OBSTACLES.V0 OROGRAPHY.V1 RESULTS.V3A

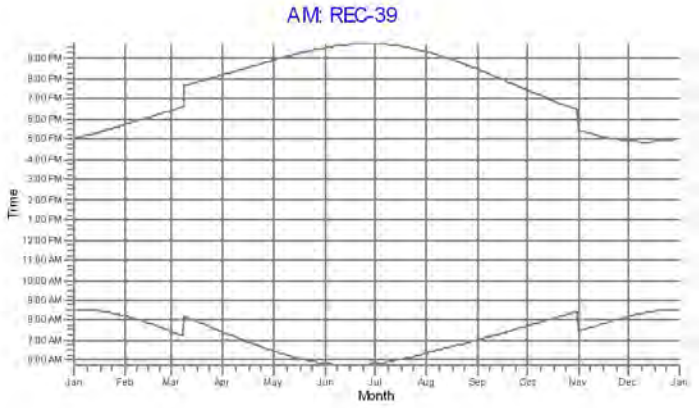
AK: REC-37



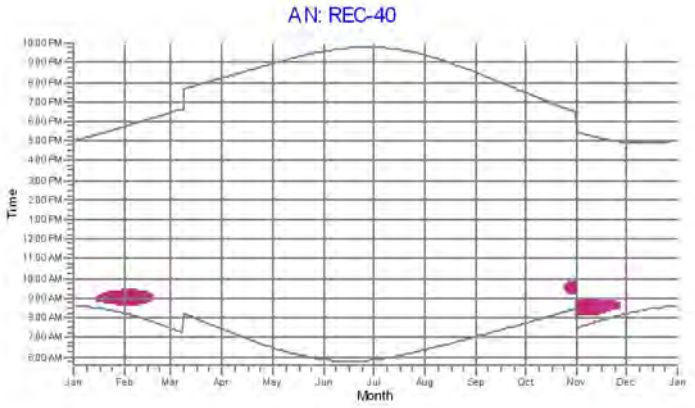
AL: REC-38



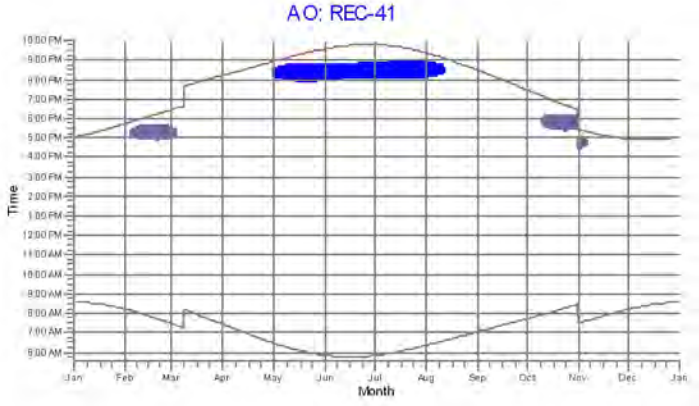
AM: REC-39



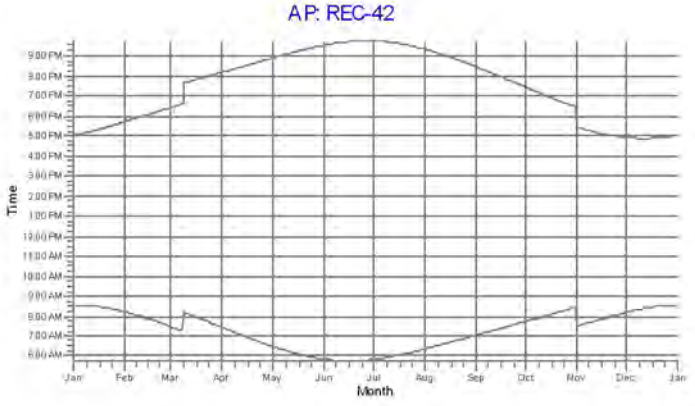
AN: REC-40



AO: REC-41



AP: REC-42



WTGs

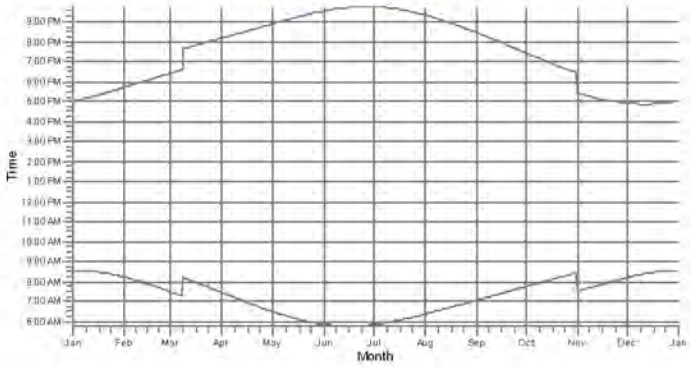
3: T-03 44: ALT-02 57: T-44

Licensed user:
Burns & McDonnell Engineering Company Inc.
9400 Ward Parkway
US-KANSAS CITY, MO 64114
(816) 333 9400
Andrew Glenski / aglenski@burnsmcd.com
Calculated:
12/21/2018 10:12 AM/3.0.654

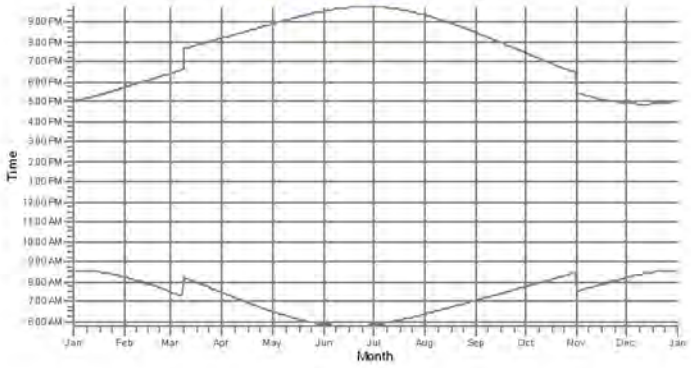
SHADOW - Calendar, graphical

Calculation: RUSO WIND PARTNERS, LLC - RUSO WIND PROJECT - TURBINECOORD.V2 RECEPTORCOORD.V0 OBSTACLES.V0 OROGRAPHY.V1 RESULTS.V3A

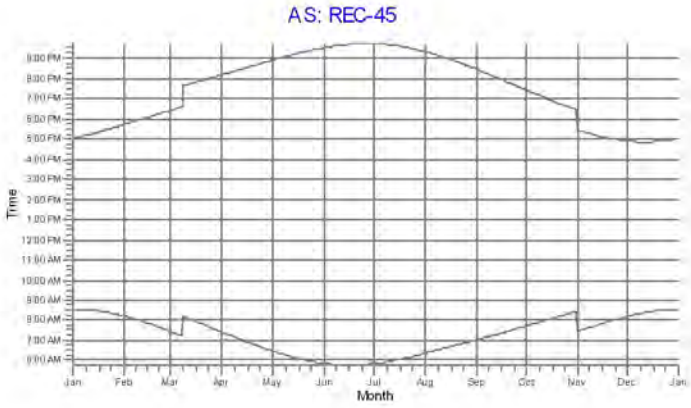
AQ: REC-43



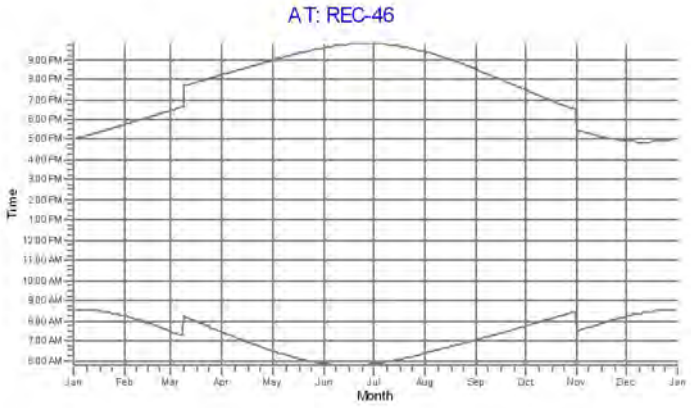
AR: REC-44



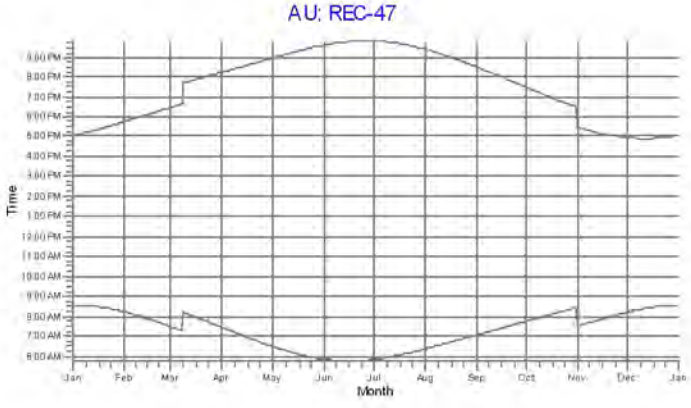
AS: REC-45



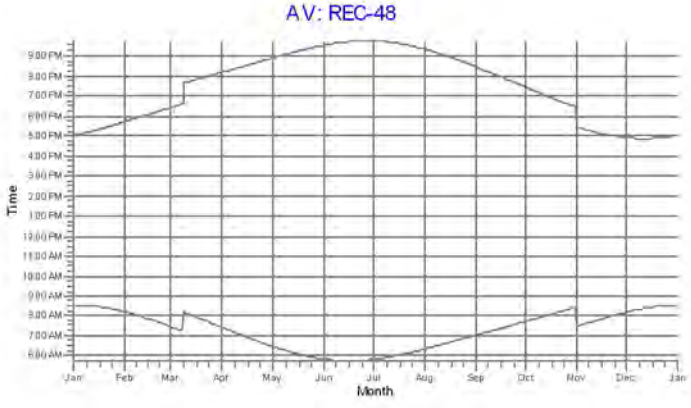
AT: REC-46



AU: REC-47



AV: REC-48



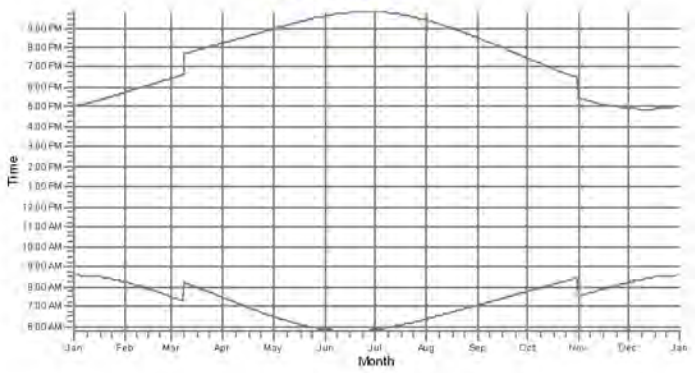
WTGs

Licensed user:
Burns & McDonnell Engineering Company Inc.
9400 Ward Parkway
US-KANSAS CITY, MO 64114
(816) 333 9400
Andrew Glenski / aglenski@burnsmcd.com
Calculated:
12/21/2018 10:12 AM/3.0.654

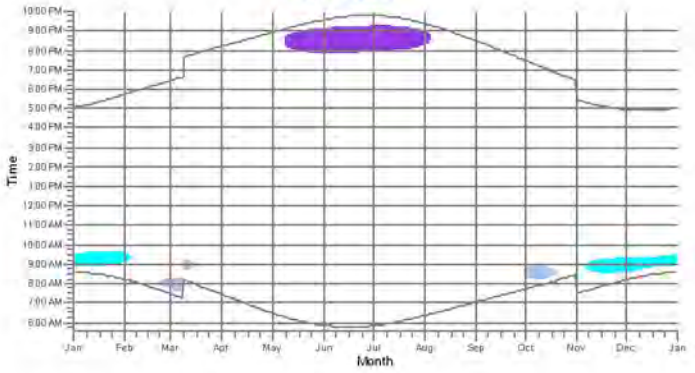
SHADOW - Calendar, graphical

Calculation: RUSO WIND PARTNERS, LLC - RUSO WIND PROJECT - TURBINECOORD.V2 RECEPTORCOORD.V0 OBSTACLES.V0 OROGRAPHY.V1 RESULTS.V3A

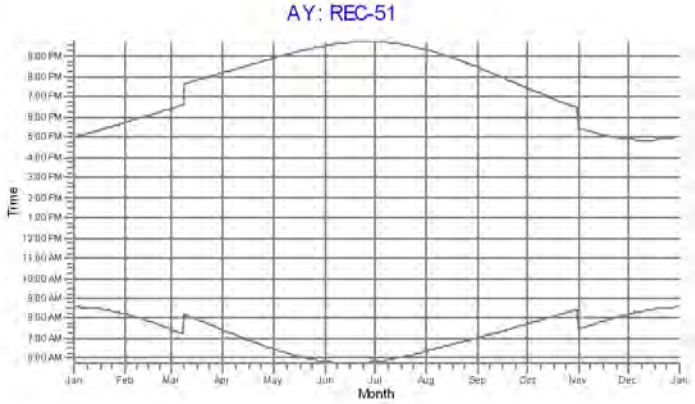
AW: REC-49



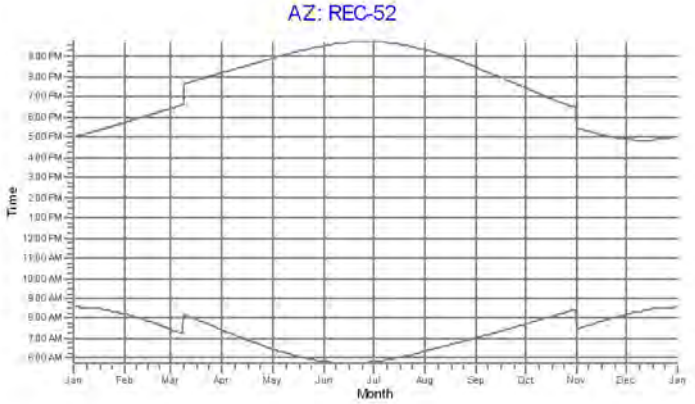
AX: REC-50



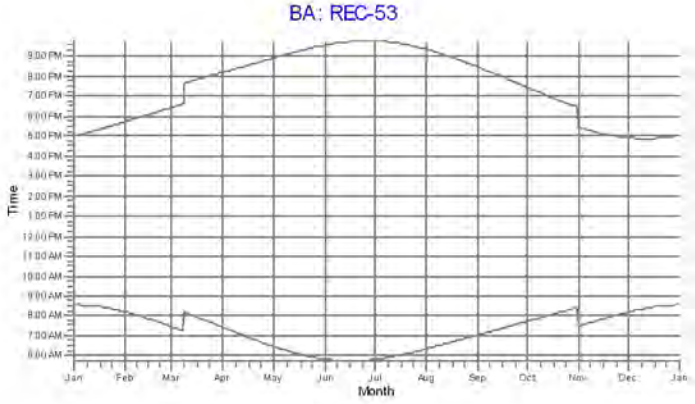
AY: REC-51



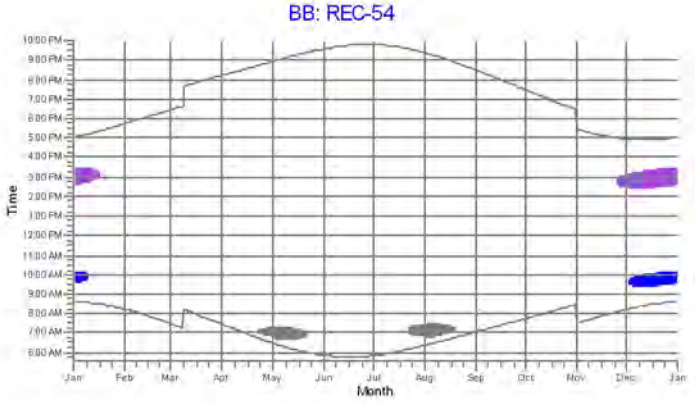
AZ: REC-52



BA: REC-53



BB: REC-54



WTGs

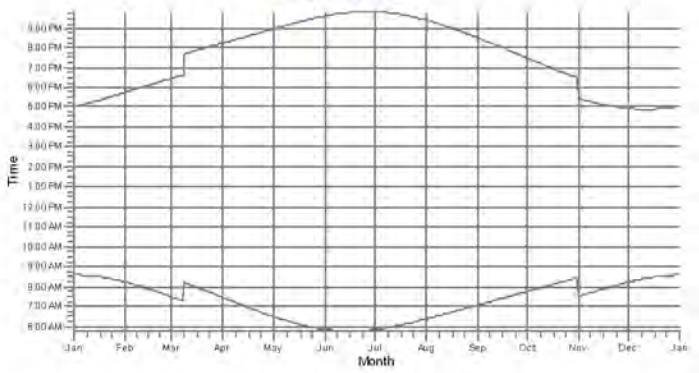
3: T-03 4: T-04 13: T-13 15: T-15 43: ALT-01 46: ALT-04

Licensed user:
Burns & McDonnell Engineering Company Inc.
9400 Ward Parkway
US-KANSAS CITY, MO 64114
(816) 333 9400
Andrew Glenski / aglenski@burnsmcd.com
Calculated:
12/21/2018 10:12 AM/3.0.654

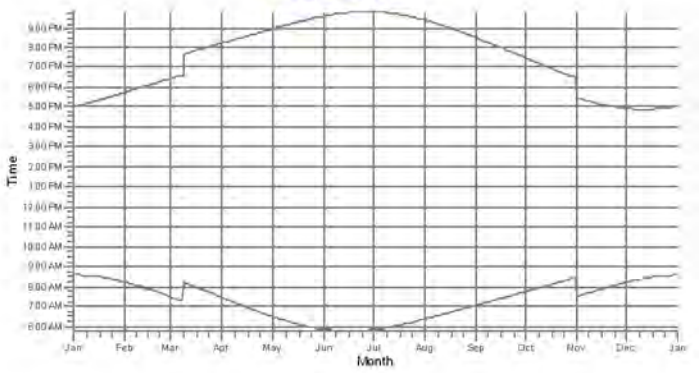
SHADOW - Calendar, graphical

Calculation: RUSO WIND PARTNERS, LLC - RUSO WIND PROJECT - TURBINECOORD.V2 RECEPTORCOORD.V0 OBSTACLES.V0 OROGRAPHY.V1 RESULTS.V3A

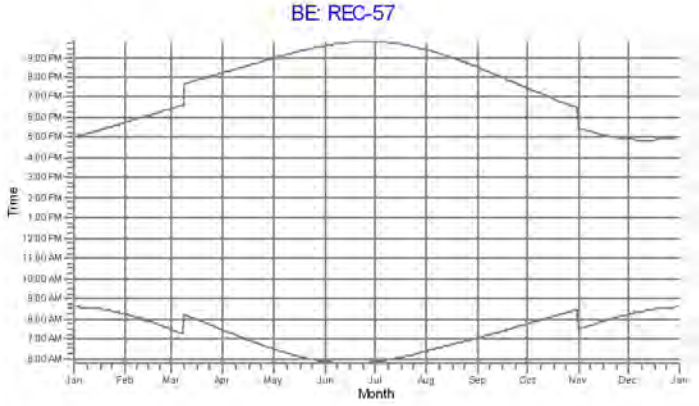
BC: REC-55



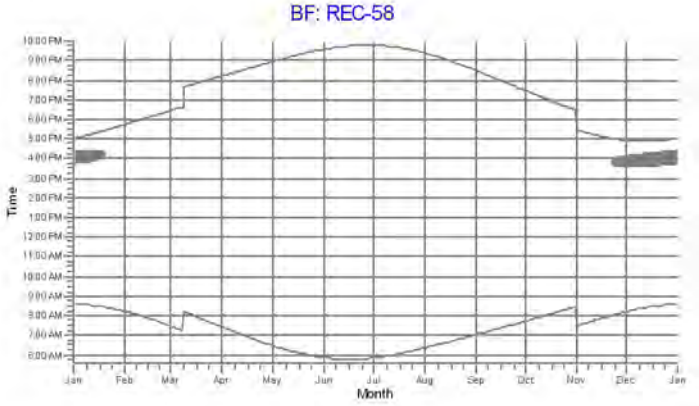
BD: REC-56



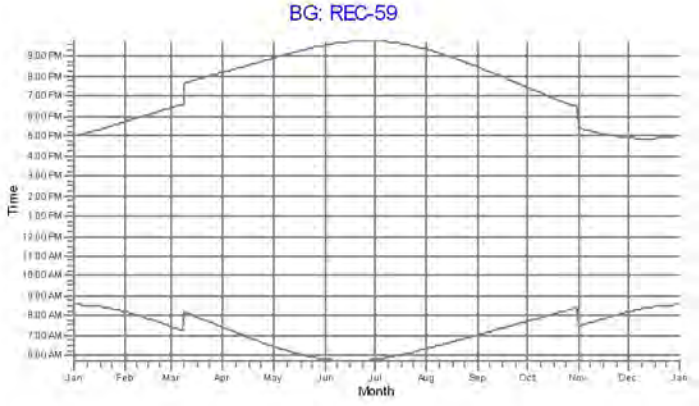
BE: REC-57



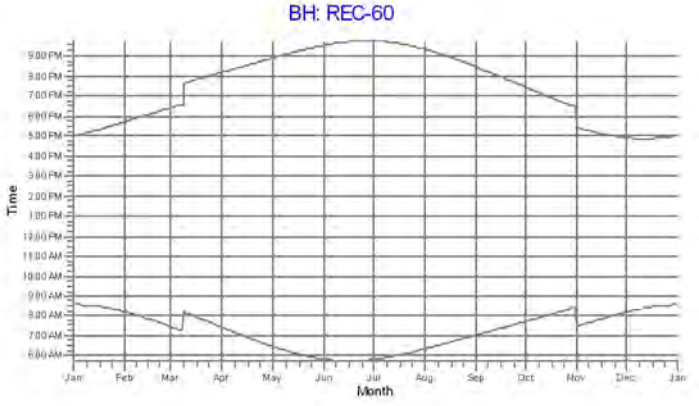
BF: REC-58



BG: REC-59



BH: REC-60



WTGs

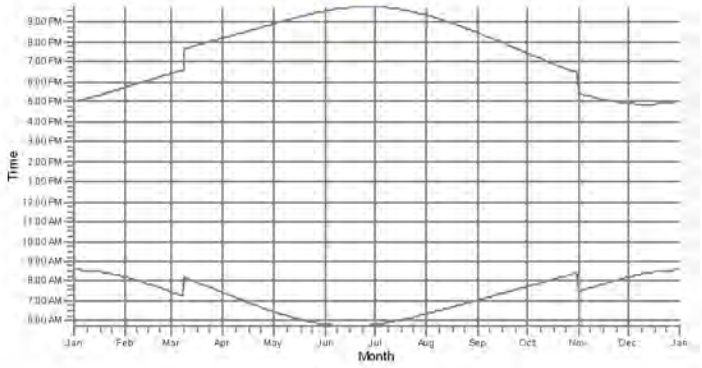
4: T-04

Licensed user:
Burns & McDonnell Engineering Company Inc.
9400 Ward Parkway
US-KANSAS CITY, MO 64114
(816) 333 9400
Andrew Glenski / aglenski@burnsmcd.com
Calculated:
12/21/2018 10:12 AM/3.0.654

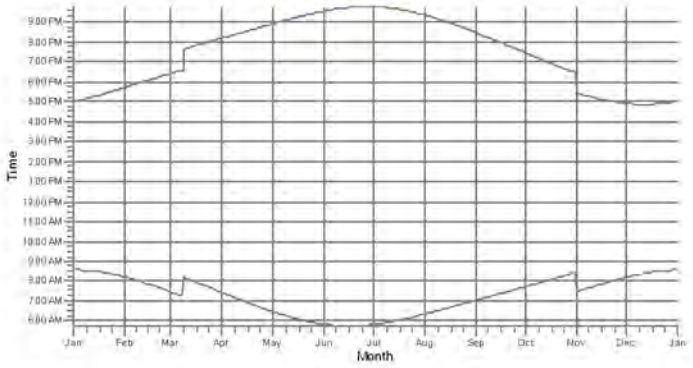
SHADOW - Calendar, graphical

Calculation: RUSO WIND PARTNERS, LLC - RUSO WIND PROJECT - TURBINECOORD.V2 RECEPTORCOORD.V0 OBSTACLES.V0 OROGRAPHY.V1 RESULTS.V3A

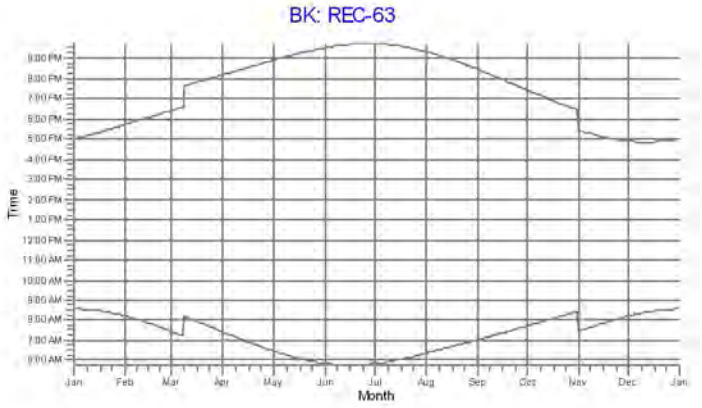
BI: REC-61



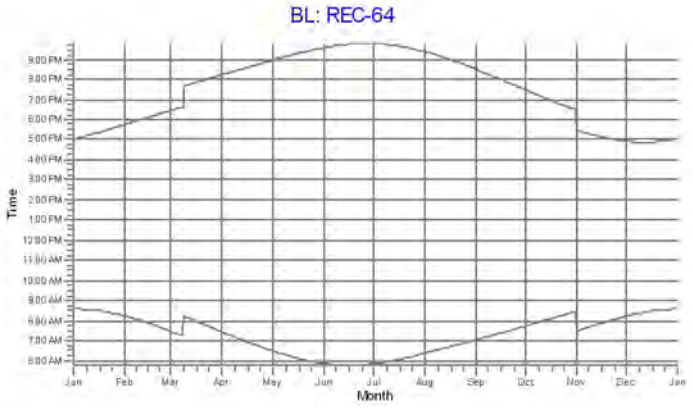
BJ: REC-62



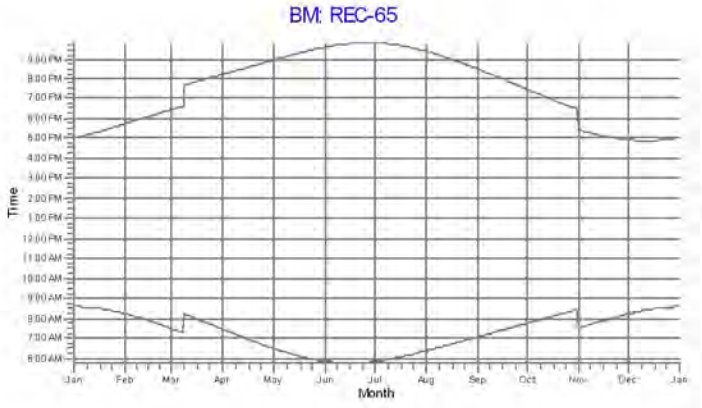
BK: REC-63



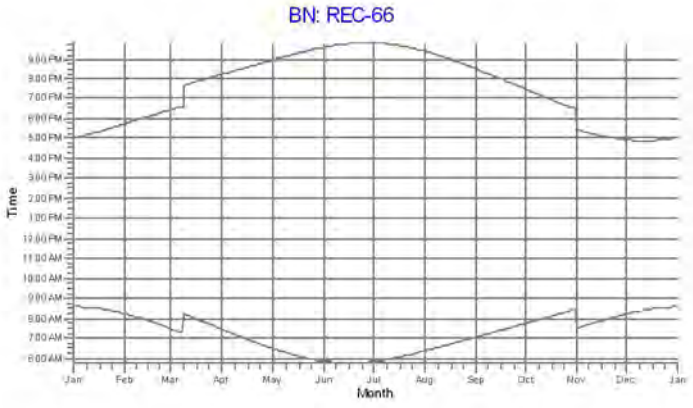
BL: REC-64



BM: REC-65



BN: REC-66



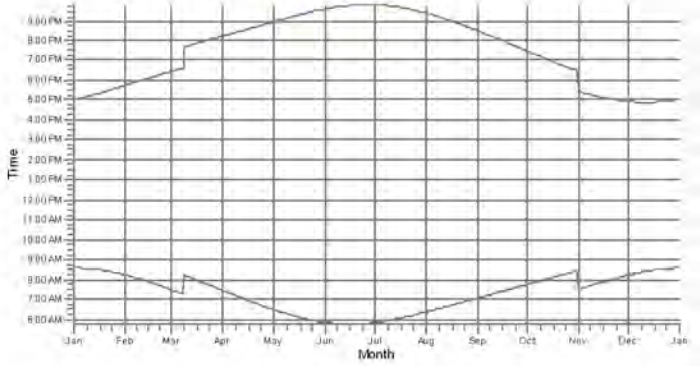
WTGs

Licensed user:
Burns & McDonnell Engineering Company Inc.
9400 Ward Parkway
US-KANSAS CITY, MO 64114
(816) 333 9400
Andrew Glenski / aglenski@burnsmcd.com
Calculated:
12/21/2018 10:12 AM/3.0.654

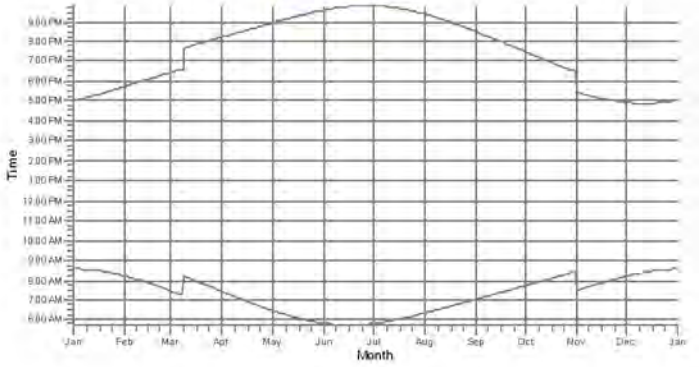
SHADOW - Calendar, graphical

Calculation: RUSO WIND PARTNERS, LLC - RUSO WIND PROJECT - TURBINECOORD.V2 RECEPTORCOORD.V0 OBSTACLES.V0 OROGRAPHY.V1 RESULTS.V3A

BO: REC-67



BP: REC-68



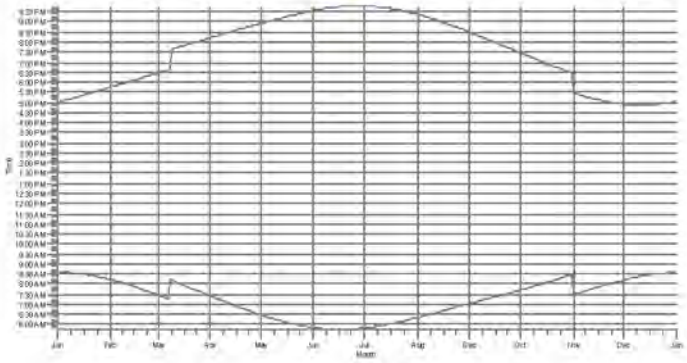
WTGs

Licensed user:
Burns & McDonnell Engineering Company Inc.
9400 Ward Parkway
US-KANSAS CITY, MO 64114
(816) 333 9400
Andrew Glenski / aglenski@burnsmcd.com
Calculated:
12/21/2018 9:39 AM/3.0.654

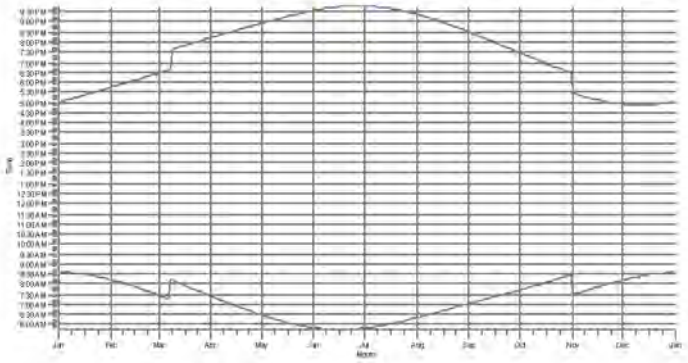
SHADOW - Calendar, graphical

Calculation: RUSO WIND PARTNERS, LLC - RUSO WIND PROJECT - TURBINECOORD.V2 RECEPTORCOORD.V0 OBSTACLES.V0 OROGRAPHY.V1 RESULTS.V3

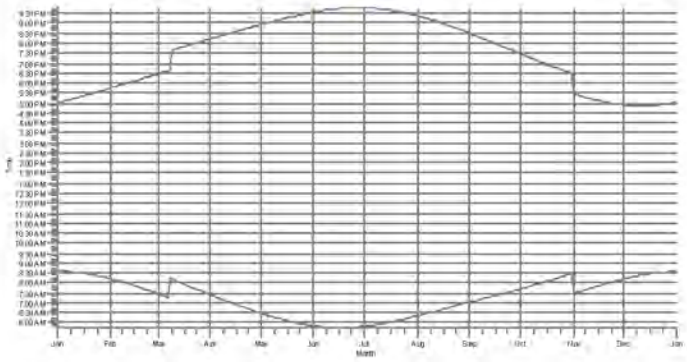
A: REC-01



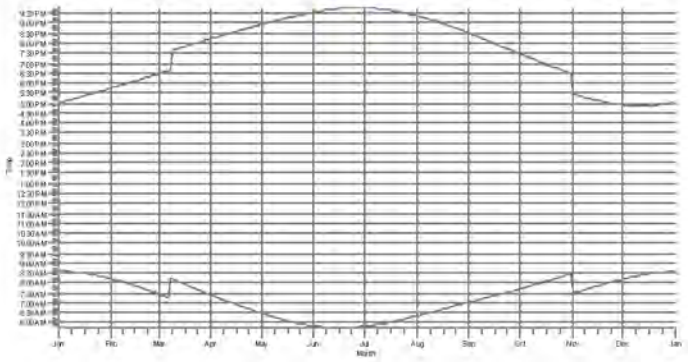
B: REC-02



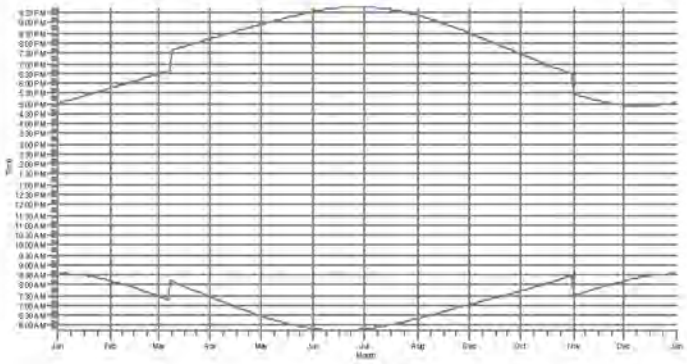
C: REC-03



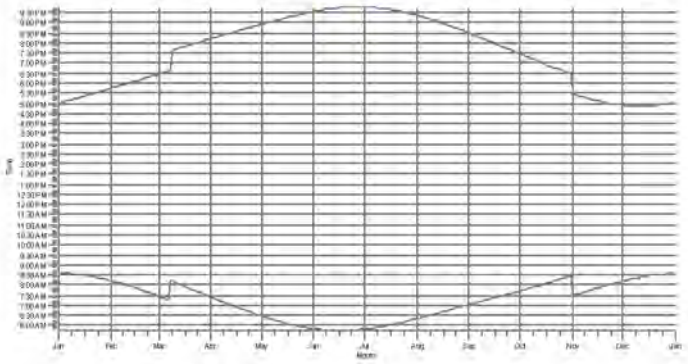
D: REC-04



E: REC-05



F: REC-06



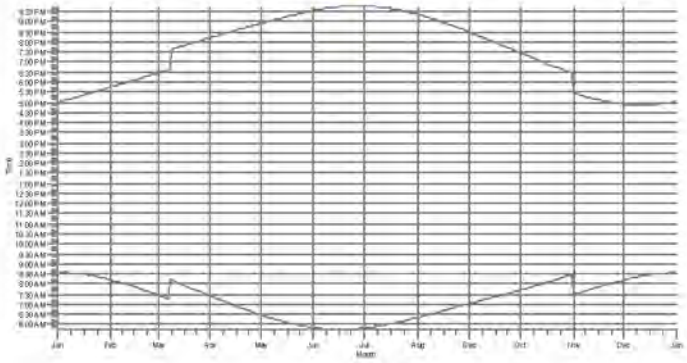
WTGs

Licensed user:
Burns & McDonnell Engineering Company Inc.
9400 Ward Parkway
US-KANSAS CITY, MO 64114
(816) 333 9400
Andrew Glenski / aglenski@burnsmcd.com
Calculated:
12/21/2018 9:39 AM/3.0.654

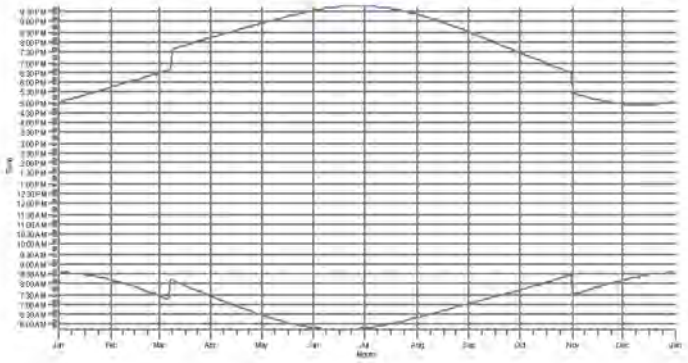
SHADOW - Calendar, graphical

Calculation: RUSO WIND PARTNERS, LLC - RUSO WIND PROJECT - TURBINECOORD.V2 RECEPTORCOORD.V0 OBSTACLES.V0 OROGRAPHY.V1 RESULTS.V3

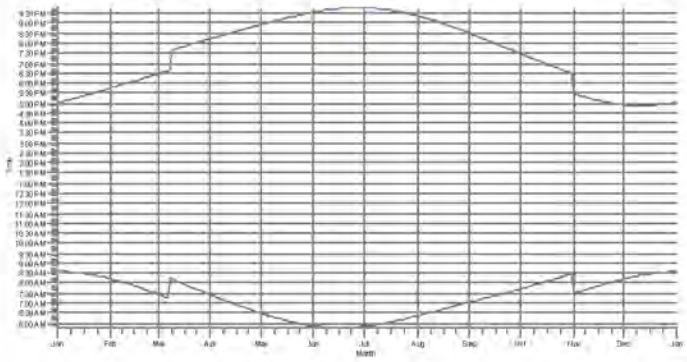
G: REC-07



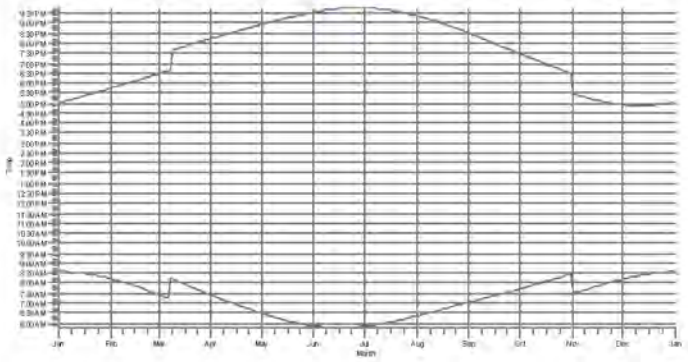
H: REC-08



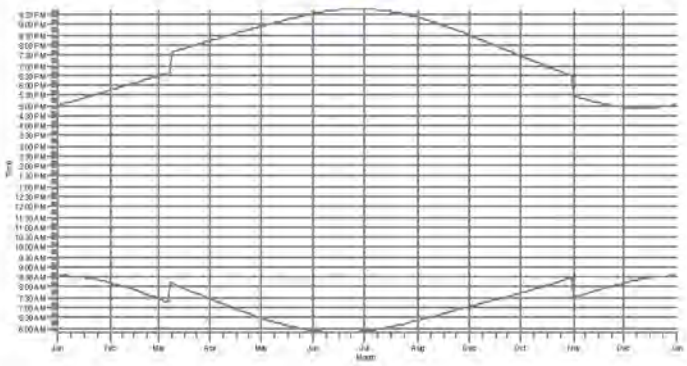
I: REC-09



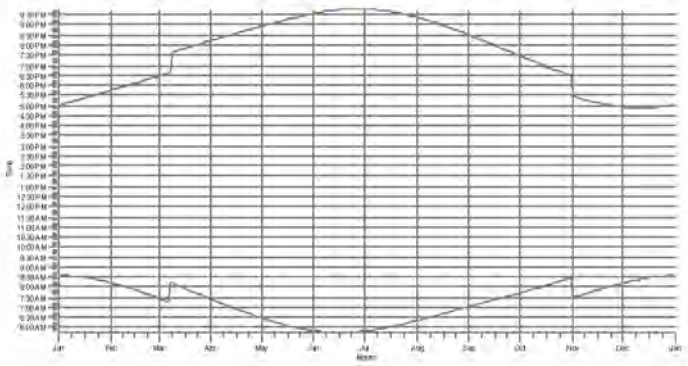
J: REC-10



K: REC-11



L: REC-12



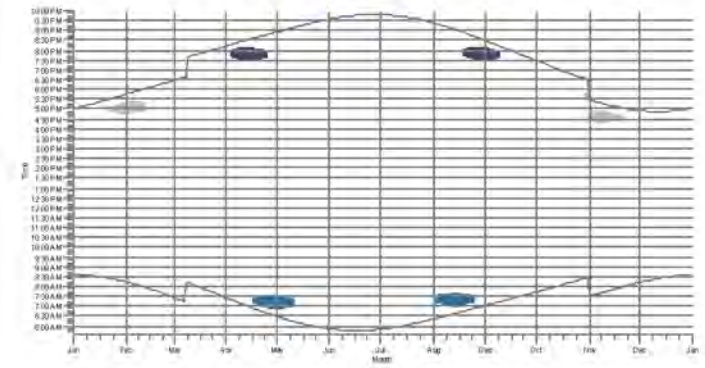
WTGs

Licensed user:
Burns & McDonnell Engineering Company Inc.
9400 Ward Parkway
US-KANSAS CITY, MO 64114
(816) 333 9400
Andrew Glenski / aglenski@burnsmcd.com
Calculated:
12/21/2018 9:39 AM/3.0.654

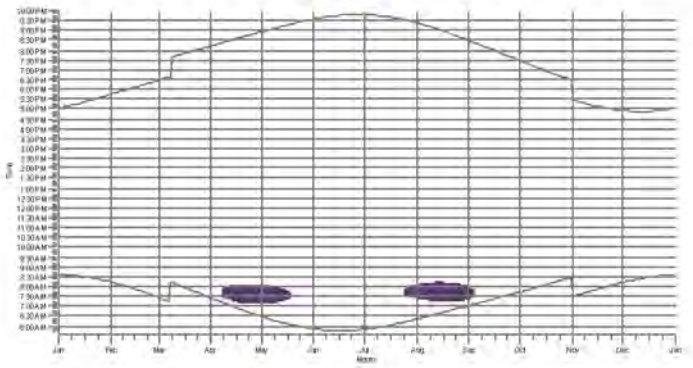
SHADOW - Calendar, graphical

Calculation: RUSO WIND PARTNERS, LLC - RUSO WIND PROJECT - TURBINECOORD.V2 RECEPTORCOORD.V0 OBSTACLES.V0 OROGRAPHY.V1 RESULTS.V3

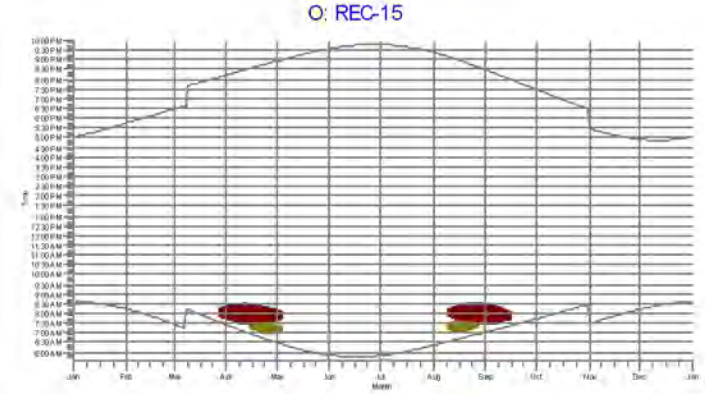
M: REC-13



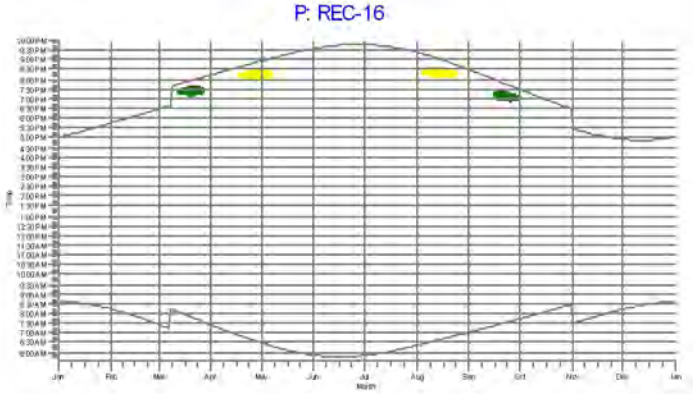
N: REC-14



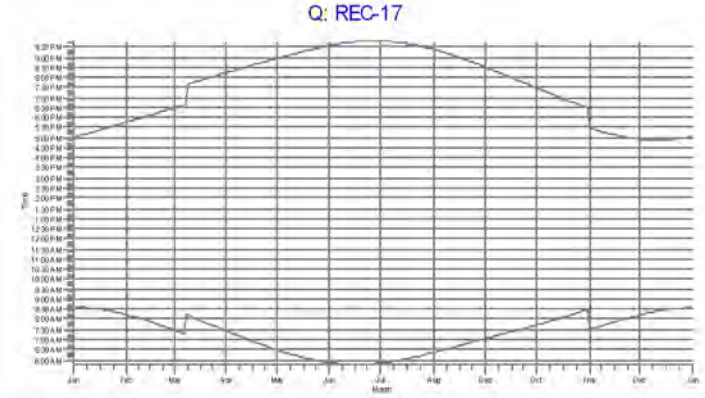
O: REC-15



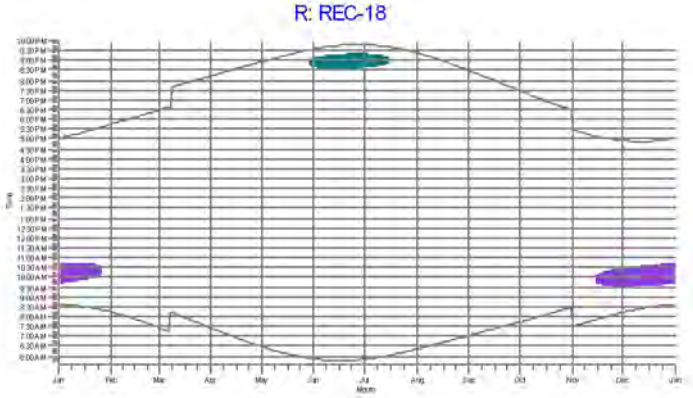
P: REC-16



Q: REC-17



R: REC-18



WTGs

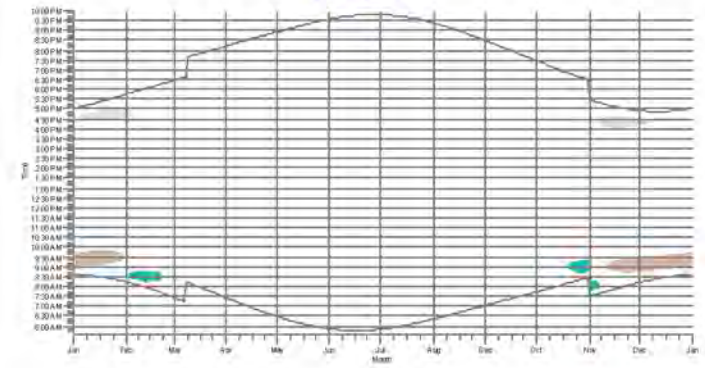
1: T-01 2: T-02 6: T-06 8: T-08 10: T-10 12: T-12 22: T-22 46: ALT-04 63: T-50

Licensed user:
Burns & McDonnell Engineering Company Inc.
9400 Ward Parkway
US-KANSAS CITY, MO 64114
(816) 333 9400
Andrew Glenski / aglenski@burnsmcd.com
Calculated:
12/21/2018 9:39 AM/3.0.654

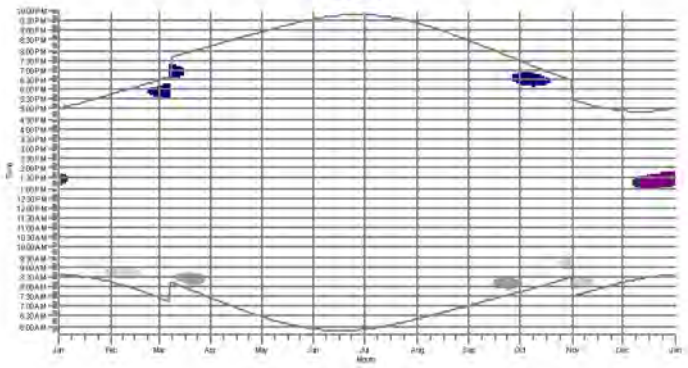
SHADOW - Calendar, graphical

Calculation: RUSO WIND PARTNERS, LLC - RUSO WIND PROJECT - TURBINECOORD.V2 RECEPTORCOORD.V0 OBSTACLES.V0 OROGRAPHY.V1 RESULTS.V3

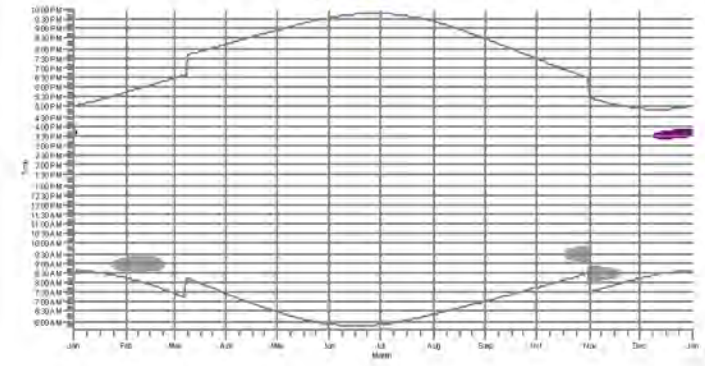
S: REC-19



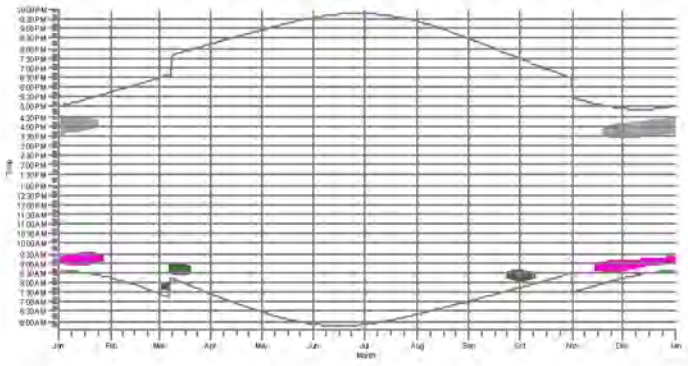
T: REC-20



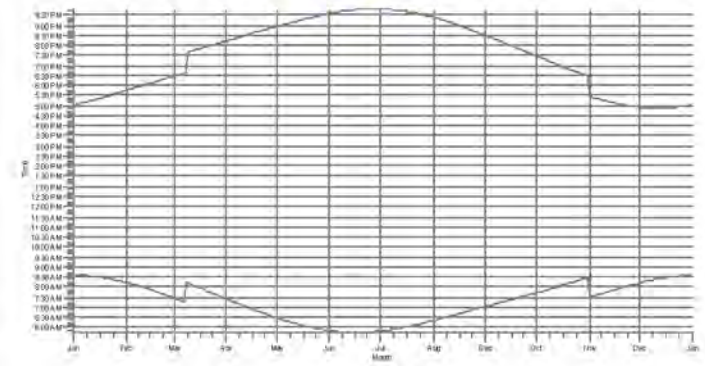
U: REC-21



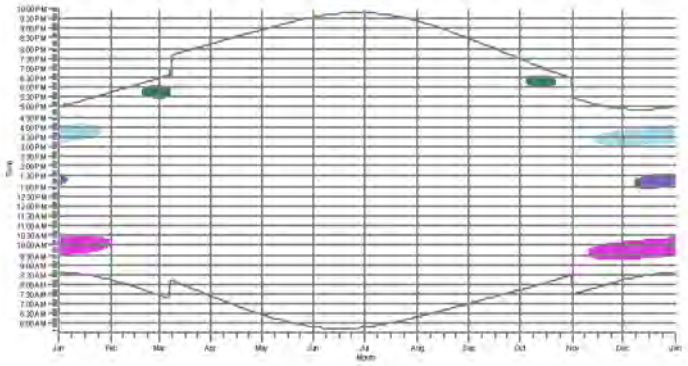
V: REC-22



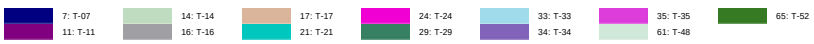
W: REC-23



X: REC-24



WTGs

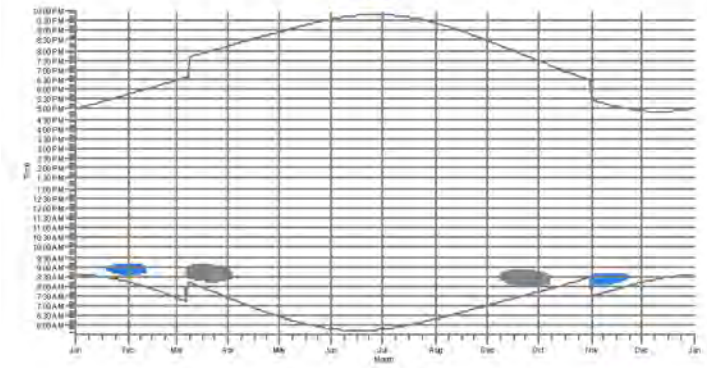


Licensed user:
Burns & McDonnell Engineering Company Inc.
9400 Ward Parkway
US-KANSAS CITY, MO 64114
(816) 333 9400
Andrew Glenski / aglenski@burnsmcd.com
Calculated:
12/21/2018 9:39 AM/3.0.654

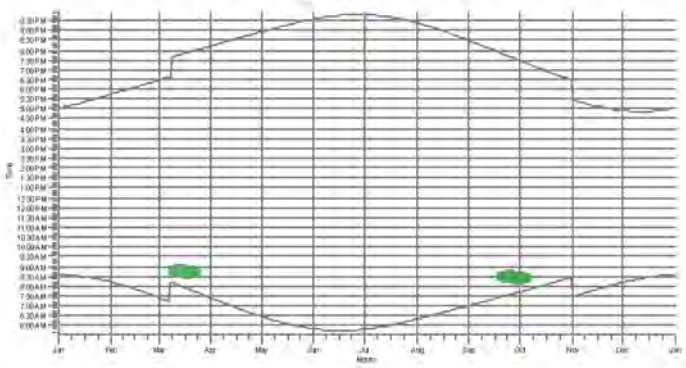
SHADOW - Calendar, graphical

Calculation: RUSO WIND PARTNERS, LLC - RUSO WIND PROJECT - TURBINECOORD.V2 RECEPTORCOORD.V0 OBSTACLES.V0 OROGRAPHY.V1 RESULTS.V3

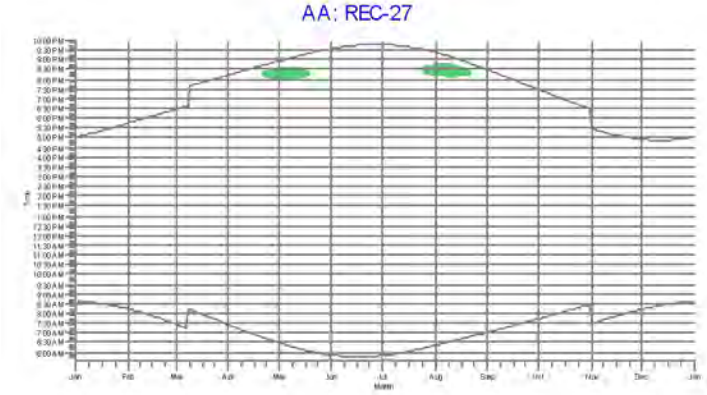
Y: REC-25



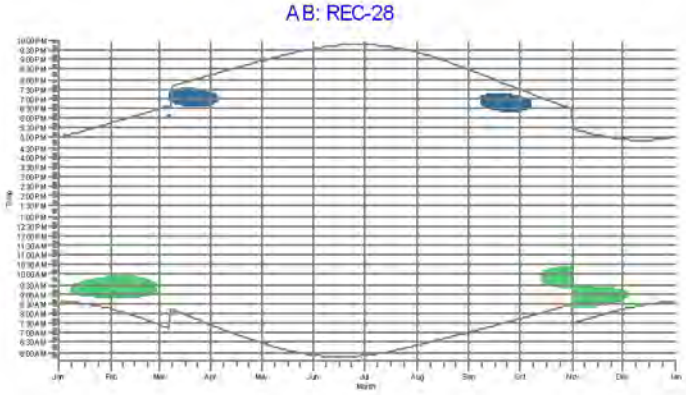
Z: REC-26



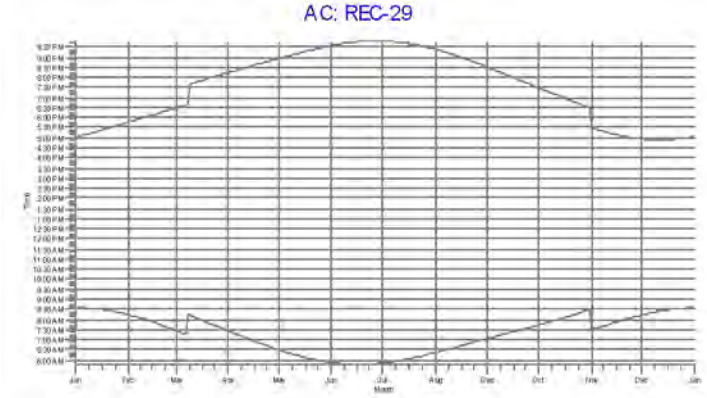
AA: REC-27



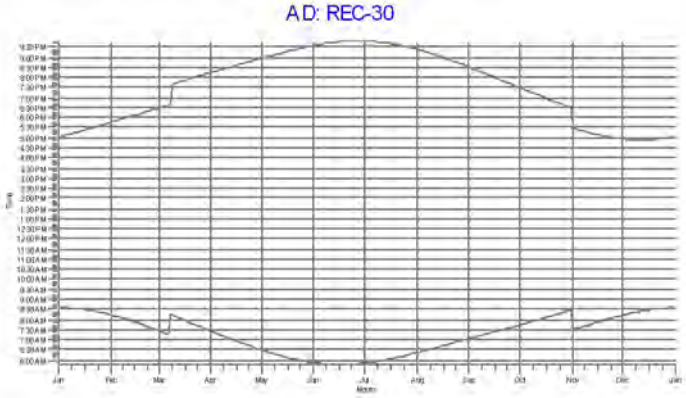
AB: REC-28



AC: REC-29



AD: REC-30



WTGs

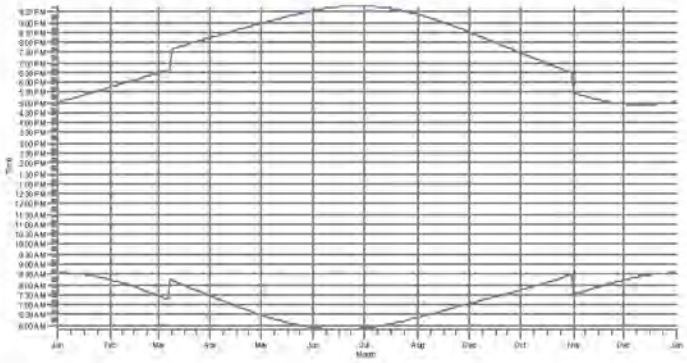
22: T-22 28: T-28 38: T-38 39: T-39 85: NF-19

Licensed user:
Burns & McDonnell Engineering Company Inc.
9400 Ward Parkway
US-KANSAS CITY, MO 64114
(816) 333 9400
Andrew Glenski / aglenski@burnsmcd.com
Calculated:
12/21/2018 9:39 AM/3.0.654

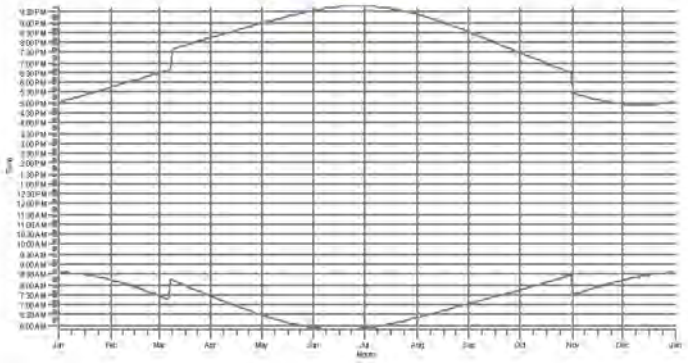
SHADOW - Calendar, graphical

Calculation: RUSO WIND PARTNERS, LLC - RUSO WIND PROJECT - TURBINECOORD.V2 RECEPTORCOORD.V0 OBSTACLES.V0 OROGRAPHY.V1 RESULTS.V3

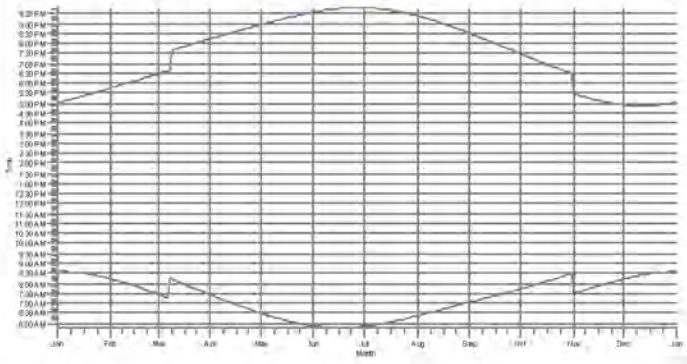
AE: REC-31



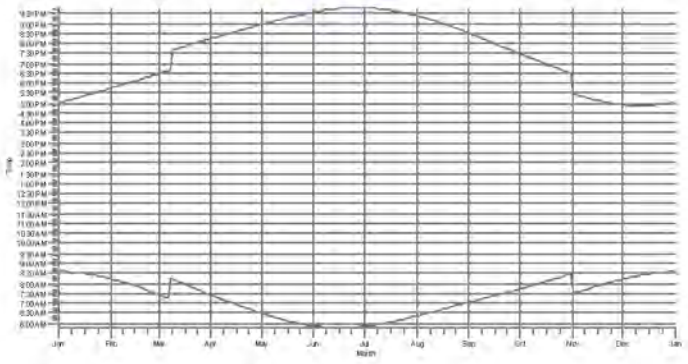
AF: REC-32



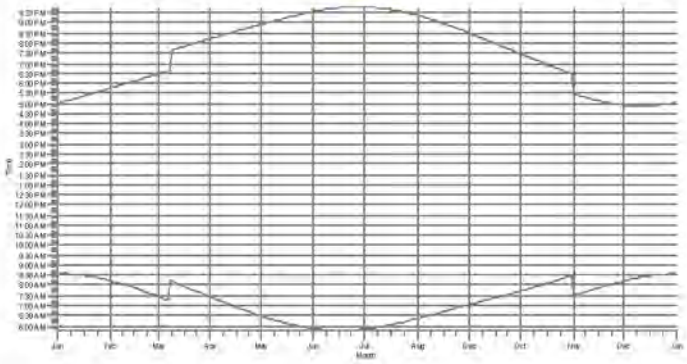
AG: REC-33



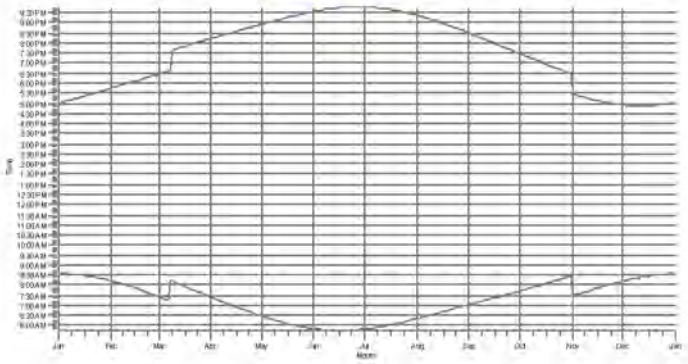
AH: REC-34



AI: REC-35



AJ: REC-36



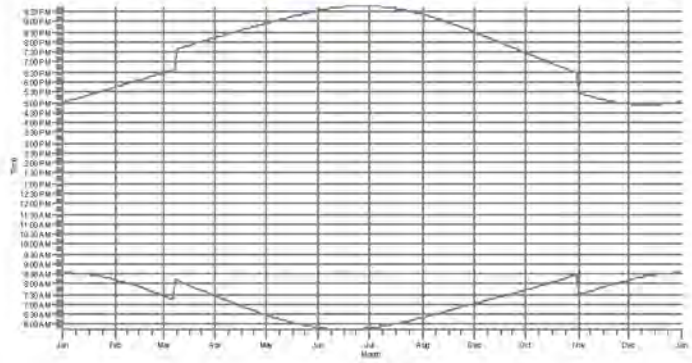
WTGs

Licensed user:
Burns & McDonnell Engineering Company Inc.
9400 Ward Parkway
US-KANSAS CITY, MO 64114
(816) 333 9400
Andrew Glenski / aglenski@burnsmcd.com
Calculated:
12/21/2018 9:39 AM/3.0.654

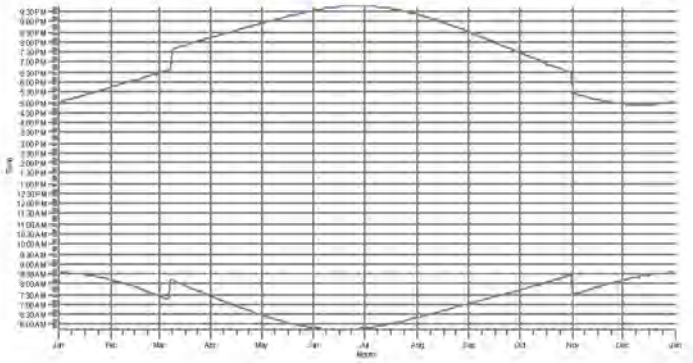
SHADOW - Calendar, graphical

Calculation: RUSO WIND PARTNERS, LLC - RUSO WIND PROJECT - TURBINECOORD.V2 RECEPTORCOORD.V0 OBSTACLES.V0 OROGRAPHY.V1 RESULTS.V3

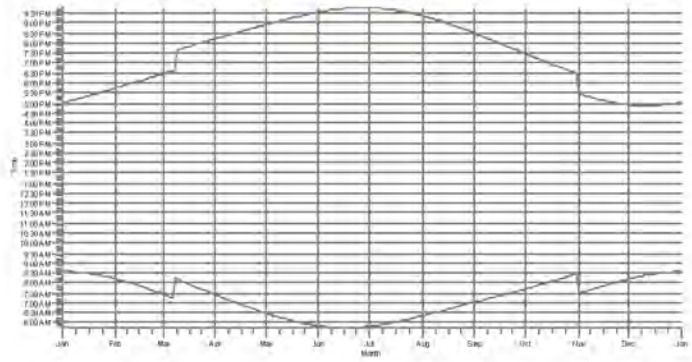
AK: REC-37



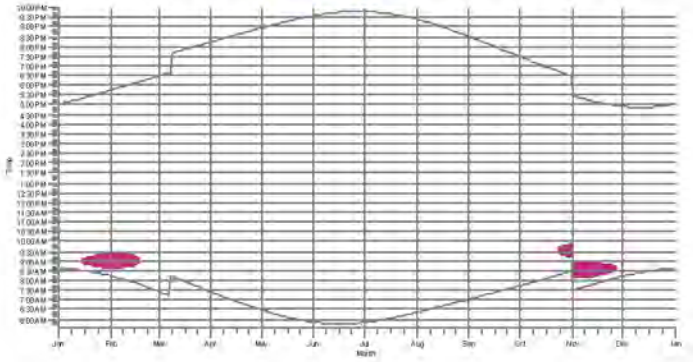
AL: REC-38



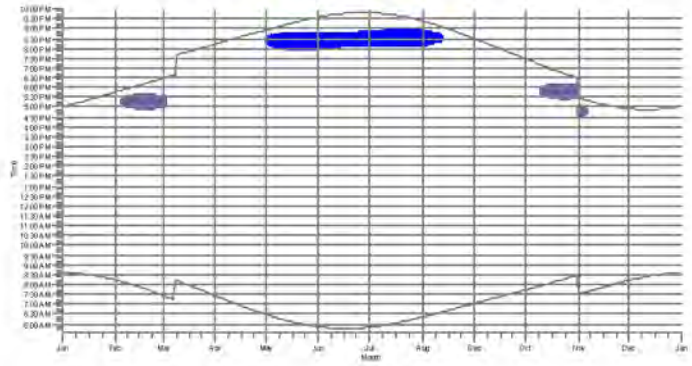
AM: REC-39



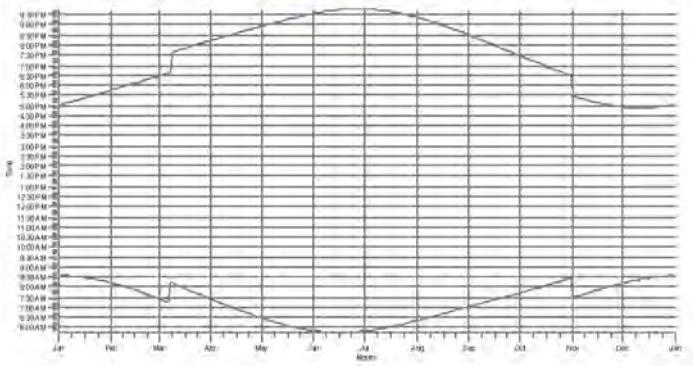
AN: REC-40



AO: REC-41



AP: REC-42



WTGs

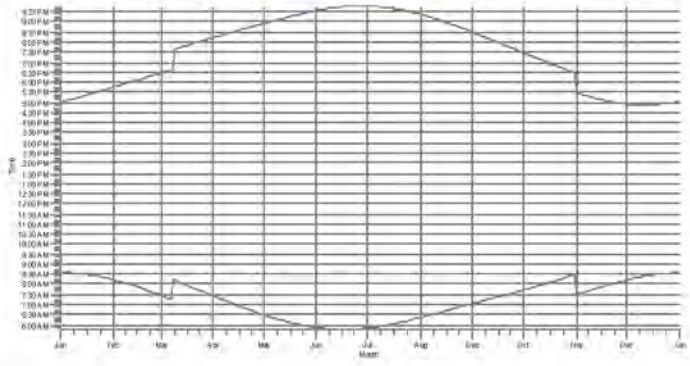
3: T-03 44: ALT-02 57: T-44

Licensed user:
Burns & McDonnell Engineering Company Inc.
9400 Ward Parkway
US-KANSAS CITY, MO 64114
(816) 333 9400
Andrew Glenski / aglenski@burnsmcd.com
Calculated:
12/21/2018 9:39 AM/3.0.654

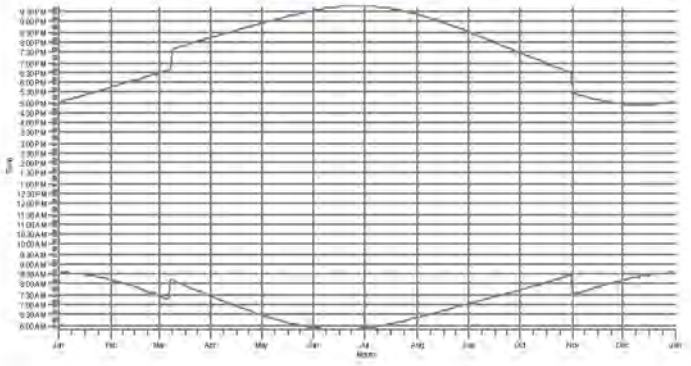
SHADOW - Calendar, graphical

Calculation: RUSO WIND PARTNERS, LLC - RUSO WIND PROJECT - TURBINECOORD.V2 RECEPTORCOORD.V0 OBSTACLES.V0 OROGRAPHY.V1 RESULTS.V3

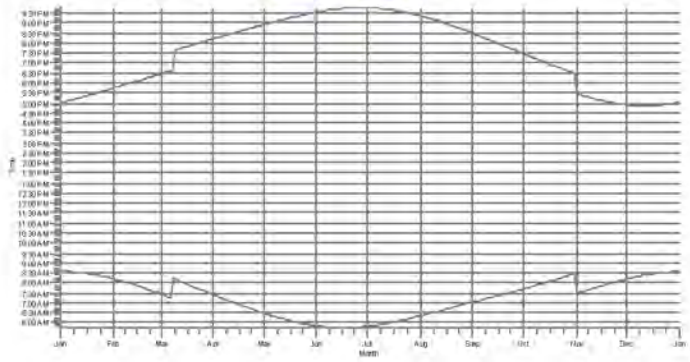
AQ: REC-43



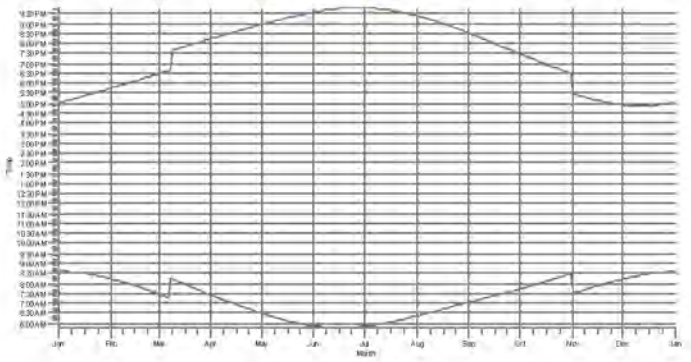
AR: REC-44



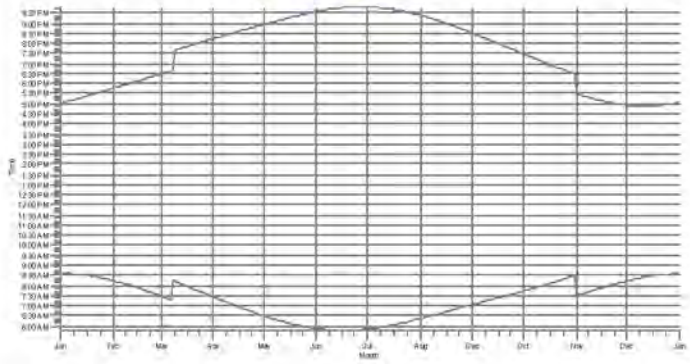
AS: REC-45



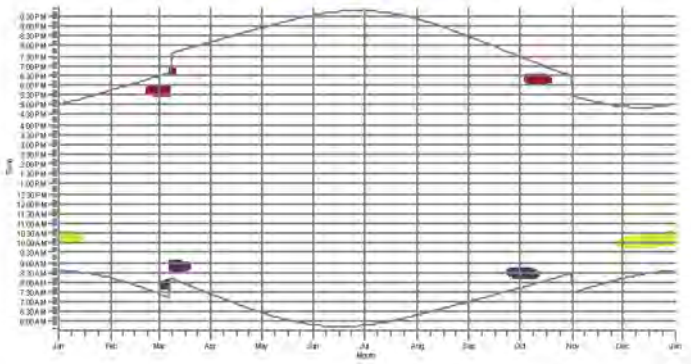
AT: REC-46



AU: REC-47



AV: REC-48



WTGs

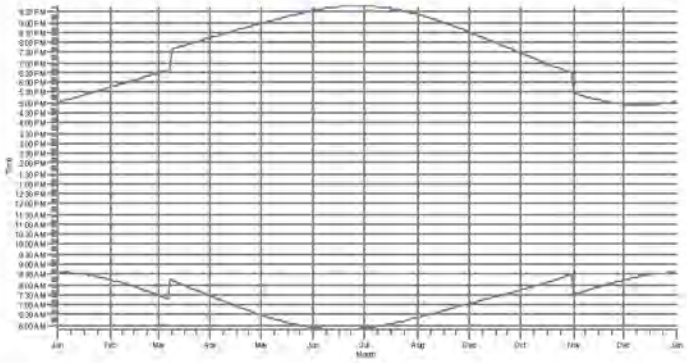
102: NF-36 103: NF-37 106: NF-40

Licensed user:
Burns & McDonnell Engineering Company Inc.
9400 Ward Parkway
US-KANSAS CITY, MO 64114
(816) 333 9400
Andrew Glenski / aglenski@burnsmcd.com
Calculated:
12/21/2018 9:39 AM/3.0.654

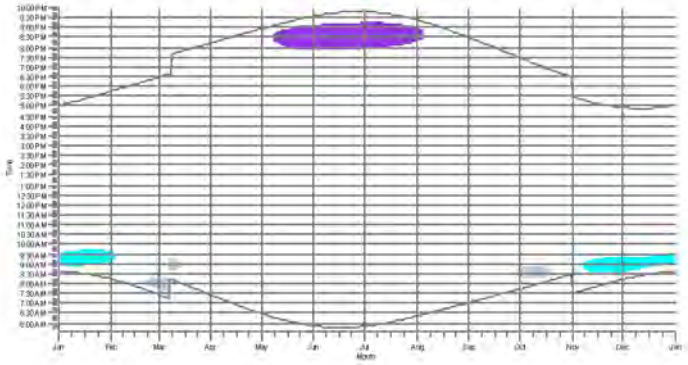
SHADOW - Calendar, graphical

Calculation: RUSO WIND PARTNERS, LLC - RUSO WIND PROJECT - TURBINECOORD.V2 RECEPTORCOORD.V0 OBSTACLES.V0 OROGRAPHY.V1 RESULTS.V3

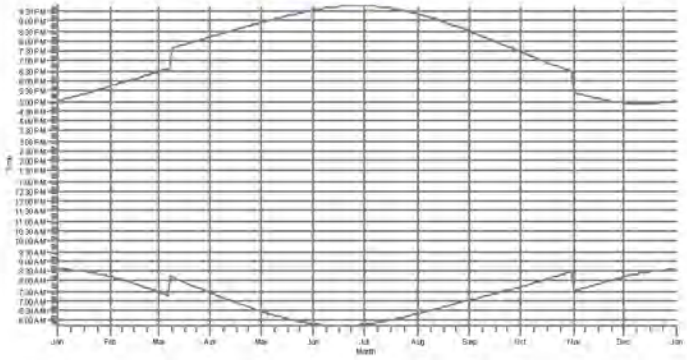
AW: REC-49



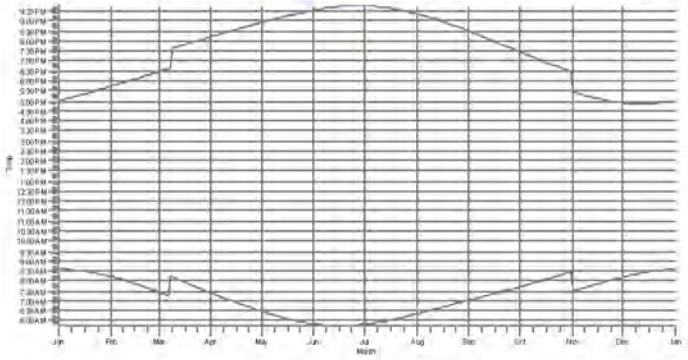
AX: REC-50



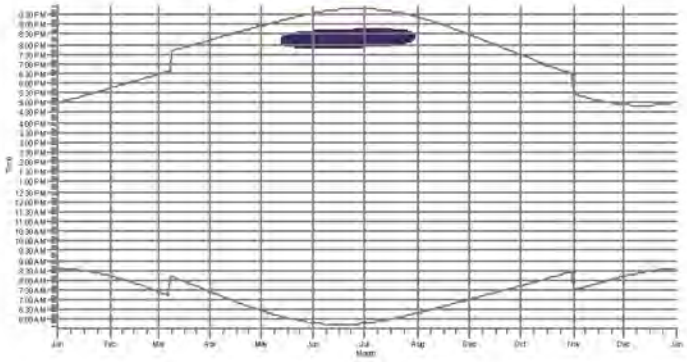
AY: REC-51



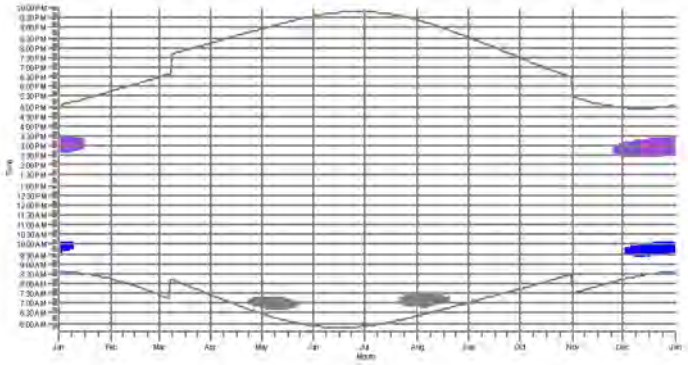
AZ: REC-52



BA: REC-53



BB: REC-54



WTGs

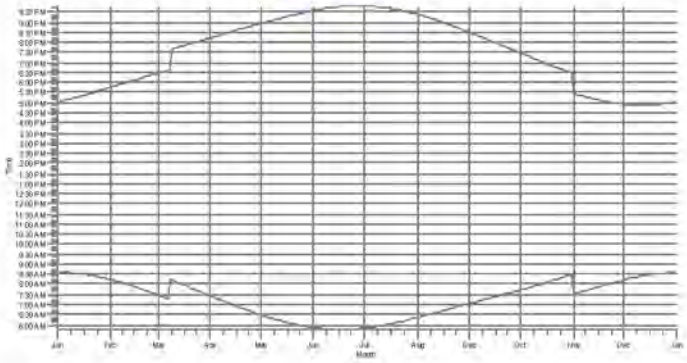
3: T-03 4: T-04 13: T-13 15: T-15 43: ALT-01 46: ALT-04 74: NF-08

Licensed user:
Burns & McDonnell Engineering Company Inc.
9400 Ward Parkway
US-KANSAS CITY, MO 64114
(816) 333 9400
Andrew Glenski / aglenski@burnsmcd.com
Calculated:
12/21/2018 9:39 AM/3.0.654

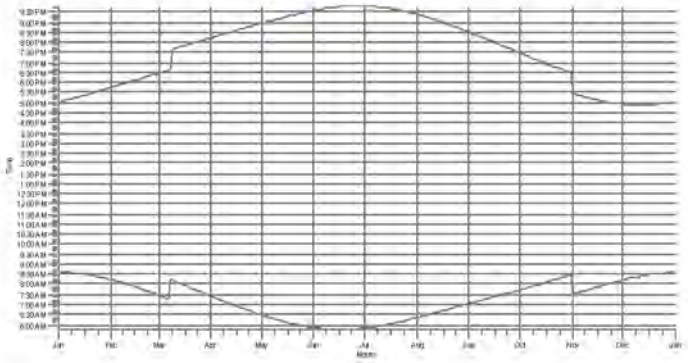
SHADOW - Calendar, graphical

Calculation: RUSO WIND PARTNERS, LLC - RUSO WIND PROJECT - TURBINECOORD.V2 RECEPTORCOORD.V0 OBSTACLES.V0 OROGRAPHY.V1 RESULTS.V3

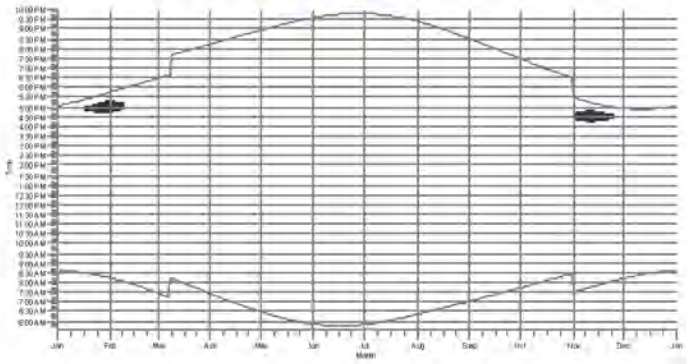
BC: REC-55



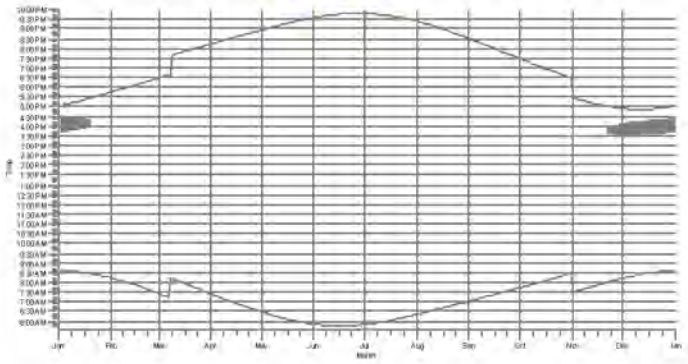
BD: REC-56



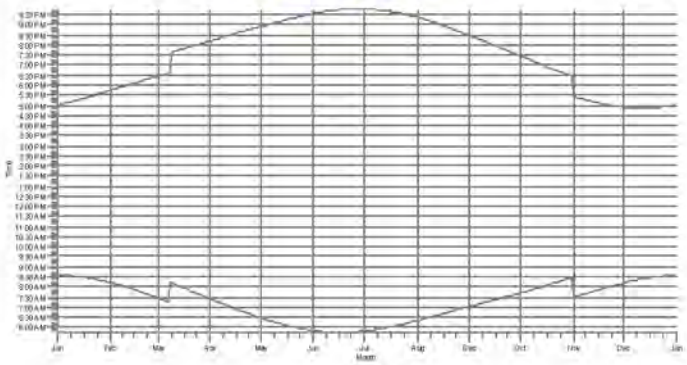
BE: REC-57



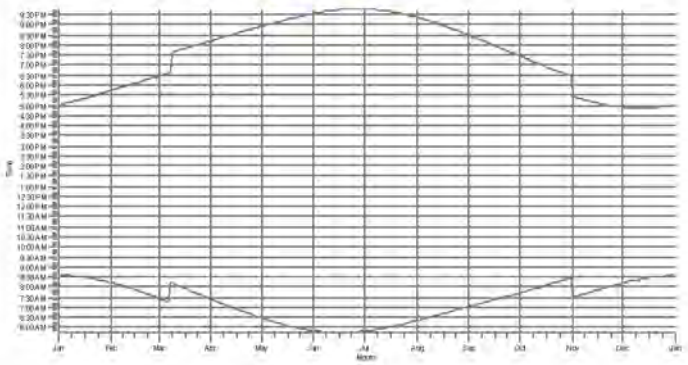
BF: REC-58



BG: REC-59



BH: REC-60



WTGs

4: T-04

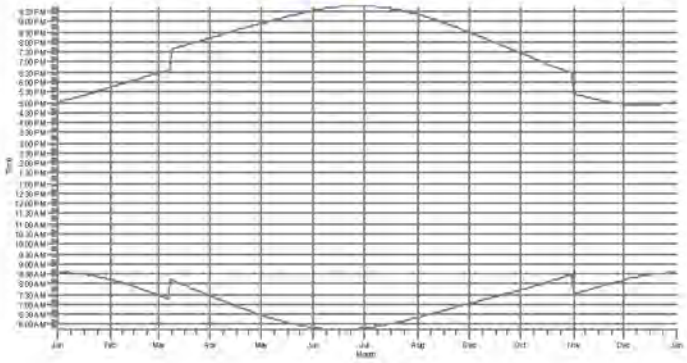
185: PW-75

Licensed user:
Burns & McDonnell Engineering Company Inc.
9400 Ward Parkway
US-KANSAS CITY, MO 64114
(816) 333 9400
Andrew Glenski / aglenski@burnsmcd.com
Calculated:
12/21/2018 9:39 AM/3.0.654

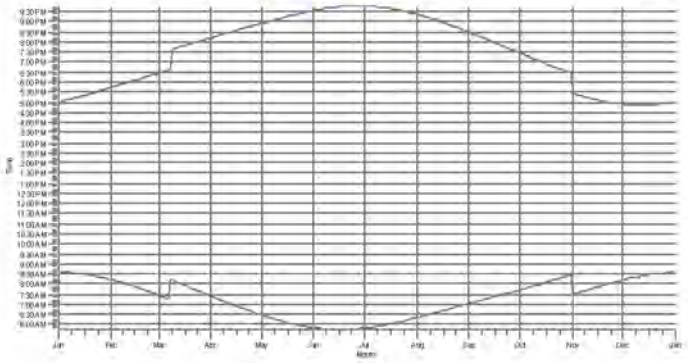
SHADOW - Calendar, graphical

Calculation: RUSO WIND PARTNERS, LLC - RUSO WIND PROJECT - TURBINECOORD.V2 RECEPTORCOORD.V0 OBSTACLES.V0 OROGRAPHY.V1 RESULTS.V3

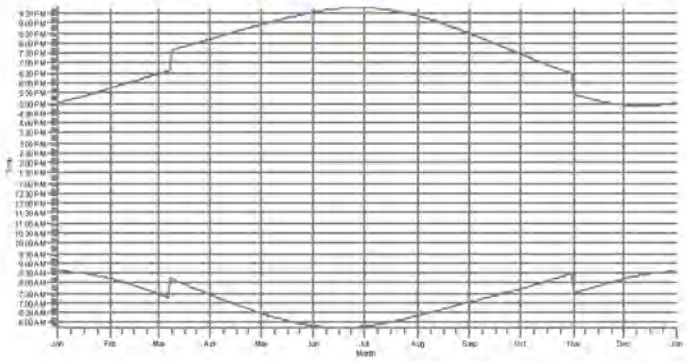
BI: REC-61



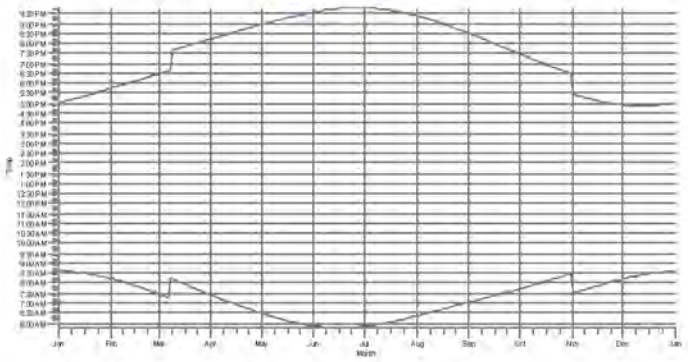
BJ: REC-62



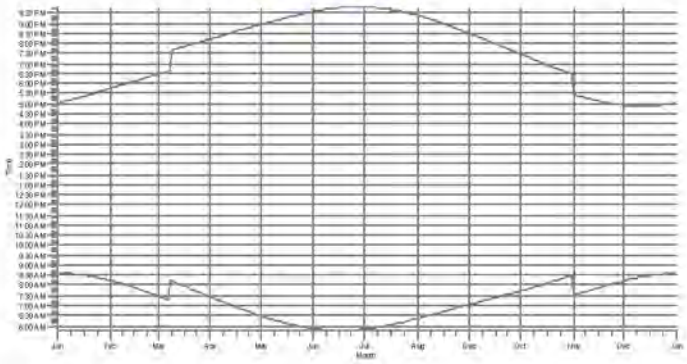
BK: REC-63



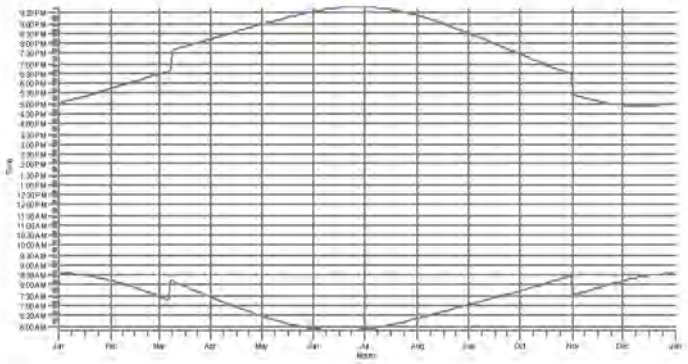
BL: REC-64



BM: REC-65



BN: REC-66



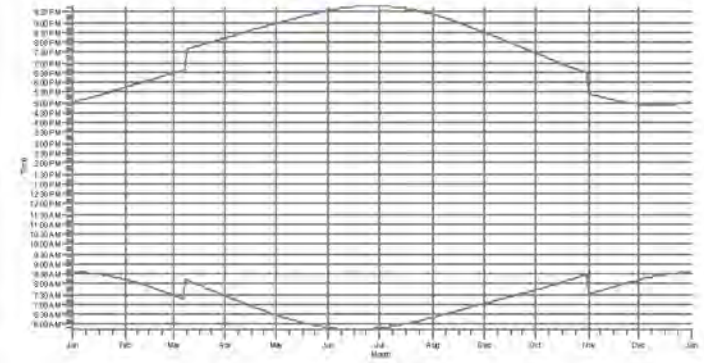
WTGs

Licensed user:
Burns & McDonnell Engineering Company Inc.
9400 Ward Parkway
US-KANSAS CITY, MO 64114
(816) 333 9400
Andrew Glenski / aglenski@burnsmcd.com
Calculated:
12/21/2018 9:39 AM/3.0.654

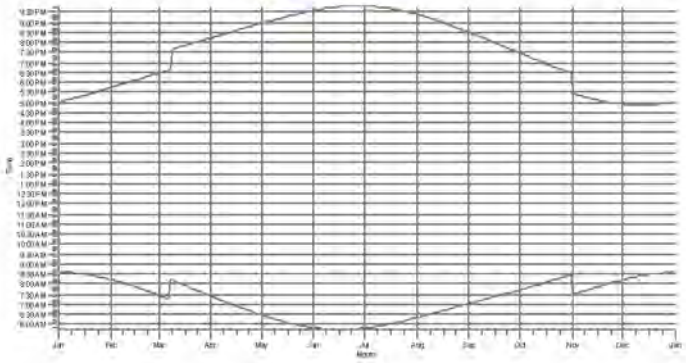
SHADOW - Calendar, graphical

Calculation: RUSO WIND PARTNERS, LLC - RUSO WIND PROJECT - TURBINECOORD.V2 RECEPTORCOORD.V0 OBSTACLES.V0 OROGRAPHY.V1 RESULTS.V3

BO: REC-67



BP: REC-68



WTGs

BURNS McDONNELL

CREATE AMAZING.

Burns & McDonnell World Headquarters
9400 Ward Parkway
Kansas City, MO 64114
O 816-333-9400
F 816-333-3690
www.burnsmcd.com

Appendix R. Sound Study

Sound Study

Ruso Wind Partners, LLC

Ruso Wind Project
Project No. 112086

Revision 1
12/21/2018

Sound Study

prepared for

Ruso Wind Partners, LLC
Ruso Wind Project
Ward County, North Dakota

Project No. 112086

Revision 1
12/21/2018

prepared by

Burns & McDonnell Engineering Company, Inc.
Kansas City, Missouri

COPYRIGHT © 2018 BURNS & McDONNELL ENGINEERING COMPANY, INC.

TABLE OF CONTENTS

Page No.

1.0 EXECUTIVE SUMMARY 1-1

2.0 ACOUSTICAL TERMINOLOGY 2-1

3.0 REGULATIONS 3-1

4.0 WIND TURBINE SOUND MODELING 4-1
4.1 Model Inputs and Settings 4-2
4.1.1 Project Layout 4-2
4.1.2 Neighboring Projects 4-2
4.1.3 Terrain and Vegetation 4-2
4.1.4 Sound Propagation and Directivity 4-2
4.1.5 Atmospheric Conditions 4-3
4.1.6 Sound Emission Data 4-3
4.2 Acoustical Modeling Results 4-5

5.0 CONCLUSION 5-1

APPENDIX A – FIGURES
APPENDIX B – MODEL RESULTS

LIST OF TABLES

Page No.

Table 2-1: Typical Sound Pressure Levels Associated with Common Noise Sources 2-2
Table 4-1: Wind Turbine Sound Power Levels 4-4

LIST OF ABBREVIATIONS

Abbreviation	Term/Phrase/Name
The Act	The Noise Control Act of 1972
Burns & McDonnell	Burns & McDonnell Engineering Company, Inc.
CadnaA	Computer Aided Design for Noise Abatement
dB	decibel
dBA	A-weighted decibels
DEM	Digital Elevation Model
Developer	Ruso Wind Partners, LLC
EPA	U.S. Environmental Protection Agency
Hz	hertz
IEC	International Electrotechnical Commission
ISO	International Organization for Standardization
Project	Ruso Wind Project
PSC	North Dakota Public Service Commission
SG	Siemens
U.S.C.	United States Code
USGS	U.S. Geological Survey
WTG	wind turbine generators

DISCLAIMERS

This report may have been prepared under, and only be available to parties that have executed, a Confidentiality Agreement with Developer. Any party to whom the contents are revealed or may come into possession of this document is required to request of Developer if such Confidentiality Agreement exists. Any entity in possession of, or that reads or otherwise utilizes information herein, is assumed to have executed or otherwise be responsible and obligated to comply with the contents of such Confidentiality Agreement. Any entity in possession of this document shall hold and protect its contents, information, forecasts, and opinions contained herein in confidence and not share with others without prior written authorization from Developer.

In preparation of this report, Burns & McDonnell Engineering Company, Inc. (Burns & McDonnell) has relied upon information provided by Developer and other third-party sources. While there is no reason to believe that the information provided is inaccurate or incomplete in any material respect, Burns & McDonnell has not independently verified such information and cannot guarantee or warranty its accuracy or completeness.

Burns & McDonnell's estimates, analyses, and recommendations contained in this report are based on professional experience, qualifications, and judgment. Burns & McDonnell has no control over weather; cost and availability of labor, material, and equipment; labor productivity; energy or commodity pricing; demand or usage; population demographics; market conditions; changes in technology; and other economic or political factors affecting such estimates, analyses, and recommendations. Therefore, Burns & McDonnell makes no guarantee or warranty (actual, expressed, or implied) that actual results will not vary, perhaps significantly, from the estimates, analyses, and recommendations contained herein.

Burns & McDonnell has not been engaged to render legal services. The services Burns & McDonnell provides occasionally require the review of legal documents, statutes, cases, regulatory guides, and related matters. The opinions, analysis, and representations made in this report should not be construed to be legal advice or legal opinion concerning any document produced or reviewed. These documents and the decisions made in reliance of these documents may have serious legal consequences. Legal advice, opinion, and counsel must be sought from a competent and knowledgeable attorney.

This report is for the sole use, possession, and benefit of Developer for the limited purpose as provided in the agreement between Developer and Burns & McDonnell. Any use or reliance on the contents, information, conclusions, or opinions expressed herein by any other party or for any other use is strictly

prohibited and is at that party's sole risk. Burns & McDonnell assumes no responsibility or liability for any unauthorized use.

1.0 EXECUTIVE SUMMARY

Ruso Wind Partners, LLC (Developer) is proposing to construct the Ruso Wind Project (Project). Burns & McDonnell Engineering Company, Inc. (Burns & McDonnell) was retained by the Developer to conduct a sound study for the Project. The Project will be located approximately 7 miles northwest of the city of Ruso and approximately 22 miles southeast of the city of Minot, North Dakota. The Project will include a total of 53 wind turbine generators (WTG). The total number of turbines is comprised of 42 Siemens SG4.5-145 WTG and 11 Siemens SWT2.415-108 WTG. For purposes of this Study, a total of 66 turbine positions were evaluated, although only up to 53 turbines are expected to be installed. Two neighboring WTG projects were also included in the analysis. New Frontier is located immediately east of the Project and consists of 44 Vestas V126-3.45 WTGs. Prairie Winds 1 is located immediately west of the Project and consists of 82 General Electric GE 1.5-77 WTGs. There were several objectives in this study, which included:

- Identification of applicable county, city, State, or Federal noise ordinances;
- Estimation of the cumulative sound levels from the Project layout and neighboring wind farms using the three-dimensional sound modeling program Computer Aided Noise Abatement (CadnaA); and
- Determination of whether the wind farm can operate in compliance with the identified applicable regulatory standards.

There are no Federal noise regulations that apply to this Project. Therefore, only local regulations apply.

The State of North Dakota has adopted regulations from the North Dakota Public Service Commissions (PSC) for the sound emitted from wind energy facilities under PSC Chapter 69-06-08-01(4). The regulation states that sound produced by wind turbines shall not exceed 50 dBA, average A-weighted sound pressure within 100 feet of an inhabited residence or community building. Therefore, the design criteria for the Project is 50-dBA within 100 feet of residential and community structures.

The wind turbines were modeled using manufacturer-specified sound power levels. Sound pressure levels were predicted at all identified receivers within and surrounding the Project area. There are no expected exceedances of the established design criteria due to operation of any of the Project wind turbine locations.

2.0 ACOUSTICAL TERMINOLOGY

The term “sound level” is often used to describe two different sound characteristics: sound power and sound pressure. Every source that produces sound has a sound power level. The sound power level is the acoustical energy emitted by a sound source and is an absolute number that is not affected by the surrounding environment. The acoustical energy produced by a source propagates through media as pressure fluctuations. These pressure fluctuations, also called sound pressure, are what human ears hear and microphones measure.

Sound is physically characterized by amplitude and frequency. The amplitude of sound is measured in decibels as the logarithmic ratio of a sound pressure to a reference sound pressure (20 microPascals). The reference sound pressure corresponds to the typical threshold of human hearing. To the average listener, a 3-decibel (dB) change in a continuous broadband sound is generally considered “just barely perceptible”; a 5-dB change is generally considered “clearly noticeable”; and a 10-dB change is generally considered a doubling (or halving, if the sound is decreasing) of the apparent loudness.

Sound waves can occur at many different wavelengths, also known as the frequency. Frequency is measured in hertz (Hz) and is the number of wave cycles per second that occur. The typical human ear can hear frequencies ranging from approximately 20 to 20,000 Hz. Normally, the human ear is most sensitive to sounds in the middle frequencies (1,000 to 8,000 Hz) and is less sensitive to sounds in the lower and higher frequencies. As such, the A-weighting scale was developed to simulate the frequency response of the human ear to sounds at typical environmental levels. The A-weighting scale emphasizes sounds in the middle frequencies and de-emphasizes sounds in the low and high frequencies. Any sound level to which the A-weighting scale has been applied is expressed in A-weighted decibels, or dBA. For reference, the A-weighted sound pressure level and subjective loudness associated with some common sound sources are listed in Table 2-1.

Table 2-1: Typical Sound Pressure Levels Associated with Common Noise Sources

Sound Pressure Level (dBA)[a]	Subjective Evaluation	Environment	
		Outdoor	Indoor
140	Deafening	Jet aircraft at 75 feet	--
130	Threshold of pain	Jet aircraft during takeoff at a distance of 300 feet	--
120	Threshold of feeling	Elevated train	Hard rock band
110		Jet flyover at 1,000 feet	Inside propeller plane
100	Very loud	Power mower, motorcycle at 25 feet, auto horn at 10 feet, crowd noise at football game	--
90	--	Propeller plane flyover at 1,000 feet, noisy urban street	Full symphony or band, food blender, noisy factory
80	Moderately loud	Diesel truck (40 mph)[a] at 50 feet	Inside auto at high speed, garbage disposal
70	Loud	B-757 cabin during flight	Close conversation, vacuum cleaner
60	Moderate	Air-conditioner condenser at 15 feet, near highway traffic	General office
50	Quiet	--	Private office
40	--	Farm field with light breeze, birdcalls	Soft stereo music in residence
30	Very quiet	Quiet residential neighborhood	Bedroom, average residence (without TV and stereo)
20	--	Rustling leaves	Quiet theater, whisper
10	Just audible	--	Human breathing
0	Threshold of hearing	--	--

Source: Adapted from *Architectural Acoustics*, M. David Egan, 1988 and *Architectural Graphic Standards*, Ramsey and Sleeper, 1994.

a) dBA = A-weighted decibels; mph = miles per hour

3.0 REGULATIONS

Federal, State, and county regulations were reviewed to determine the applicable overall sound level limits for the Project.

The Noise Control Act of 1972 (The Act) (United States Code [U.S.C.] 4901) mandated a national policy "to promote an environment for all Americans free from noise that jeopardizes their health or welfare, to establish a means for effective coordination of Federal research activities in noise control, to authorize the establishment of Federal noise emission standards for products distributed in commerce, and to provide information to the public respecting the noise emission and noise reduction characteristics of such products."

As required by The Act, the U.S. Environmental Protection Agency (EPA) established criteria for protecting the public health and wellbeing. However, these criteria do not constitute enforceable Federal regulations or standards. The EPA has since delegated regulatory authority to local entities. Therefore, there are no Federal noise regulations that apply to this Project.

The State of North Dakota has adopted regulations from the North Dakota Public Service Commissions (PSC) for the noise emitted from wind energy facilities under PSC Chapter 69-06-08-01(4). The regulation states that noise produced by wind turbines shall not exceed 50 dBA, average A-weighted sound pressure within 100 feet of an inhabited residence or community building. Therefore, the design criteria for the Project is 50-dBA within 100 feet of residential and community structures.

4.0 WIND TURBINE SOUND MODELING

The sound commonly associated with a wind turbine is described as a rhythmic "whoosh" caused by aerodynamic processes. This sound is created as air flow interacts with the surface of rotor blades. As air flows over the rotor blade, turbulent eddies form in the surface boundary layer and wake of the blade. These eddies are where most of the "whooshing" sound is formed.

Additional sound is generated from vortex shedding produced by the tip of the rotor blade. Air flowing past the rotor tip creates alternating low-pressure vortices on the downstream side of the tip, causing sound generation to occur. Older wind turbines, built with rotors which operate downwind of the tower (downwind turbines), often have higher aerodynamic impulse sound levels. This is caused by the interaction between the aerodynamic lift created on the rotor blades and the turbulent wake vortices produced by the tower. Modern wind turbine rotors are mostly built to operate upwind of the tower (upwind turbines). Upwind wind turbines are not impacted by wake vortices generated by the tower and, therefore, overall sound levels can be as much as 10 dBA less than downwind wind turbines. The rhythmic fluctuations of the overall sound level are less perceivable the farther one gets from the turbine.

Additionally, multiple turbines operating at the same time will create the whooshing sound at different times. These non-synchronized sounds will blend together to create a more constant sound to an observer at most distances from the turbines. Another phenomenon that reduces perceivable sound from turbines is the wind itself. Higher wind speed produces self-generated sound that tends to mask (or drown out) the sounds created by wind turbines.

Advancement in wind turbine technology has reduced pure tonal emissions of modern wind turbines. Manufacturers have reduced distinct tonal sounds by reshaping turbine blades and adjusting the angle at which air contacts the blade. Pitching technology allows the angle of the blade to adjust when the maximum rotational speed is achieved, which allows the turbine to maintain a constant rotational velocity. Therefore, sound emission levels remain constant as the velocity remains the same.

Wind turbines can create sound in other ways as well. Wind turbines have a nacelle where the mechanical portions of the turbine are housed. The current generation of wind turbines uses multiple techniques to reduce the sound from this portion of the turbine: vibration isolating mounts, special gears, and acoustic insulation. In general, all moving parts and the housing of the current generation wind turbines have been designed to minimize the sound generated.

4.1 Model Inputs and Settings

Predicted sound levels were modeled using industry-accepted sound modeling software. The program used to model the turbines was CadnaA, Version 2019, published by DataKustik, Ltd., Munich, Germany. The CadnaA program is a scaled, three-dimensional program that accounts for air absorption, terrain, ground absorption, and ground reflection for each piece of sound-emitting equipment and predicts downwind sound pressure levels. The model calculates sound propagation based on International Organization for Standardization (ISO) 9613-2:1996, General Method of Calculation. ISO 9613, and therefore CadnaA, assesses the sound pressure levels based on the Octave Band Center Frequency range from 31.5 to 8,000 Hz. Compliance with the regulations for all turbines operating should equate to compliance for any combination of turbines operating.

4.1.1 Project Layout

The Project layout contains 66 total wind turbine sites: 53 expected sites and 13 alternate sites. Predictive modeling was conducted to determine the impacts at the residential structures surrounding the Project. The turbine locations are shown in the turbine layout figure included as Figure A-1 of Appendix A. There are 68 residences near the Project.

4.1.2 Neighboring Projects

The Project is located between two existing wind farms. New Frontier is located immediately southeast of the Project and consists of 44 Vestas V126-3.45 WTGs. Prairie Winds 1 is located immediately northwest of the Project and consists of 82 General Electric GE 1.5-77 WTGs. The locations of the New Frontier and Prairie Winds turbines are shown in the turbine layout figure included as Figure A-1 of Appendix A.

4.1.3 Terrain and Vegetation

Terrain and attenuation from ground absorption can have a significant impact on sound transmission. U.S. Geological Survey (USGS) Digital Elevation Model (DEM) contours were imported into the model to account for topographic variations around the Project. The terrain around the Project is mostly rural with few minor changes in elevation. Vegetation is mostly low-lying with some small areas of trees. Therefore, vegetation was excluded from the analysis to maintain conservativeness in the model. Ground attenuation is expected to be fairly high, due to the “soft ground” of the surrounding areas; however, a conservative value of 0.5 was used in the model.

4.1.4 Sound Propagation and Directivity

CadnaA calculates downwind sound propagation using ISO 9613 standards, which use omnidirectional downwind sound propagation and worst-case directivity factors. In other words, the model assumes that

each turbine propagates its maximum sound level in all directions at all times. While this may seem to over-predict upwind sound levels, this approach has been validated by field measurements. Under most normal circumstances, wind turbine sound is not significantly directional, but tends to radiate uniformly in all directions.

4.1.5 Atmospheric Conditions

Atmospheric conditions were based on program defaults. Layers in the atmosphere often form where temperature increases with height (temperature inversions). Sound waves can reflect off the temperature inversion layer and return to the surface of the earth. This process can increase sound levels at the surface, especially if the height of the inversion begins near the surface of the earth. Temperature inversions tend to occur mainly at night when winds are light or calm, usually when wind turbines are not operating. CadnaA calculates the downwind sound in a manner which is favorable for propagation (worst-case scenario) by assuming a well-developed moderate ground-based temperature inversion (such as those that can occur at night). Therefore, predicted sound level results tend to be higher than what would actually occur.

The atmosphere does not flow smoothly and tends to have swirls and eddies, also known as turbulence. Turbulence is basically formed by two processes: thermal turbulence and mechanical turbulence. Thermal turbulence is caused by the interaction of heated air rapidly rising from the heated earth's surface, with cooler air descending from the atmosphere. Mechanical turbulence is caused as moving air interacts with objects such as trees, buildings, and wind turbines. Turbulent eddies generated by wind turbines and other objects can cause sound waves to scatter, which in turn, provides sound attenuation between the wind turbine and the receiver. The acoustical model assumes laminar air flow, which minimizes sound attenuation that would occur in a realistic inhomogeneous atmosphere. This assumption also causes the predicted sound levels to be higher than what would actually occur.

4.1.6 Sound Emission Data

Acoustical modeling was conducted for the Project. Wind turbine heights and acoustical emissions were input into the model. The expected worst-case overall sound power levels for the turbines were contained in documents provided by the Developer from the respective vendor Siemens Gamesa (SG), based on various wind speeds. The sound emissions data supplied was developed using the International Electrotechnical Commission (IEC) 61400-11 acoustic measurement standards. The expected sound power level and modeled heights for the turbine types to be installed are displayed in

Table 4-1. The vendor data only included total sound power levels for each respective turbine. The total sound power level for the SG 4.5-145 is 108.7 dBA and for the SWT 2.415 is 107.0 dBA. Therefore, the octave band sound profile from a similar SG unit, SG 2.7-129, was used to estimate octave band sound power levels for the Project wind turbines for the model. The wind turbines located at the New Frontier site are V126-3.45 models. Because the exact configuration of the V126-3.45 turbines at New Frontier is unknown, worst-case noise emissions at each third octave band were used from in-house data on V126-3.45 turbines to develop a sound power level profile for the existing New Frontier turbines. The wind turbines located at the Prairie Winds 1 site are GE 1.5-77 models. In-house data on these vendor models was used to develop a sound power level profile for the Prairie Winds 1 turbines. The sound power levels for all turbines modeled in this analysis are shown below in Table 4-1.

Table 4-1: Wind Turbine Sound Power Levels

Turbine	Height (meters)	Octave Band Center Frequency (Hertz)									
		31.5	63	125	250	500	1000	2000	4000	8000	Total
		A-weighted decibels									
SG 4.5-145[b]	107.5	--	86.8	93.7	98.7	101.7	103.6	102.7	98.3	89.2	**108.7**
SWT 2.415[b]	80	--	85.1	92.0	97.0	100.0	101.9	101.0	96.6	87.5	**107.0**
V126-3.45	87	82.3	87.4	95.4	98.1	101.9	105.0	103.3	93.6	78.2	**109.1**
GE 1.5-77	80	--	85.4	94.0	97.2	98.6	97.9	94.5	87.3	78.1	**104.0**

(a) dBA = A-weighted decibels
(b) Octave band sound power levels for the SG2.7-129 were scaled up to the total sound power level provided.

A point source at the hub was used to model sound emissions from the wind turbines. This approach is appropriate for simulating wind turbine sound emissions due to the large distances between the turbines and the receivers as compared to the dimensions of the wind turbines. The appropriate sound level profile listed in the table above was applied to each point source.

Locations of receivers and wind turbines around the Project area were provided by the Developer and the turbine layout is shown in Figure A-1 of Appendix A. Each receiver was assumed to have a height of 1.52 meters (5.0 feet) above ground level. Compliance with the regulation was assessed at the residential structure (each receiver).

The following assumptions were made to maintain the inherent conservativeness of the model and to estimate the worst case modeled sound levels:

- Attenuation was not included for sound propagation through wooded areas, existing barriers, and shielding
- All turbines were assumed to be operating at maximum power output (and therefore, maximum sound levels) at all times to represent worst-case noise impacts from the wind farm as a whole

4.2 Acoustical Modeling Results

Sound pressure levels were predicted for the identified receivers in the CadnaA noise modeling software using the manufacturer-specified sound power levels and the assumptions listed above. CadnaA modeling results have been demonstrated in previous studies to conservatively approximate real-life measured sound from a source when extraneous sounds are not present.

As previously mentioned, decibels are a logarithmic ratio of a sound pressure to a reference sound pressure. Therefore, the decibels must be logarithmically added to determine a cumulative impact (i.e., logarithmically adding 50-dBA and 50-dBA results in 53-dBA). Logarithmically adding each of the individual turbine's impacts together at each receiver provides an overall Project impact at each receiver.

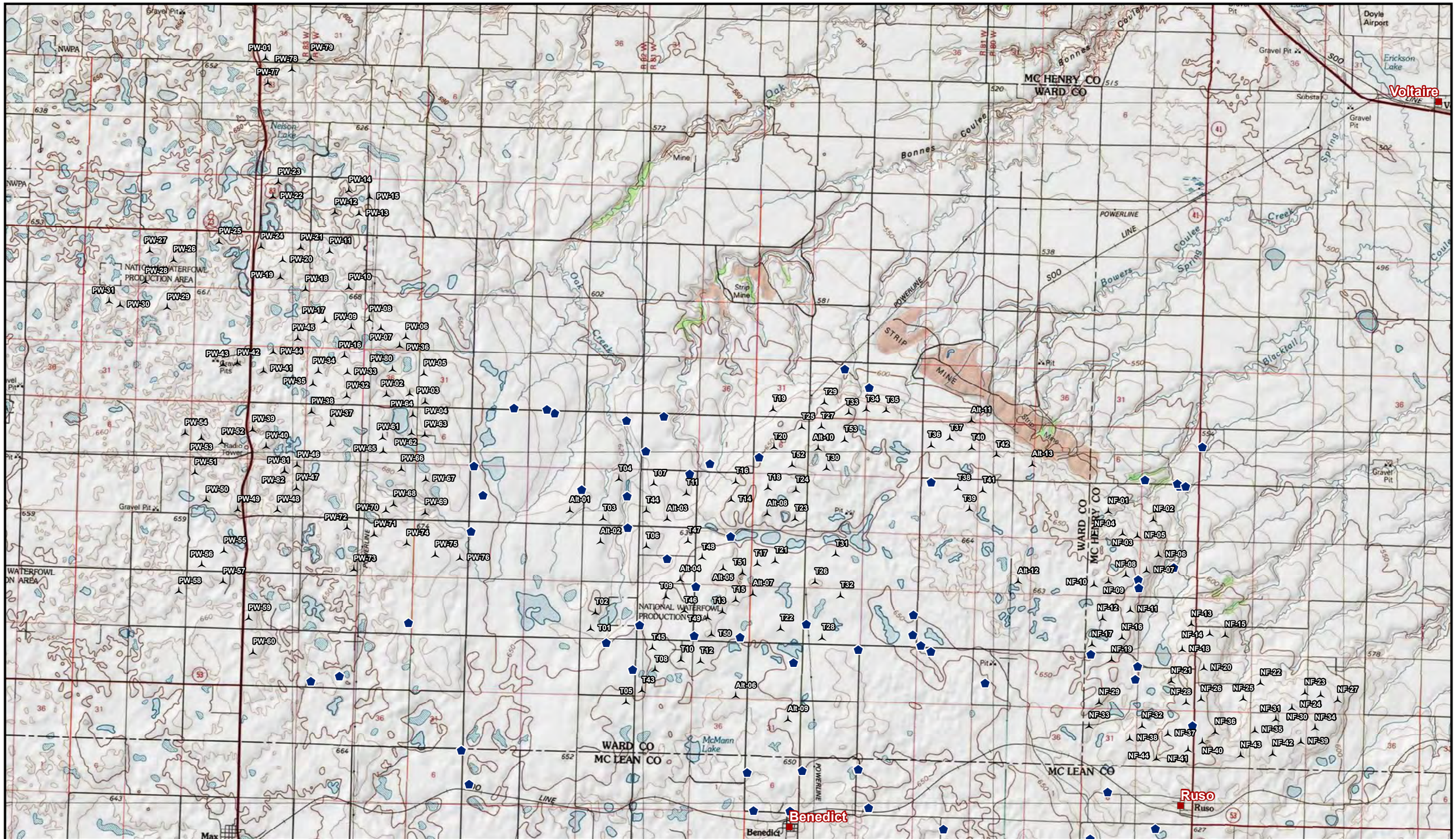
The regulatory sound limit is 50-dBA within 100 feet of a residential or community structure. Due to the distances between turbines and receptors relative to the 100-foot buffer, predicted values within 100 feet of a receptor will be similar if not equal to the predicted values at the receptor itself. Therefore, model receptors were placed at each residential structure for evaluation. The worst-case receptor (REC-53) had a predicted sound pressure level of 49.3 dBA. To demonstrate that the sound pressure levels at a 100-foot buffer of a receptor would be similar to the predicted levels at the receptor, a receiver was placed 100 feet from REC-53 in the direction of the nearest turbine. The predicted sound pressure level at this location was 49.6 dBA. Since the worst-case receptor did not exceed the 50-dBA limit using this method, there are no expected exceedances of 50 dBA at any of the identified residences. Appendix A contains a graphical representation of the Project's impact on the surrounding area for the turbines. Figure A-2 of Appendix A shows the turbine layout and the sound contours extending out from the Project sound sources and the existing wind farms. The sound level modeled at each residential structure for the Project is provided in Appendix B.

5.0 CONCLUSION

Burns & McDonnell conducted a predictive sound assessment study for the Project. The study included identification of applicable sound regulations and predictive modeling to estimate the cumulative Project and neighboring project-related sound levels in the surrounding community.

Sound pressure levels were predicted at occupied receivers within and surrounding the Project area using manufacturer-specified sound power levels for each wind turbine. A number of conservative assumptions were applied to provide worst-case predicted sound pressure levels. Those results were then compared to the identified design goals. There are no expected exceedances of the 50-dBA limit due to operation of any of the Project wind turbine locations or neighboring wind turbine sites.

APPENDIX A – FIGURES



LEGEND

- Residence
- Proposed Turbine Location

PRELIMINARY
NOT FOR CONSTRUCTION

REFERENCE

0 1 2
MILES
0 0.9 1.8
KILOMETERS

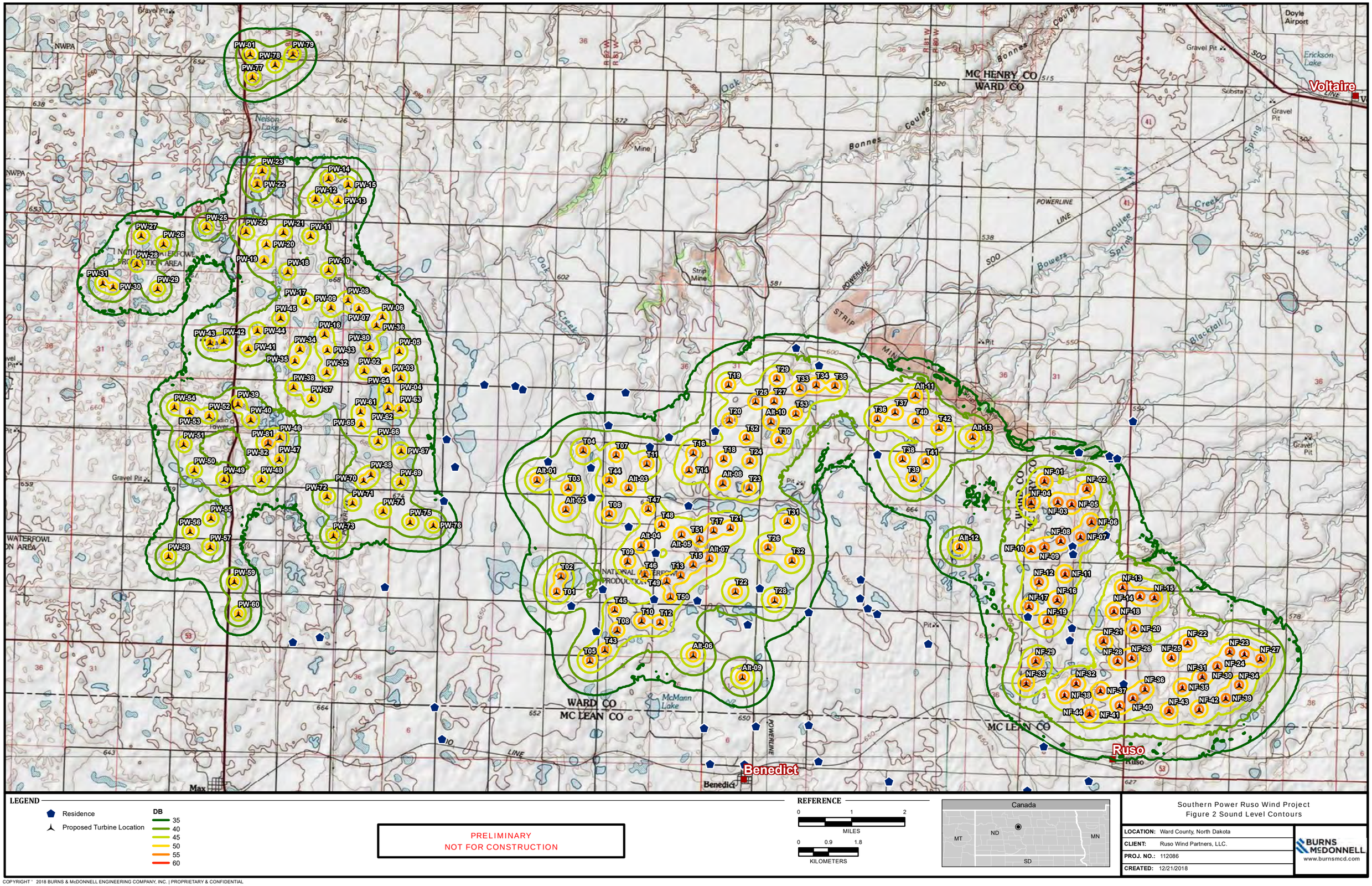
Southern Power Ruso Wind Project
Figure 1 Project Layout

LOCATION:	Ward County, North Dakota
CLIENT:	Ruso Wind Partners, LLC.
PROJ. NO.:	112086
CREATED:	12/21/2018

BURNS McDONNELL
www.burnsmcd.com

Path: \\bmcd\Dfs\Clients\BTS\SOUTHERNPOWER\112086_RusoWindStudies\Geospatial\DataFiles\ArcDocs\Noise\Layout 2\1111860_RusoWind_NoiseStudy_Project.mxd □ Coordinate System: WGS 1984 UTM Zone 14N □ Units: Meter

COPYRIGHT © 2018 BURNS & McDONNELL ENGINEERING COMPANY, INC. | PROPRIETARY & CONFIDENTIAL



LEGEND

- Residence
- Proposed Turbine Location

DB
- 35
- 40
- 45
- 50
- 55
- 60

PRELIMINARY
NOT FOR CONSTRUCTION

REFERENCE

0 1 2
MILES

0 0.9 1.8
KILOMETERS

Southern Power Ruso Wind Project
Figure 2 Sound Level Contours

LOCATION:	Ward County, North Dakota
CLIENT:	Ruso Wind Partners, LLC.
PROJ. NO.:	112086
CREATED:	12/21/2018

BURNS McDONNELL
www.burnsmcd.com

COPYRIGHT © 2018 BURNS & McDONNELL ENGINEERING COMPANY, INC. | PROPRIETARY & CONFIDENTIAL

Path: Z:\Clients\BT SIS\OUTHRNPOWER\112086_RusoWindStudies\Geospatial\DataFiles\ArcDocs\NoiseLayout\211111860_RusoWind_NoiseBudy_SoundContours.mxd □ Coordinate System: WGS 1984 UTM Zone 14N □ Units: Meter

APPENDIX B – MODEL RESULTS

WIND TURBINE COORDINATES

Turbine Number	Turbine Type	Easting [m]	Northing [m]	Hub Height [m]
T-01	SG_4p5	338,486.53	5,305,223.71	107.5
T-02	SG_4p5	338,614.22	5,305,693.67	107.5
T-03	SG_4p5	338,837.46	5,308,371.30	107.5
T-04	SG_4p5	339,285.93	5,309,501.19	107.5
T-05	SG_4p5	339,488.34	5,303,136.91	107.5
T-06	SG_4p5	340,075.15	5,307,578.77	107.5
T-07	SG_4p5	340,281.62	5,309,362.07	107.5
T-08	SG_4p5	340,317.54	5,304,055.49	107.5
T-09	SG_4p5	340,629.20	5,306,141.45	107.5
T-10	SG_4p5	341,059.76	5,304,341.53	107.5
T-11	SG_4p5	341,219.33	5,309,097.79	107.5
T-12	SG_4p5	341,614.09	5,304,294.66	107.5
T-13	SG_4p5	342,242.10	5,305,719.27	107.5
T-14	SG_4p5	342,499.69	5,308,909.23	107.5
T-15	SG_4p5	342,619.80	5,306,043.76	107.5
T-16	SG_4p5	342,623.14	5,309,427.90	107.5
T-17	SG_4p5	343,241.89	5,307,077.12	107.5
T-18	SG_4p5	343,542.21	5,309,244.78	107.5
T-19	SG_4p5	343,686.83	5,311,489.29	107.5
T-20	SG_4p5	343,716.47	5,310,405.12	107.5
T-21	SG_4p5	343,745.78	5,307,162.34	107.5
T-22	SG_4p5	343,897.68	5,305,227.01	107.5
T-23	SG_4p5	344,318.19	5,308,366.39	107.5
T-24	SG_4p5	344,339.57	5,309,178.60	107.5
T-25	SG_4p5	344,509.17	5,310,981.65	107.5
T-26	SG_4p5	344,885.31	5,306,562.69	107.5
T-27	SG_4p5	345,067.29	5,310,992.43	107.5
T-28	SG_4p5	345,084.65	5,304,964.18	107.5
T-29	SG_4p5	345,150.90	5,311,682.93	107.5
T-30	SG_4p5	345,209.60	5,309,800.80	107.5
T-31	SG_4p5	345,472.71	5,307,356.97	107.5
T-32	SG_4p5	345,615.48	5,306,167.07	107.5
T-33	SG_4p5	345,848.03	5,311,385.80	107.5
T-34	SG_4p5	346,345.37	5,311,482.33	107.5
T-35	SG_4p5	346,914.82	5,311,456.84	107.5
T-36	SG_4p5	348,199.29	5,310,460.53	107.5
T-37	SG_4p5	348,739.66	5,310,657.55	107.5
T-38	SG_4p5	348,960.02	5,309,235.59	107.5
T-39	SG_4p5	349,291.91	5,308,635.96	107.5
T-40	SG_4p5	349,359.69	5,310,382.76	107.5
T-41	SG_4p5	349,675.25	5,309,168.45	107.5

WIND TURBINE COORDINATES

Turbine Number	Turbine Type	Easting [m]	Northing [m]	Hub Height [m]
T-42	SG_4p5	350,063.71	5,310,184.33	107.5
T-43	SWT2p3	339,945.61	5,303,463.85	80
T-44	SWT2p3	340,073.48	5,308,592.97	80
T-45	SWT2p3	340,239.42	5,304,679.86	80
T-46	SWT2p3	341,153.72	5,305,742.05	80
T-47	SWT2p3	341,262.00	5,307,733.99	80
T-48	SWT2p3	341,664.26	5,307,254.16	80
T-49	SWT2p3	341,817.07	5,305,544.67	80
T-50	SWT2p3	341,929.30	5,305,074.13	80
T-51	SWT2p3	342,821.07	5,306,819.70	80
T-52	SWT2p3	344,231.04	5,309,888.56	80
T-53	SWT2p3	345,728.95	5,310,611.68	80
Alt-01	SG_4p5	337,888.24	5,308,605.78	107.5
Alt-02	SG_4p5	338,760.63	5,307,711.39	107.5
Alt-03	SG_4p5	340,663.48	5,308,366.56	107.5
Alt-04	SG_4p5	341,042.65	5,306,632.97	107.5
Alt-05	SG_4p5	342,269.62	5,306,948.96	107.5
Alt-06	SG_4p5	342,621.41	5,303,307.24	107.5
Alt-07	SG_4p5	343,117.47	5,306,227.60	107.5
Alt-08	SG_4p5	343,517.52	5,308,502.67	107.5
Alt-09	SG_4p5	344,116.58	5,302,636.27	107.5
Alt-10	SG_4p5	344,979.09	5,310,374.01	107.5
Alt-11	SG_4p5	349,352.76	5,311,160.96	107.5
Alt-12	SG_4p5	350,685.28	5,306,573.05	107.5
Alt-13	SG_4p5	351,085.66	5,309,911.44	107.5
NF-01	V126-3.45	354,545.96	5,308,338.06	87
NF-02	V126-3.45	353,666.94	5,307,933.07	87
NF-03	V126-3.45	352,856.00	5,307,921.88	87
NF-04	V126-3.45	354,088.07	5,307,872.05	87
NF-05	V126-3.45	354,685.96	5,307,333.04	87
NF-06	V126-3.45	354,350.95	5,306,882.14	87
NF-07	V126-3.45	353,753.91	5,306,759.15	87
NF-08	V126-3.45	353,266.00	5,306,574.15	87
NF-09	V126-3.45	352,851.06	5,306,482.15	87
NF-10	V126-3.45	353,886.97	5,305,762.01	87
NF-11	V126-3.45	353,094.03	5,305,514.93	87
NF-12	V126-3.45	355,628.04	5,305,352.14	87
NF-13	V126-3.45	356,152.05	5,305,083.90	87
NF-14	V126-3.45	356,591.95	5,305,042.06	87
NF-15	V126-3.45	353,647.08	5,304,971.09	87
NF-16	V126-3.45	352,792.99	5,304,775.03	87

WIND TURBINE COORDINATES

Turbine Number	Turbine Type	Easting [m]	Northing [m]	Hub Height [m]
NF-17	V126-3.45	355,362.94	5,304,631.92	87
NF-18	V126-3.45	353,353.09	5,304,335.09	87
NF-19	V126-3.45	355,980.08	5,304,095.98	87
NF-20	V126-3.45	355,048.97	5,303,730.98	87
NF-21	V126-3.45	357,601.98	5,303,674.88	87
NF-22	V126-3.45	358,873.95	5,303,402.10	87
NF-23	V126-3.45	359,315.96	5,303,330.15	87
NF-24	V126-3.45	357,108.06	5,303,225.89	87
NF-25	V126-3.45	355,904.99	5,303,219.01	87
NF-26	V126-3.45	359,805.00	5,303,191.92	87
NF-27	V126-3.45	355,477.93	5,303,123.11	87
NF-28	V126-3.45	352,996.97	5,303,122.08	87
NF-29	V126-3.45	358,499.90	5,302,963.96	87
NF-30	V126-3.45	358,038.95	5,302,637.95	87
NF-31	V126-3.45	354,222.02	5,302,449.12	87
NF-32	V126-3.45	352,706.03	5,302,448.96	87
NF-33	V126-3.45	359,158.52	5,302,397.10	87
NF-34	V126-3.45	357,435.01	5,302,324.15	87
NF-35	V126-3.45	356,300.90	5,302,271.93	87
NF-36	V126-3.45	354,958.97	5,302,223.91	87
NF-37	V126-3.45	353,867.91	5,302,092.94	87
NF-38	V126-3.45	358,752.98	5,301,998.95	87
NF-39	V126-3.45	355,942.70	5,301,996.97	87
NF-40	V126-3.45	355,538.06	5,301,770.14	87
NF-41	V126-3.45	357,948.97	5,301,658.17	87
NF-42	V126-3.45	357,032.02	5,301,606.03	80
NF-43	V126-3.45	354,624.99	5,301,518.11	80
NF-44	V126-3.45	329,203.61	5,321,495.24	80
PW-01	GE 1.5-77	332,658.98	5,311,915.73	80
PW-02	GE 1.5-77	333,318.72	5,311,942.64	80
PW-03	GE 1.5-77	333,758.03	5,311,705.33	80
PW-04	GE 1.5-77	333,721.17	5,312,506.93	80
PW-05	GE 1.5-77	333,204.43	5,313,544.26	80
PW-06	GE 1.5-77	332,497.03	5,313,799.30	80
PW-07	GE 1.5-77	332,168.89	5,314,055.42	80
PW-08	GE 1.5-77	331,649.70	5,313,823.71	80
PW-09	GE 1.5-77	331,582.63	5,314,957.45	80
PW-10	GE 1.5-77	331,031.31	5,315,990.15	80
PW-11	GE 1.5-77	331,184.26	5,317,101.38	80
PW-12	GE 1.5-77	331,868.78	5,317,058.77	80
PW-13	GE 1.5-77	331,584.43	5,317,732.94	80

WIND TURBINE COORDINATES

Turbine Number	Turbine Type	Easting [m]	Northing [m]	Hub Height [m]
PW-14	GE 1.5-77	332,173.81	5,317,545.77	80
PW-15	GE 1.5-77	331,451.48	5,313,022.16	80
PW-16	GE 1.5-77	330,895.31	5,314,002.16	80
PW-17	GE 1.5-77	330,342.49	5,314,906.13	80
PW-18	GE 1.5-77	329,625.63	5,315,245.86	80
PW-19	GE 1.5-77	329,696.81	5,315,736.89	80
PW-20	GE 1.5-77	330,211.91	5,316,092.76	80
PW-21	GE 1.5-77	329,418.02	5,317,558.27	80
PW-22	GE 1.5-77	329,565.37	5,317,966.70	80
PW-23	GE 1.5-77	329,074.84	5,316,123.65	80
PW-24	GE 1.5-77	327,875.76	5,316,266.62	80
PW-25	GE 1.5-77	326,580.34	5,315,751.81	80
PW-26	GE 1.5-77	325,904.14	5,315,999.65	80
PW-27	GE 1.5-77	325,774.42	5,315,134.69	80
PW-28	GE 1.5-77	326,404.41	5,314,390.44	80
PW-29	GE 1.5-77	325,051.83	5,314,458.90	80
PW-30	GE 1.5-77	324,740.36	5,314,569.72	80
PW-31	GE 1.5-77	331,526.33	5,311,869.34	80
PW-32	GE 1.5-77	331,535.93	5,312,538.30	80
PW-33	GE 1.5-77	330,712.41	5,312,567.08	80
PW-34	GE 1.5-77	330,555.98	5,312,210.49	80
PW-35	GE 1.5-77	333,028.22	5,313,294.15	80
PW-36	GE 1.5-77	331,059.20	5,311,062.69	80
PW-37	GE 1.5-77	330,517.21	5,311,415.08	80
PW-38	GE 1.5-77	328,833.94	5,310,907.13	80
PW-39	GE 1.5-77	329,218.45	5,310,435.03	80
PW-40	GE 1.5-77	329,141.84	5,312,578.24	80
PW-41	GE 1.5-77	328,395.82	5,312,804.66	80
PW-42	GE 1.5-77	327,993.00	5,312,766.93	80
PW-43	GE 1.5-77	329,423.50	5,313,123.27	80
PW-44	GE 1.5-77	330,123.15	5,313,506.74	80
PW-45	GE 1.5-77	330,104.53	5,309,897.18	80
PW-46	GE 1.5-77	330,082.29	5,309,241.26	80
PW-47	GE 1.5-77	329,542.80	5,308,614.20	80
PW-48	GE 1.5-77	328,410.57	5,308,620.28	80
PW-49	GE 1.5-77	327,508.11	5,308,897.79	80
PW-50	GE 1.5-77	327,191.58	5,309,682.82	80
PW-51	GE 1.5-77	327,961.59	5,310,546.88	80
PW-52	GE 1.5-77	327,370.64	5,310,668.06	80
PW-53	GE 1.5-77	326,906.47	5,310,812.69	80
PW-54	GE 1.5-77	328,017.11	5,307,450.14	80

WIND TURBINE COORDINATES

Turbine Number	Turbine Type	Easting [m]	Northing [m]	Hub Height [m]
PW-55	GE 1.5-77	327,385.63	5,307,054.03	80
PW-56	GE 1.5-77	327,991.48	5,306,569.38	80
PW-57	GE 1.5-77	326,734.70	5,306,289.96	80
PW-58	GE 1.5-77	328,723.00	5,305,525.82	80
PW-59	GE 1.5-77	328,851.01	5,304,557.39	80
PW-60	GE 1.5-77	332,550.02	5,310,680.85	80
PW-61	GE 1.5-77	333,367.38	5,310,803.92	80
PW-62	GE 1.5-77	333,747.96	5,310,758.94	80
PW-63	GE 1.5-77	333,407.99	5,311,332.01	80
PW-64	GE 1.5-77	332,563.70	5,310,287.13	80
PW-65	GE 1.5-77	333,077.80	5,309,781.58	80
PW-66	GE 1.5-77	333,775.74	5,309,490.13	80
PW-67	GE 1.5-77	332,859.80	5,308,773.85	80
PW-68	GE 1.5-77	333,758.05	5,308,537.79	80
PW-69	GE 1.5-77	332,636.57	5,308,604.83	80
PW-70	GE 1.5-77	332,305.84	5,307,911.23	80
PW-71	GE 1.5-77	331,531.12	5,308,104.05	80
PW-72	GE 1.5-77	331,728.86	5,306,920.16	80
PW-73	GE 1.5-77	333,228.78	5,307,662.63	80
PW-74	GE 1.5-77	334,049.62	5,307,336.17	80
PW-75	GE 1.5-77	334,751.10	5,307,236.01	80
PW-76	GE 1.5-77	329,268.49	5,320,797.78	80
PW-77	GE 1.5-77	329,960.20	5,321,174.00	80
PW-78	GE 1.5-77	330,500.94	5,321,501.30	80
PW-79	GE 1.5-77	332,826.65	5,312,628.30	80
PW-80	GE 1.5-77	329,742.63	5,309,724.94	80
PW-81	GE 1.5-77	329,742.63	5,309,724.94	80
PW-82	GE 1.5-77	329,742.63	5,309,724.94	80

Notes:

[1] All coordinates provided in UTM WGS 1984 Zone 14 (meters)

[2] All project coordinates provided by Ruso Wind Partners, LLC in "Ruso Layout 21 Coordinates and Picture 121918.xlsx"

[3] Neighboring turbine coordiantes retrieved from OE/FAA database on 12-11-18

RECEPTOR COORDINATES - SORTED BY RECEPTOR ID

Receptor Name	Easting (m)	Northing (m)	Sound Level (dBA)
REC-01	348,190.60	5,304,548.89	--
REC-02	347,680.21	5,305,019.68	25.2
REC-03	347,693.89	5,305,600.32	27.6
REC-04	347,909.08	5,304,718.83	23.6
REC-05	349,744.00	5,303,649.00	--
REC-06	354,097.45	5,304,121.64	43.2
REC-07	354,024.59	5,303,758.20	42.6
REC-08	346,117.02	5,301,187.21	22.2
REC-09	346,418.06	5,300,083.15	--
REC-10	345,874.75	5,298,412.30	--
REC-11	344,515.44	5,301,154.03	29
REC-12	344,273.27	5,304,234.65	37.9
REC-13	342,749.34	5,304,953.43	41.9
REC-14	341,433.07	5,304,999.65	45.4
REC-15	339,687.21	5,304,032.17	43.3
REC-16	339,876.41	5,305,312.09	40.8
REC-17	338,933.61	5,304,801.18	41.3
REC-18	340,668.82	5,307,194.67	44
REC-19	342,476.61	5,307,832.56	42.5
REC-20	341,312.66	5,309,608.24	42.9
REC-21	341,888.25	5,309,910.30	40
REC-22	343,294.11	5,310,095.10	44.2
REC-23	345,735.12	5,312,610.87	38
REC-24	346,436.32	5,312,071.20	42.8
REC-25	348,198.89	5,309,380.98	40.4
REC-26	352,760.90	5,304,466.92	48.4
REC-27	346,120.30	5,304,608.47	34.8
REC-28	344,635.91	5,305,323.19	42.9
REC-29	335,222.08	5,298,452.59	--
REC-30	334,701.29	5,298,469.27	--
REC-31	336,516.52	5,298,865.91	--
REC-32	335,014.08	5,300,760.19	--
REC-33	334,791.60	5,301,735.38	--
REC-34	338,529.72	5,298,524.82	--
REC-35	342,950.72	5,301,098.43	27.6
REC-36	349,361.17	5,297,133.02	--
REC-37	349,893.61	5,298,060.44	--
REC-38	352,736.73	5,299,207.54	20.6
REC-39	354,601.16	5,299,495.84	30.4
REC-40	339,527.12	5,308,984.93	44
REC-41	339,543.94	5,308,073.64	43.5
REC-42	348,545.94	5,299,476.97	--

RECEPTOR COORDINATES - SORTED BY RECEPTOR ID

Receptor Name	Easting (m)	Northing (m)	Sound Level (dBA)
REC-43	343,127.80	5,300,013.94	20.4
REC-44	344,170.18	5,299,993.65	21.3
REC-45	353,241.60	5,300,540.75	34
REC-46	331,314.55	5,303,850.91	19.2
REC-47	330,497.36	5,303,697.80	24.5
REC-48	355,658.40	5,302,435.57	47.6
REC-49	333,282.15	5,305,370.85	27.4
REC-50	341,489.39	5,306,401.05	45.6
REC-51	355,124.59	5,306,942.52	43.8
REC-52	354,128.93	5,306,363.72	47
REC-53	354,113.15	5,306,603.68	49.3
REC-54	338,231.49	5,309,173.01	41
REC-55	335,152.00	5,309,843.57	32.9
REC-56	335,405.09	5,309,005.86	31.7
REC-57	335,069.72	5,307,972.42	35.5
REC-58	340,057.44	5,310,258.23	38.4
REC-59	355,937.97	5,310,385.26	22.9
REC-60	355,464.79	5,309,261.22	34.6
REC-61	355,286.05	5,309,259.75	35.7
REC-62	355,226.95	5,309,338.38	35.5
REC-63	354,308.82	5,309,437.30	37.5
REC-64	336,301.96	5,311,491.42	24.6
REC-65	337,238.03	5,311,458.86	23.1
REC-66	337,458.64	5,311,352.61	24.1
REC-67	339,506.34	5,311,135.07	31
REC-68	340,571.80	5,311,251.04	30.6

Notes:

[1] All coordinates provided in UTM WGS 1984 Zone 14 (meters)

[2] All coordinates provided by Ruso Wind Partners, LLC in “Ruso Homes - REVISED 2018-12-04.KMZ”

BURNS McDONNELL

CREATE AMAZING.

Burns & McDonnell World Headquarters
9400 Ward Parkway
Kansas City, MO 64114
O 816-333-9400
F 816-333-3690
www.burnsmcd.com

Appendix S. Class III Cultural Resource Inventory (Redacted)

A Class III Cultural Resource Inventory of the Ruso Wind Project in Ward and McHenry Counties, North Dakota

By:
Brittany Brooks

Prepared for:
Ruso Wind Partners, LLC

Prepared by:
Beaver Creek Archaeology, Inc.
1632 Capitol Way
Bismarck, ND 58501
www.bcarch.org

Wade Burns, Principal Investigator

BCA Project No.: 2018-1306
December 2018

FOR OFFICIAL USE ONLY: DISCLOSURE OF SITE LOCATIONS PROHIBITED (43 CFR 7.18)

Beaver Creek
ARCHAEOLOGY

WHERE PROGRESS MEETS PRESERVATION
1632 Capitol Way | Bismarck, ND 58501 | PH [701] 663.5521 | FX [701] 663.5589
www.bcarch.org | e-mail: info@bcarch.org

MANUSCRIPT DATA RECORD FORM

1. Manuscript Number:

2. SHPO Reference #:

3. Author: **Brittany Brooks**

4. Title: **A Class III Cultural Resource Inventory of the Ruso Wind Project in Ward and McHenry Counties, North Dakota**.

5. Report Date: **December 2018**

6. Number of Pages: **47**

7. Type: **I**

   I = Inventory, T = Test, E= Excavation, O = Other

8. List formally tested or excavated sites (not probes): **None**

9. Acres: **860**

10. List the legal description* and study unit. For study unit assignment, use the township tables in the *State Plan*, http://history.nd.gov/hp/stateplan_arch.html.
    Study Units: LM, CB, KN, HE, SM, GA, JA, GR, NR, SR, SO, SH, YE

*For *inventory*, *formal testing* and *excavation* projects, *list the CLASS III legal locations only*.

County	Township	Range	Section	Study Unit
McHenry	**151N**	**80W**	**5, 6**	**SO**
Ward	**151N**	**81W**	**1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14, 15, 17, 18, 19, 20, 29, 30, 31**	**SO**
Ward	**151N**	**82W**	**9, 10, 11, 12, 13, 14, 15, 22, 23, 24, 25, 26, 34**	**SO**
McHenry	**152N**	**80W**	**31, 32**	**SO**
Ward	**152N**	**81W**	**31, 32, 33, 34**	**SO**

Abstract

Ruso Wind Partners, LLC (the Proponent) has contracted Beaver Creek Archaeology, Inc. (BCA) to complete a Class III cultural resource survey of the proposed Ruso Wind project in Ward and McHenry Counties, North Dakota. The proposed Ruso Wind project is under the jurisdiction of the Public Service Commission (PSC). Due to the involvement of the PSC, the proponent is required comply with Section 106 of the National Historic Preservation Act (NHPA). The NHPA requires the Proponent and/or applicant to consider what effects the undertaking will have on cultural resources within the Area of Potential Effect (APE). The APE is defined as the combined construction area of all project components, and the survey area encompasses the entire APE and buffer.

Located on private property, the proposed project consisted of a total of 24.15 miles of access roads, 8 miles of general tie line, and 125 wind turbine locations. The access roads and general tie line were inventoried with a 100' corridor width. Each wind turbine location was centered on a 5-acre pad. Some of the access roads and wind turbine pad locations overlap due to the two possible arrays. The proposed project covers approximately 860 acres located in the following sections:

Table 1. Legal Locations.

County	Township	Range	Sections	USGS Quad. Map
McHenry	151N	80W	5, 6	Blacktail Coulee
Ward	151N	81W	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14, 15, 17, 18, 19, 20, 29, 30, 31	Blacktail Coulee, Robinson Coulee, & Benedict
Ward	151N	82W	9, 10, 11, 12, 13, 14, 15, 22, 23, 24, 25, 26, 34	Robinson Coulee, Benedict NW, Benedict SW, & Benedict
McHenry	152N	80W	31, 32	Blacktail Coulee
Ward	152N	81W	31, 32, 33, 34	Robinson Coulee

The proposed project is located on pastureland and agricultural fields within the Souris River Study Unit (SRSU) as defined by the North Dakota State Historic Preservation Office (SHPO). The proposed project location was identified using topographic and aerial maps, as well as global positioning system (GPS) hardware. Survey methods included an intensive pedestrian survey. In October and November 2018, Katherine West (Field Director), Melody Abbott, Alex Atkinson, and Paul van Wandelen (Field Archaeologists) conducted the Class III cultural resource inventory. Wade Burns served as the Principal Investigator for this project.

The Class I file search revealed seven sites, 13 site leads, and no isolated finds within a one-mile radius of the survey area. Four of the previously recorded site leads (32WDx2, 32WDx15, 32WDx588/32MHx335, and 32WDx589) were potentially located within the survey area and were revisited during the current inventory. In addition, five new cultural resources (32WD2406, 32WD2407, 32WD2408, 32WDx819, and 32MHx336) were discovered during the cultural resource inventory.

- For site leads (32WDx2, 32WDx15, 32WDx588/32MHx335, and 32WDx589), fieldwork has determined that cultural material, equipment, structure, or foundations associated with strip or drift mining were not located within the survey area. However, significant land scarring from the strip mining process was located within 32WDx558/32MHx335 and 32WDx589. No avoidance of the site leads is necessary within the survey area. The portions of the site lead boundaries located outside the survey area are still recommended as unevaluated for the National Register of Historic Places (NRHP).
- Sites 32WD2406 (a cairn), 32WD2407 (possible effigy), and 32WD2408 (a cairn) were recommended as unevaluated for the NRHP and require avoidance.

- Isolated finds 32WDx819 (3 whiteware fragments) and 32MHx336 (1 whiteware fragment) are not eligible for the NRHP and no avoidance is required.

Recommendations are listed in the table below.

Table 2. Site Avoidance Recommendations.

SITS #	Description	NRHP Status	Avoidance Recommendations
32WD2406	Cairn	Unevaluated	100' Avoidance, Temporary Fencing, Monitoring
32WD2407	Possible Effigy	Unevaluated	100' Avoidance, Temporary Fencing, Monitoring
32WD2408	Cairn	Unevaluated	100' Avoidance, Temporary Fencing, Monitoring
32WDx2	Site Lead: Bartoshivich Coal Mine	Unevaluated	No Avoidance Necessary
32WDx15	Site Lead: Red Flag Coal Mine	Unevaluated	No Avoidance Necessary
32WDx588	Site Lead: Truax-Traer Coal	Unevaluated	No Avoidance Necessary
32WDx589	Site Lead: Quist Mine	Unevaluated	No Avoidance Necessary
32WDx819	Isolated Find: 2 Ceramics	Not Eligible	No Avoidance Necessary
32MHx336	Isolated Find: 1 Ceramic	Not Eligible	No Avoidance Necessary

Consequently, as long as the avoidance recommendation in Table 2 are followed, BCA recommends that the proposed project proceed under a finding of *No Historic Properties Affected* as mapped, photographed, and described herein.

An architectural visual impact inventory will be written as an addendum to this report as will collector lines, crane paths, the operations and maintenance (O&M) building, and potential laydown area. Further survey will need to be conducted for any project changes that fall outside the currently inventoried survey area.

Table of Contents

Abstract i
Table of Contents iii
List of Tables iv
List of Figures iv
Acronyms v
Introduction 1
Project Description 1
Objective 2
  Site Evaluation Criteria 2
Environmental Setting 4
  Souris River Study Unit 4
Historic Context 4
  Native American Cultural Background 4
    Paleo-Indian Period (9500-5500 BC) 5
    Plains Archaic Period (5500-400 BC) 5
    Plains Woodland Period (400 BC–AD 1200) 5
    Plains Village Period (AD 1200-1780) 6
    Equestrian/Fur Trade Period (AD 1780-1880) 6
    Reservation Era (AD 1880-present) 6
  Euro-American Cultural Background 7
    Dakota Territory (1858-1889) 7
    North Dakota (1889-Present) 8
Class I Literature Search 10
  North Dakota SHPO Files 10
Class III Pedestrian Survey 10
  Survey Methods 10
  Project Personnel 11
  Survey Conditions 11
  Survey Results 11
Conclusion and Recommendation 12
Ruso Wind Unanticipated Discovery Plan 14
  Human Remains/Burial Goods 14
  General Archaeological Sites (not including human remains or burial goods) 14
References Cited 16
Appendix A: Maps
Appendix B: Photos
Appendix C: File Search Results
Appendix D: Site Descriptions
  Previously Recorded Cultural Resources D-1
  Newly Recorded Cultural Resources D-5

List of Tables

Table 1. Legal Locations. i
Table 2. Site Avoidance Recommendations. ii
Table 3. Proposed Project Location. 1
Table 4. Breakdown of Acres Surveyed. 1
Table 5. Site Avoidance Recommendations. 13
Table 6. Sites on file at the ND SHPO within a one-mile radius of the survey area. C-1
Table 7. Site leads/isolated finds on file at the ND SHPO within a one-mile radius of the survey area. C-1
Table 8. Manuscripts on file at the ND SHPO from the section in which the survey area is located. C-1

List of Figures

Figure 1. Location of survey area in Ward and McHenry Counties, North Dakota. 3
Figure 2. Project map. A-1
Figure 3. Overview of the survey area. View to the west. B-1
Figure 4. Overview of the survey area. View to the north. B-1
Figure 5. Overview of the survey area. View to the south. B-2
Figure 6. Overview of the survey area. View to the north. B-2
Figure 7. Overview of the survey area. View to the north. B-3
Figure 8. Overview of the survey area. View to the southwest. B-3
Figure 9. Overview of the survey area. View to the west. B-4
Figure 10. Overview of the survey area. View to the north. B-4
Figure 11. Overview of the survey area. View to the east. B-5
Figure 12. Overview of the survey area. View to the southeast. B-5
Figure 13. Overview of the survey area. View to the north. B-6
Figure 14. Overview of the survey area. View to the northeast. B-6
Figure 15. Overview of a survey area access road. View to the east. B-7
Figure 16. Overview of the survey area substation. View to the northeast. B-7
Figure 17. Overview of a field clearing pile. B-8
Figure 18. Overview of a field clearing pile. B-8
Figure 19. Site Lead 32WDx2 overview. View to the southeast. D-1
Figure 20. Site Lead 32WDx15 overview. View to the north. D-2
Figure 21. Site Lead 32WDx588/32MHx335 overview. View to the northwest. D-3
Figure 22. Site Lead 32WDx589 overview. View to the southwest. D-4
Figure 23. Site 32WD2406. View to the north. D-5
Figure 24. Site 32WD2407. View to the south. D-6
Figure 25. Site 32WD2408. View to the west. D-7
Figure 26. Isolated Find 32WDx819. ..... D-8
Figure 27. Isolated find 32MHx336. ..... D-9

Acronyms

AML: Abandoned Mine Lands

AMSL: Above Mean Sea Level

APE: Area of Potential Effect

BCA: Beaver Creek Archaeology, Inc.

CCC: Civilian Conservation Corps

CR: County Road

CRF: Code of Federal Regulations

FWP: Federal Writers Program

GPS: Global Positioning System

GSV: Ground Surface Visibility

KRF: Knife River flint

MHA: Mandan, Hidatsa, and Arikara

MW: Megawatt

N: North

NAGPRA: Native American Graves Protection and Repatriation Act

NDCC: North Dakota Century Code

NHPA: National Historic Preservation Act

NRHP: National Register of Historic Places

O&M: Operations and Maintenance

Proponent: Ruso Wind Partners, LLC

PSC: Public Service Commission

Quad: Quadrangle

R: Range

S: Section

SHPO: State Historic Preservation Office

SHSND: State Historical Society of North Dakota

SOI: Secretary of the Interior

SRC: Swan River chert

SRSU: Souris River Study Unit

SU: Study Unit

T/Twp: Township

TCP: Traditional Cultural Property

USC: United States Code

USGS: United States Geological Survey

W: West

WPA: Works Progress Administration

Introduction

Ruso Wind Partners, LLC (the Proponent) contracted Beaver Creek Archaeology, Inc. (BCA) to complete a Class III cultural resource survey of the Ruso Wind project in Ward and McHenry Counties, North Dakota (see Figure 1 and Appendix A: Map). The Class III inventory included a Class I file search, a Class III cultural resource survey, and a cultural resource survey report. This project is under the jurisdiction of the North Dakota Public Service Commission (PSC) and the North Dakota State Historic Preservation Office (SHPO).

The proposed project will consist of up to 53 5-acre wind turbine locations, a substation, 24.15 miles of access roads, and 8 miles of general tie line. Several of the access roads and wind turbine locations overlap due to the two possible arrays. As such, a total of 125 wind turbine locations, including 20 alternate locations, were mapped. Each wind turbine location was centered in a 5-acre survey block. The proposed access roads and general tie line were buffered 50' on either side of the centerline, resulting in a 100' wide survey corridor. A total of 860 acres were inventoried to Class III standards. See Table 2 for project location details.

Table 3. Proposed Project Location.

Agency	North Dakota PUC; North Dakota SHPO
USGS Quad	Benedict, Benedict NW, Benedict SW, Blacktail Coulee, & Robinson Coulee
Survey Area	Sections 5 and 6 in T151N, R80W Sections 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 14, 15, 17, 18, 19, 20, 29, 30, and 31 in T151N, R81W Sections 9, 10, 11, 12, 13, 14, 15, 22, 23, 24, 25, 26, and 34 in T151N, R82W Sections 31, and 32 in T151N, R80W Sections 31, 32, 33, and 34 in T151N, R81W
Sites in Survey Area	32WD2406, 32WD2407, 32WD2408, 32WDx2, 32WDx15, 32WDx588/32MHx335, 32WDx589, 32WDx819, 32MHx336

In October and November 2018, Katherine West (Field Director), Melody Abbott, Alex Atkinson, and Paul van Wandelen (Field Archaeologists) conducted the Class III cultural resource inventory. Wade Burns served as the Principal Investigator for this project. This report will detail the results of the record search and pedestrian inventory, as well as the environmental and cultural background of the project area.

Project Description

The Area of Potential Effect (APE) is defined as the combined construction area of all project components. As such, the APE includes the location of turbines, access roads, general tie line, and substation.

Table 4. Breakdown of Acres Surveyed.

	Acres
Turbine Locations	447
Access Roads	293
General Tie Line	106
Substation Location	14
Total	**860**

The Ruso Wind project, when completed, will generate up to 200 megawatts (MW) of electricity. There are two proposed arrays in which this survey covered. Option A would consist of 53 wind turbine generators using a Siemens SWT 2.415 108 m generator with a turbine height of 80 m. Ten

alternate wind turbine locations were provided for Option A. Option B would consist of 52 wind turbine generators using a Siemens SG 4.2 145 m generator with a turbine height of 107.5 m. Ten alternate wind turbine locations were provided for Option B. If any of the alternate turbine pads are used, additional survey will be needed for access roads. No operations and maintenance (O&M) building, laydown area, collector lines, or crane paths were inventoried. An addendum to this report will be needed for the aforementioned components if they are not located within the current survey area.

The Proponent is seeking a Certificate of Site Compatibility for the North Dakota PSC in accordance with the North Dakota Energy Conversion and Transmission Facility Siting Act as set forth in North Dakota Century Code (NDCC) 49-22. The survey area was inventoried to comply with state and federal regulations in locating any cultural resources within the project area. This allows the Proponent to plan construction that will minimize impact to any National Register of Historic Places (NRHP) - eligible cultural resources.

Objective

The proposed project is under the jurisdiction of the North Dakota PSC, which requested that the applicant comply Section 106 of the National Historic Preservation Act (NHPA). The NHPA requires the agency to consider what effects the undertaking will have on historic properties within the survey area. As such, the three central management objectives of this study are: to assist the federal agency with their Section 106 compliance obligations; to identify and assess project impacts to cultural resources located within the survey area; and to provide NRHP recommendations for historic properties encountered within the survey area. In addition, the scientific objective of the study is to gather more comparative information that can be used to answer questions posed in the state plan.

Historic properties consist of any historic or prehistoric district, site, building, structure, or object (usually) over 50 years of age. Cultural resources include archaeological, historic, and architectural sites, as well as properties of traditional, cultural, or religious importance.

Site Evaluation Criteria

To be eligible for inclusion on the NRHP, a site must usually be more than 50 years old, retain its integrity of location, design, setting, materials, workmanship, feeling, and association and it must meet one of the following criteria:

(a) Be associated with events that have made a significant contribution to the broad patterns of our history; or
(b) Be associated with the lives of persons significant in our past; or
(c) Embody distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinctions; or
(d) Have yielded, or may be likely to yield, information important in prehistory or history.

In addition, cultural resources that hold traditional, cultural, or religious significance may be eligible for the NRHP as Traditional Cultural Property (TCP).

Beaver Creek
ARCHAEOLOGY

Ruso Wind Project
Ruso Wind Partners, LLC
Ward & McHenry Counties, North Dakota

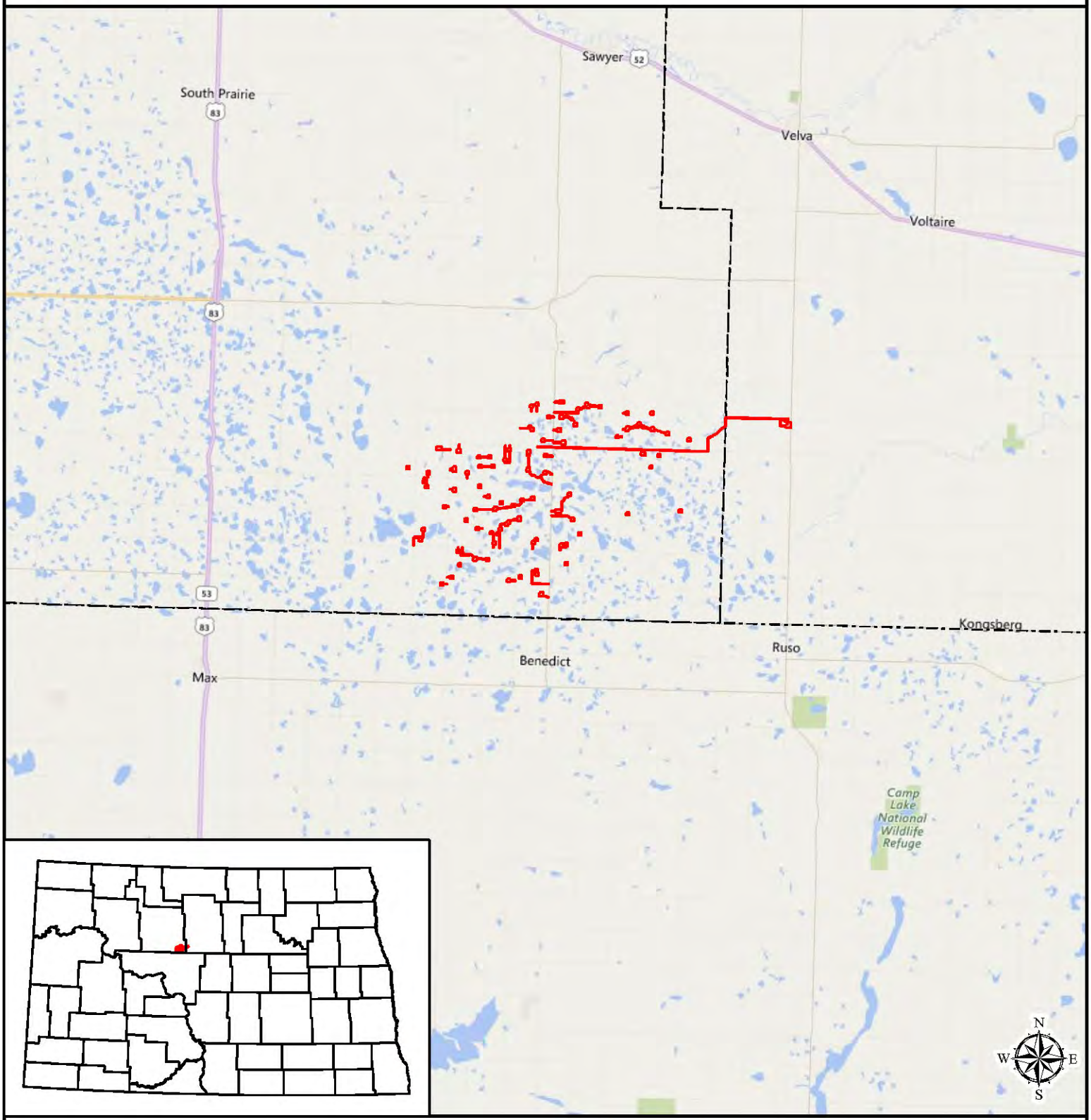


Figure 1. Location of survey area in Ward and McHenry Counties, North Dakota.

Legend

Survey Area (860 acres)

0 2,100 4,200 8,400 12,600 16,800 Meters

0 1.25 2.5 5 7.5 10 Miles

Base Map: USGS 7.5'
Scale: 1:250,000
UTM NAD83 Zone 14

GE

Environmental Setting

North Dakota is divided into 13 Archeological Study Units based on areas with similar environment, history, and archaeological factors, and equate with different orders of hydrologic units (or drainage basins). These study units provide a broad archaeological overview, which can be utilized to understand and help predict the type and density of archaeological sites in the area. The borderlines of the study units generally follow township and range lines (but not section lines), as well as the state border. The empirical value of the 13 study units to North Dakota prehistory is unknown but remains a general starting point to determine the likelihood of archaeological sites within a region (State Historical Society of North Dakota [SHSND] 2016:B.1-4).

Souris River Study Unit

The project lies within the Souris River Study Unit (SRSU), which is located in north-central North Dakota. The SRSU is located across two physiographic provinces: Central Lowlands and Great Plains. The Drift Prairie and the Missouri Coteau represent the terrain types in each of these physiographic provinces. Drainage is split between those waterbodies that are to the southwest of the Missouri Coteau which end up in the Gulf of Mexico and those to the northeast of the Coteau which end up in the Hudson Bay. Prominent rivers in the SU are the Des Lacs and the Souris rivers, both of which originate in Canada. There are several smaller streams that are also located in the SRSU. These include Little Deep Creek, Cut Bank Creek, Willow Creek, Ox Creek, and Wintering River. Lake Darling and the Crosby Reservoir are notable water bodies in the study unit (SU) (SHSND 2016:11.1-11.6).

The climate in the SRSU is defined as northern continental. This type of climate is typified by extreme fluctuations in temperature with sporadic precipitation (SHSND 2016:11.6).

Landforms in this area consist of upland till plain, valley wall side slopes, valley wall foot slopes, alluvial fans, river terraces, and river floodplains. The SU is located within the Temperate North American Grassland ecological biome and supports northern floodplain forests, aspen parklands, and grasslands. The grasslands are comprised of needle grasses, slender wheat grass, needle and thread, grama grasses, and bluestem. Trees that are located in these different environs include the bur oak, aspen poplars, cottonwood, willow, elm, box elder, and green ash. Edible shrubs include the chokecherry, juneberry, buffaloberry, and the wild rose. The prairie and riparian environments are host to a variety of large and small animals. Animals that could have been hunted for meat, hides, feathers, teeth, bones, etc. in the past included white-tailed deer, pronghorn, elk, mule deer, grizzly bear, moose, caribou, bison, coyote, red fox, the long-tailed weasel, beaver, muskrat, mink, coot, ducks, geese, perch, and northern pike (SHSND 2016:11.10).

Preferred materials for making chipped stone tools in the Souris River valley of North Dakota include Knife River flint (KRF) and Swan River chert (SRC). Granite cobbles were also abundant in the SU and were used in a variety of ways by past peoples (SHSND 2016:11.1).

Historic Context

The SRSU has its own historic context, which provides a description of the different types of prehistoric and historic districts, sites, buildings, structures, and objects that are known from various times in the past in different parts of the state. This information provides the comparative base needed for the management of cultural resources.

Native American Cultural Background

The majority of archaeological sites found within the SRSU are cultural material scatters and stone circles. These types of sites are most often found on hills, ridges, and terraces (SHSND 20016:11.13). The archaeological horizons encountered in the SRSU are as follows:

Paleo-Indian Period (9500-5500 BC)

Paleo-Indian settlement sites are not well known in the Souris River valley. It has been postulated that future research could expect to find them on remnant surfaces of river terraces or buried in floodplain or alluvial fan contexts (SHSND 2016:11.27). Lanceolate projectile points and blades are common artifact types recovered in Paleo-Indian cultural material assemblages. The available Paleo Period evidence in the SRSU is limited to these types of lithic remains. Specimens in private collections suggest that Agate Basin, Cody knife, and Parallel-Oblique KRF flaked points were all in use during the period in the SU (SHSND 2016:11.26, 11.28).

Long distance trade is evidenced in the SRSU by the high number of KRF lithic materials that have been found for the period in the study unit. Non-local chert materials have also been found which suggest contact with peoples as far afield as the Big Horn Mountains in Wyoming (SHSND 2016:11.29).

Megafauna species like the mastodon, mammoth, and giant bison would have likely been hunted by early Paleo-Indian peoples in the SU. This would have been mixed with the collection of a variety of plant resources to supplement the diet (SHSND 2016:11.28).

Plains Archaic Period (5500-400 BC)

The Plains Archaic Period is thought to have been mainly arid and droughty with episodes of more mesic conditions. The short spans where the environment was more mesic would have allowed for biomass to build up in areas of the SU and, in turn, would have provided more favorable conditions for human activity and settlement in the SRSU (SHSND 2016:11.30). However, there is not much information for Early Period Plain Archaic settlement in the SU. The Middle Plains Archaic is more well represented by a variety of lithic point types and suggests more intense occupation. The types of sites that are expected included residential bases, temporary camps, and burial sites (SHSND 2016:11.31).

Stone projectile points characteristic of all three of the Plains Archaic sub-divisional periods are represented in the SRSU. These include large side-notched forms in the Early Period, McKean Lanceolate, Duncan, and Hanna points in the Middle Period. Corner-notched points like the Pelican Lake type are well represented for the Late Plain Archaic. Larger-scale interactions are suggested based on the occurrence of Simonsen, Hawken, Oxbow, Duncan, Hanna, and Pelican Lake point types in the SU (SHSND 2016:11.32-11.33).

Data for subsistence practices during the Plains Archaic Period in the SRSU are largely absent. The only site that has produced any significantly robust data is 32MH94 where faunal remains almost entirely consist of processed bison bone. Faunal evidence from other Plains sites in the region suggest that dogs may have also been an important food surplus resource during the Plains Archaic. Wild plants would have continued to supplement the hunting diet (SHSND 2016:11.22, 11.31-11.32).

Plains Woodland Period (400 BC–AD 1200)

In comparison to the previous Plains Archaic Period, more regular mesic conditions are postulated during the Plains Woodland Period. This would have allowed for an increase in the amount of people who could have been settled or active the SRSU. Very little in the way of settlement evidence exists in the SU for the Plains Woodland Period. There are, however, identified settlement sites across the Canadian border along the Souris (DiMd-7 & DiMd-8). In addition, a few burial mound sites have been identified in the SRSU. The nearby sites and the mounds indicate that the area was being used in some capacity (SHSND 2016:11.35).

Plains Woodland ceramic and lithic technologies are represented in the SU. Besant/Sonota and straight rimmed, cord roughened, undecorated pottery sherds have been recovered from counties

in the SRSU and are suggestive of a Middle and Late Woodland presence (SHSND 2016:11.36). Local collections of lithic materials provide evidence for large and small side-notched points and cutting tools of the Samantha, Avonlea, and Besant varieties. The presence of non-local artifact materials, coupled with non-local ceramic styles provide convincing evidence that regional interactions were important during the Plains Woodland Period in the SRSU (SHSND 2016:11.37).

Plains Village Period (AD 1200-1780)

The range of Plains Village Period sites that occur in the SRSU is not well known. Only very few sites have been identified, most of which occur along the Souris and have been classified as Plains Village based on ceramic samples identified at these sites (e.g., 32RV429) (SHSND 2016:11.39). Based on analogies from neighboring ND study units, site types that should be expected for the Plains Village Period in the SRSU include hunting and field camps.

Stone, ceramic, bone, and shell materials would have been in use for tool construction. Local collections evidence that small, straight-sided triangular points with deep side-notches were common Plains Village Period projectile types, however, little to none have been identified in the SU. Regional interaction is attested to by some obsidian and red catlinite pipestone finds in the SU (SHSND 2016:11.40), while very little information exists surrounding the types of subsistence activities that were practiced during the Plains Village Period in the SRSU. Seasonal bison hunting would have likely continued to be the mainstay (SHSND 2016:11.39).

Equestrian/Fur Trade Period (AD 1780-1880)

Sites of equestrian peoples are expected to occur in the SRSU, although no sites are currently known. Ethnohistories in neighboring SUs attest to subsistence practices focused on horseback bison hunting and hunting for hides to trade for garden produce and Euro-American metal trade goods (SHSND 2016:11.41-11.42). However, horses were not likely active in the SU until after 1725-1750 (SHSND 2016:11.41). After contact with Euro-American peoples, much of the technological types that were in use in previous periods (stone, ceramic, shell, and bone) went out of use with the introduction of these new types of metal tools.

Reservation Era (AD 1880-present)

Between 1850 and 1870, the United States government created reservations to separate the Native Americans and the influx of settlers. The Fort Berthold Reservation was established in 1870 for the Mandan, Hidatsa, and Arikara to protect them from hostile Equestrian Nomads (SHSND 2016:6.76). In 1887, United States congress passed the General Allotment Act, known more commonly as the Dawes Act. This brutal piece of legislation provided the federal government with the ability to divide communal tribal land into individual allotments. Some lawmakers, including Henry Dawes (for whom the act is named), believed that forcing Native Americans to adopt agriculture while simultaneously removing the communal element of tribal village life would assimilate them into mainstream, or "civilized" society. They did not view the act of removing cultural traditions and general lifeways as destructive, but as a way of saving Native Americans from disappearing altogether, a misguided notion that many people believed. At the same time, other lawmakers saw the monetary potential in selling allotments to non-Indians, something that indeed came to fruition when certain allotments were not sold and therefore deemed "surplus." Today, the Dawes Act is considered the most destructive policy dealing with Native peoples (Mandan, Hidatsa, and Arikara [MHA] Nation 2012a, 2012b; SHSND 2008b).

As an additional means of forced integration, Christian missionaries were sent to reservations and children were taken from their family and placed in boarding schools (Indian schools), such as the Fort Stevenson Indian School, Bismarck Indian School, and the Carlisle Indian School in Pennsylvania, where students were prohibited from using their language, practices, and culture and were subjected to a curriculum that emphasized Euro-American culture (MHA Nation 2012a, 2012b; SHSND 2008b).

In 1934, in an effort to rectify some of the damage done, the Indian Reorganization Act was established that secured certain rights to Native Americans. This included the reversal of the Dawes Act and a return to local self-government on a tribal basis. However, in the late 1940s and early 1950s the Indian Reorganization Act was disassembled. The plan was to establish a policy that would eliminate tribal status all together. In 1975, the Indian Self-Determination and Education Assistance Act was enabled. This policy meant to allow tribal autonomy while still benefitting from government treaty obligations. American Indian Religious Freedom Act of 1978 was created to protect and preserve the traditional religious rights and cultural practices of Native Americans. In addition to Self-Determination, other laws were passed such as the Indian Civil Rights Act, the Indian Financing Act, and the Indian Child Welfare Act (SHSND 2008b).

Today, reservations have tribal government, which administers many governmental, economic, health, welfare, and educational programs. There are still problems on Indian reservations, such as poverty, crime, and alcoholism; however, there is also economic growth because of small independent business, farming, and gaming (MHA Nation 2012c).

Euro-American Cultural Background

The majority of historic sites within North Dakota are farmsteads/homesteads from the late 19th century and early 20th century.

Dakota Territory (1858-1889)

The Dakota Territory consisted of the northernmost part of the land acquired from France in the 1803 Louisiana Purchase and in 1818, the United States acquired the northeastern portion of the Dakota Territory in a treaty with Great Britain. The Dakota Territory included North Dakota, South Dakota and much of present-day Montana and Wyoming. After becoming an incorporated territory in 1861, the population was slow to increase due to Indian attacks. Eventually, the population increased during the "Dakota Boom," from 1870 to 1880, because of the railroad growth and the Homestead Act of 1862. Many of the settlers came from Germany and the Scandinavian countries of Norway and Sweden. The economic base was organized around agriculture, mining, and cattle ranching (Federal Writers Project [FWP] 1938).

Fur Trade – The earliest Europeans and European-Americans to venture into the region were looking for trade routes or to establish fur trading posts. Before and after the Lewis and Clark 1804-1806 expedition, notable explorers included Sieur de la Vérendrye, David Thompson, Charles Chaboillez, Alexander Henry, and Manuel Lisa. Some Europeans and European-Americans settled in the area, including "Spaniards from St. Louis, Frenchmen from Quebec, Scots and Britons from Hudson's Bay and Montreal and Americans working either as free traders or engaged for a dozen fur companies" (FWP 1938; Lamar 1996:27).

Forts – The majority of the forts in the region were constructed in the 19th century. Their purpose included trading outposts, primarily fur trade and military posts for the protection of supply routes, trails, trade, and settlers. These forts, prior to the introduction of the railroad were along rivers such as the Missouri, Yellowstone, Heart, and Red rivers. Some of the more notable forts include Fort Mandan, Fort Lisa, Fort Henry, Fort Clark, Fort Union, Fort Abercrombie, Fort Berthold, Fort Buford, Fort Rice, Fort Totten, and Fort Abraham Lincoln (FWP 1938; SHSND 2008a).

Trails – Two major trails, the River Trail and the Ridge Trail, branches of the network of Red River Trails in the Red River Valley, originally were Native American trails that were later used by Euro-American fur traders. The Red River Trails connected fur trading posts, where they hauled furs and goods by ox cart. Later, the trails also connected military posts, where military supplies and men were sent. These military posts (e.g., Fort Abercrombie, Fort Totten, and Fort Ransom) also protected the trails as well as the people traveling up and down the trails. Eventually the trails and ox carts were replaced by the railroad (Gilman et al. 1979).

A notable trail in the western part of the region is the Bismarck-Deadwood Stage Trail (1877-1880). This trail was a stagecoach and supply line that ran between Bismarck, the western terminus of the Northern Pacific Railroad and the Black Hills gold town of Deadwood in Dakota Territory. There was transportation and economic booms associated with this trail and these booms ended when the railroad reached Pierre and an alternate line opened (SHSND 2008a).

Riverboats – The Missouri and Red rivers were important to the settlement and expansion of the Dakota Territory and were used the most for river transportation. Riverboats such as rafts, sailboats, rowboats, Mackinaws, keelboats, and steamboats brought explorers and fur traders into the Dakota Territory; however, the keelboat and steamboat were probably used more often due to their carrying capacity. "Keelboats were used primarily from 1800 to 1840, when they were replaced by steamboats" (Miller 2012). This type of boat floated high in the water allowing it to travel on shallow rivers and was able to carry 15 to 30 tons of cargo. River transportation became increasingly important for transporting goods to outposts and returning furs downstream.

Steamboats eventually replaced the keelboats and were used for cargo and passenger transportation. The riverboat industry became a popular mode of transportation, as it was much easier to deliver goods to remote areas by boat than overland routes. In addition, "settlers and visitors could also travel much more safely by taking steamboats" (Burns 2004:14). The demise of riverboat transportation occurred for several reasons: (1) less shipping of passengers and cargo, (2) scarcity of wood yards, (3) inconvenient climate, (4) labor unrest, and (5) the railroad. Shipping on the Red River continued until 1912 and until the 1930s on the Missouri River (Burns 2004).

Railroad - Major development of the railroad in the Dakota Territory occurred in the 1870s and 1880s with the Northern Pacific Railroad and the Great Northern Railroad facilitating population growth during this time. Federal land grants were given to the Northern Pacific Railroad, who in turn sold the land, while the Great Northern Railroad bought its lands from the federal government and promoted settlement along its lines (FWP 1938).

Agriculture – The Federal Homestead Act of 1862 offered free land to anyone over 21 years-old who would cultivate and improve his 160 acres of land and live on it for five years. An additional 160 acres could be obtained for a tree claim and a third tract of land could be acquired before or after the land was surveyed. Crops planted and harvested included spring wheat, durum, flaxseed, barley, oats, sugar beets, corn, hay, red clover, alfalfa, sweet clover, and seed potato. Ranching of cattle and sheep, poultry raising, and bee keeping was also done on farms (FWP 1938).

In eastern North Dakota, large tracts of land were often sold to just one family or one individual. These "Bonanza farms" were often large operations, often owned by companies in the east and run like factories with hundreds of men using the most advanced farming technologies of the time. Bonanza farming fluoresced in the Red River Valley during the last two decades of the 19th century, and the railroad companies appreciated the endeavor since it served as a great promotional tool for the land. However, land in the western part of North Dakota was more arid and posed more problems for farmers, especially those from other countries. Populations remained relatively small and early homesteading was often unsuccessful. The difficulty of farming the land, the isolation required to live on their claims while improving them, and the harsh and cold North Dakota landscape just proved to be too much for many of these first settlers (FWP 1938; Sherman 1986:12).

North Dakota (1889-Present)

North Dakota became the 39th state to enter the Union on November 2, 1889. After statehood, industrial development increased. The railroad industry expanded and peaked in 1905 through competition between the Great Northern Railway and the Soo Line. Large lignite mines opened and local brickworks and flourmills flourished in the state. Entrepreneurs built stores, shops, and offices along Main Street and town squares. While rural areas still relied on small local general

stores, city consumers had more choice with locally owned department retail stores. In 1919, the Bank of North Dakota at Bismarck opened and has become a large and powerful economic force. "The State Mill and Elevator at Grand Forks, completed in 1922, provided a market for grain and a source of feed and seed [and] the state hail insurance program benefitted many farmers until its elimination in the 1960s" (SHSND 2012).

Farm homes in the eastern part of the state were typically small, located close together, and made up of well-painted modernized buildings surrounded by neat lawns and tree groves. They had modern conveniences like electricity, telephones, radios, and cars. In the central part of the state, farms were not as modernized as eastern North Dakota but were well-kept. In western North Dakota, farm homes were often little more than shacks erected to establish residence under the Federal Homestead Act. Many such buildings were still in use in the early 20th century (FWP 1938).

The collapse of wartime prices for grain in the 1920s instigated an economic depression in North Dakota that lasted through the 1930s, concurrent with the Great Depression era. In 1921, more banks closed than in any other year, resulting in a wave of farm foreclosures. The Great Depression of the 1930s spurred change throughout the state. Rural populations decreased while city populations grew. Because of the price decline of farm produce, cooperatives enjoyed a renewed popularity as farmers banded together to market their produce and reduce the cost of farming. Farmers Unions built local elevators and organized oil cooperatives that served the needs of the rural community. Despite economic problems, crop failures, dust storms, and extreme weather, North Dakota visibly modernized during the 1930s, shifting to mechanized farming operations and motorized transportation. Federal relief programs improved highways, state parks, and city services throughout the state. State departments undertook public health and safety problems, and a movement for consolidated law enforcement was started with the formation of a State Highway Patrol in 1935. "Rural schools consolidated at an increasing rate. Public utilities extended their reach through development or rural electric cooperatives; the first, Baker Electric of Cando, energized its lines in 1938" (SHSND 2012).

Immediately after Franklin Roosevelt took the oath of office, he began passing a series of laws aimed at putting people back to work, restoring faith in the banking system, and shoring up the economy (SHSND 2012). Among these efforts were the Works Progress Administration (WPA) and the Civilian Conservation Corps (CCC). In North Dakota between 1935 and 1942, the WPA built 20,373 miles of highways and streets, 821 new bridges and viaducts, 166 miles of sidewalks, 15,012 culverts, 503 new public buildings, 61 building additions, 680 outdoor recreation facilities, 809 water wells, two irrigation projects, 39 sewage treatment plants, and nine water treatment plants, as well as other reconstructions and repairs (Robinson 1966:408). In June of 1933, some 235,000 men were enrolled in the CCC to work on federal and state public improvement projects. They built national forest trails, campsites, and visitor centers in state and national parks as well as roads and dams (SHSND 2012).

From the 1940s to the 1960s, North Dakota continued to develop modern agriculture, industry and infrastructure. Starting in the 1940s, favorable weather and improved crop yields coincided with higher prices stimulated by America's entry into World War II. By the end of the war, farm debt had dropped noticeably. After the war, the industrial economy continued to prosper. The rapid agricultural and industrial developments led to the construction of the Garrison Dam in 1946. Industrial developments included the beginning of the energy industry; in 1951, oil was discovered within the Bakken near Tioga. North Dakota also played a role in the military industry and two large Air Force Bases, one in Minot and the other in Grand Forks, had been built by the 1960s. Infrastructure developments included communication and interstate transportation systems, which were improved and expanded in the 1950s. As private auto transportation increased, the use of

passenger rail service declined, and railroads increasingly became a means of hauling freight (SHSND 2012).

Large-scale energy development took off in the 1960s owing to high demand. Initially, coal strip mines and coal-fired power plants were the dominant form of energy in the state. An oil boom occurred in 1978 as international crude oil prices skyrocketed; oilfield towns such as Dickinson, Williston, and Watford City exploded along with the industry. This oil boom and subsequent population increase was short-lived, as worldwide oil prices declined in 1981 and oil workers moved away (SHSND 2012). Another oil boom started in 2008, resulting in enough oil and gas jobs to give North Dakota the lowest unemployment rate in the United States. In addition, the oil boom has supplied economic growth in other areas such as the service industry (Rocco 2013).

Class I Literature Search

The literature search is used to provide an indication of the types, distribution, and density of cultural resources near the proposed project area. This is done by checking individual files at the North Dakota SHPO in Bismarck, North Dakota. The proposed project is located off County Road (CR) 23 north of Benedict, and the site distribution is light within a one-mile radius of the survey area (where the file search was conducted).

North Dakota SHPO Files

On October 26, 2018 and November 13, 2018, Greg Erickson of BCA conducted a literature search at the North Dakota SHPO. Records at the North Dakota SHPO were searched in order to identify all cultural resources within a one-mile radius of the survey area and previous surveys within the section in which the survey area is located.

The results of the file search indicate that 15 projects have been conducted within the sections where the survey area for the proposed project is located, of which eight were conducted within the last 10 years. None of the previous surveys conducted within the last 10 years crossed into the survey area. The manuscripts are included in tabular form in Appendix C.

The file search also revealed seven sites, 13 site leads, and no isolated finds within a one-mile radius of the survey area that were on file at the North Dakota SHPO at the time of the file search. These results are included in tabular form in Appendix C. Four previously recorded site leads were potentially located within the survey area. These cultural resources were revisited during the current inventory.

Class III Pedestrian Survey

The 860-acre survey area for the current inventory was mapped over the center of the proposed wind turbine pads, associated access roads, general tie line, and substation location. The file search results, including previously recorded cultural resources, were then added to this map. This Class III pedestrian survey covered the entire APE for the wind turbines, access road, general tie line, and substation location construction area plus an adequate buffer zone. The purpose of the inspection was to identify, via pedestrian survey, any cultural resources within the survey area.

Survey Methods

Prior to the inventory, the survey area and known cultural resources were mapped and loaded onto a Trimble Juno global positioning system (GPS). United States Geological Survey (USGS) topographic maps and the Trimble Juno GPS were used by BCA staff to navigate and orient within the survey area.

The survey area was inventoried by BCA archaeologists walking parallel linear pedestrian transects between 10-15 m apart based upon terrain and probability for cultural resources. Shovel probes would be implemented if the ground surface visibility (GSV) dropped below 30%. If a cultural resource was encountered, the location was marked with pin-flags and the surrounding area was intensely scrutinized to determine the nature and extent of the resource. The resource was then plotted on a USGS 7.5' Quadrangle map utilizing a Trimble GPS. Cultural material was not collected.

Throughout the survey, field observations were recorded as field notes in a bound notebook and digital photographs were taken. Portions of the field notes and a sample of the photos are included in this report, which is printed on acid-free paper. Original notes and photos are kept at the BCA offices in Bismarck, North Dakota.

Project Personnel

The Secretary of the Interior (SOI) qualified archaeologist Wade Burns served as the Principal Investigator for this project. On October 15-16, 2018, the survey area was inventoried by Katherine West (Field Director), Melody Abbott, Alex Atkinson, and Paul van Wandelen (Field Archaeologists). And on November 1 and 2, 2018, Katherine West and Alex Atkinson inventoried an additional survey area, the general tie line and substation location.

Survey Conditions

Weather conditions consisted of clear to overcast skies, and the temperature varied from 33-60°F. The project area was located in kames and kettles topography within the Missouri River, Painted Woods Creek, and Souris River drainage systems. The survey area was located within agricultural fields and rangeland. Vegetation in the area consisted of flax, soybeans, harvested soybeans, harvested wheat, harvested canola, alfalfa, yellow sweet clover, brome, crested wheatgrass, western wheatgrass, buffaloberry, snowberry, thistle, needle-and-thread, blue grama, wormwood, box elder, green ash, and other native and non-native grasses, plants, trees, and shrubs. The elevation of the survey area ranged from 1,780-2,198' above mean sea level (AMSL). During the course of the inventory, the GSV was approximately 90% within plowed soybean fields, 60-70% within the harvested agricultural fields, 40% within the unharvested soybean and flax fields, 50% within cut hay fields, and 30-50% within rangeland. As a result, no shovel probes were implemented as the GSV never dropped below 30%. Areas of higher visibility, such as erosion features, areas of sparse vegetation and rodent burrows were also closely examined for cultural material. Overview photos of the survey area are included in Appendix B.

Survey Results

While conducting the pedestrian survey, it was noted that the survey area is presently used for agricultural production, livestock grazing, and wildlife habitat. Previous disturbances include gravel roads, two-tracks, barbed wire fencing, grazing, past plowing events, overhead electric lines, shelterbelts, and field-clearing piles.

Field-clearing piles are often encountered within or adjacent to previously plowed fields but are not regarded as cultural resources. However, due to similarities to Native American stone features, when rock piles are encountered they are inspected, and evidence of Euro-American origin is noted. The rock pile observed in this survey were field-clearing piles comprised of loose, unsodded large rocks and boulders located in a pile within agricultural fields, along fence lines, and section lines. The majority of the field-clearing piles were devoid of cultural material; however, a few were used as modern trash dump locations.

During the cultural inventory, five newly recorded cultural resources (32WD2406, 32WD2407, 32WD2408, 32WDx819, and 32MHx336) were discovered and recorded. In addition, four previously recorded site leads (32WDx2, 32WDx15, 32WDx588/32MHx335, and 32WDx589)

were potentially located within the survey area and were revisited. The site descriptions are located in Appendix D.

The cultural resources included three archaeological stone feature sites, two archaeological isolated finds, and four historical archaeological coal mines. Sites 32WD2406 (a cairn), 32WD2407 (possible effigy), and 32WD2408 (a cairn) were recommended as unevaluated for the NRHP and requires avoidance. Isolated finds 32WDx819 (3 whiteware fragments) and 32MHx336 (1 whiteware fragment) are not eligible for the NRHP be definition and no avoidance are required. For the previously recorded site leads (32WDx2, 32WDx15, 32WDx588/32MHx335, and 32WDx589), fieldwork has determined that cultural material, equipment, structure, or foundations associated with strip or drift mining were not located within the survey area. However, significant land scarring from the strip mining process was located within 32WDx558/32MHx335 and 32WDx589. No avoidance of the site leads is necessary within the survey area. The portions of the site lead boundaries located outside the survey area are still recommended as unevaluated for the NRHP.

Conclusion and Recommendation

The Proponent has proposed the construction of the Ruso Wind project in Ward and McHenry Counties, North Dakota. In order to accomplish this, the Proponent hired BCA to conducted a Class I file search, a Class III cultural resource survey, and complete a Class III cultural resource survey report for submittal to the PSC and North Dakota SHPO.

The proposed Ruso Wind project will generate approximately 200 MW of electricity and will consist of up to 53 wind turbine locations. Two array options were inventoried during the pedestrian survey and covered 125 wind turbine locations, of which 20 were alternate locations. In addition, 24.15 miles of access roads, an 8-mile general tie line, and a substation location were surveyed for cultural resources during the current inventory. The array for Option A would consist of 53 wind turbines using Siemens SWT 2.415 108 m generator with a turbine height of 80 m. Ten alternate wind turbine locations were provided for Option A array. The array for Option B would consist of 52 wind turbines using Siemens SG 4.2 145 m generator with a turbine height of 107.5 m. Ten alternate wind turbine locations were provided for Option B array. This project is subject to the jurisdiction of the North Dakota PSC.

In October and November 2018, BCA inventoried the proposed Ruso Wind project. The proposed wind project consisted of a survey area comprised of approximately 860 acres of wind turbine pads, access roads, general tie line, and substation location. The location of the survey area can be seen on the map located in Appendix A.

The Class I file search revealed seven sites, 13 site leads, and no isolated finds within a one-mile radius of the survey area. Four previously recorded site leads were potentially located within the survey area. The other previously recorded cultural resources were located well outside the survey area and will not be impacted by the proposed project. However, five newly recorded cultural resources were discovered within the survey area.

Site lead 32WDx2 was potentially the Bartoshivich Coal Mine and fieldwork had determined that no cultural material, equipment, structure, or foundations associated with coal mining were located within the survey area. Site lead 32WDx 15 was potentially the Red Flag Coal Mine and fieldwork has determined that no cultural material, equipment, structure, or foundations associated with coal mining were located within the survey area. Site lead 32WDx588/32MHx335 was the Traux-Traer/Velva strip mine and fieldwork had determined that no cultural material, equipment, structure, or foundations associated with drift mining was located within the survey area. However, significant land scarring from the strip mining process is visible. Site lead 32WDx589 was the Quist drift mine and fieldwork had determined that no cultural material, equipment, structure, or

foundations associated with drift mining was located within the survey area. However, significant land scarring from the strip mining process is visible. No avoidance of the site leads is necessary within the survey area. The portions of the site lead boundaries located outside the survey area are still recommended as unevaluated for the NRHP.

Isolated find 32WDx819 was three whiteware fragments and was not eligible for the NRHP. Isolated find 32MHx336 was one whiteware fragment and was not eligible for the NRHP. Isolated finds, by definition, are not eligible for the NRHP and, as such, no avoidance is required.

Site 32WD2406 was a single stone cairn and was recommended as unevaluated for the NRHP, as further work is needed to determine its significance. Site 32WD2407 was a possible effigy and was recommended as unevaluated for the NRHP, as further work is needed to determine its significance. Site 32WD2408 was a single stone cairn and was recommended as unevaluated for the NRHP, as further work is needed to determine its significance. As these three sites are recommended unevaluated for the NRHP avoidance measures are required. Beaver Creek Archaeology, Inc. recommends that the sites be avoided by a minimum of 100' with temporary fencing placed along the 100' avoidance buffer in conjunction with archaeological monitoring when ground disturbing activities occur within 100' of the sites.

Table 5. Site Avoidance Recommendations.

SITS #	Description	NRHP Status	Avoidance Recommendations
32WD2406	Cairn	Unevaluated	100' Avoidance, Temporary Fencing, Monitoring
32WD2407	Possible Effigy	Unevaluated	100' Avoidance, Temporary Fencing, Monitoring
32WD2408	Cairn	Unevaluated	100' Avoidance, Temporary Fencing, Monitoring
32WDx2	Site Lead: Bartoshivich Coal Mine	Unevaluated	No Avoidance Necessary
32WDx15	Site Lead: Red Flag Coal Mine	Unevaluated	No Avoidance Necessary
32WDx588	Site Lead: Truax-Traer Coal	Unevaluated	No Avoidance Necessary
32WDx589	Site Lead: Quist Mine	Unevaluated	No Avoidance Necessary
32WDx819	Isolated Find: 3 Ceramics	Not Eligible	No Avoidance Necessary
32MHx336	Isolated Find: 1 Ceramic	Not Eligible	No Avoidance Necessary

Consequently, as long as the avoidance measures listed in Table 5 and discussed above are followed, BCA recommends that the proposed project proceed under a finding of *No Historic Properties Affected*, as surveyed, mapped, and described herein.

Ruso Wind Unanticipated Discovery Plan

The following protocol defines the appropriate procedures to deal with any potential discovery of cultural resources in accordance with the regulatory requirements of the following federal statutes: Section 106 of the NHPA (16 United States Code [U.S.C.] 470) and 36 Code of Federal Regulations (CFR) 800); Section 3(d) (U.S.C. Part 3002) of the Native American Graves Protection and Repatriation Act (NAGPRA) (25 U.S.C. Part 3001-3013).

A cultural resource could consist of:

- Prehistoric features (e.g., stone features, hearths, charcoal stains)
- Prehistoric artifacts (e.g., lithic debitage, projectile points, ceramics)
- Historic features (e.g., wells, trails, foundations)
- Historic artifacts (e.g., military artifacts, farm implements, glass)
- Burials and funerary items including, but not limited to skeletal remains, headstones, coffin wood fragments, burial goods (e.g., pipes, pottery, ornaments)

Ruso Wind Partners, LLC has the responsibility to ensure that all construction staff present during groundbreaking activities monitor construction for potential archaeological remains. If unanticipated cultural resources are discovered during the course of construction, the following procedures should be followed, which are described below according to the type of cultural material discovered.

Human Remains/Burial Goods

In the event that human remains or burial goods are uncovered during any construction activities, whoever identified the cultural resource will immediately notify the Construction Manager of the location and type of discovery. The Construction Manager will ensure that all construction activities cease at once in the immediate vicinity of the find. "Immediate vicinity" is defined as a 100' radius around the discovery or a boundary determined at the discretion of the BCA archaeologist. After visiting the discovery and determining the site boundary, the BCA archaeologist will recommend a distance at which to place protective fencing. If there is inclement weather during the discovery or subsequently, weatherproof material will be utilized immediately in order to protect the remains.

Once construction activities have ceased, the Construction Manager will notify local law enforcement (the Ward County and/or McHenry County Sheriff's Office) and BCA who will, in turn, contact the North Dakota SHPO.

Construction shall not resume work at the discovery site until notice to proceed is given by the Sheriff and the North Dakota SHPO. *Under no circumstances* should human remains be removed from the site until all necessary parties have agreed upon an avoidance/mitigation plan. "Necessary parties" may include, but are not limited to a medical examiner, local law enforcement, the North Dakota SHPO, Native American representatives, BCA, and other federal and state agencies/entities as appropriate. Further work at the discovery site will be suspended until the avoidance/mitigation plan agreed upon by necessary parties has been put into place.

General Archaeological Sites (not including human remains or burial goods)

In the event that finds of archaeological sites, such as artifact caches or hearths, are uncovered during any construction activities, whoever identified the cultural resource will notify the Construction Manager of the location and type of discovery. The Construction Manager will ensure that all construction activities cease at once in the immediate vicinity of the find. The Construction Manager will contact the BCA archaeologist in order to conduct a preliminary evaluation of the discovery to make work stoppage recommendations to the Construction Manager. Should a work

stoppage authority be deemed necessary, BCA will notify the North Dakota SHPO. Further work at the discovery site will be suspended until the avoidance/mitigation plan agreed upon by necessary parties has been put into place. "Necessary parties" may include, but are not limited to North Dakota SHPO, BCA, Native American representatives, and other federal and state agencies/entities as appropriate.

The contact information for the project includes:

Company/Agency	Name	Telephone Number
Construction Manager		
Project Manager		
North Dakota SHPO	Paul Picha	(701) 328-3574
Ward County Sheriff	Robert Barnard	(701) 857-6500
Ward County Coroner	Trinity Medical Center	(701) 857-5000
McHenry County Sheriff	Trey Skager	(701) 537-5633
McHenry County Coroner	Charles Nyhus	(701) 324-4856
Beaver Creek Archaeology, Inc.	Main Office	(701) 663-5521
	Wade Burns	(701) 367-8993

References Cited

Burns, Wade
2004 *The Effect Transportation Routes had on Military Installation Placement, Settlement, and Agricultural Patterns in Dakota Territory: 1860-1890*. Unpublished Master's thesis, Department of Sociology-Anthropology, North Dakota State University, Fargo.

Federal Writers Project (FWP)
1938 *North Dakota: A Guide to the Northern Prairie State*. Oxford University Press: New York.

Gilman, Rhoda, Carolyn Gilman, and Deborah Stultz
1979 *The Red River Trails: Oxcart Routs between St. Paul and the Selkirk Settlement 1820-1870.* Minnesota Historical Society Press: St. Paul.

Lamar, Howard
1996 *Dakota Territory 1861-1889.* Institute for Regional Studies, NDSU: Fargo.

Mandan, Hidatsa, and Arikara (MHA) Nation
2012a Allotment. Electronic document, http://www.mhanation.com/main2/history/PDFs/Allotment.pdf, accessed February 15, 2013.

2012b Early Education and Civilization. Electronic document, http://www.mhanation.com/main2/history/PDFs/Early%20Education%20and%20Civilization.pdf, accessed February 15, 2013.

2012c Present Day. Electronic document, http://www.mhanation.com/main2/history/PDFs/Present%20Day.pdf, accessed February 15, 2013.

Miller, Michael
2012 The Missouri River: Historical Overview. Electronic document. Retrieved November 27, 2012. http://library.ndsu.edu/grhc/outreach/exhibit/riverexhibit.html

Robinson, Elwyn
1966 *History of North Dakota.* University of Nebraska Press: Lincoln.

Rocco, Matthew
2013 North Dakota Oil Boom Driving Economic Development. Electronic document, http://www.foxbusiness.com/economy/2013/02/11/north-dakota-oil-boom-driving-economic-development/, accessed February 15, 2013.

Sherman, William C. (editor)
1986 *Plains Folk: North Dakota's Ethnic History*. North Dakota Institute for Regional Studies at North Dakota State University, in cooperation with the North Dakota Humanities Council and the University of North Dakota, Fargo.

economic-development/

Snortland, J. Signe, L. Martin Perry, Lauren McCroskey, Fern E. Swenson, and Amy Bleier
2017 NDCRS Site Form Training Manual: Archeological Sites. Division of Archaeology and Historic Preservation, State Historical Society of North Dakota, North Dakota Heritage Center: Bismarck.

State Historical Society of North Dakota (SHSND)
2016 *North Dakota Comprehensive Plan for Historic Preservation: Archaeological Component*. State Historical Society of North Dakota: Bismarck

2012 History of North Dakota. Electronic document, http://history.nd.gov/ndhistory/index.html, accessed February 15, 2013.

2008a Historic Sites. Electronic document, http://history.nd.gov/historicsites/index.html, accessed November 27, 2012.

2008b People Encountered – Government Policy. Electronic document, http://www.history.nd.gov/exhibits/lewisclark/govtpolicy.html, accessed February 15, 2013.

Appendix A: Maps

Ruso Wind Project

Ruso Wind Partners, LLC

Legend

- Survey Area Total (860 acres)
- Turbines Option A
- Alternates Option A
- Turbines Option B
- Alternates Option B
- Proposed Access Roads
- Substation Options
- Proposed Gen-Tie In

T151N R80W; T151N R81W; T151N R82W;
T152N R80W; T152N R81W

Benedict, Benedict NW, Benedict SW,
Blacktail Coulee, & Robinson Coulee Quad. Maps

Missouri River, Painted Woods Creek,
& Souris River Drainages

McHenry & Ward Counties, North Dakota

0 0.25 0.5 1 1.5 2 Miles

0 400 800 1,600 2,400 3,200 Meters

N W E S

Beaver Creek ARCHAEOLOGY

Base Map: USGS 7.5'
Scale: 1:24,000
UTM NAD83 Zone 13

Appendix B: Photos

Figure 3. Overview of the survey area. View to the west.

Figure 4. Overview of the survey area. View to the north.

Figure 5. Overview of the survey area. View to the south.

Figure 6. Overview of the survey area. View to the north.

Figure 7. Overview of the survey area. View to the north.

Figure 8. Overview of the survey area. View to the southwest.

Figure 9. Overview of the survey area. View to the west.

Figure 10. Overview of the survey area. View to the north.

Figure 11. Overview of the survey area. View to the east.

Figure 12. Overview of the survey area. View to the southeast.

Figure 13. Overview of the survey area. View to the north.

Figure 14. Overview of the survey area. View to the northeast.

Figure 15. Overview of a survey area access road. View to the east.

Figure 16. Overview of the survey area substation. View to the northeast.

Figure 17. Overview of a field clearing pile.

Figure 18. Overview of a field clearing pile.

Appendix C: File Search Results

Information Removed Due to North Dakota SHPO Regulations for Public Dispersal of Documents

Appendix D: Site Descriptions

Information Removed Due to North Dakota SHPO Regulations for Public Dispersal of Documents